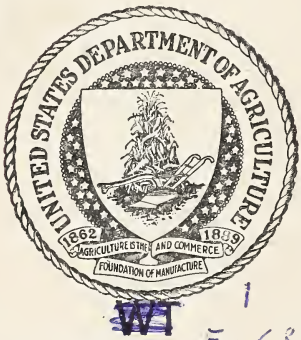

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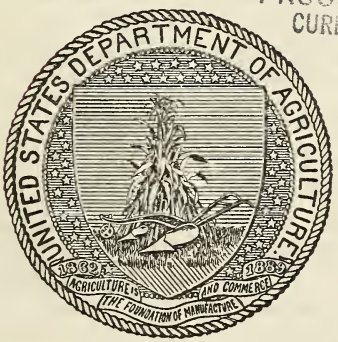

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EXPERIMENT STATION RECORD

VOL. 59 JULY, 1928 No. 1

The celebration of the semicentennial of the North Carolina Experiment Station, observed April 19, 1928, was a notable occasion both to the institution and to agricultural research. For the establishment of this station was a pioneer step, and it came at a time when science and the practical possibilities of research were recognized only by the few and before sentiment for them had been crystalized as it has to-day. Only a single State previously had made legislative provision for an experiment station, and in that case it was stimulated by the promise of additional private contributions.

Hence the foresight and confidence of North Carolina in taking this step were the more remarkable. The action helped to set in motion a new idea, a new departure in public policy which since has found nation-wide acceptance. From being itself an experiment, the North Carolina Station has been tested and proved, and has been a potent influence in the spread to other States. From being one of the very first stations organized in this country, it has become one of a large family, comprising a great and powerful system embracing our entire country and its outlying possessions. Thus the celebration was more than the commemoration of an anniversary of a single institution; it marked the beginning of a revolutionary movement.

The basis of agriculture rests on two sets of resources. The first includes the raw materials supplied by nature, the soil and the sun, climate and season, the biological and physical laws of life and change; the second expresses human ability to discover and utilize these natural resources and to grow through knowledge of nature's secrets. The elements and laws of nature are revealed to man largely through his own efforts, and knowledge of them is essential to living beyond an animal existence. Ability to understand the forces and materials supplied him, to utilize them, to cope with them is an intellectual product which man has attained in his development.

The history of agriculture is the history of this intellectual progress. Nature has not created new raw materials or elements or laws; man has discovered and developed them, and through increasing resourcefulness has brought them within his power, to adapt and direct. This has come from his ability to learn, and the knowledge gained is a product of his own efforts, first through accumulated experience and more recently through research.

It has been said that Nature can not keep a secret. She cloaks it well, but she is ready to divulge it when approached in the proper manner and with capacity to perceive and to understand. Experience based on personal observation is a slow and inadequate means of getting at such secrets, because it is likely to be misinterpreted. It can not go outside or beyond the things experienced, and there are many things it can not see or determine without special aids such as science has developed. So it happens that in a single century research in agriculture has been able to outrun the accumulated knowledge of experience gained through the ages, and has become the powerful instrument for agricultural progress we now recognize it to be.

But long before this came to realization in the experiment station, observation and test and experiment were being invoked as aids in improving agriculture. The age of experiment in this country began with the early colonists, who came into new and strange conditions. They were obliged to determine by experimental planting what crops were adapted to the new regions, and what would be most satisfactory as material for food and clothing for themselves, as feed for their livestock, and as money crops.

The desirability of encouraging agriculture through special grants by Government or by corporations promoting settlement in this country was early recognized. In 1622 James I of England encouraged the breeding of silkworms, and in 1657 the Virginia Assembly voted a premium of 500 pounds of tobacco to the person who should first make 100 pounds of wound silk in one year. In 1643 the General Court of Massachusetts offered premiums to encourage the raising of sheep.

William Penn, who brought settlers into Pennsylvania in 1681, imported well-bred horses, experimented with grasses, and encouraged his people in agricultural improvement.

In 1669 the Lords Proprietors of Carolina sent an expedition to make a settlement on the Ashley River, instructing the leader to stop at Barbados and obtain cotton seed, indigo seed, ginger roots, canes, olive sets., etc., and to make experimental plantings with reference to soils and time of planting best suited to such species, and also to provide seeds and cuttings for use on the plantations. To carry on this experimental work, one or two men were to be assigned, while the rest were engaged in the ordinary operations of farming. Here we have the germ of the experiment station idea in its pioneer form.

The example in South Carolina was followed when the settlement of Savannah, Georgia, was begun in 1733, an experimental garden of ten acres being started which contained oranges, olives, white mulberries, figs, peaches, and a variety of vegetables and other plants.

Lands were allotted on condition that mulberry trees should be planted, and between 1733 and 1743 the English Parliament granted large sums of money to promote the growing of indigo and other crops in that colony.

About 1760 George Washington began to study agricultural problems systematically and to make experiments on his estate at Mount Vernon. These he continued for many years, covering a quite wide range of subjects, such as the use of fertilizing materials, crop rotations, treatment for wheat smut, and the control of the Hessian fly and rust. He worked on the improvement of wheat by selection, and of orchard fruits and vegetables, growing experimentally many species of ornamental trees, shrubs, and flowering plants. He was especially interested in the conservation and improvement of the soil, which he noticed already was showing the tax of continued cropping.

This interest found expression in the plea Washington made in his last message to Congress in 1796 for the establishment of a national board of agriculture, one of whose functions would be, as he said, "to encourage and assist a spirit of discovery and improvement . . . by stimulating to enterprise and experiment."

The agricultural societies founded in this country near the close of the eighteenth century, the first in 1785, of which Washington was a member, supplied means for furthering experimental inquiries and the dissemination of information on improved practice. These societies encouraged their members to make such experimental trials, and published accounts of them in their transactions. The Philadelphia Society for Promoting Agriculture offered premiums for records of "actual experiments in testing various farm practices"; and the society early organized in South Carolina listed among its objects the carrying on of an experimental farm, evidently with much the same idea that found expression later on. Some of these organizations provided themselves with specialists to conduct laboratories for the analysis of soils and fertilizing materials, and to respond to inquiries on various subjects.

Closely connected with the efforts of these agricultural societies were the geological surveys provided by numerous States. Generally these surveys included the agricultural resources, along with the mineral and other features, giving attention to soils, marls, lime, and other materials of agricultural interest, while some took into account the flora of the region, especially species considered of economic importance, and even injurious insects. Such geological surveys were early established in the Southern States, beginning with North Carolina in 1823. It was in connection with a geological and agricultural survey in Mississippi (1850) that Dr. E. W. Hilgard began his classic work with soils, giving attention to the surface features, includ-

ing plants, soils, marls, water supply, and other factors and publishing a noteworthy report. The examination of marls by the geological survey in South Carolina led to the important discovery that these contained phosphate of lime, which later made them a great commercial source of supply.

The early steps of the Federal Government in the interest of agriculture took the form of the distribution of seeds and plants, begun through a congressional appropriation in 1839, under the Commissioner of Patents. Later the work under that office was extended to include chemical, botanical, and insect investigations, and a propagating garden. This was the forerunner of the Department of Agriculture.

The Morrill Land-Grant Act of 1862, providing for agricultural colleges in the States, evidently contemplated the carrying on of investigations, for it stipulated an annual report including, among other things, "any improvements and experiments made, with their cost and results." Such experimental investigations in field and laboratory were undertaken by many of the colleges, usually with small means and, for the most part, voluntarily by professors outside their regular instruction duties. Frequently these were stimulated by the departments and boards of agriculture which in due course had been organized in various States, and publicity was given to such work through their meetings and annual published reports. The advent of commercial fertilizers and the need for their testing and control further emphasized the desirability of a special agency for agricultural inquiry, while the work of the European experiment stations, notably the Rothamsted Station and those in Germany, aroused increasing interest in the United States.

Such, briefly, were some of the leading events which led up to and paved the way for experiment stations in this country. It was not until 1875, however, that the State of Connecticut took the initial step and made a small appropriation for establishing, in quarters furnished by Wesleyan University at Middletown, the first American station. The same year the University of California provided funds to enable Dr. E. W. Hilgard, who had recently gone there, to organize agricultural investigation; and two years later North Carolina followed with the action commemorated by the recent celebration.

At the semicentennial exercises the unique rôle which the North Carolina Station has played in the development of agricultural research was fittingly depicted. All of its former directors who were still living were in attendance, and among the speakers were Dr. Charles W. Dabney, the second director, who served from 1880 to 1887; his successor, Dr. H. B. Battle, director during the next decade;

and Dr. B. W. Kilgore, who was director from 1899 to 1907 and again from 1913 to 1925. The U. S. Department of Agriculture was represented by Dr. E. W. Allen, Chief of the Office of Experiment Stations, the State Department of Agriculture by Commissioner of Agriculture W. A. Graham, and several other State experiment stations and educational institutions by one or more delegates.

The addresses of Drs. Dabney and Battle were mainly historical and reminiscent, and presented a graphic story of the early days. It seems that the leading part in founding an experiment station was taken by Dr. Kemp P. Battle, then president of the University of North Carolina. This institution had just opened its doors to students, and its president was alert and active in extending its scope and influence. Learning of the experiment station established in Connecticut, he visited it and became impressed with the need for such a station in North Carolina to assist in the regeneration of agriculture in the State. As in Connecticut a special argument for such an institution was found in the fact that commercial fertilizers were being introduced into the State, and there was no provision for any control.

In January, 1877, President Battle called a meeting of representatives of State agricultural organizations, at which he presented a report of his observations. It was decided to appeal to the legislature for the establishment of a State department of agriculture, supported by fertilizer license fees, and an experiment station connected with that department and supported from its funds. The legislature acted quite promptly upon this request, passing on March 12 an act creating the North Carolina Agricultural Experiment and Fertilizer Control Station. On April 19, Dr. Albert R. Ledoux began work at the station as its first director, so that the date celebrated represents the conclusion of 50 years of work.

Dr. Dabney's address dealt with the incidents which led up to the establishment of the station, with an appreciation of the foresight of Dr. Battle and of the Governor and other State officials who were responsible for success in securing the legislation. He enumerated the wide variety of service expected from the experiment station in the early days, including not only the inspection of fertilizers but the analysis of soils and other materials sent in for examination, a vast amount of chemical work for the State Geological Survey, laboratory examinations for the Public Health officials, the examination of viscera, etc., in poison cases, and other activities. The station chemist was regarded as State chemist, and this implied a large amount of work which was not strictly within the range of the experiment station. Dr. Dabney contrasted the meager allotment of funds and the very small and limited equipment of the station in the early

days with those at its disposal at the present time, pointing to the present broad range of its work and the personnel of its staff, which now covers practically every important branch of agriculture.

A distinctive feature concluding the exercises was a pageant portraying the steps which led to the establishment of the station. This pageant was based on the minutes, which fortunately had been preserved, of the meeting called by President Battle in 1877 to discuss ways and means of bringing about needed agricultural relief, and which was attended by representatives of the State Agricultural Society, the Grange, prominent planters, and several members of the university faculty. The addresses made, some of which were reported as historically correct, presented in vivid form the conditions existing and the need for assistance based on education and research. It is interesting to note that out of this conference the concrete things which resulted were the establishment of a State Department of Agriculture with a fertilizer control and experiment station.

The noteworthy accomplishments of the station during its long history were recounted by several speakers. For example, Dr. Clarence Poe, agricultural editor and a member of the board of trustees, declared that no farmer will this year raise his crops and feed his stock without making use of the results secured by the station. A more specific enumeration of its achievements was made by Dean I. O. Schaub, director of extension in the college, entitled Contributions of the Station to the Agriculture of North Carolina. Among the matters mentioned by Dean Schaub were the work with fertilizers for different crops and on different soil types, the development of natural resources such as the marl beds, variety testing, and plant improvement. In the latter connection he stated that a survey has shown that 66 per cent of the North Carolina acreage in cotton is planted with two varieties developed or introduced and adapted by the station, with an increased value estimated at over $3,000,000. The average yield of corn, due to better methods based on station recommendations, has shown an increase of almost 100 per cent, equivalent to from $15,000,000 to $20,000,000, as compared with 20 years ago. Tobacco has greatly increased in production per acre, in quality, and in value. The station introduced the soy bean into the State in 1881, and to this crop a half million acres are now planted. The control of various diseases affecting crops has resulted in great financial savings and enabled the extension forces to give growers the aid they require. In horticulture the station has fostered the development of dewberry growing and has promoted the growing of peaches, which has resulted in an annual crop of several thousand carloads. Likewise, in animal husbandry poultry production has been increased as a result of the work in breeding, feeding, and man-

agement. The station's work has contributed to the production and utilization of pastures, the intelligent and safe use of cottonseed products, and the finding of methods of producing hard pork and avoiding the softening effects of certain feeds. Summarizing, he estimated that the annual value of the products of North Carolina, as a result of the work of its station and of those in other States, is fully $50,000,000 more than it would have been if the farmers of the State had not had such agencies available.

An epitome from a somewhat different angle was presented by Dr. Allen, whose paper has been freely drawn upon in the present discussion. He brought out the fact that the State of North Carolina "was among the very first to provide for a fertilizer control, and the efficiency of the station in maintaining this and in studying fertilizing materials and their use has been of great value wherever commercial fertilizers are used. The attention directed to this important matter has included the study of fertilizer resources such as phosphates and marls, the maintenance of fertility, the improvement of more lands by the system of farming and the growth of cowpeas and other green manures, and the testing of various crop rotations. The station was a pioneer in carrying its soil and fertility experiments out into different sections of the State, by means of a system of test farms or branch stations located on type soil areas or those representing special farming conditions. These were made available by the State Department of Agriculture, and continue to be enjoyed. This activity, aside from its local results, has demonstrated the value of an orderly type of work carried on under known conditions for a sufficient period to give safe conclusions.

"In its promotion of the livestock industry, special attention has been given to working out the possibilities, studying the feed resources of the State, the suitability of forage crops of various kinds to the region, and the culture of clovers, vetches, and other leguminous crops, to develop home-grown feed resources. In the field of poultry raising conspicuous service has been rendered on feeding, management, and diseases.

"Cotton growing, with special reference to improvement in culture and in type of product, and study of the value and uses of cottonseed meal and hulls have naturally occupied a prominent place in the station's program. The determination of the toxic principle of cottonseed meal constitutes one of its notable contributions. The studies on cotton breeding by the present director have made him one of the best known specialists in that field. Another crop to receive special attention is tobacco, which has been studied as to its fertilizing and culture, curing and diseases. The investigations long under way on

the plant diseases and other pests with which agriculture is menaced have yielded abundantly.

"More than thirty years ago the station demonstrated, under Professor Massey, the possibilities of the successful growing of flowering bulbs on a commercial scale, an industry practically unknown in this country at the time the work was done.

"From the first agricultural chemistry has figured prominently in the activities of the station, as was commonly the case with the early stations; but this fact has not been reflected in a narrowness of view or organization in providing for a well-rounded field of inquiry. This has been the workshop of such men as Ledoux, Dabney, Battle, Withers, Kilgore, and Williams, whose investigations have added luster to the progress of chemistry as applied to various branches of agriculture, as well as practical results. It is worth while also to call attention to the long list of workers who have gone out from the service of this station as a credit to it in continuing their work and making their mark elsewhere—Fraps, Bizzell, Blair, Stevens, Wolf, Gray, Reimer, Detjen, Cooper Curtice, Kendall, and others. The late Milton Whitney, for many years a national figure as chief of the U. S Bureau of Soils, was agriculturist of this station back in the early 80's.

"Throughout its course," Dr. Allen concluded, "the station has stood as a live, progressive agency for the growth of sound fact and the protection of the agricultural industry, not only against fraud, deception, and misconception, but against natural enemies and from the errors of man's own ways in handling the soil and other resources. In these ways it has far more than fulfilled the prophesies of the fathers whose vision led to its birth, and in conjunction with a strong and efficient State Department of Agriculture it has given a background for agricultural development of which any State might justly be proud."

The frequent references in this and other addresses during the celebration to the North Carolina State Department of Agriculture served to emphasize the intimate associations which have characterized the work of these agencies. As Dr. Allen stated elsewhere in his address, "wherever there has been a strongly organized State department of agriculture, the relations with the experiment station have been close and coordinated. This is not only logical but important from a practical standpoint, and frequently offers opportunity for collaboration.

"This State," he went on to say, "has been especially happy in preserving and carrying forward this relationship. The experiment station started out as a division of the Department of Agriculture. For the first ten years of its career its support came from that source. Later it became affiliated with the agricultural college, as the Hatch Act provided, but it continued to receive support and enjoy the

facilities of the State Department. Gradually, in the coordination of effort, it became the agency primarily responsible for carrying on agricultural research, as in other States; but this, instead of weakening the State Department, has put it in an even stronger position to concentrate upon its special work and responsibilities, backed by the findings of research. As an agency for the promotion of agriculture in the State, it naturally is concerned for the utmost success of the experiment station. In this respect, its position is not unlike that of the Federal Department of Agriculture, through whose annual appropriation the experiment stations receive so bountifully towards their support and which, in turn, looks to the stations to cover a certain portion of the necessary field of activity. This expresses the modern view of coordination and interdependence of State institutions,—of teamwork and the spirit of cooperation and helpfulness on which the advancement of the art and the theory of agriculture rests."

Further testimony as to the cordiality and mutual helpfulness of these relations was given by Commissioner of Agriculture Graham who voiced a very high appreciation of the work of the station and of what it has accomplished for the agriculture of the State. His address bore out the sympathetic attitude of the State Department toward the station exemplified in the financial contributions and the facilities it has made available.

The development of cooperation in agricultural research has been one of the significant changes of recent years. In the early days and even after the passing of the Hatch Act the stations worked rather independently, regarded problems from their own viewpoint, and knew relatively little of what was being done by others until it was published. Frequently they were somewhat jealous of their fields and of their methods of approaching problems, apprehensive of losing some advantage which they felt they had gained. Gradually, however, the immensity of the field and the idea of the interdependence of the stations and of their workers in solving the intricate problems before them became evident.

This has been fortunate, for the development of new facts and their applications usually is the combined result of many efforts, frequently widely distributed and marking successive steps or stages. One discovery leads to another, making possible still further advance through the suggestion offered. Once we get below the surface, the problems of agriculture are found to be very complex and many-sided. They must be analyzed to get at their real nature and what is involved in studying them, and then they must be worked out part by part.

All this limits what any individual worker or single institution can hope to do alone, and it emphasizes the idea of cooperation and collaboration, and of taking account of what others are doing in developing methods and results. In this respect no man and no station lives and works unto himself. There is mutual dependence, a class community of interest. Furthermore, the value and application of results are not necessarily restricted to the State where they are first brought to light, and the advance which one investigator makes in clearing up a problem may be further pushed forward by one in another locality. This gives a regional and often a national value to the results of individual stations.

The public is not interested, therefore, in divorcing the sciences and the agencies which represent them, but rather in their union and joint effort. Departments and divisions and separate institutions are set up as administrative units rather than as wholly unrelated research units, for projects to be most effective need to be organized around problems in a way to integrate the various specialties and viewpoints.

This idea of mutual relations has found increasing recognition in recent years, resulting in less duplication and one-sided effort, and more effective and rapid advance. As evidence of this progress, no less than 620 cooperative projects are being carried on between the Federal Department of Agriculture and the State experiment stations at the present time. In other words, fully one-tenth of all the experiment station projects are cooperative, and beyond this special attention is being given to coordinated effort. For coordination is hardly less important than actual cooperation, and provision for it is incorporated in the Federal acts making appropriation for the stations in the States.

It is because of these relationships one to another and their copartnership in the search for truth and understanding that the American stations are referred to as constituting a system. Although separate State institutions, they represent a vast cooperative enterprise between the States and the General Government, the most extensive example ever undertaken in research, bound together by common purpose and mutual interest. What this will mean in better and more enlightened agriculture as the years go on stimulates the imagination, for thus far we have only made a beginning in finding out how to learn.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

A comparative study of the glutelins of the cereal grains, R. K. Larmour (*Jour. Agr. Research [U. S.], 35 (1927), No. 12, pp. 1091–1120*).—Following a rather extensive digest of the literature, this contribution from the Minnesota Experiment Station reports the isolation, analysis, and examination for basic amino acid content and other nitrogen distribution by Van Slyke's method (E. S. R., 26, p. 22) of glutelins from common wheat, spelt, durum wheat, emmer, einkorn, rye, oats, maize, teosinte, barley, and rice.

"Analyses for nitrogen distribution by the Van Slyke method revealed a well-marked relationship between the various preparations, especially in respect to the basic nitrogen fraction. Glutenin of wheat, *T. vulgare*, and oryzenin of rice, *O. sativa*, both well-defined glutelins, occupy positions at the extreme opposite limits of the class in respect to ammonia nitrogen (practically) and total basic nitrogen, and the corresponding values for the other proteins described fall within these limits. This is submitted as evidence that the preparations obtained belong to a definite class of proteins, the glutelins, which is represented in all the cereal grains thus far studied."

Non-protein nitrogen of the velvet bean, E. R. Miller and M. A. Barnes (*Alabama Sta. Rpt. 1925, p. 11*).—An average of 4 per cent total nitrogen and 0.51 per cent nonprotein nitrogen was found in the seed. The nonprotein nitrogen consisted of acid amide nitrogen, basic nitrogen, and amino acid nitrogen, the latter predominating. From 0.35 to 0.4 per cent of nitrogen was found extractable by prolonged treatment with 90 to 95 per cent alcohol. The greater part of this was attributed to 3-4-dihydroxyphenylalanine. In the pods an average of several determinations showed 0.609 per cent total nitrogen, 0.166 per cent being nonprotein nitrogen.

Non-protein nitrogen of the Tracy velvet bean seed, E. R. Miller and C. R. Saunders (*Alabama Sta. Rpt. 1925, p. 12*).—Results similar to those noted above for the velvet bean seed in general are reported.

The movement of nitrogen in the yeast mash [trans. title], S. M. Filosofov and B. K. Shtaub (*Nauch. Zap. Gosud. Eksper. Inst. Sakh. Promysh. [Kiev], 5 (1927), No. 6, pp. 193–200*).—The authors present comparative experimental data on the nitrogen losses in the process of yeast manufacture from grain and sirup. The losses are due to the inability of the yeast to utilize most of the nitrogen from the substrata.

Watery whites in eggs, J. L. St. John and E. L. Green (*Washington Col. Sta. Bul. 222 (1927), pp. 15, 16*).—An attack upon this problem was based on the thesis that the difference between watery and firm egg white is due to a difference in the colloidal condition. An apparatus was designed and a number of determinations of mobility were made, leading to the conclusion, among others, that the difference between watery and firm egg white is not of the same nature as the difference between fresh and storage eggs. Fairly

definite differences in H-ion activity strengthened this conclusion. Indications that there is a variation in the proportion of the various protein constituents were obtained.

Heat and moisture as factors in the destruction of gossypol in cottonseed products, W. D. GALLUP (*Indus. and Engin. Chem., 19 (1927), No. 6, pp. 726–728, fig. 1*).—This contribution from the Oklahoma Experiment Station describes experiments on the detoxication of cottonseed by heating dry in an electric oven, in an autoclave in the presence of excessive moisture, and by germinating. It was found that heating the seeds in a dry condition, though it effected a change in the condition of the gossypol, only slowly reduced the toxicity of the seed. In the autoclave the gossypol was rapidly destroyed and a nontoxic product was produced. Germination was ineffective.

Toxicological chemistry, E. MANNHEIM and F. X. BERNHARD (*Toxikologische Chemie. Berlin: Walter de Gruyter & Co., 1926, 3. rev. ed., pp. 135, figs. 5*).—This is a summary guide to the toxicological examination of foods and other materials. Following a brief introduction, the contents are as follows: The reactions of metal poisons, the general reactions of the alkaloids, and the procedure for the detection and quantitative determination of poisons. The last named subject is subdivided into (1) volatile poisons, (2) nonvolatile organic poisons, (3) metal poisons, (4) free mineral acids, (5) oxalic acid, (6) acetic acid, (7) caustic alkalies, (8) carbon monoxide and dioxide, (9) sulfurous acid and sulfureted hydrogen, and (10) chlorine, bromine, iodine, and fluorine. An appendix describes the preparation and testing of reagents.

[Bacteriological and chemical investigations in Wisconsin] (*Wisconsin Sta. Bul. 396 (1927), pp. 83–85*).—Among bacterial activities studied are noted studies on the production of sauerkraut (E. S. R., 58, p. 712) and of bacterial fermentations yielding acetone, ethyl alcohol, and butyl alcohol. The production of acetyl methyl carbinol was found to be increased by the addition of phosphates to the cooked corn mash and decreased by the addition of proteins. Eleven strains of the butyl alcohol organism were isolated. It is noted that these organisms are anaerobes capable of fermenting a great variety of carbohydrates other than those of corn, as well as a number of proteins.

On the citric acid fermentation [trans. title], M. S. FILOSOFOV and V. E. MALINOVSKIĬ (*Nauch. Zap. Gosud. Èksper. Inst. Sakh. Promysh. [Kiev], 5 (1928), No. 7, pp. 235–239, figs. 4*).—Two types of Penicillium, *Aspergillus niger*, *A. clavatus*, and Citromyces were tested for their ability to convert sugar into citric acid. The medium used was a modification of the Henneberg liquid medium, and consisted of 0.2 per cent of $NH_4H_2PO_4$, 0.2 per cent of KNO_3, 0.05 per cent of $MgSO_4$, and 10 per cent of sugar and tap water. In 20 days Citromyces produced citric acid equal to 17.1 per cent of the sugar in the medium.

Iodine in drinking waters, J. B. ORR, W. GODDEN, and J. M. DUNDAS (*Jour. Hyg. [London], 27 (1928), No. 2, pp. 197–199*).—The authors conclude from a study of the relation between the iodine content of drinking waters in various localities in England and Scotland that no correlation can be established between a low iodine content in the drinking water and the endemicity of goiter.

Two possible sources of error in the determination of iodine in drinking waters are noted: (1) It was observed that when the water on being made alkaline and evaporated gave a large precipitate of calcium carbonate or other salts it was sometimes difficult to insure complete extraction of the potassium iodide by alcohol. To avoid this difficulty, it is recommended to extract the residue from the first ashing with about 10 cc. of hot water and to repeat this extraction twice. The iodine in the residue and in the aqueous extract may then be determined separately in the usual way. As examples

of the need for this precaution, it is noted that a hard water from Canterbury gave by the usual method 0.25γ per liter, but when treated as above recommended showed 4.32γ per liter. The Cambridge sample gave 0.08 and 0.8γ per liter by the two forms of the method, respectively. (2) In the case of an acid mineral water with a high iodine content sufficient potassium hydroxide to make the water alkaline should be added when the sample is taken. The loss possible when this precaution is neglected is illustrated by an example in which 285γ per liter was found when the sample was handled in the ordinary way, but when made alkaline on collection the result was 930γ per liter.

The influence of the presence of sugar in the waste waters used for slaking lime on the filtration of the juices [trans. title], B. A. Lĭasko (*Nauch. Zap. Gosud. Èksper. Inst. Sakh. Promysh. [Kiev], 5 (1927), No. 3, pp. 105–109, figs. 3*).—It was noted that whenever the lime used in the filtration of the juice in the process of the first saturation was slaked with the waste waters from the sugar factory the filter presses clogged. A series of experiments showed that the presence of the sugar in the waste waters is responsible for the trouble. As a result some of the lime remains unslaked, calcium sucrate is formed, and a change in consistency of the slaked lime particles takes place. These changes hinder the process of filtration.

The utilization of filter press residues [trans. title], M. S. Filosofov (*Nauch. Zap. Gosud. Èksper. Inst. Sakh. Promysh. [Kiev.], 5 (1928), No. 8, pp. 256–260*).—The author proposes a scheme for the utilization of the lime residues at the sugar plant, based on his experiments in producing citric and lactic acids from molasses biologically. The calcium salts of these acids are to be produced at the sugar factory and as such shipped for purification to the centers where these acids are utilized in industry.

The problem of conserving sugar beets by drying [trans. title], G. S. Benin (*Nauch Zap. Gosud. Èksper. Inst. Sakh. Promysh. [Kiev], 5 (1927), No. 2, pp. 49–55*).—The author discusses the effect of drying sugar beets in a rarefied atmosphere, and his conclusions are summarized as follows: (1) The purification of the diffusion juice obtained from dried beets by the ordinary methods of defecation-saturation is satisfactory, and (2) the coloration of the purified juice is several times as great from dried beets as from raw beets. Even the best quality of dried beets give a definite coloration, and it is necessary to use activated carbon for clarifying the juice.

Use of the refractometer in the analysis of individual sugar beets, S. F. Sherwood (*Jour. Agr. Research [U. S.], 36 (1928), No. 1, pp. 41–52*).—The author finds possible a satisfactory determination of total soluble solids in the beet juice by the examination with the refractometer of a few drops of juice squeezed from a very small sample of the pulp, the juice being allowed to fall directly upon the prism of the instrument. It was found safe to delay the determination up to 24 hours if the pulp were stored in air-tight containers at a temperature of approximately 12° C. It is considered that the percentage of total soluble solids affords only an extremely rough and very unreliable approximation of the percentage of sucrose, so that it should not be used for this purpose. The determination of sucrose by means of a saccharimeter is considered necessary.

A method for determining "apparent purity by refractometer," for the details of which the original must be consulted, is described. The figures were found not comparable with apparent purity of juice as determined by the Brix hydrometer, but appeared to be comparable among themselves within a rather small range of error, so that this factor is believed to afford a valuable criterion for estimating the comparative quality of individual beets.

Polarized platinum electrode in neutralization reactions, A. H. WRIGHT and F. H. GIBSON (*Indus. and Engin. Chem., 19 (1927), No. 6, pp. 749, 750, figs. 2*).—By means of a supplementary electrode and a polarizing circuit producing a polarizing current of 2.3×10^{-5} amperes, the platinum electrode of the system Pt | titrand | sat. KCl | Hg_2Cl_2 | Hg was cathodically polarized, and acid base titrations were successfully performed with the system. Titration curves for the titration of hydrochloric acid with sodium hydroxide, phosphoric acid with sodium hydroxide, and sodium carbonate with hydrochloric acid are given. The apparatus is said to be similar to that described by Willard and Fenwick.[1]

The phosphate ion and hydrolysis by pancreatic lipase, E. R. DAWSON and B. S. PLATT (*Jour. Gen. Physiol., 11 (1928), No. 4, pp. 357–360, figs. 4*).—The equation (activity of enzyme) $(pPO_4)^n=K$, was investigated and shown to have only a limited application to the effect of the phosphate ion on the hydrolytic activity of pancreatic lipase. The deviations observed are ascribed to the effect of certain factors on the stability of the enzyme.

Determining moisture by the distillation method [trans. title], G. S. BENIN (*Nauch. Zap. Gosud. Èksper. Inst. Sakh. Promysh. [Kiev], 5 (1927), No. 5, pp. 145–156, figs. 6*).—After reviewing the large number of distillation methods used in the determination of water in various substances, the author presents experimental work on the use of a distillation method in determining the moisture content of sugar beets. Toluol, xylol, and turpentine were used as working liquids. The distilling apparatus consisted of a 250-cc. flask, connected with a Liebig condenser and a burette measuring 30 cc. with 0.1 cc.-scale divisions. The thermometer fitted in the stopper of the flask with the mercury bulb subjected to the hot vapors. With each determination a blank was run, and the value was subtracted from or added to the determination. The results, presented in graphic form, show that at first the temperature rises, then the working liquid and water begin to boil (in all cases the temperature is below 100), and the temperature remains constant until all the water has been driven off.

With xylol the distillation was completed in 10 minutes after the xylol began to boil, and with turpentine in 7 minutes. The distillate had the appearance of an emulsion, but after standing a little while the water layer separated out. It takes about 40 minutes to distill over 20 cc. of water from sugar beets.

Xylol and turpentine are both recommended by the author as working (extraction) liquids for determining moisture in sugar beets. A list of 35 references is appended.

An all-glass distilling tube without constriction, H. J. LUCAS (*Indus. and Engin. Chem., 19 (1927), No. 6, p. 680, figs. 2*).—It is noted that the usual form of distilling tube is constricted near the bottom where maximum capacity ought, as a matter of fact, to be provided. The device here described and figured overcomes this difficulty without the use of metal parts by supporting in a straight, wide tube, provided with the usual side tube near the top, a column of hollow cylindrical beads upon a short piece of tubing expanded in the middle into a bulb capable of resting on four indentations in the wall of the large tube and pierced above the bulb with sufficient holes to permit the free passage of vapor. Below, the short tube, like the main tube, is cut at an angle. It is noted that the same principle can be applied in the construction of the Pim chlorinator, and the modified form of the latter device is also shown.

Manganese interference in the o-tolidine test for available chlorine, E. S. HOPKINS (*Indus. and Engin. Chem., 19 (1927), No. 6, pp. 744–746, figs. 3*).—The characteristic yellow color produced by free chlorine on adding the *o*-toli-

[1] Jour. Amer. Chem. Soc., 44 (1922), No. 11, pp. 2504–2529.

dine reagent is not specific, and is here shown to be proportional in intensity to the concentration of loosely-bound oxygen. Stable manganese salts were found not to affect the *o*-tolidine reagent, but manganese compounds capable of acting as oxygen carriers (the hydrated oxides resulting from making solutions of manganese salts alkaline) had a marked effect. "Such a condition [the presence of soluble manganese in a reactive condition] may easily exist in a small purification plant . . . where greater reliance is placed upon the residual chlorine test than in the larger ones under constant bacteriological control."

Estimation of acid amide nitrogen, E. R. MILLER and C. R. SAUNDERS (*Alabama Sta. Rpt. 1925, p. 12*).—A study of the usual method of determining amide nitrogen by distillation with magnesia showed that in the cases of urea and of eight organic acid amides the method was inadequate to release all the amide nitrogen even after the amides had been treated for 30 minutes with 20 per cent hydrochloric acid to effect hydrolysis.

The determination of the equivalent weight of proteins, A. E. STEARN (*Jour. Gen. Physiol., 11 (1928), No. 4, pp. 377–389, figs. 4*).—The conclusion of Hoffman and Gortner (E. S. R., 54, p. 801) that proteins combine stoichiometrically with acids and bases only between limits of approximately pH 2.5 and pH 10.5, indicated by the experiments of the authors cited as holding true for the prolamines examined by them, was tested in the investigation here reported with respect to its applicability to gelatin. "The present paper presents data indicating that, in the case of gelatin and HCl, the same value is obtained for the equivalent weight of gelatin whether the gelatin is titrated with acid or the acid with gelatin. In the case of gelatin and NaOH, contrary to obtaining a higher equivalent weight for the gelatin when titrating the base with the protein, a slightly lower value was obtained, due probably to carbon dioxide absorption."

It is concluded that the binding due to adsorption is, in the case of gelatin, not significant as compared with that due to chemical combination. Though admitting that gelatin experiments are not an entirely satisfactory basis for generalizations with respect to protein behavior, the author feels that "the conclusions of Hoffman and Gortner from their work on the prolamines may also be too widely generalized, and that, on the whole, the acid or alkali bound by adsorption in the case of proteins will not constitute the large majority of the total amounts bound, though certainly one will expect a certain amount of such binding in all cases."

The determination of benzoic acid in foodstuffs, G. W. MONIER-WILLIAMS ([*Gt. Brit.*] *Min. Health, Rpts. Pub. Health and Med. Subjs. No. 39 (1927), pp.* [3]+57, *fig. 1*).—This is a short monograph taking up (1) extraction with solvents, (2) steam distillation, (3) purification of crude benzoic acid, (4) confirmatory tests for benzoic acid, and (5) natural occurrence of benzoic acid. Details are given of a method, the essentials of which are as follows:

Place 30 to 100 gm. of the sample in a 500-cc. flask and, if liquid, saturate with salt, about 40 gm. per 100 gm. of water present being required. Mix non-liquid samples with water to the required consistency and saturate with salt. Make the mixture distinctly acid with phosphoric acid and distill in a rapid current of steam, collecting the distillate in a vessel containing about 10 cc. of N sodium hydroxide. Collect about 500 cc. of distillate in from 1.25 to 1.5 hours. Heat the flask containing the material distilled sufficiently to prevent increase of volume by condensation of steam. Evaporate the distillate after washing down the condenser with 25 cc. of 0.1 N sodium hydroxide to a volume of from 10 to 30 cc., keeping the liquid alkaline. Allow the concentrated distillate to cool to from 40 to 50° C., and treat with a 5 or 6 per cent solution

of potassium permanganate in water until a slightly pink color is clearly visible and persistent. Destroy the excess of permanganate, after cooling, by the addition of either sodium sulfite or of a few bubbles of sulfur dioxide gas. Acidify with a few drops of sulfuric acid when the precipitated manganese dioxide should be dissolved and the liquid should become colorless. A little more sulfur dioxide will clear the liquid if necessary.

The procedure is completed by saturating this solution with salt, extracting the benzoic acid with several portions of a mixture of methylated ether and petroleum ether, evaporating in such a manner as to avoid loss of the benzoic acid, and subliming the acid from its mixture with sand through disks of filter paper in test tubes. The final determination is gravimetric.

Comparison of sensitivity of various tests for methanol, L. O. WRIGHT (*Indus. and Engin. Chem., 19 (1927), No. 6, pp. 750–752*).—The following procedure, evolved after a careful survey of available methods, is recommended as both convenient and amply sensitive:

(1) Potassium permanganate—dissolve 3 gm. of potassium permanganate in 100 cc. of water previously distilled over potassium permanganate, and containing 15 cc. of phosphoric acid. By using water previously distilled from potassium permanganate solution, this reagent can be kept for a long time. (2) Oxalic acid solution—dissolve 5 gm. of oxalic acid in a solution made by diluting 50 cc. of sulfuric acid (1.84) to 100 cc. (3) Schiff's reagent (modified)—dissolve 0.2 gm. of rosaniline, or an equivalent weight of its salt, in 120 cc. of hot water, cool, and add this to a solution of 2 gm. sodium bisulfite in 20 cc. of water. Finally add 2 cc. of concentrated hydrochloric acid and dilute the whole to 200 cc. This solution should become colorless or nearly so after standing. If it is protected from the air no deterioration results.

Place 2 cc. of the sample in a test tube and add 1 cc. of the potassium permanganate solution. Allow to stand for 10 minutes; decolorize by adding 1 cc. of the oxalic solution, followed by 2 cc. of the modified Schiff's reagent and mix. The solution must be mixed thoroughly. If methanol is present a violet color is developed. With traces of methanol the color is not developed for an hour.

Glycerol or pectin in sufficient amounts will produce a like color. The test should then be made on the distillate.

SOILS—FERTILIZERS

[Soil investigations at the Connecticut State Station] (*Connecticut State Sta. Bul. 291 (1927), pp. 102, 103, fig. 1*).—The completion of the classification of 51 soil series is noted, these having been divided into 10 major groups which, with some subgrouping, make 15 of these groups, a key to which has been worked out for the use of county agents. Greenhouse studies on 22 soils, representing 12 types, showed a marked response to lime in all but 3, and some potash response in all but 2, though potash was as valuable as phosphorus in only 5 of the soils studied.

Soil survey of the Hollister area, California, S. W. COSBY and E. B. WATSON (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1923, pp. IV+643–681, pls. 4, figs. 3, map 1*).—The Hollister area, comprising 192,640 acres, includes practically all of the important improved agricultural areas of San Benito County in west-central California. The topographic features vary from those of the very flat Bolsa de San Felipe region, which has heavy textured soils, rather poor drainage, and irregularly distributed concentrations of alkali salts, to high, rough, and broken land reaching 2,000 ft. above sea level on the slopes of the eastern boundary range and 2,500 ft. on the east

slopes of the western boundary range. With the exception above noted, drainage is in general well developed.

Of the total area 27.7 per cent is placed by this survey in the unclassified group of rough mountainous lands, Altamont clay loam, 11.4 per cent, being next in extent. In all, 12 soil series of 23 types are mapped and described. The survey was made in cooperation with the California Experiment Station.

Soil survey of Monroe County, Indiana (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1922, pp. IV+1723–1770, pl. 1, figs. 2, map 1*).—This report, prepared in cooperation with the Indiana Experiment Station, is in two parts:

I. [*Soil survey*], T. M. Bushnell and E. D. Fowler (pp. 1723–1755).—Monroe County, in south-central Indiana, comprises 266,240 acres, subdivided with respect to topography into three principal sections of (1) the Norman upland, (2) the Mitchell plain, and (3) the Crawford upland. The Norman upland consists of the remnants of old plains much dissected by creeks and their tributaries into valleys 200 to 400 ft deep. The Mitchell plain is in general smooth and level, though locally irregular by reason of numerous sink holes and roughly dissected areas along the streams, while the Crawford plain resembles the Norman, except in that it possesses less sharply sloping dissection features than the Norman plain and has less complete drainage.

Muskingum stony silt loam 20.0 per cent of the total area of the county, Frederick silt loam 15.2, Bedford silt loam 13.6, and Tilsit silt loam 11.8 per cent are the more extensive of the 28 soil types, here assigned to 21 series, which are mapped and described, together with 2.1 per cent of rough stony land.

II. *The management of Monroe County soils*, A. T. Wiancko and S. D. Conner (pp. 1757–1770.)—General information is given on the management of Monroe County soils, chemical analyses and suggestions as to fertilizer needs being included.

Soil survey of Appanoose County, Iowa, C. L. Orrben and W. W. Strike (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1923, pp. III+683–713, fig. 1, map 1*). Appanoose County includes 328,320 acres of broad, even, extensively dissected plain in southeastern Iowa. The Chariton River has cut a deep, wide valley, and erosion has produced hilly and broken land near the streams. Good drainage, in part to the Mississippi River and in part to the Missouri River, is provided by a number of small streams.

Of the 15 soil types included in the 12 series here mapped and described, the more extensive are Shelby loam 40.1 per cent, Grundy silt loam 25.8 per cent, and Lindley loam 10.8 per cent, of the total area surveyed. The survey was made in cooperation with the Iowa Experiment Station.

Reconstruction of forest cover based on soil maps, J. O. Veatch (*Michigan Sta. Quart. Bul., 10 (1928), No. 3, pp. 116–126, figs. 4*).—A study of natural forestation with relation to natural soil type is reported, the data including a table showing the principal soil types of the southern and northern peninsula regions of Michigan, the character of these types, and their forestations in their well drained and in their poorly drained phases. It is considered that such a correlation may be capable of use in the reconstruction of the original forest or plant cover, to a large extent destroyed by lumbering and agricultural operations.

Soil types and thickness of stand affect the root development of crops, M. M. McCool (*Michigan Sta. Quart. Bul., 10 (1928), No. 3, pp. 131–135, figs. 9*).—Alfalfa, sweet clover, and red clover were seeded on Brookston silt loam, Miami loam, Hillsdale sandy loam, Isabella sandy loam, and Coloma loamy sand, the seed being drilled in the row 7 in. apart at 15 lbs. per acre. One portion

of the area thus seeded was thinned to 7 in. distance, while in the unthinned portion the plants stood 10 to 12 per foot of drill.

Marked differences in the extent and nature of the root development were noted in the different soil types, and there were also striking differences between the thinned and unthinned rows. In the latter plants the roots were smaller, carried fewer lateral branches, and did not penetrate as deeply as those of plants standing farther apart. It is considered that these variations may account, in part at least, for differences in effectiveness of the same or different crops when used as green manures for varying soil types.

Utilization of irrigation water and its influence on soil composition, F. J. Sievers, H. F. Holtz, and C. C. Wright (*Washington Col. Sta. Bul. 222 (1927), p. 47*).—The following conclusions are presented:

The alkali soils may be divided into two types, saline and alkaline, the former being a soil containing abnormal quantities of water-soluble salts and the latter a soil containing appreciable quantities of replaceable bases (chiefly sodium). Alkali soils may originate from the parent rock in the natural processes of weathering or from the application of irrigation water containing soluble salts. Alkali may have at least two harmful effects, in that it may accumulate in amounts beyond the tolerance of crop plants and also in that it may cause soils to become puddled and impermeable to the penetration of irrigation water. A total of 39,209 acres were reported as damaged by alkali in this State, of which 26,600 are in the Yakima Valley, while in many of the irrigation projects there is no alkali land. The quality of irrigation water in this State is unusually good, carrying on an average less than 150 parts per million of dissolved material.

The maintenance of organic matter in eastern Washington soils, F. J. Sievers and H. F. Holtz (*Washington Col. Sta. Bul. 222 (1927), p. 45*).—It was noted in leaching experiments with several soil types from sections having different climatic conditions that the nitrogen-carbon ratio of the leached organic matter was always narrower than in the organic matter as found in the surface soil. It is considered that the narrower nitrogen-carbon ratio of the subsoil as compared with the surface soil is to be attributed largely, if not entirely, to the fact that the subsoil organic matter results largely from the deposit of leached material. Variations in the cropping system produced on the same soil type very distinct differences in the quantity and composition of the leached organic matter.

[Soil and fertilizer studies at the Iowa Station] (*Iowa Sta. Rpt. 1927, pp. 15, 16, 17, 52, 53*).—Among the studies reported are the following:

Iowa system of soil management.—Two examples of the successful application of the recommendations of the soils section of the station are very briefly noted.

Treatment of soils as affecting bacteria.—Results of studies on nitrification showed that where the final pH value was lower than 4.2, the nitrification of ammonium sulfate was slight. Calcium carbonate effected a considerable increase in the nitrificaton. Manure with lime gave the greatest increase in nitrification, followed by crop residues with lime, while lime alone was third in effectiveness. Manure alone had little stimulating effect on nitrification, though it increased the number of microorganisms and somewhat stimulated all the bacterial activities studied. Continuous cropping to corn appeared to reduce bacterial activity as compared with that observed in the soil of an untreated 5-year rotation plat.

Humus investigations.—Eleven soil plats under a definite cropping and fertilizer treatment system were examined for their fungus flora, with the result

that 44 species belonging to 14 genera were isolated and identified, and an unidentified species of four other genera were found. The results are said to confirm a previous conclusion that there is a definite soil fungus flora consisting principally of species of Penicillium, Aspergillus, Trichoderma, Cladosporium, Rhizopus, and Mucor, with the occasional appearance of representatives of other genera.

Artificial manures.—Composts of straw with Adco, of sweet clover alone, and of sweet clover and straw in the proportions of 4 to 16 and of 8 to 12 were compared with fresh manure alone, and with the addition of rock phosphate, the influence of the various treatments on biological activities in the soil having been studied. In general the various treatments increased the numbers of microorganisms, fresh cow manure having the largest influence. Nitrification was but slightly affected, and the nitrate content similarly varied but slightly in the various plats. Greenhouse experiments with wheat indicate that the various composts increased the yield as much as did the manure.

[Soil and fertilizer experiments at the Wisconsin Station] (*Wisconsin Sta. Bul. 396 (1927), pp. 123–126, fig. 1*).—The following experiments are included in this report, continuing earlier work (E. S. R., 56, p. 714):

[*Soil acidity studies*].—Recent investigations by A. R. Whitson and H. D. Chapman indicating that in a number of Wisconsin soil types excellent alfalfa may be produced in the presence of considerable acidity are noted. The inference is drawn that phosphorus and potash are often the limiting factors for good alfalfa production, considerable quantities of available calcium frequently existing in soils having a distinct acidity. It is believed to be for this reason important to determine directly the amount of available lime in a soil rather than merely to estimate the soil acidity. The use of a carbonic acid solution is said to have given much promise in available lime experiments. Most soils showing 500 to 600 lbs. of available calcium per acre are said not to have responded to additional applications of lime even where these soils were quite strongly acid, and for alfalfa, sweet clover, and other crops, phosphate fertilizer has been found in many cases as generally beneficial and profitable as lime.

[*The nature of soil acidity and base exchange*].—A study of natural and artificial zeolites by E. Truog and H. W. Kerr is briefly noted. Among other results, it is stated that the work has furnished rather conclusive evidence that soil acidity is a purely chemical reaction rather than an absorption process, and that the principles of base exchange hold true to a surprisingly definite degree.

An improved color method for determining phophorus.—Truog found that a relatively large volume of such a weak acid as carbonic acid or a 0.001 N sulfuric acid solution, these reagents being considered to possess an acidity not unlike that conditioning plant nutrition, could be used in a method said to be adapted for the rapid determination of available phophorus. The results apparently check well with field experiments.

[*Fertilizer experiments.*].—Fertilizer experiments by A. A. Albert and F. L. Musbach showing in general an economic return from the use of commercial fertilizers are reported from the Hancock, Coddington, Spooner, and Marshfield Substations. At Marshfield the use of nitrate fertilizer, as well as superphosphate and potash, showed progressively increasing returns per acre.

Results of field experiments with fertilizers in the Pskov District [trans. title], V. A. Beketov (W. A. Beketoff) (*Trudy Nauch. Inst. Udobr. (Trans. Sci. Inst. Fert. [Moscow]), No. 44 (1927), pp. 5–60, figs. 16*).—The fertilizer experiments in this district cover a period of from 2 to 15 years, depending

on the crop, each one of which is discussed separately. In the summary the following points are outstanding:

Rye responded to phosphates, these alone increasing the yield by 50 per cent, while a combination of phosphorus-nitrogen, phosphorus-potash, or a complete fertilizer increased the yield by 75 per cent. Potash alone did not show any effect. Loam soils responded better to phosphorus fertilization than sandy soils. Oats were increased in yield from nitrogen and phosphorus fertilization by one-third, but from potash only by one-fifth. Loam and sandy soils responded similarly to phosphorus fertilization. Barley responded very favorably to fertilizer applications, nitrogen increasing the yield three-fourths, phosphorus and potash each one-half, phosphorus-potash three-fourths, and a complete fertilizer four-fifths. Loams responded better than sandy soils.

Flax responded favorably to complete fertilizers, but more experiments are needed to corroborate the results. Potatoes were increased in yield from 40 to 50 per cent upon the addition of a complete fertilizer. Clover increased in yield 50 per cent with phosphorus alone, while a complete fertilizer doubled the yield. Fodder beets also doubled in yield with a complete fertilizer, but phosphorus fertilization showed the least effect.

Results of experiments with fertilizers in the Smolensk District [trans. title], L. L. Balashev (*Trudy Nauch. Inst. Udobr.* (*Trans. Sci. Inst. Fert.* [*Moscow*]), *No. 43* (*1927*), *pp. 108, fig. 1*).—The first chapter covers the period of the early fertilizer experiments of A. N. Ėngel'gardt, in whose name an experiment station was established in 1894. From 1866 to 1893, when he died, experiments with various fertilizers, primarily phosphates, were conducted by Ėngel'gardt in cooperation with other landowners of the district. His experiments led him to the following conclusions: (1) Natural phosphate rock when finely ground may serve as well as chemically treated phosphates (superphosphates), especially on grain crops; (2) the beneficial effect of the phosphate is due to the calcium phosphate, it being most effective when present in the amorphous state; (3) the degree of fineness of the ground rock phosphate determines its effectiveness; (4) rye responds best to phosphate applications; (5) barnyard manure when reinforced with phosphate gives better results; (6) soils poor in lime will respond better to ground phosphate rock than to superphosphate (acid phosphate); and (7) when a soil is depleted of nitrogen it is best to plant clover, to which kainit should be applied.

The second chapter takes up the results of fertilizer experiments at the Ėngel'gardt Experiment Station for the periods 1894–1906 and 1908–1917. The results show that rye responded better than any other grain crop to phosphate fertilization. Oats was benefited by nitrogen fertilizers but more by phosphate additions, primarily superphosphate. When ammonium sulfate was used, raw phosphates were also beneficial. For potatoes a nitrogen-potash fertilizer gave increased yields. All fertilizers influenced negatively the starch content of potatoes. Flax was benefited by additions of kainit. Excessive use of complete fertilizers on flax was harmful, causing lodging. Gypsum and kainit acted favorably on clover, as did Thomas slag; raw phosphates did not increase the yields sufficiently to warrant their use. Additions of potash and phosphates gave the best results with clover.

The third chapter deals with the results of collective fertilizer experiments in the district, which in general corroborate the other reports, while the fourth chapter takes up the results of experiments on demonstration farms, carried out in cooperation with the peasants. The results were not very definite, and no conclusions were drawn.

Collective experiments with mineral fertilizers in the Tver District [trans. title], A. V. Kazakov and S. L. Shapiro (*Trudy Nauch. Inst. Udobr. (Trans. Sci. Inst. Fert. [Moscow])*, *No. 37 (1926)*, *pp. 61–91*, *figs. 12*).—The authors summarize fertilizer experiments conducted in the Tver District during the years 1911–1915 and 1924, mostly on podsolized loam and sandy loam soils.

The results indicate that on these soils phosphorus appears as a first minimum. With grain crops Thomas slag gives the best results; clover responds better to superphosphate (acid phosphate), yielding one and one-half times as much as with slag. As second minima either nitrogen or potash appear, depending on the crop. Winter rye and flax respond better to nitrogen, while potatoes and spring grains respond better to potassium. Application of gypsum influences favorably the yield of clover; the effect of iron sulfate is insignificant. Of the mixed fertilizers a complete mixture is most effective on the soils studied; the combination of phosphorus and potash is next in order of effectiveness, followed by phosphorus and nitrogen.

Summary of the results obtained from experiments with fertilizers on the meadows in the Tver District [trans. title], M. D. Bakhulin (*Trudy Nauch. Inst. Udobr. (Trans. Sci. Inst. Fert. [Moscow])*, *No. 44 (1927)*, *pp. 61–79*, *figs. 3*).—The results with fertilizer experiments on meadows covering a six-year period show that Thomas slag and potash increased the yield 66 per cent. Phosphorus alone gave slightly greater yields than potash alone. Lime did not show any favorable effect.

Results of experiments with fertilizers in the Vladimir District [trans. title], L. L. Balashev (Balacshov) (*Trudy Nauch. Inst. Udobr. (Trans. Sci. Inst. Fert. [Moscow])*, *No. 37 (1926)*, *pp. 5–60*, *figs. 7*).—This is a summary of fertilizer experiments for the 12-year period 1905–1917 conducted throughout the Vladimir District.

The results indicate that as far as response to complete fertilizer is concerned, rye stands out foremost, followed in order by oats, potatoes, and flax. On sandy and sandy loam soils oats and rye respond more quickly to fertilizers, flax responds best to fertilizers on loam soils, and potatoes respond to fertilizer treatment on either soil. Loam soils respond best to phosphates and light soils to nitrogenous and nitrogen-potassium fertilizers. On loam soils the combination of phosphorus and potash favors rye and potatoes; the combination phosphorus and nitrogen favors rye on loam, and flax on sandy loam; and the combination nitrogen-potash favors potatoes on light soils and flax on loam soils.

Applications of from 1,500–2,000 poods of barnyard manure per dessiatine (10 to 13.33 tons per acre) on light soils exceeded in their effect on rye the yields from any mineral fertilizer. At times the phosphorus and potash combination may replace part of the manure. Fertilizing clover gives a residual effect for from 2 to 3 years. Phosphorus applications give good results after clovers, but nitrates do not. The yield of oats and the effect of the mineral fertilizers depend on the amount of rainfall during the second period of vegetation, it being more pronounced on sandy loam soils. The influence of mineral fertilizers on the yield of buckwheat is determined by the meteorological conditions.

Various phosphorus sources (bone meal, superphosphate (acid phosphate), Thomas slag) influence rye favorably. In certain cases phosphate rock was also effective. For clover potassium sulfate was more effective than any other potash salt, but for potatoes and flax the chloride was best. Manganese influenced oats and clover negatively. All fertilizers except phosphates decreased the starch content of potatoes. Increased applications of fertilizers on oats and

potatoes caused a drop in the coefficient of useful action. At times potassium chloride and gypsum antagonize each other.

Manures and manuring, F. E. Corbie (*London: Chapman & Hall, 1927, pp. XI+168, figs. 3*).—This is a condensed textbook, addressed directly to the practical farmer with the intention of presenting "in a simple manner the more important principles underlying the practice of manuring."

Manuring is itself here to be considered as signifying "a means of obtaining and maintaining that condition of soil fertility most suitable for the production of crops and livestock," but particular emphasis is laid upon the fallacy of the view that the only factor to be considered by the farmer in deciding upon the manures to be used is that of forcing a large return from a particular crop. The main treatment of the subject is presented in five sections: (1) The soil and plant nutrition, containing data as to the composition of the plant, how plants feed, and factors which influence manuring; (2) manurial ingredients—their sources and use, dealing with nitrogen from leguminous crops, green manuring, farmyard manure, poultry manure, stable manure and town refuse, sewage sludges, guano, meat manures, fish manures, nitrogenous fertilizers, phosphatic fertilizers, potash fertilizers, and miscellaneous materials; (3) the manurial treatment of farm crops, covering aims and effects of manuring and the manuring of crops; (4) the legal and commercial aspects of manuring, including the sale and description of fertilizers, conversion factors, compound fertilizers, valuation of fertilizers, mixing of artificial fertilizers, storage of fertlizers, and residual values of feeding stuffs and fertilizers; and (5) the influence of manuring on animal nutrition.

Artificial manure from straw, R. C. Collison and H. J. Conn (*New York State Sta. Circ. 95 (1928), pp. 3*).—This is a popular statement of methods differing very little from those commonly used. The mixture used as a starter chemical contains ammonium sulfate 60 lbs., superphosphate (acid phosphate) 30 lbs., potassium chloride 25 lbs., and ground limestone 50 lbs. The labor and expense involved are briefly discussed, and suggestions as to the practicability of the process in various circumstances are made.

The relationship between plant response to lime, phosphate, and potash and the need for these treatments as indicated by laboratory tests, F. W. Parker (*Alabama Sta. Rpt. 1925, pp. 7, 8*).—Melilotus and sorghum were used as test plants in greenhouse work. The laboratory tests included the Truog soil acidity test (E. S. R., 43, p. 622), the determination of H-ion concentration, determination of the calcium and phosphorus soluble in N/5 nitric acid, and estimations of total exchange capacity. Twenty-three soils were examined. "It seems probable that better laboratory methods will have to be developed before one can determine, with any degree of accuracy, the phosphorus and potash requirements of soils by laboratory tests."

The agricultural value of cyanamid (*New York: American Cyanamid Co., [1928], pp. 47, figs. 21*).—This is a report and discussion of fertilizer experiments conducted by the American Cyanamid Company and based upon the thesis that experimental work in which this product has failed to give satisfactory results has been done without due attention to the avoidance of conditions unfavorable to the conversion of the nitrogen of cyanamide into forms available for the nutrition of plants. A considerable number of apparently satisfactory results are shown in the forms both of numerical data and of photographs of check plats and plats fertilized with mixtures containing cyanamide as the source of nitrogen. Unfavorable results obtained by other workers are attributed to (1) the use of old material held in storage more than a year

and subsequently used as the sole source of nitrogen; (2) the mixing of cyanamide in large proportions with superphosphate (acid phosphate) without provision for the escape of the heat of reaction; (3) the application of the cyanamide in direct contact with, or in too close proximity to, the seed; or (4) a combination of these errors of practice. It is maintained that dicyandiamide in the proportion of about 10 per cent of the total nitrogen does not decrease the efficiency of the fertilizer, but that conditions leading to the presence of larger proportions are to be avoided.

The agricultural value of specially prepared blast furnace slag, J. W. WHITE (*Pennsylvania Sta. Bul. 220 (1928), pp. 19, figs. 7*).—The experiments reported in this bulletin were undertaken for the purpose of determining the liming value of various preparations of blast furnace slag. The results were in part as follows:

Granulated agricultural slag at the rate of 1 ton per acre increased the yields over those on unlimed check soils in the case of red clover by 61 per cent, sweet clover 78 per cent (pot culture tests); on plats of Dekalb soil, bluegrass hay 70 per cent, soy bean hay 45 per cent, timothy hay 87 per cent, corn grain 64 per cent, oats grain 17 per cent, and barley (grain and straw) 80 per cent.

According to a table showing the effects of granulated slag, 20-mesh slag and slag meal as against those of 20-mesh limestone, the latter being taken as 100, the numerical effectiveness of the 20-mesh slag varied with different crops from 60 to 121, slag meal from 57 to 118, granulated slag from 38 to 55. It is considered that the relatively high yields of the slag ground to a degree of fineness the same as that of the limestone indicate the stimulating effect of slag constituents other than the basic oxides. Per unit of oxides applied, it was shown that in the cases of 13 out of 14 crops 20-mesh agricultural slag gave greater yields than limestone. It is noted that, as in all other liming materials, the availability of the slag bases is dependent upon the degree of fineness of the material.

Analyses of commercial fertilizers and ground bone; analyses of agricultural lime, 1927, C. S. CATHCART (*New Jersey Stas. Bul. 464 (1927), pp. 40*).—The customary analyses and related data with respect to commercial fertilizers, ground bone, and agricultural lime are reported, supplementing data previously noted (E. S. R., 58, p. 421).

Fertilizer registrations for 1928, C. S. CATHCART (*New Jersey Stas. Bul. 467 (1928), pp. 23*).—This bulletin is the customary report of brands of fertilizers registered in New Jersey for 1928, together with manufacturers' guaranties.

Composition and prices of commercial fertilizers in New York in 1927, L. L. VAN SLYKE (*New York State Sta. Bul. 548 (1927), pp. 20*).—This is a review of the commercial fertilizer situation in New York State for the year 1927, comparison being made in some cases with prewar conditions and with changes noted since the war. The figures presented are considered to support fully the following, among other conclusions: (1) That in 1927 the complete fertilizers contained a larger average percentage of plant food than at any previous time, with the single exception of the year 1926, and (2) that there has been in 1927 a marked increase in the number of fertilizers of high grade with respect to total plant food, with a corresponding relative decrease in grades of lower analysis.

The data presented include the composition and cost of plant food in various unmixed fertilizer materials, as dried animal manures, and limes.

AGRICULTURAL BOTANY

The elements of vegetable histology, C. W. BALLARD (*New York: John Wiley & Sons; London: Chapman & Hall, 1926, 2. ed., rev. and enl., pp. XVIII+289, figs. 93*).—In this second edition, the chapters of the former (E. S. R., 46, p. 322) dealing with the chemical reactions of plant tissues, staining, fruit structure, and seed structure have been revised and enlarged, and minor changes have been made throughout the book.

Investigations on chlorophyll: Methods and results, R. WILLSTÄTTER and A. STOLL, trans. by F. M. SCHERTZ and A. R. MERZ (*Lancaster, Pa.; Sci. Press Ptg. Co., 1928, pp. XII+385, pls. 11, figs. 16*).—"The translation [E. S. R., 30, p. 311] as given herein is an outgrowth of a rough translation of many of the chapters on the chloroplast pigments. . . . A few corrections have been made. . . . References are given to the works of Willstätter and his students which were unpublished at the time the book was edited, 1913. The reference to zinc and copper compounds of pheophytin is given because of its close relation to the contents of the book."

Studies on the pigments of plastids and on photosynthesis [trans. title], V. LUBIMENKO (*Rev. Gén. Bot., 38 (1926), Nos. 450, pp. 307–328; 451, pp. 381–400, figs. 2*).—The author, purposing to review phases and results of his own work (E. S. R., 50, p. 126; 53, pp. 518, 727) as done during 20 years and dealing in part with questions related to chlorophyll assimilation, presents the first part of this account dealing with the physiology of plastids.

It is claimed on the basis of evidence set forth that plastids in higher plants differ but little from those in unicellular algae. Chloroplasts present the normal primitive plastid form in all the green plants, and this form they may conserve indefinitely from generation to generation if the cellular nutrition remains unchanged.

Normal development of chloroplasts is not bound up with the chlorophyll function, and the nutrition (saprophytic or parasitic) of the cell has of itself no unfavorable influence on the condition of the green plant. It is exclusively the chemical nature of the nutritive organic substances and the quantitative ratio between carbohydrate and nitrogenous substances which influences directly the plastids.

Internal and external factors are dealt with in considerable detail.

A practical method for the determination of the chloride content of plant tissue fluids, J. V. LAWRENCE and J. A. HARRIS (*Ecology, 6 (1925), No. 4, pp. 391–396*).—The importance to ecological research of the determination of the chloride content of plant tissue fluids is indicated, and a practical method is described. This method is said to be applicable to freshly expressed or to preserved fluids, and to be well adapted for use in the field, requiring a minimum of apparatus and of time. It is said to possess accuracy sufficient for phytophysiological work and extreme simplicity and rapidity, adapting it to the running of the large series of samples which are necessary in phytogeographical work.

The effect of the H ion concentration on the availability of iron for Chlorella sp., E. F. HOPKINS and F. B. WANN (*Jour. Gen. Physiol., 9 (1925), No. 2, pp. 205–210, fig. 1*).—Data obtained are said to indicate clearly that unless the necessary precautions are taken to keep the iron of the culture medium in solution the results obtained by varying the H-ion concentration will not represent the true effect of this factor on growth. In general ferric citrate seems to be the most favorable source of iron. By omitting calcium from the culture solution iron can be maintained in a form available for growth in alkaline solutions by the addition of sodium citrate. In such solutions the

maximum growth of Chlorella occurred at pH 7.5, the alkaline limit for growth not yet having been established.

Movement of nitrogenous substances from leaves to trunks and roots of trees during autumnal yellowing [trans. title], R. Combes (*Rev. Gén. Bot., 38 (1926), Nos. 452, pp. 430–448; 453, pp. 510–517; 454, pp. 565–579; 455, pp. 632–645, fig. 1; 456, pp. 673–686, fig. 1*).—This is an elaborate extension of the study noted previously (E. S. R., 53, p. 325). The principal movements of materials after storing are indicated.

Synthesis of starch in plants in the presence of calcium and sodium salts, W. S. Iljin (*Ecology, 6 (1925), No. 4, pp. 333–351*).—Leaves of plants were immersed in weak solutions of maltose or glucose, to which different quantities of $CaCl_2$ or NaCl were added. These salts, when sufficiently concentrated, prevented starch formation in the leaves, but the concentration at which the process was stopped differed with different plants. Species growing on lime endured extremely high concentrations of calcium chloride, but many of these plants showed little tolerance to sodium ions. Plants growing on lime-free soils were susceptible to calcium. High sodium concentrations were tolerated better by halophytes.

The action of Ca and Na ions is specific. The prejudicial action of certain ions can be counteracted by other ions. Calcium in small quantities overcomes the effect of sodium, but in excess acts injuriously. Magnesium salts strengthened the injurious action of calcium. The injurious action of calcium can not be counteracted by Na ions nor by mixtures of KCl, NaCl, and $MgCl_2$ salts. The difference between the low concentration of calcium (as well as of other salts) which cause injury in some plants and the high concentrations required to cause injury in others is very wide. A plant particularly resistant to the action of a particular salt will be placed at a considerable advantage on soils containing that salt in abundance.

The effects of certain heavy metals on respiration, S. F. Cook (*Jour. Gen. Physiol., 9 (1926), No. 4, pp. 575–601, figs. 14*).—It is stated that the effect of the heavy metals on the respiration of *Aspergillus niger* is to cause the rate of carbon dioxide production to decrease or to increase and subsequently diminish. The speed of the toxic action varies as a constant power of the concentration, the temperature coefficient of the toxic action being between 1.5 and 2. It is assumed that the metal is activated by a chemical combination with a cell constituent. This active compound alters the velocity constants of the normal respiratory reactions, thus causing the observed changes in the rate of carbon dioxide production.

A latent period in the action of copper on respiration, S. F. Cook (*Jour. Gen. Physiol., 9 (1926), No. 5, pp. 631–650, figs. 11*).—When copper chloride is allowed to act on *Aspergillus niger*, an interval during which no change occurs, called the latent period, is followed by a fall in the rate of respiration. If the copper is removed from the external solution before the end of the latent period this interval is prolonged, after which the rate of respiration falls to a new level below the normal level. Experimentation on Nitella and Valonia indicates that the copper penetrates the cell almost immediately. The length of the latent period varies inversely as a constant power of the copper concentration. These results are explained by assuming that the copper is made active in the respiration system by means of a reversible reaction. By using appropriate velocity constants the experimental curves can be duplicated by calculated curves.

The toxic action of copper on Nitella, S. F. Cook (*Jour. Gen. Physiol., 9 (1926), No. 6, pp. 735–754, figs. 8*).—When the loss of cell turgidity is used as a criterion, it is found that the toxicity curve of copper chloride with Nitella is

sigmoid. An empirical equation can be constructed which will approximately fit the curve. If the concentration of the copper chloride is varied the toxic effect varies as a constant, fractional power of the concentration. This relation holds whether the concentration is plotted against the time necessary to reach a given point on the ordinate of the survivor curve, the maximum speed of toxic action as shown by the tangent to the survivor curve, or the first derivative of the equation which fits the survivor curve. When the temperature is varied and the logarithm of the reciprocal of the time necessary to reach a given point on the survivor curves is plotted against the reciprocal of the absolute temperature, the resulting figure shows several intersecting curves. A hypothetical system is described which will give straight lines under normal conditions and curves when acted upon by a toxic agent.

The adsorption of bacteria by the soil and the effect on the microbiological soil processes [trans. title], N. N. CHUDIAKOW (*Centbl. Bakt. [etc.], 2. Abt., 68 (1926), No. 15–25, pp. 345–358, pls. 2, fig. 1*).—This is a condensed review of work done during 1923–1926 at the bacterial laboratory of the Timirjasew Agricultural Academy in Moscow.

Influence of radiations on the nutrition of Aspergillus niger, F. GAYRAL (*Influence des Radiations sur la Nutrition de l'Aspergillus niger. Toulouse: Douladoure, 1926, pp. 49*).—*A. niger* is modified by radiations of various kinds, which are indicated, in its nutritive functions and occasionally in its morphology.

Studies on Rhizobium leguminosarum (*Iowa Sta. Rpt. 1927, pp. 50, 51*).—Studies of agglutination reactions and physiological activities of strains of organisms isolated from the roots of alfalfa, sweet clover, red clover, dalea, soy bean, and field pea are briefly reported, which seem to indicate the possibility of differentiating groups of these organisms. The ability to utilize various carbohydrates under different conditions is said to offer a means for distinguishing the legume bacteria from *Bacillus radiobacter.*

In investigations on the efficiency of legume bacteria it was found that the best method for growing red clover was in large test tubes containing a soft agar medium with all of the essential elements for plant growth except nitrogen. Alfalfa and soy beans grew well in the tubes and also in sand cultures.

Experiments in sterilizing legume seeds with 20 per cent hydrogen peroxide showed that various molds and bacteria were carried within the seeds which did not appear until germination had been begun.

Studies of the bacteria of Iowa soils are said to have shown the presence, under natural conditions, of all but one of the various cross-inoculation groups of legume bacteria.

[Naming of the organisms producing nodules on roots of leguminous plants], R. E. BUCHANAN (*Iowa Acad. Sci. Proc., 33 (1926), pp. 81–90*).—The author concludes that the bacteria of leguminous plants are sufficiently distinctive as regards morphology, physiology, cultural characters, and habitat to justify their separation from other bacteria into a distinct genus. The resemblances among types of bacteria producing the nodules of leguminous plants are said to be so great as to justify the inclusion, temporarily at least, of all these organisms within one genus, for which two names, Phytomyxa and Rhizobium, are available, the latter being preferable. If a single species of legume bacteria is to be recognized, it should be termed *R. leguminosarum.* If the peritrichous forms are to be separated from the monotrichous as different species, the former should bear the name *R. leguminosarum* and the latter *R. japonicum.* If various cross inoculation groups are to be regarded as varieties, they should bear the varietal names proposed by Beyerinck so far

as these are appropriate. If the cross inoculation groups are to be raised to the rank of species, it will be necessary to designate as the type of *R. leguminosarum* the organisms from Lathyrus and of *R. japonicum* the organisms from Soja. The remaining varietal names could then be made specific epithets.

Preliminary note on the sterilization of seeds of the Leguminosae with hydrogen peroxide, R. H. WALKER and L. W. ERDMAN (*Iowa Acad. Sci. Proc., 33 (1926), pp. 91–95*).—Results are presented which are thought to justify the preliminary conclusion that hydrogen peroxide at concentrations of 10 or 15 per cent is an efficient and desirable solution for destroying all microorganisms on legume seeds when treated for 30 minutes at room temperature.

Effect of high pressure on germination of seeds (Medicago sativa and Melilotus alba), P. A. DAVIES (*Jour. Gen. Physiol., 9 (1926), No. 6, pp. 805–809, figs. 2*).—A germination percentage increase was obtained with seeds of *M. sativa* if exposed for from 1 to 10 minutes under 2,000 atmospheres hydraulic pressure at 20° C., dried, and germinated after 30 days; and from seeds of *M. alba* under the same conditions of pressure when exposed for from 5 to 30 minutes, dried, and germinated 30 days later. Exposure to 500 atmospheres pressure was less advantageous; the vitality of seeds normally germinating was more rapidly destroyed than the hard impermeable seeds rendered permeable by the pressure treatment. At 0° it required approximately 2½ times the exposure to 2,000 atmospheres for seeds of *M. sativa* and approximately 5 times the exposure for seeds of *M. alba* as it did at 20°.

Species and area, H. A. GLEASON (*Ecology, 6 (1925), No. 1, pp. 66–74*).—In order to give a more thorough examination to the question of the correlation previously under discussion between the author and Arrhenius (E. S. R., 51, p. 820), a careful quantitative study was made during the summer of 1923 at the Biological Station of the University of Michigan, the results from which are herein presented in tabular form, with discussion.

"All these facts warrant the general conclusion that, within the limits of a single plant association, the environment, while possibly presenting observable differences, is essentially homogeneous for each species; that the distribution of species is primarily a matter of chance, depending on the accidents of dispersal; and that the number of individuals of a species, other things being equal, is an index to its adaptation to the environment."

Ecological aspects of the deserts of California, F. SHREVE (*Ecology, 6 (1925), No. 2, pp. 93–103, figs. 2*).—In every desert moisture is the most critical condition in the physiological life history of the individual plant, and it is largely but not entirely the difference between the moisture conditions of the various habitats that underlies the dissimilarity of the vegetation. By the term moisture conditions is meant here all of those features of the environment that have to do with the maintenance of a balance between the plant's water income and water expenditure. The influence of temperature is partly exerted in intimate connection with the water relations at the same time that the water relations exert a fundamental influence on the rate and character of all the life processes in the terms of which the effects of temperature are ordinarily measured.

The biological features of desert areas are determind by a group of physical conditions and not solely by a low annual precipitation. The desert biota is characterized by a number of features as regards structure, physiological activity, or behavior. Deserts show a great variety of physical complexes and a corresponding variety of plant and animal life.

The local distribution of plants in the desert is determined chiefly by small differences in moisture conditions such as are maintained by site, shading, or soil texture. Other modifying influences are indicated.

The occurrence of self-sterility in plants and recovery from infertility under artificial and natural conditions [trans. title], W. KINZEL (*Prakt. Bl. Pflanzenbau u. Schutz, 4 (1927), No. 12, pp. 282–285*).—Conditions are briefly outlined as corresponding, in the case of the Alpine violet, to a wide range extending from remarkable fertility to practical barrenness.

GENETICS

[Investigations in genetics at the Wisconsin Station] (*Wisconsin Sta. Bul. 396 (1927), pp. 64–67*).—The results of the following studies are briefly reported:

What factors determine the number, size, and weight of newborn pigs?—From studies by B. L. Warwick of the fetuses found in the uteri of 50 sows and gilts, curves of fetal growth were constructed which showed that growth in length increased at a fairly uniform rate throughout the gestation period, while weight increased much more rapidly during the last 20 days. There was much variation in the sizes of fetuses of the same age, especially during the latter half of the gestation period.

Studies of 448 uteri of sows of unknown breeding at a packing plant showed that 3.68 per cent of the fetuses observed were in various stages of degeneration with more or less resorption. A few such degenerating fetuses were probably the result of crowding and insufficient nutrition, but genetic causes are suggested as probably more important since degenerating fetuses were found where there was no evidence of crowding.

Science shows how to select dairy sires.—Studies by C. W. Turner and L. J. Cole of the inheritance and transmission of milk and fat production, based on Jersey Register of Merit records, indicated that these characteristics are largely determined by multiple factors, which probably vary in their effect, but that most of them are apparently dominants.

What determines horn growth in cattle and goats.—In physiological studies by W. F. Dove it has been found possible by the transplantation of tissues to produce on cattle or goats almost any type of horns, comparable to the solid horn of the deer, the sheathless horn of the giraffe, the casting and sheath renewal of the prong-horned antelope, and the rhinoceros type of horn, since the type of horn depends largely upon the character of the underlying bone structure to which it is attached.

Effect of thyroid on plumage of the fowl.—In studies by Cole, D. H. Reid, and Hutt, the characteristic sexual plumage of fowls was found to be modified by thyroid feeding. Capons of the normally feathered breeds did not acquire female plumage if thyroid was administered. Further thyroid administration was found to hasten the molt and accelerate the growth of new feathers. With excessive doses of thyroid, white feathers commonly abnormal in structure were produced in both sexes.

[Plant breeding at the Connecticut State Station] (*Connecticut State Sta. Bul. 291 (1927), pp. 101, 102, fig. 1*).—Certain inbred strains of sweet corn maintained at the station have been under investigation for 20 continuous generations. Selection from crosses between inbred strains of Evergreen sweet corn yielded 13 lines deemed of particular promise for canning purposes. Inbreeding of yellow sweet corns was pursued preparatory to the development of desirable market garden types. Observations upon carrot plants used in inbreeding studies showed about 15 per cent to be self-fertile. Records taken on second-generation lines of selfed black raspberries and strawberries showed a notable decline in vigor and productivity in the strawberry strains. Pure line breeding was also conducted with tobacco, lettuce, lima beans, and peppers.

Partition wall formation in the pollen mother cells of Zea mays, R. G. Reeves (*Amer. Jour. Bot., 15 (1928), No. 2, pp. 114–122, pls. 2, figs. 2*).—Cytological studies at the Iowa State College on Stowell Evergreen sweet corn demonstrated that partition walls in the pollen mother cells of *Z. mays* are formed by the cell-plate method, and contrary to the usual situation found in walls so formed both primary and secondary walls are composed of callose.

A case of natural crossing in sweet peas, W. M. Fleming (*Sci. Agr., 8 (1928), No. 6, pp. 386, 387*).—That natural crossing may occur in the sweet pea was suggested in the discovery of a purple flowered rogue in a stock of the pink-flowered Kenneth growing at the Dominion Experimental Station, Summerland, British Columbia. Segregation in the first three filial generations conformed to the Mendelian hypothesis, the F_1 being all purple, the F_2 and F_3 containing purples, pinks, and intermediates (the last an indication of the heterozygous nature of the unknown purple parent).

Concerning the transmission of an acquired character in flax, B. B. Robinson (*Science, 67 (1928), No. 1731, p. 242*).—This contribution from the U. S. D. A. Fiber Investigations discusses the observations of Bolley (E. S. R., 58, p. 219) on the inheritance of wilt resistance in flax. "It seems probable that the variation in wilt resistance may be due to unselected factors in an otherwise pure line or possibly to natural crossing rather than a gradual change in a hereditary gene."

Production of fertile hybrids in the ascomycete Neurospora, B. O. Dodge (*Jour. Agr. Research [U. S.], 36 (1928), No. 1, pp. 1–14, pls. 4*).—In a previous paper by Shear and Dodge (E. S. R., 57, p. 620) the authors suggested the possibility of hybridization between species of Neurospora. Continuing these studies the author produced hybrids by crossing *N. sitophila* and *N. crassa*, eight-spored species, with *N. tetrasperma*, a four-spored form. The characters of the perithecia and mycelia of the hybrids are described.

Growth of horns in sheep: The effect of castration on the development of horns in Rambouillet ram lambs, J. E. Nordby (*Jour. Heredity, 19 (1928), No. 3, pp. 119–122, figs. 2*).—In a study of the effect of castration on the growth of horns in Rambouillet rams at the Idaho Experiment Station, monthly measurements of the length, diameter, and spread of the horns in 2 normal rams and 2 rams castrated at 3 months of age showed that castration reduced the growth of the horns about one-third in the succeeding 4-week period and about one-tenth in the 12-week period following castration. It was further found that the increase in the length and diameter of the horns occurs entirely at their base during growth.

Effect of different amounts of sexual indulgence in the albino rat.—III, Food consumption, J. R. Slonaker (*Amer. Jour. Physiol., 83 (1927), No. 1, pp. 302–308, figs. 2*).—In continuing this series (E. S. R., 58, p. 630), the author reports the food consumption of the groups of rats exerting different degrees of sexual indulgence.

The results showed that during the first 20 days of pregnancy the average daily food consumption was increased 2 gm. and during the first 20 days of lactation 9 gm. more than was consumed by nonpregnant females. The reduced voluntary activity associated with gestation and lactation no doubt tended to reduce the extra food consumption necessary for the prenatal growth and postnatal nursing of the young.

It was estimated that approximately 97.35 gm. were required for the development of each young from conception to weaning age, the greater part of which was required for postnatal development, as less than 21 gm. were required for prenatal growth. The light-breeding groups required a greater expenditure of energy for reproduction than the medium or heavy breeders.

The effect of different amounts of sexual indulgence in the albino rat.—IV, Length of sexual life, J. R. Slonaker (*Amer. Jour. Physiol., 84 (1928), No. 1, pp. 192–199*).—In continuing this series (see above), it was found that the heavy breeding group of females had a somewhat greater length of sexual life than the other groups, but in no case was the amount of sexual activity greater than half the possible amount. Heavy breeding caused a shifting of reproduction toward early life, but the number of litters born appeared to be as great a factor in determining the length of the reproductive sexual cycle as age. The rhythmic cycles of virgins ceased at an earlier age than in the other groups, though the length of the interval between puberty and the last oestrum was somewhat greater.

FIELD CROPS

Further studies on the permanence of differences in the plots of an experimental field, J. A. Harris and C. S. Scofield (*Jour. Agr. Research [U. S.], 36 (1928), No. 1, pp. 15–40, figs. 6*).—Continued studies (E. S. R., 44, p. 631) at the Huntley, Mont., Field Station were largely concerned with the relationship between the yields of various crops and other crops grown on the plats from 1911 to 1925, inclusive. The data analyzed deal particularly with crops grown during the period 1920–1925.

The problem of the permanence of the heterogeneity of the agricultural experimental field seemed to be capable of treatment by the method of interannual correlation. Even in small experimental tracts there appears to be a positive correlation between the yields of a series of plats throughout a period of years, i. e., plats showing a heavier yield one year will in general show heavier yields in other years during the period under investigation. However, under some conditions plats which produce superior yields under the conditions of one year may produce on an average inferior yields another year. In the present experiments fluctuations in the level of the water table in irrigated land may play a large part in determining the relative productivity of the different plats. A deep-rooted crop, e. g., alfalfa, seems more affected by such conditions than cereals.

"The importance of these results for agricultural experimentation is increased rather than diminished by the finding of significant negative as well as positive relationships between the yields of crops in different years. Both positive and negative correlations may indicate the importance of a preceding crop in determining the characteristics of an experimental field. . . . On the other hand, such correlations may indicate changing environmental conditions such as may be induced by variations in the level of the water table in the case of irrigation agriculture. Too great caution can not be exercised by agronomists in the selection of plots for tillage, fertilizer, or variety tests. It is clear from these results that not merely the physical and chemical characteristics of the soil but the nature of the preceding crop and changes in physical conditions from year to year must be taken into account in planning any such experiments."

[Agronomic experiments in Alabama], H. B. Tisdale, M. J. Funchess, H. B. Helms, and W. A. Gardner (*Alabama Sta. Rpt. 1925, pp. 5, 6, 10, 11*).—Strains of Cook and Cleveland cotton led the varieties, and Cook strains and Petty Toole were the best producers among the wilt resistant sorts. The highest yields were made from two plants per hill spaced 18 in. apart in the drill. Sodium nitrate applications made best returns when applied one-fourth at planting and the rest at the first cultivation after chopping, although about the

same yield resulted when all was added at planting. The effect of boll weevil control methods was most pronounced on plats receiving 1,000 and 1,500 lbs. of fertilizer, respectively. When seven cotton varieties were grown during 4 years in six localities in the Southern States the longest fiber was produced at the Tennessee Station and the shortest at the Alabama Station.

Whatley, Hastings, and Weekley, all prolific corn varieties, have been among the consistently high producers over a number of years. Oats on rather poor Norfolk sandy loam responded strikingly to sodium nitrate, which should probably be supplied in a single application between March 1 and 20.

In sweet potatoes a reciprocal relation was observed between decrease in starch and depression of freezing point of expressed juice, such depression becoming greater with advance of season. With the growth of the root the percentage of moisture rapidly decreases, of starch rapidly increases, of nonreducing sugar gradually increases, and of reducing sugars remains nearly constant. Cured and uncured Porto Rico sweet potatoes varied similarly in moisture content when stored in the same room but lost more moisture than those stored in a bank. In Triumph sweet potatoes a high moisture percentage usually accompanied a low starch content, and cured, uncured, and banked roots ranked in order in sugar percentage. The percentage of reducing sugar was increased by harvesting and affected little by storage method. Removal of tops resulted in an increase in moisture percentage, a decrease of starch and sucrose, and no important change in the percentage of reducing sugar. Previous work has been noted (E. S. R., 58, p. 427).

[Farm crops investigations in Iowa] (*Iowa Sta. Rpt. 1927, pp. 12–15, 16, 26, 27, 58–61*).—Hybrids of inbred strains of corn averaged several bushels more per acre than open-pollinated strains in comparative trials in different parts of the State. In corn improvement studies a check, Four County White corn, averaged 55.1 bu. per acre, F_1 crosses, largely between inbreds from the check or Silver King, 65.7 bu., 9 high-yielding varieties 63.6 bu., and the highest F_1 cross 86.5 bu. A second comparison showed the same check to average 58.3 bu., 9 varieties 63.3, F_1 crosses between inbreds from early yellow varieties 62.6, and the highest F_1 cross 78.5 bu. In a third test the acre yields were Iodent check 72.7 bu., 9 high-yielding varieties 77.8 bu., F_1 crosses between inbred lines from later maturing yellow varieties 81.7, and highest F_1 cross 111.2 bu.

Phalaris grass has outyielded timothy, and alfalfa surpassed other legumes compared therewith the first crop year. General recommendations based on extensive studies are made in regard to the inoculation of legumes. The comparative yields of corn following Sudan grass, soy beans, and oats are discussed in relation to soil productivity. Rotations of different duration have been described elsewhere (E. S. R., 56, p. 634).

The continued spread of sow thistle is commented on. Determinations made at 2-week intervals throughout the year on the carbohydrates in the roots of Canada thistle showed the smallest quantity present during the latter part of June, when the tops had attained their greatest elongation. The roots, which may penetrate to a depth of 7 ft. or more, contain much inulin from which levulose or diabetic sugar may be derived.

[Field crops investigations in Washington], S. C. Vandecaveye, E. G. Schafer, E. F. Gaines, O. M. Morris, H. M. Wanser, C. E. Hill, R. P. Bean, et al. (*Washington Col. Sta. Bul. 222 (1927), pp. 13, 14, 24–26, 28, 29, 36, 37, 53–56, 57–61, 63–65, 67, 68*).—Agronomic experiments (E. S. R., 56, p. 525) reported on from the station and substations included variety tests with winter and spring wheat, corn, oats, barley, rye, flax, alfalfa, sweet clover, vetch, field peas,

potatoes, and sweet potatoes; miscellaneous cultivation and fertilizer tests; and crop rotations. Breeding work was concerned with the inheritance of stinking smut in wheat and covered smut in oats, miscellaneous characters in sunflowers, and seed production work with potatoes.

Winter wheat following corn for silage averaged 47.2 bu. per acre and after sunflowers 36.4 bu. and spring wheat after corn 31.6 bu. and after sunflowers 28.4 bu. Winter wheat sown with the hoe drill at the Adams Substation outyielded that seeded with the furrow drill in both east-west and north-south plantings. Soil moisture conditions at seeding appeared to determine the success of fall-sown wheat at Waterville.

Clean cultivation, alfalfa, and heavy pasturing with hogs appeared to be means for controlling wild morning glory (bindweed). Sodium chloride and a commercial herbicide gave the most promising results of the chemicals tested.

Alfalfa seed inoculated with 24 selected strains of nodule bacteria able to produce nodules on alfalfa in normal soil were planted in the field on the soil types where alfalfa had failed or had grown with difficulty. Alfalfa nodule bacteria had not been found present on any of the fields. Certain soils were extremely difficult to inoculate. The differences in inoculating power of the various strains were quite pronounced and uniform regardless of soil type, and the differences in nitrogen-fixing power of the various strains were also demonstrated. Failure of alfalfa to develop vigorously on certain soil types in spite of adequate nodule production suggested that some factor other than inoculation was deficient.

Experiments on summer fallow tillage at Waterville showed that a bare surface throughout the growing season is the prime need and the methods used depend upon cost and field conditions. Cultivation more than needed to control weeds and for a firm, level seed bed did not increase yields. A duckfoot cultivator was more effective than a double-disk harrow to kill volunteer grain on land to be plowed later or summer fallowed without plowing. The forage and seed yields of wheat, oats, peas, corn, and potatoes after other crops are tabulated.

Alfalfa at the Irrigation Substation cut in one-fourth bloom has averaged 5.79 tons per acre, one-half bloom 6.71, and three-fourths bloom 6.68 tons. Potato seed spaced 6 in. apart in the row made 10 tons per acre and 24 in. apart 8 tons. An irrigation system maintaining a medium to light soil moisture content up to the blossom bud formation followed by abundant moisture until tubers were nearly mature gave the highest potato yield, and tubers were uniform in size, shape, and smoothness,

A light soil moisture content gave the highest yield and most uniform roots of the several irrigation systems used with sweet potatoes. A close spacing of plants within the row resulted in the highest yields of commercial sweet potatoes and total weight, the yield decreasing with increased spacing. Level culture outyielded ridge culture, and the level-grown sweet potatoes were smooth and chunky while those in ridges were stringy and grew very deep. Practically no difference in yield was noted between the lifted and nonlifted vines.

Seven legume crops grown under varying shade intensities did best in full sunlight, under one-third shade next, and poorest under two-thirds shade. Alfalfa plants grown in full sunlight bore an average of from 8 to 10 times as many stems and leaves as plants in partial shade, and the air dried weights of plants showed a similar proportion. The individual alfalfa leaves increased in area and weight in direct proportion to the light intensity under which the plants were grown, while the width: length ratio of leaves remained the same under all conditions.

[Field crops investigations in Wisconsin, 1926–27] (*Wisconsin Sta. Bul. 396 (1927), pp. 71–75, 77–79, 81–83, figs. 3*).—The progress of previously noted work (E. S. R., 56, p. 732) is reported.

Early corn varieties have given the most fodder and ripe grain in tests by E. J. Delwiche at the substations. Corn planted shallow (1 in.) has succeeded best on heavy soils in northern Wisconsin. At Ashland on heavy red clay rutabagas averaged 11.45 tons per acre with a labor cost of $4.29 per ton, corn silage 6.76 tons with a labor cost of $4.69, and sunflowers 10.99 tons with a labor cost of $3.23 per ton. Sunflowers also endure drought and withstand frosts that kill corn. Strains of a new white smooth awned barley brought forward by B. D. Leith and derived from crosses between Dwarf Black Barbless barley and pedigreed Oderbrucker outyielded Oderbrucker by an average of 25 per cent.

Experiments by A. H. Wright suggested that part of the hemp crop may be planted to the early Ferramington and part to common Kentucky hemp, thus prolonging the harvesting period. Fertilizer trials indicated that fertilizers, particularly those high in phosphate, can be used to advantage on most of the soils on which hemp is grown. Improved methods of handling and preparing the fiber, especially in softening and shaking tow, together with the hand hackling of line, were found of value. Supplementing hemp milling with the curing of seed corn in large quantities appeared to be practicable.

Fertilizer tests with sugar beets by Wright showed that application of fertilizer in the row does not affect the shape or size of the beets, and that the fertilizer will not prevent germination permanently or injure seedling growth. While excessive quantities may delay germination, up to 500 lbs. per acre of complete fertilizer including sodium nitrate 100 lbs., potassium chloride 150 lbs., and superphosphate (acid phosphate) 250 lbs. may be used with the seed without injury.

In experiments where air from 80 to 180° F. was blown through corn for from 24 to 120 hours and at moisture contents from 15 to 5 per cent, Wright and F. W. Duffee observed that warm air kept moving may be used at temperatures up to 130° to cure seed corn without injury to germination, seedling growth, or maturation. Freshly harvested corn containing from 30 to 50 per cent moisture may be cured in from 60 to 96 hours down to 12 per cent of moisture without detriment to germination and subsequent growth. The rapid drying of bulk seed corn in bins appears to be satisfactory and decidedly cheaper and much more certain than by methods used previously.

During trials with quick growing pasture and hay crops G. B. Mortimer found that an acre of winter rye will give pasture adequate for two mature cattle during May. Sudan grass seeded the last of May on the pastured rye field could be grazed July 10 and 1 acre gave two animals pasture for two periods totaling 42 days (84 cow-days). Sweet clover sown in early spring without a nurse crop could furnish considerable pasturage by August for 2 head of cattle for 60 days. The utilization of these crops for maximum pasture growth and the handling of sweet clover for hay are discussed briefly. Harrowing broadcasted soy beans when from 4 to 6 in. high greatly reduced the weed content of the resulting hay, and a rather heavy seeding rate has also helped to control weeds.

Heavy and close premature grazing throughout the growing season greatly reduced the productivity of a permanent bluegrass pasture, and root growth was hindered proportionately in comparison with light grazing in studies by L. F. Graber. A system of deferred grazing is suggested for the maintenance of

productivity in permanent pastures in the State. The merits of sweet clover for improvement of bluegrass pastures are discussed below.

An investigation by G. E. Helz, I. L. Baldwin, and E. B. Fred (E. S. R., 58, p. 727) in the legume group, including peas, lentils, and vetch revealed considerable differences in the ability of various strains of nodule-forming bacteria to promote the growth of plants of the different species. While nodules were readily formed on all three plants, differences appeared in the relative growth of the plants according to the strain of bacteria inoculating them. The mere presence of nodules did not seem to indicate absolutely that the plant can assimilate effectively the nitrogen from the air. It appeared necessary to determine if the strain of bacteria present is the one most efficient in aiding plant growth for the particular legume plant. Continued tests by Whiting, Fred, and Helz (E. S. R., 56, p. 734) on methods of applying fertilizer to beans and soy beans showed broadcasting to be the most desirable. In contrast to drilling the fertilizer close to the seed, quantities of fertilizer up to 400 lbs. per acre broadcast resulted in excellent plant growth and nodule formation.

Improvement of permanent bluegrass pastures with sweet clover, L. F. Graber (*Jour. Amer. Soc. Agron., 19 (1927), No. 11, pp. 994–1006, figs. 5*).—Practical ways of improving permanent bluegrass pastures by the use of sweet clover (*Melilotus alba*) are suggested in this contribution from the Wisconsin Experiment Station (E. S. R., 56, pp. 433, 732). Sweet clover and other plants producing abundant spring growth are said to make possible a deferred system of management for permanent bluegrass. Grazing has been injurious to sweet clover seedling plants and should be avoided during the year of seeding. Factors tending to depress the growth of bluegrass aid sweet clover in becoming thickly established in permanent bluegrass pastures.

Revegetation of waste range land, H. C. Hanson (*Colorado Sta. Bul. 332 (1928), pp. 9, figs. 7*).—Experiments showed that abandoned plowed areas in the foothills could be reclaimed by sowing such forage grasses as smooth brome grass, slender wheat grass, and crested wheat grass on a well-prepared seed bed. In many cases the grazing value of alkali seepage land might be improved by similarly sowing slender wheat grass, yellow sweet clover, meadow fescue, redtop, and smooth brome grass. Removal of sagebrush by burning on sagebrush land in many parts of Colorado is followed by natural increases of the native grasses. Areas undergoing revegetation should be protected from grazing for at least one year and the deferred rotation system of grazing used after the first year if possible.

Hardy alfalfa varieties needed in Michigan, J. F. Cox and C. R. Megee (*Michigan Sta. Quart. Bul., 10 (1928), No. 3, pp. 79–82, figs. 2*).—Test results over several years showed that the Hardigan, Grimm, Cossack, and Ontario Variegated strains of alfalfa are winter hardy, high-yielding strains and are well adapted to Michigan conditions. A few common strains will give fair yields when seeded under favorable conditions, but are not so dependable as the varieties indicated. Strains from Arizona, South America, and South Africa lacked winter hardiness and were not suitable.

Broomcorn experiments at the United States Dry-Land Field Station, Woodward, Okla., J. B. Sieglinger (*U. S. Dept. Agr., Tech. Bul. 51 (1928), pp. 32, figs. 8*).—Experiments with broomcorn from 1914 to 1926, inclusive, involving varietal, planting, spacing, and harvesting tests are summarized, supplementing an earlier report (E. S. R., 43, p. 232). A key is given to groups and varieties of broomcorn, and conditions in the dwarf broomcorn district and at the station are described, with meteorological data.

Western dwarf varieties, e. g., Acme, Evergreen Dwarf, and Scarborough, were found to be best adapted to conditions at Woodward and outyielded both the standard and whisk dwarf varieties on the average. Agronomic data are tabulated for the principal varieties of the several groups.

Seeding experiments with western dwarf broomcorn showed highest average yields to come from plantings about June 15, followed by July 1 plantings. Environmental conditions influenced suckering and the brush development to a considerable extent. Spacing tests with both dwarf and standard types suggested spacing plants from 6 to 9 in. apart in 44-in. rows for the best yields and quality of brush in the vicinity of Woodward. Culture of plants in hills showed no advantage over the ordinary drilling, and brush yields from rows 88 in. apart were considerably lower than from 44-in. rows, even with the same number of plants per acre. Harvesting experiments indicated that broomcorn should be harvested when the entire brush is green, about the time when the seed is in the milk stage.

Fertilizer experiments with corn, J. T. Williamson, W. H. Appleton, and H. B. Helms (*Alabama Sta. Circ. 52 (1927), pp. 12*).—Cooperative fertilizer experiments, 56 in number, made with corn on different soil types in Alabama from 1911 to 1921 showed that fertilizing with either superphosphate (acid phosphate) or kainit was unprofitable except on soils of the Appalachian and Piedmont Plateaus. Cottonseed meal seldom returned a profit, whereas sodium nitrate was profitable on all the soils studied, making its best returns on the Appalachian and Piedmont soils and the smallest on the Greenville-Orangeburg soils of the Coastal Plain.

Applications of superphosphate and potassium chloride were seldom profitable when applied to corn receiving varying quantities of sodium nitrate. Agreeing with earlier findings (E. S. R., 43, p. 333), test results indicated that sodium nitrate is best applied to corn 5 or 6 weeks after planting. There seemed no advantage in making two applications of sodium nitrate instead of one.

Variations of water and dry matter in the leaves of Pima and Acala cotton, R. S. Hawkins (*Arizona Sta. Tech. Bul. 17 (1927), pp. 417–444, figs. 14*).—Samples were taken from the uppermost mature leaves of Acala and Pima cotton every 2 hours from 7.30 a. m. to 7.30 p. m. daily from July 28 to August 20, 1926. The average Acala plant had 170 leaves with a total leaf surface of 15.08 sq. ft., and the average Pima plant had 103 leaves with a total surface of 12.58 sq. ft.

Acala cotton leaves always contained more water (436 mg.) than Pima leaves (355 mg.), suggesting a greater water requirement in Acala. The quantity of water in Acala leaves was correlated more closely with the soil moisture supply than was the water in Pima leaves. Acala seemed to suffer more from water stress, as indicated by heavier shedding of young bolls during such periods, and Acala leaves did not recover after wilting as soon as Pima leaves.

Acala leaves contained more dry matter by weight than did the Pima leaves, although the Pima had a higher percentage of dry matter. Variations observed in dry matter appeared to be due largely to the accumulation of food materials in the leaves. The quantity of dry matter increased more rapidly during the day in the Pima leaves than in the Acala leaves when abundant soil moisture was available, whereas the reverse was observed during periods of water shortage.

Cotton fertilizer experiments, T. S. Buie and J. D. Warner (*South Carolina Sta. Bul. 245 (1928), pp. 32, figs. 8*).—Cooperative fertilizer experiments (E. S. R., 58, p. 632) with cotton on eight important soil types involving formulas varying in contents of phosphorus, nitrogen, and potassium and at 6-acre rates

during the period 1920–1926 gave indications that a well balanced complete fertilizer is required for economical cotton production. Yields were almost in direct proportion to the quantity of nitrogen applied. Nitrogen was the first limiting factor and was followed by phosphorus, which in liberal applications resulted in increased total yields and earlier crops. Potassium seemed to prolong the productive fruiting period of cotton, although its effect on yields was not so pronounced as those of nitrogen and phosphorus. With the formulas used, from 600 to 800 lbs. per acre gave the most profitable returns. Variations in the formulas or acre rates did not affect lint percentage or boll size significantly, although bolls were somewhat smaller where no fertilizer, no phosphorus, or no potassium was applied.

Cotton fertilizers, R. W. HAMILTON (*Clemson Agr. Col. S. C., Ext. Bul. 86 (1928), pp. 15, figs. 2*).—Based extensively on investigations by the South Carolina Experiment Station, practical information is given on the principles of fertilizing cotton, sources of materials, plant food needs of cotton, and the preparation and application of fertilizer mixtures for cotton.

Depth of plowing influences yields of hemp, B. B. ROBINSON (*Michigan Sta. Quart. Bul., 10 (1928), No. 3, p. 94*).—Larger yields of green hemp were made on 6-in. than on 4-in. plowing, whereas little difference was noted between 6-in. and deeper plowing. Fall plowing seemed preferable to spring plowing.

Iogold oats, L. C. BURNETT (*Iowa Sta. Bul. 247 (1928), pp. 186–198, figs. 5*).—Iogold, a new variety of oats originating in a single plant selected from Kherson oats at the Iowa Station, is said to be characterized by stiffness of straw, a high grain yield, and resistance to stem rust. Comparisons covering ten crop seasons indicate that it ripens about the same time as Kherson, is taller than and stands as well as Iowa No. 105, and has outyielded Kherson, Iowa No. 103, Iowa No. 105, and Iowar. It outyielded local varieties in 65 per cent of the tests in cooperation with farmers. Increases in the yield of Iogold oats were made by drilling instead of broadcasting, sowing 3 bu. of seed per acre, and by applying manure and manure with phosphates.

Report of certified Irish potato seed tests for 1927, H. H. WEDGWORTH, W. S. ANDERSON, and H. F. WALLACE (*Mississippi Sta. Circ. 75 (1927), pp. 8, figs. 3*).—Comparative trials between certified seed of Irish Cobbler and Triumph potatoes from different northern States and uncertified seed of these varieties from several localities in Mississippi demonstrated the general superiority of the certified stock. This was especially true of the Triumph variety, in which many of the uncertified lots were heavily infected with mosaic.

Production test of commercial sugar beet seed, J. G. LILL (*Michigan Sta. Quart. Bul., 10 (1928), No. 3, pp. 107–110*).—The stand, acre yields of beets and sugar, sucrose content, and purity are tabulated for sugar beets grown from 42 brands of commercial sugar beet seed at the station and at Saginaw, Mich., in 1927. The Belotzerkov I, R. & G. Old Type, Horning, and Otto Dippe brands appeared to lead in sugar production per acre.

[Tobacco investigations in Connecticut] (*Connecticut State Sta. Bul. 291 (1927), p. 103*).—Fertilizer experiments at the Tobacco Substation and soil studies (E. S. R., 57, p. 333) showed definitely that old tobacco soils do not respond to applications of phosphorus in any form, so that in such soils growers may omit or greatly reduce the application of phosphorus. Of a number of potassium sources, potassium carbonate has so far given the best quality of leaf, whereas double manure salts did not surpass potassium sulfate. Acidity tests of more than 1,500 tobacco soil samples showed that all cases of black root rot have occurred above 5.6 pH, the worst being above 6 pH.

In topping and suckering experiments the best results were obtained with plants topped four leaves below the first bald sucker at the opening of the first flowers. Removing suckers twice seemed to give optimum results.

Preservative treatments for tobacco shade cloth have been noted elsewhere (E. S. R., 57, p. 297).

Cultural methods for winter wheat and spring wheat in the Judith Basin, A. OSENBRUG (*Montana Sta. Bul. 205 (1927), pp. 53, figs. 20*).—Results obtained with winter and spring wheat in the crop rotation and tillage method experiments at the Judith Basin Substation in cooperation with the U. S. Department of Agriculture during the period 1909–1925, inclusive, are reported, with the usual data on the soil and climatic conditions. See also a previous note (E. S. R., 58, p. 638).

Continuous winter wheat on shallow plowing yielded slightly more and cost and winterkilled less than on deep plowing. Subsoiling gave no increase or other advantage over fall plowing, and fall listing was not so productive as plowing for either winter or spring wheat. Summer fallowing has resulted in much larger winter wheat yields than continuous cropping, even on fall plowing, although control of soil blowing is sometimes a problem on summer fallow. Disked corn ground has given only slightly lower yields of winter wheat than summer fallow. Green manure of rye or field peas was not profitable. Yields of winter wheat on disked corn land approached those made on summer fallow. Winter wheat and corn had more beneficial effects on following crops than spring wheat.

Weeds were controlled slightly better on 7-in. spring plowing for spring wheat than on 3-in. plowing, although the latter was preferable because of similar yields and lower cost. Spring wheat yields were about alike on fall and spring plowing, albeit fall plowing has been the more effective in controlling wild oats. Subsoiling was of no value, and fall listing proved inferior to plowing. While spring wheat on fallow has yielded only from 3 to 4 bu. more than on continuously cropped plowed land, weed growth has increased on the latter, so that summer fallowing in alternate years has become much more productive and profitable. Spring wheat yields on clean plowed ground nearly equaled those on fallow, suggesting that fallow is of primary value in the region for weed control. Spring wheat was most profitable on disked corn land, giving yields nearly equal to those on fallow and slightly outyielding that on plowed corn land. Summer fallowing or growing a cultivated crop every third year resulted in slightly larger yields of the following crop of spring wheat than fallowing or growing a cultivated crop every second year. Green manures were neither effective nor economical.

Manure applied to corn from 1 to 2 years before spring wheat resulted in increases in spring wheat yields approximating 3.5 bu., whereas manure applied directly to oats had no effect on wheat 2 years later. In rotations including brome grass or alfalfa the spring wheat yields were reduced by volunteer brome grass or volunteer alfalfa, whereas clover was slightly beneficial. Dynamiting increased spring wheat yields slightly but was unprofitable. Spring wheat did not respond to phosphorus fertilizers with yield increase.

Winter wheat has outyielded spring wheat by a distinct margin on summer fallowed land, and is deemed the more desirable to seed on fallow, provided satisfactory means are employed to prevent soil blowing. Spring wheat is generally better than winter wheat for seeding on disked corn ground. The advantages in favor of winter wheat do not suffice to warrant its seeding on corn stubble land, except in years when there is plentiful precipitation in the fall and the wheat may be seeded before September 15.

Correlation of kernel texture, test weight per bushel, and protein content of hard red spring wheat, J. H. SHOLLENBERGER and C. F. KYLE (*Jour. Agr. Research [U. S.], 35 (1927), No. 12, pp. 1137–1151, figs. 2*).—Correlation studies reported from the U. S. D. A. Bureau of Agricultural Economics were made on 1,290 samples of hard red spring wheat grown during the crop years from 1915–1923, inclusive, largely in Northern and Western States. About half came from commercial lots of grain and half from experimental plats, and 29 wheat varieties were represented.

A fairly strong tendency noted for the protein content to increase as the percentage of dark, hard, and vitreous kernels increased was curvilinear in character and was pronounced in samples with a high percentage of such kernels. Test weight and protein content were significantly correlated. Protein tended to increase as the test weight rose in wheats weighing less than 54 lbs. per bushel, whereas in wheats testing more than 54 lbs. the tendency was for protein to decrease as the test weight increased. Variations in kernel texture and in test weight accounted for 44 per cent of the variations in protein content. No correlation was found between test weight per bushel and kernel texture, but kernel texture was considerably more important than was test weight.

A method for estimating the protein content when the kernel texture and test weight are known is outlined.

HORTICULTURE

[Horticultural investigations at the Alabama Station], C. L. ISBELL (*Alabama Sta. Rpt. 1925, pp. 14–16*).—Of various types of pears tested in the station orchard the European (*Pyrus communis*) varieties all succumbed to blight. Only the resistant sand pear hybrids such as Kieffer and Garber gave satisfactory results. The pineapple pear bloomed so early that the young fruits were usually destroyed by frost.

Among newly introduced peaches the June Elberta, Illinois, and Augbert appeared promising. A local variety, Big Indian Blood, was found high in quality and useful for pickling, but the fruit and foliage were unusually susceptible to spray injury.

The results of studies upon the fruiting and growth habits of the pecan are discussed as in the preceding report (E. S. R., 58, p. 434). The removal of the second growth shoot caused growth and nut production to shift to the primary part of the shoot. The ringing of shoots during the last 10 days of July increased the number of young shoots produced above the ring, provided partial or complete healing took place. Lack of healing resulted in a decrease in the number and vigor of the shoots above the wound. Ringing without healing was more potent than defoliation in reducing catkin and pistillate cluster formation in the Delmas and Pabst varieties. With partial or complete healing, ringing increased slightly the number of catkins and decreased the number of pistillate clusters in both varieties. Defoliation tended to increase the number and lower the vigor of shoots and to decrease materially the number of clusters of pistillate blooms. When the wound was not permitted to heal, a combination of ringing and defoliation to the base prevented fruiting in the Delmas and reduced fruiting in Pabst. Where the wound was allowed to heal, ringing and defoliation increased the number of catkins and pistillate clusters in Pabst but reduced catkins and completely inhibited formation of pistillate clusters in Delmas.

[Horticultural investigations at the Iowa Station] (*Iowa Sta. Rpt. 1927, pp. 27, 30, 31, 38–40, 41*).—Continuing the study discussed in the preceding report (E. S. R., 56, p. 832) on the economic possibilities of milkweed as a

source of rubber, paper, and oil, it was found that difficulties in germination could be overcome by scarifying the seeds. Many of the plants blossomed the first year. Translocation studies upon the entire plant over a 1-year period showed the rubber and fat contents to increase and the total nitrogen and sugars to decrease logarithmetically with the maturity of the plant. Maturity in the stem was associated with high reserve carbohydrates. Milkweed seed meal had a protein content of 49 per cent, half of which was water soluble.

Studies of the inheritance of chemical characters (carbohydrates, fats, and proteins) in crosses between dent and sweet corns showed conformity to the expected Mendelian ratios. In the hybrid generations separate sweet corn grains of the original carbohydrate composition reappeared.

Apple storage studies showed that keeping quality is associated with the rate of loss of acids which in turn is largely governed by temperature. A high initial rate of acid destruction is usually accompanied by an increased production of unsound tissue. The time of picking had but little influence on the composition of stored apples.

Tests of various methods of combining lime sulfur and lead arsenate indicated the advisability of adding lead arsenate in solution to dilute lime sulfur in agitation. Hydrated calcium lime was more effective than high magnesium lime in preventing the precipitation of sulfur lead compounds in the lime sulfur-lead arsenate mixture.

Favorable reports were received from various sections on the behavior of the Sharon apple, Patten pear, and Patten plum. In an Ontario test the Patten pear survived —34° F., while Kieffer, Anjou, and Flemish were killed outright. The Patten pear is also found very resistant to fire blight.

Pruning accompanied by fertilization with quickly available nitrogen proved an effective means of regulating growth and fruitfulness, and the trees thus treated outyielded the pruned, the fertilized, and the control trees. Observations in a commercial orchard at Charles City again indicated that from 3 to 5 lbs. of nitrate of soda per tree applied from 2 to 3 weeks before bloom is an effective treatment for increasing the amount and the regularity of production.

Studies in tomato fertilization indicated that potash has a retarding influence on ripening. Phosphates had a slight hastening effect but scarcely sufficient to warrant their use. Fertilizers in general were not beneficial for the tomato, liberal application resulting in an excess of vegetation, delayed maturity, and reduced yields. Phosphates had a material influence in hastening the maturity of sweet corn. At Marshalltown plants fertilized with 2–16–2 (N-P-K) showed 25 per cent of tasseling before the controls had begun to bloom. On strongly fertile soils fertilizers had no effect on yields.

[Horticultural investigations at the Washington Station] (*Washington Col. Sta. Bul. 222 (1927), pp. 15, 16, 35, 36, 37, 38, 39, 40, 66, 68, 69, 72, 73, 74*).—The usual annual report (E. S. R., 56, p. 533).

J. R. Neller working on the arsenical residue problem found certain lots of apples and pears carrying as high as 0.07 grains of As_2O_3 per pound of fruit. Of various removal treatments, spraying the fruits with dilute solutions of hydrochloric acid was most satisfactory. Determinations of the respiration rate of apples coated with oil after cleansing showed a reduction of from 30 to 40 per cent. The hydrochloric acid treatment when applied without brushing had no material effect upon the rate of CO_2 respiration or of weight loss. F. L. Overley found that arsenical residues on apples were removed most easily at harvest time. Later, wax coverings interfered, and the removal of the wax seemed to lessen keeping quality. Studies by F. D. Heald brought out the fact that dry wiping does not consistently reduce arsenic residues. Wash-

ing in solutions was more effective, although the ultimate results as concerned storage quality were not yet established. H. J. Jensen found no effect of chemical washes on the keeping quality, provided the rinse water was kept free of acids. Breakdown in Jonathan apples was apparently equally rapid in control and washed lots.

Observations by Neller and R. B. McKinnis upon the chamical composition of apples gathered at weekly intervals showed a distinctly lower acid content in drops than in picked fruits. Sugars and starches were quite uniform in all cases. A period of severe freezing during the harvest season did not affect the progressive maturity changes in Delicious apples either on the tree or in storage. Early harvested Jonathans contained less sugar and more starchy material than fruits gathered later. In both Delicious and Jonathan late picked fruits were better colored, larger, superior in quality, and kept equally well in storage. After several months in storage the respiration rate as measured by carbon dioxide evolution was approximately the same for apples harvested 3 weeks apart. Fruit in cold storage had a distinctly higher respiratory rate than that harvested at the same time and kept in air cooled storage.

Observations by O. M. Morris on peaches indicated that color is a satisfactory index to picking maturity, and although fruits gathered somewhat green kept longer and handled better, they did not develop satisfactory quality. Work on fruit pollination by Morris and W. A. Luce cited on page 42 is briefly reviewed. Morris found that at least one form of internal breakdown in Jonathan and Delicious apples was associated with delayed harvesting. Delay in storing was also a contributory cause, and the size of crop, distribution on the tree, and weather and growth conditions are all deemed potential factors. Apples harvested just prior to maturity were found by Overley and Jensen to have as good storage quality as more immature fruits. Dessert quality was higher in fruits approaching maturity when harvested. High prices for early fruit and premature dropping encourage early harvesting. Observations by Jensen at Prosser showed Jonathan, Rome, and Winesap to produce a light second bloom following frost. Delicious failed to produce any second bloom. Heavily pruned Jonathan trees were more susceptible to fire blight than were lightly pruned trees. Observations in an irrigated orchard, part planted with alfalfa and part clean tilled, showed a much higher water requirement in the alfalfa section accompanied by a retarded terminal bud formation. Everbearing strawberries, particularly the Mastodon, outyielded the spring fruiting kinds.

Cranberry investigations conducted in Pacific County by D. J. Crowley indicated that various insect pests, including the oyster and Putman scales, can be held in check by spraying in early spring with diluted lime sulfur. Oil was found less effective than lime sulfur. Harvesting berries while wet was observed to increase decay quite irrespective of spraying practice. Of various chemicals tested for weed control, distillate was apparently more effective than kerosene for destroying marsh grasses. Sodium arsenate destroyed horsetails where present in small numbers on new bogs, but was dangerous to cranberry plants if used freely and also poisoned the soil for several seasons.

[Horticultural investigations at the Wisconsin Station] (*Wisconsin Sta. Bul. 396 (1927), pp. 67–69, 70, 107–110, figs. 2*).—This is the usual progress report (E. S. R., 56, p. 739).

Discussing the methods of technique employed in the improvement of corn by inbreeding, R. A. Brink, B. D. Leith, and J. G. Dickson report success with sweet corn improvement in 1927. Not only gains in yield but also striking im-

provement in uniformity of ripening was secured by recombining inbred lines of the Narrow Grained Evergreen variety. The recombined crossbreds yielded a much higher proportion of ears in prime condition at any one picking. Tests conducted by E. D. Holden showed Wisconsin-grown sweet corn seed to be superior in hardiness and productiveness. It was found that sweet corn seed could be gathered in the milk stage provided the ears were subjected to artificial heat and aeration. Grading of sweet corn seed according to size promoted evenness in maturity.

Again discussing (E. S. R., 55, p. 537) the effects of environment and plant food on the growth of apple trees, the conclusion is reached that growth responses are related to the elaborated food conditions within the tree rather than directly to the tree's environment. Fruiting and growth are regulated by the balance between carbohydrate and protein materials. Lack of fruitfulness accompanies conditions of overvegetativeness or undervegetativeness. Propagation experiments conducted by R. H. Roberts are again reviewed (E. S. R., 58, pp. 138, 139).

Paper wrappers and their effect upon physical and chemical properties of horticultural products, H. D. Brown (*Michigan Sta. Tech. Bul. 87 (1928), pp. 29, figs. 6*).—Studies of the effect of several types of wrapping papers on various fruit and vegetable products indicated that the chief benefits of paper are in reducing moisture changes, preventing injury, and in adding to the market attractiveness. The chemical effects resulting from the use of paper wrappers were found to be negligible in almost all cases. Kraft, tissue, waxed, vegetable parchment, and "whalehide" papers were compared in the test. Waxed papers were effective in reducing moisture changes, but limited ventilation and promoted decay at high temperatures. Parchment and whalehide possessed high resistance to disintegration in water, and hence are deemed useful for wrapping products which are to be iced. Both parchment and whalehide were sufficiently porous to allow ventilation. Newspaper provided satisfactory insulation for lining flower boxes.

Studies with an ultra-violet light machine and with sunlight upon the light penetrability of various papers and other materials showed that both sunlight and ultra-violet light pass readily through waxed papers, Flex-O-Glass, Cel-O-Glass, and Vitrex. Parchment paper also transmitted considerable of both kinds of light. Whalehide was practically impermeable to both.

In respect to measurements of the changes in quality of horticultural products, refractometer and cryoscope readings gave quick results, checking quite well in most cases with the results of chemical analyses. Total sugars in sweet corn and peas but not in grapes were quickly reduced in quantity upon exposure to high temperature. The sugar in peas apparently first changed to acid-hydrolyzable material and then to starch. In corn the change was apparently directly to starch. Storage at low temperature materially retarded these changes. Catalase activity was not found a useful index for recording the effect of wrappers on peas.

Hotbeds and coldframes, R. V. Lott (*Colorado Sta. Bul. 328 (1928), pp. 24, figs. 9*).—A presentation of general information on the construction and management of hotbeds and coldframes. Supplementary information is given on soil sterilization, growing plants in pots and bands, transplanting to the field, and the use of plant protectors.

The quality of vegetable seed bought by market gardeners in Connecticut in 1927, E. M. Stoddard and A. D. McDonnell (*Connecticut State Sta. Bul. 293 (1928), pp. 179–186, fig. 1*).—In a like manner to the previously noted bulletin (E. S. R., 57, p. 40) this contains the tabulated results of germination

tests of vegetable seeds collected in Connecticut in 1927. A table of germination standards adopted by the station for vegetable seed is included.

Washington asparagus in Tennessee, J. A. McClintock (*Tennessee Sta. Circ. 21 (1928), pp. 4, figs. 4*).—Briefly discussing the history and development of the Washington variety of asparagus, the author discusses the best methods of planting, culture, and fertilization.

Some edible and poisonous mushrooms of Colorado, B. O. Longyear (*Colorado Sta. Bul. 331 (1928), pp. 48, pl. 1, figs. 39*).—Discussing the nature and growth of fungi and methods of propagation, the author describes and illustrates a large number of mushrooms occurring in Colorado, supplementing this information with notes on their edibility or nonedibility. Suggestions are offered upon the culture of mushrooms and upon their use as food.

Pollination of deciduous fruits, W. A. Luce and O. M. Morris (*Washington Col. Sta. Bul. 223 (1928), pp. 22, figs. 3*).—Controlled self-pollination tests in the Wenatchee district in 1926 and 1927 showed Winesap, Stayman Winesap, Delicious, and Arkansas Black apples to be completely self-sterile. At the same time Richared (Delicious sport) set 5.2 per cent, Rome 10, Banana 10.8, Jonathan 3.5, and Esopus (Spitzenberg) 8.1 per cent of their blooms. Cross-pollination tests showed Arkansas Black, Banana, Delicious, Gano, Jonathan, Red Rome (Rome sport), Richared sport, and Rome to be satisfactory pollinizers for Winesap. In applying compatible pollen of several varieties to Winesap trees of varying vigor much better sets were secured on high vigor trees. Abundant fertilization with nitrogen fertilizers also increased the percentage of set in the case of Winesap×Delicious. As pollinizers for Delicious, Esopus, Banana, Red Rome, and Jonathan proved particularly adaptable. Winesap and Richared gave negative results.

Pear pollination studies showed Bartlett, Anjou, Bosc, and Winter Nelis to be practically self-sterile and Flemish to be self-fertile. Anjou, Bosc, Flemish, and Winter Nelis proved satisfactory pollinizers for Bartlett; Anjou, Flemish, Bartlett, and Winter Nelis for Bosc; Anjou, Bartlett, Bosc, Winter Nelis, and Flemish for Flemish; and Anjou, Bartlett, and Flemish for Winter Nelis. Results with Anjou were generally unsatisfactory, the highest average percentage set in 1925–26 being only 2.3 per cent. Further work with Anjou in 1927 indicated that stimulation of the trees with fertilizer and pruning increased the set.

The J. H. Hale peach was found self-sterile but satisfactorily pollinated with Elberta and Slappey. The pollination situation in sweet cherries, plums, and apricots is discussed, an emergency pollination practice outlined, and the function of insects emphasized.

Cutting corners and cutting profits in spraying, V. R. Gardner (*Michigan Sta. Quart. Bul., 10 (1928), No. 3, pp. 88–92*).—Cutting the cost of spraying by reducing concentrations of materials, using less spray per tree, and by leaving out certain materials or applications is not deemed a sensible procedure. Instead the author urges increasing the yield per tree by better orchard management. Since there is no significant increase in cost of spraying a large crop, the net cost per bushel of fruit is materially decreased. Data are included on the cost of sprays and of spraying.

Spraying calendar, W. C. Dutton, R. H. Pettit, and C. W. Bennett (*Michigan Sta. Spec. Bul. 174 (1928), pp. 31, figs. 9*).—Spray calendars are presented for various tree and small fruits, supplemented with general information on the nature, composition, and preparation of spray and dusting materials, the cost of spraying apples, etc. Various auxiliary control measures, such as the

paradichlorobenzene treatment for the peach borer and the roguing of raspberry plantations for disease, are discussed.

1928 spraying and dusting recommendations for apples (*New Jersey Stas. Circ. 209 (1928), pp. 4, fig. 1*).—A spray calendar for New Jersey apples.

Other fig chimeras, I. J. Condit (*Jour. Heredity, 19 (1928), No. 2, pp. 48–53, figs. 3*).—Discussing in a general way the occurrence of chimeras in the fruits and leaves of the fig, the author records several instances of these offtypes in California orchards.

Grafting grapes, F. E. Gladwin (*New York State Sta. Circ. 97 (1928), pp. 6, pls. 4*).—A circular of information concerning methods and practices employed in grafting grapes and in handling the resulting plants, designed to replace in part an earlier and now unavailable bulletin (E. S. R., 52, p. 538) on the same subject by the same author.

The direct effect of pollen on the fruit of the date palm, R. W. Nixon (*Jour. Agr. Research [U. S.], 36 (1928), No. 2, pp. 97–128, figs. 7*).—Investigations conducted at the U. S. D. A. Experiment Date Garden, Indio, Calif., and in the Salt River Valley, Arizona, with pollens from 25 male plants, 22 seedlings of *Phoenix dactylifera*, and 3 seedlings of *P. canariensis*, showed that the pollen has an unquestionable immediate influence on the fruits. The most striking differences were observed in the time of ripening, in certain instances amounting to as much as 10 days in the early part of the season with a tendency to increase later. Two of the pollens which gave diverse results were directly compared in 30 separate tests and gave consistent differences. Significant differences were also noted in the effect of the pollens on the size and the shape of the seed, e. g., pollen of *P. canariensis* produced seeds having a distinct tapering base. Variations in the size of seed were correlated to a mild degree with differences in the size of fruits.

Xenia is not deemed to be altogether a satisfactory explanation of the phenomena, since it does not account for the influence on the fleshy part of the fruits. There was an apparent interrelation between the embryo and the endosperm and the flesh of the date. From a practical standpoint the results suggest the importance of careful selection of male date palms for pollination purposes.

Determination of length of time during which the flowers of the date palm remain receptive to fertilization, A. R. Leding (*Jour. Agr. Research [U. S.], 36 (1928), No. 2, pp. 129–134, fig. 1*).—The value of prompt pollination following the opening of the female flowers of the date palm was indicated in studies at the U. S. D. A. Field Station, Sacaton, Ariz. For example, in 1923 the highest average percentage of fertilized blossoms, 89, was attained in second day pollinations, with a gradual decline to 23.2 on the eleventh day. Similar results were obtained in succeeding years, leading to the conclusion that the longer the pollination is delayed after the opening of the spathe the fewer will be the fertilizations effected. High percentages of fertilization after a delay of 10 days or more are deemed impossible.

A score of easily propagated lilies, D. Griffiths (*U. S. Dept. Agr. Circ. 23 (1928), pp. 36, pls. 8, figs. 19*).—Devoted mainly to the individual propagation requirements of 20 lily species, namely, Madonna, Nankeen, Easter, Regal, Umbellatum, Orange, Thunberg, Redstar, Tiger, Leopard, Lemon, Humboldt, Turk's-cap, Columbia, Canada, Coral, Martagon, Hanson, Henry, and Speciosum, this circular presents in addition information concerning the cultural and propagation requirements of lilies in general; also information concerning the handling of seed and seedlings and the control of various pests.

Culture of Christmas holly, H. D. Locklin (*Western Washington Sta. Bul. 7–W (1928), pp. 25, figs. 5*).—A general discussion with relation to botanical characteristics, soil requirements, varieties, propagation, culture, pruning, harvesting, grading, packing, and marketing.

The garden lover, L. H. Bailey (*New York: Macmillan Co., 1928, pp. [3]+154*).—A helpful and interesting discussion designed primarily for the amateur.

FORESTRY

The study of natural reproduction on burned forest areas, J. A. Larsen (*Jour. Forestry, 26 (1928), No. 3, pp. 332–337*).—Observations on natural regeneration following fires in the Bitterroot Mountains led the author to believe that every silvical characteristic of the species, every factor of site whether climatic, physiographic, or edaphic, and every condition surrounding the fire itself influences regeneration in some way or other. Certain factors, the prevailing climate, the topography, and the nature of the soil create conditions favoring certain forest types quite irrespective of the fire. Age, composition, and density of the forest, the amount of inflammable material on the ground, and existing weather conditions at the time of the fire influence the degree of destruction and the amount of seed available for restocking. Seed for restocking is, according to the author's observations, obtained from cones of trees injured or killed in the fire, from seed buried by rodents, and from that carried in by the wind from adjacent unburned trees. The possibility is suggested that seed may be also distributed by the strong air currents developed by the fire.

Best white pine seedlings follow fall planting, A. K. Chittenden and P. W. Robbins (*Michigan Sta. Quart. Bul., 10 (1928), No. 3, pp. 95–97, fig. 1*).—Observations on white pine nursery seedlings from beds established in November, 1926, and May, 1927, showed distinctly in favor of fall planting. Data recorded in the fall of 1927 showed the fall-sown seedlings to weigh approximately 50 per cent more and to possess a sturdier root system and top. Some of the other advantages for fall sowing are less damping off, less weed competition, and no holdover germination. It is suggested that seedlings be left in the seed beds until 2 years old.

Preliminary report on partial measurements of forest plantations, R. R. Paton and L. J. Leffelman (*Jour. Agr. Research [U. S.], 36 (1928), No. 1, pp. 91–96, figs. 2*).—Realizing the necessity of extreme accuracy in the measurement of trees grown in plantations, studies were conducted by the Ohio Experiment Station upon planted stands at Oberlin, Wooster, and Athens to determine the percentage of the stand that it is necessary to measure in order to obtain accurate interpretations. Measurements of the diameter and height were made upon each tree and probable errors computed and plotted for height and diameter for various percentages of the stand. Using as standards the variations of ±0.1 in. in the mean of the diameter and ±0.5 ft. in the mean of the height, it was found that in the 11 stands measured in 4 instances all the trees needed measuring to give the desired accuracy in respect to diameter, while for height 100 per cent was required in only 2 of the 11 stands. It is concluded that in the majority of small but uniform stands measurements of 50 per cent of the trees will give accurate interpretation, and that in uniform stands of over 500 trees a third or even a quarter will give reliable results. The data suggest the possibility that fewer trees are needed for height than for diameter estimates.

Volume computations of the stands brought out the fact that somewhere between 200 and 400 trees there is a sharp trend toward a common line, and

that allowing an error of ±5 per cent of the true volume, measurement of approximately 250 trees gave satisfactory results. In the stands measured, data on 250 or more trees gave results within the limits of accuracy as determined by both volume and probable errors.

Relative accuracy of calipers and diameter tape in measuring Douglas fir trees, R. E. McArdle (*Jour. Forestry, 26 (1928), No. 3, pp. 338–342*).—Repeated measurements on 200 Douglas fir trees tagged at breast height in order that each tree might be remeasured at exactly the same point showed no significant differences between the tape and calipers as far as checking one's own data was concerned. In repeated readings on the same material the tape proved somewhat more consistent. Tape readings were, however, invariably higher than caliper readings; for example, in two series of measurements on the 200 trees the increases from tape readings were 1.5 and 1.4 per cent. Discrepancies in readings increased progressively with the size of the tree, a fact explained by a greater irregularity in the shape of large trees. Practically the same time was required for making accurate readings by either method. Calipers are deemed preferable for measuring large trees where an absolute degree of accuracy is desired.

Growth of conifers measured in upper peninsula, P. W. Robbins (*Michigan Sta. Quart. Bul., 10 (1928), No. 3, pp. 113–115*).—Measurements taken on white spruce and balsam fir growing near the Dunbar Forest Experiment Station showed the two species to have about the same growth rate. At 60 years white spruce was 53 ft. high and 9.8 in. in diameter as compared with 49 ft. and 9.7 in. for balsam fir. In respect to regeneration on a site logged over 5 years previously and not burned since that time, white spruce and balsam fir were practically equal in number. On another site 3 years from logging over poplar and balsam fir were the most numerous species. Since white spruce is more valuable than balsam fir it is recommended that adequate seed trees be left at the time of logging. All poplar and birch trees should be cut at the time of logging.

DISEASES OF PLANTS

Plant pathology [California], D. G. Milbrath (*Calif. Dept. Agr. Mo. Bul., 15 (1926), No. 7–12, pp. 131–133*).—*Heterodera radicicola* appears to be widely distributed in soils of gardens, nurseries, and orchards in California. Normal flower production is prevented in such plants as *Berberis wilsonae, Diervilla florida, Clematis* sp., *Paeonia* sp., and *Chrysanthemum* sp. Field inspections of narcissus plants show that the beneficial effects of the hot water treatment for *Tylenchus dipsaci* have fulfilled expectations.

In 1926, powdery mildew showed on cantaloupe vines in Imperial Valley in a far more destructive form than during the previous year. A temporary preventive measure was found to depend, as regards efficiency, on complete coverage of the plant, the tolerance of the host for the fungicide, and the method of application. Sulfur dust appeared to be the most promising material. The growing normal leaf proved to be the most tolerant as regards sulfur. Dilution of the sulfur did not lower injury. The best temporary preventive appeared to be commercial ground sulfur and flowers of sulfur placed on the soil under the plants.

In the cling peach district of Sutter and Yuba Counties, rust (*Puccinia prunispinosae*) occurred sporadically, and it appeared that a study of the disease and of host relationship was necessary.

Late blight (*Phytophthora infestans*) occurred on late tomatoes in the southern part of the State. This disease tends to become epidemic under favoring conditions.

Downy mildew (*Peronospora schleideni*) on onion seed crops was widespread and destructive, less so on bulb crops. Of the fungicidal preparations tested, copper-lime dust and Bordeaux mixture plus paper-hangers' paste appeared the most promising as regards adhesiveness and fungicidal value.

In sections of the San Joaquin and Sacramento Valleys, *Fusarium vasinfectum tracheiphilum* was a limiting factor in black-eye bean production, but the small Lima bean appeared resistant. In the same sections *F. niveum* has been a factor in watermelon production.

Botany (*Connecticut State Sta. Bul. 291 (1927), pp. 98, 99, figs. 2*).—Mosaic diseases are reported to have been especially troublesome in the State during the year. A microscopical study of a type of mosaic is said to have shown the occurrence of definite inclusions in the nucleus of infected cells similar to the plate crystals in the cell outside. The infective principle of mosaic was found to be active in tobacco leaves that had been preserved in the herbarium for 24 years.

Experiments with Semesan, formalin, and corrosive sublimate for the treatment of seed potatoes are said to have shown no positive stimulating effects for any of the disinfectants.

Experiments for the control of apple diseases, especially scab, were not so successful as in previous years, due, it is thought, to excessive rainfall. Comparisons were made of the efficiency of a complete spray schedule; a complete dust schedule with each of the dusts Pomodust and Kolodust; and two combinations of dust and spray. Kolodust is said to have given the best control of scab, with Pomodust second and spray third. This order of efficiency is believed to have been due to the fact that the calyx treatment with dust was put on immediately before a 3-day rain period during which the maximum discharge of scab spores took place, while the spray was not applied until after this period.

Spraying is said to have given considerably better control of sooty blotch and fruit speck than did the dust.

Division of plant pathology (*Washington Col. Sta. Bul. 222 (1927), pp. 38, 39, 40–43*).—Continuing investigations on the control of bunt or stinking smut of wheat (E. S. R., 56, p. 540), F. D. Heald tested a number of copper-containing dusts, organic mercury dusts, liquid disinfectants, and sodium azide as a dust and as a liquid fungicide. The copper compounds and some of the organic mercury dusts, as well as the liquid treatments, gave excellent control. Sodium azide when used in solution was more effective in reducing smut than when it was employed as a dust.

Studies of apple rots, by Heald and G. R. Ruehle, are said to have shown that dry wiping of the fruits did not reduce the fungus flora below that of unwiped fruit. Storage tests showed a slight increase in rots in certain varieties of apples when machine wiped. Fungi belonging to 21 genera were isolated from apples, and special investigations by G. A. Newton showed the presence of *Pleospora mali* and *Stemphylium congestum* on apples in storage, where they caused a dark or black dry-rot. Blue mold, *Penicillium expansum*, is considered to be the cause of the most serious rot of apples in storage, and washing the fruit to remove arsenical spray residue did not increase the amount of blue mold in storage.

Tests by B. F. Dana and L. E. Miles are said to indicate that corrosive sublimate was effective for the control of Rhizoctonia on potatoes, but Semesan Bel and Dip Dust did not control the disease or increase yields.

Experiments by the same investigators resulted in the maintenance of disease-free strains of Netted Gem and Bliss Triumph potatoes, but plats of Irish

Cobbler and Idaho Rural were abandoned on account of the extensive presence of mosaic and leaf roll. These plats were rogued of everything except leaf roll and were continued for further experiments on this disease.

The plant disease survey is said to have revealed alfalfa wilt (*Sclerotinia trifoliorum*) as being very serious in the western part of the State. Dodder, *Cuscuta* sp., is reported on chrysanthemums grown under glass. Blight or heart rot of beets, due to *Mycosphaerella tabifica*, caused losses to mangels in neutral or alkaline soils. A marked reduction in the percentage of western yellow blight of tomatoes and the blight of squashes, cucumbers, and ornamentals was found to be associated with a lessened prevalence of sugar beet curly top during the year.

[Plant disease investigations in Wisconsin] (*Wisconsin Sta. Bul. 396 (1927), pp. 111–122, figs. 2*).—Experiments by G. W. Keitt, E. E. Wilson, and J. M. Hamilton showed that the best control of apple scab was secured in 1927, a year very favorable for the disease, by applications of 1–40 lime sulfur made at the delayed dormant, closed cluster, and open cluster stages of development. Preliminary experiments with various compounds of copper, sulfur, mercury, and arsenic applied after harvesting the fruit crop, but before leaf fall, appeared to reduce the production of ascospores. These experiments are believed to indicate the possible value of such treatments for the control of apple scab.

Cherry leaf spot is reported to have been severe in 1927, and Bordeaux mixture, 3–3–50, was more effective for its control than was lime sulfur. Dust treatments of various kinds were not satisfactory. The critical period for the control of cherry leaf spot is said to be about 14 days after petal fall. No consistent results were obtained in studies of the relation of spray mixtures to size of fruit.

In continuation of studies on crown gall of apple and its control (E. S. R., 56, p. 746), Keitt and W. M. Banfield found that the organism *Bacterium tumefaciens* survived the winter in the soil where no susceptible plants were growing, and in greenhouse experiments the organism was recovered from an unsterilized soil at various periods up to one year.

Observations on malformations of nursery stock are said to have shown that a large percentage was caused by overgrowths developed during callusing or soon after planting. This condition was controlled by making well-fitted grafts and using suitable wrapping material.

Studies of fire blight development and control, by Keitt and P. W. Miller, showed a considerable overwintering of the organism in cankers on blighted twigs. Apple varieties were found to differ widely in the percentage of infection from overwintering bacteria. The first bacterial exudate from overwintered cankers was noticed on April 19, and the first blighted flower clusters were found before the blossoms opened. Rain is considered to have been more important than insects in disseminating blossom blight in 1927. Twig blight was disseminated by aphids and leafhoppers and also by rain. Cutting out blighted parts reduced blossom blight, but spraying with Bordeaux mixture before the blossoms opened did not lessen blighting.

A correlation was found by J. G. Dickson and associates between resistance of corn and wheat to seed blights and root and ear rots and the pentosan content of the plants. Susceptible seedlings are said to have been high in pentosans, etc., while resistant ones were low in these substances.

Experiments by R. W. Leukel showed that barley stripe was controlled better by some commercial dusts than by the usual formaldehyde treatment. Selection work with cereals, by Dickson, showed varietal differences in susceptibility to

diseases, and a number of promising strains of wheat and barley were under investigation.

Continued studies of neck rot of onions, by J. C. Walker, have shown that this storage trouble is caused by three species of Botrytis (E. S. R., 56, p. 450). Artificial drying of onion bulbs controlled the disease, but present methods are considered too costly for this use, although they will probably be practicable for sets.

Protecting asters from leafhoppers was found by L. R. Jones and R. S. Riker to control aster yellows, a virus disease. Promising results are said to have been secured in developing strains of asters resistant to wilt, caused by *Fusarium* sp., by following methods that have been worked out for cabbage yellows.

Studies by W. J. Zaumeyer of bacterial blights of beans showed that these diseases are primarily dependent on seed infection, and the use of healthy seed is recommended. Western-grown seed appeared less infected than eastern seed. Wide differences were noted in varietal susceptibility to blight.

A short account is given of a study by T. G. Fajardo of bean mosaic. The disease is said to be spread in the field by insects, mainly aphids, although mealybugs appeared to be potential carriers.

A wilt disease of peas attributed to *Fusarium orthoceras* by M. B. Linford and Jones is stated to be the major cause of pea failures in many sections of Wisconsin and second only to root rot for the State as a whole. It is deemed evident that the soil harbors the organisms for long periods, but certain varieties of peas are practically immune.

Report of the Dominion botanist for the year 1926, H. T. Güssow et al. (*Canada Expt. Farms, Div. Bot. Rpt. 1926, pp. 149, figs. 50*).—In continuation of accounts previously noted (E. S. R., 57, p. 145), divisional, regional, cooperational, and individual reports are presented.

Report of the advisory mycologist, N. C. Preston (*Harper Adams Agr. Col., Advisory Rpt. 2 (1926–27), pp. 2–6*).—Except for local crop damage due to potato blight and bean chocolate spot, no very severe plant disease appeared.

Experimentation attempting control of finger-and-toe or clubroot in cabbage seedlings on heavily infected soil showed the most satisfactory results from mercuric chloride (1 oz. in 6 gal. of water, 0.5 pint to each plantlet when set out), with Uspulun as a fairly satisfactory second, as regards both disease reduction and weight increase. However, mercury compounds are suitable to disease control only over comparatively small areas.

The genetics, biology, and physiology of some Erysiphaceae [trans. title], C. Hammarlund (*Hereditas, 6 (1925), No. 1, pp. 1–126, figs. 10; Eng. abs., pp. 118–121*).—The first chapter deals with a number of biotypes in Erysiphaceae as demonstrated in numerous infection experiments. A few methods are set forth. The second chapter demonstrates the effect of the moisture content of the air upon the development of conidia. The results are tabulated. The third chapter deals with the "matrical-modifications" produced in genetically differing host material.

Fungicidal colloids [trans. title], L. Guyot (*Jour. Agr. Prat., n. ser., 44 (1925), No. 39, pp. 250–252*).—A short review is given of experimentation and opinion regarding the action and effects of colloidal fungicides.

Dry seed treatments [trans. title], P. Pouzin (*Jour. Agr. Prat., n. ser., 44 (1925), No. 45, pp. 378, 379, figs. 2*).—The author sets forth a convenient method of applying dust fungicides to seed grain, without special reference to an account of such work previously noted (E. S. R., 54, p. 452). In January, 1925, use was made of dry copper sulfate and a complex powder, "Vitrioline."

[Barley smut infection], J. Seiffert (*Kühn Arch., 12 (1926), pp. 423–515*).—An account in systematic detail is given of tests by artificial infection of the sensitivity of barley varieties toward *Ustilago hordei nuda* under the influences of various external conditions, as shown by the resulting percentage of smut developed.

An occasional disease of oats [trans. title], L. Rives (*Jour. Agr. Prat., n. ser., 44 (1925), No. 34, p. 148*).—It is thought that *Asterocystis radicis*, found in roots of oats, may prove to be only an occasional parasite, depending for its ability to attack upon conditions unfavorable to the plant.

Further studies on the soil relationships of the mosaic disease of winter wheat, R. W. Webb (*Jour. Agr. Research [U. S.], 36 (1928), No. 1, pp. 53–75, figs. 4*).—In connection with other investigations of wheat mosaic that have been reported upon (E. S. R., 58, p. 445), the author made studies of the distribution of the causal agent in the soil, the effect of soil dilution, filtration, etc., on the occurance of the disease in the same varieties of wheat previously reported upon. The experiments were carried on at the Wisconsin Experiment Station with infested soil from Granite City, Ill.

In one series of pots the soil was stratified in various ways, and it was found that the disease developed when the infested soil was either below, above, or lateral to the seeds and at a considerable distance from them. When infested soil was diluted 50 per cent with noninfested soil relatively high percentages of rosette were obtained. With greater dilutions, the percentages decreased more or less.

It was found that filtration of the infested soil by the passage of large quantities of water through it did not remove any detachable quantities of the virus. In all cases, negative results were obtained when the soil filtrates were mixed with noninfested soil. Positive results were obtained only from the silt fraction removed from the filtrates. Infested soil through which water was filtered several times produced no visible diminution in disease development.

Under the conditions of the author's experiments the mottling phase of mosaic is said to have persisted in higher percentages and greater intensity than the rosette phase. Unmistakable symptoms of rosette were obtained when the plants were exposed to outdoor conditions from a normal seeding date (September 28) until October 31. After a longer exposure the symptoms were greater, both in percentage and intensity.

Observations on rust [trans. title], F. Desprez (*Jour. Agr. Prat., n. ser., 44 (1925), No. 32, pp. 118–120*).—Observations are somewhat detailed as made on early, second-early, and late wheats in connection with fertilizers, as regards sensitivity to rust, the resistant varieties mentioned including Nursery, Dattel, Téverson, and Geldendorp.

The influence of external factors on wheat stinking smut [trans. title], R. Caspar (*Kühn Arch., 12 (1926), pp. 205–256*).—The influence of manuring is not very important as regards attack by stinking smut, which is, however, more severe on damp than on extremely dry or wet soils. Looseness of soil lessens the attack. The kind of soil is not very important. Attack is lowered by high germination temperature, but importance attaches to the consequent tillering relations. Shading lengthens the period of sensitivity to infection. Depth of seeding favors the stinking smut percentage, as does also thick seeding. Age of seed lowers the infection rate. Late-grown wheat is less severely attacked.

Seed treatments for stinking smut of wheat, E. A. Lungren and L. W. Durrell (*Colorado Sta. Bul. 333 (1928), pp. 12, fig. 1*).—The results are given of investigations on the conditions influencing smut infection and of three

years' experiments in treating seed wheat with various chemicals for the control of stinking smut.

Fourteen materials were tested, and of the dust treatments two forms of copper carbonate and Bayer Compound reduced smut to the lowest percentage. Other dusts controlled smut, but to a lesser degree. The wet treatments gave good control of smut but injured the germination and stand.

Smut infection was found to be influenced by soil temperature and moisture, soil moistures of from 15 to 20 per cent and a temperature of about 55° F. being the most favorable for smut germination. Soil temperatures at the station in August and September are said to be usually too high for smut germination, while October temperatures are more favorable. It is claimed that wheat sown in heavily infected soil will be more smutty than that planted in soil free from smut spores. Field experiments are said to indicate that it is doubtful if smut spores in the soil live over winter to infect spring wheat.

Diseases of canning crops in 1927, L. K. JONES (*New York State Sta. Circ. 99 (1928), pp. 5*).—Accounts are given of the occurrence and severity of various diseases of peas, beans, and tomatoes.

Under the notes on tomato diseases a new bacterial disease is reported, which is said to have appeared in Niagara County, N. Y., in 1926 and caused considerable losses in 1927. Further studies have shown that this disease is a form of bacterial canker or Grand Rapids disease.

Suggestions are given for the control of the various diseases described.

Black-leg disease of Brussels sprouts, cabbage, and cauliflower, E. E. CLAYTON (*New York State Sta. Bul. 550 (1927), pp. 27, pls. 8*).—A report is given of experiments conducted from 1922 to 1927 for the control of blackleg of cabbage, cauliflower, and Brussels sprouts caused by the fungus *Phoma lingam*.

The source of blackleg infection was said to be in the seed or in the soil, and locally grown seed of Brussels sprouts and cabbage was found commonly infected with blackleg, the causal fungus living practically as long as the seed. The fungus was also found to live in the soil for at least three years. Tests of a large number of cabbage and cauliflower varieties and strains showed that all were susceptible to the disease. Similar trials with Brussels sprouts showed one strain that was partially resistant.

Of the various seed treatment tests, hot water treatments proved the most effective. For the control of blackleg the author recommends rotation of seed bed and field areas, selecting land for the seed bed that has not grown susceptible crops for five or six years, and land for the field where crops other than those subject to disease have been grown for the previous three years.

Building up resistance to diseases in beans, D. REDDICK (*New York Cornell Sta. Mem. 114 (1928), pp. 15*).—An account is given of seven years' experiments in crossing and selecting strains and varieties of beans to increase their resistance to anthracnose and mosaic. A considerable number of resistant hybrid forms were produced, but their commercial value remains to be tested, as is also their reaction to other bean diseases, as bacterial blight, root rot, and rust.

Breeding Phaseolus vulgaris for immunity against Colletotrichum lindemuthianum [trans. title], G. BREDEMANN and H. TEN DOORNKAAT-KOOLMAN (*Ztschr. Pflanzenzücht., 12 (1927), No. 2, pp. 209–217*).—In work which is said to have been started in 1921, and since carried forward by one or both, the authors have tested principally cross-breeding on the control of *C. lindemuthianum* in *P. vulgaris*. The results are detailed, and suggestions are offered.

Save the beans, L. L. HARTER and F. C. MEIER (*U. S. Dept. Agr., Misc. Pub. 16 (1928), pp. 4, figs. 2*).—Suggestions are given for the prevention of losses through the decay of snap beans in transit to market. The recommendations

include picking of beans when the vines are dry, sorting them so as to discard all wounds of any kind, and protecting the beans from the sun and rain.

Brief descriptions are also given of a number of field diseases, with suggestions for their control.

Clover anthracnose caused by Colletotrichum trifolii, J. MONTEITH, JR. (*U. S. Dept. Agr., Tech. Bul. 28 (1928), pp. 27, pls. 7, figs. 4*).—In a previous publication the author called attention to the fact that almost identical diseases of clover are caused by *C. trifolii* and *Gloeosporium caulivorum* (E. S. R., 58, p. 548). The present bulletin is devoted to a study of the anthracnose caused by *C. trifolii*.

The disease and cultural characters of the fungus are described in detail. The pathogenicity of the fungus has been demonstrated on *Trifolium pratense, T. pratense perenne, T. incarnatum, Medicago sativa, H. hispida*, and *Melilotus alba*. The fungus is said to be favored by periods of hot weather, which are unfavorable to red clover. The organism was found to retain its viability on dried material for long periods of time and to survive unfavorable conditions on infected tissue of either living or dead plants. The dissemination of the fungus may be accomplished by wind-blown dried infected leaves or stems, spattering rain, insects, animals, etc. Infection of leaves and stems is said usually to take place directly through the uninjured epidermis, while crown or root infection is greatly aided by insect injuries.

Various methods of control are suggested, but the use of resistant varieties is considered to offer the most promise. The Tennessee anthracnose-resistant strain of red clover, described in 1910 (E. S. R., 23, p. 448), is said to still show decided resistance, although no recent selections have been made.

Corn disease studies (*Iowa Sta. Rpt. 1927, p. 57*).—Laboratory tests are said to have shown the value of dusts for the control of dry-rots of corn. While better growth and fewer lesions were obtained by the use of dusts, seed treatment did not equal in stand and freedom from disease the rigorous selection of seed corn free from disease.

Smut susceptibility of naturally resistant corn when artificially inoculated, M. A. GRIFFITHS (*Jour. Agr. Research [U. S.], 36 (1928), No. 1, pp. 77–89, figs. 4*).—The author reports experiments in which it was found that plants of selfed lines of corn and crosses between them, which were resistant to natural infection by smut in the field at the Arlington Experiment Farm, were quite susceptible when artificially inoculated in very young tissue. The apical and nodal bud tissues, immature ears, young leaves, and tassels were all found highly susceptible when injected with conidial suspensions.

The various lines of corn are said to have been susceptible to several individual smut collections, as well as to mixed collections from other localities. This is believed to indicate that the susceptibility of the naturally resistant lines need not be attributed to the use of physiologic forms of other localities.

The "downy mildew" or "spike-disease" of the hop in 1925, E. S. SALMON and W. M. WARE (*Jour. Min. Agr. [Gt. Brit.], 33 (1926), No. 2, pp. 149–161, pls. 4*).—During 1925 hop downy mildew (*Pseudoperonospora humuli*) occurred widely on wild and cultivated hops in France and Belgium and on wild hops in Russia. In Germany it was first noticed in 1924, and by May, 1926, it had spread to the important hop-growing districts. In all these countries it can be regarded as a menace to hop culture. In England, hops in gardens in parts of Kent were attacked during 1925. Cases occurred in Hampshire and Worcestershire. On wild hops the fungus became widespread, particularly in the hop-growing counties.

The mycelium can overwinter in the underground portions of the hop plant. Resting spores (oospores) have been found in the tissues of the spikes, also in the "petals" of the hop cone.

Control measures recommended are based on the recognition and destruction of the primary sources of infection.

Some mushroom diseases and their carriers, V. K. CHARLES and C. H. POPENOE (*U. S. Dept. Agr. Circ. 27 (1928), pp. 10, fig. 1*).—Descriptions are given of two diseases of mushrooms, both of which are said to have been disseminated by insects.

For the control of the bubbles disease, caused by the fungus Mycogone, sanitation and fumigation are recommended. For the plaster-mold disease no satisfactory control measures are known.

Suggestions are given for the control of the various insects that frequent mushroom houses and serve as carriers of the diseases.

Studies of the nature and control of blight, leaf and pod spot, and foot-rot of peas caused by species of Ascochyta, L. K. JONES (*New York State Sta. Bul. 547 (1927), pp. 46, pls. 7, figs. 4*).—Attention is called to the confusion in literature as to the causal agent of the disease variously known as Ascochyta blight, leaf spot, and pod spot of peas. The author separates them into three distinct diseases, Ascochyta leaf and pod spot, caused by *A. pisi;* Mycosphaerella blight, due to *M. pinodes;* and Ascochyta foot rot, caused by *A. pinodella.* The different diseases are described, and a technical description is given of *A. pinodella,* which is considered to be a new species.

Laboratory tests of a large number of pea seed samples showed that seed produced in semiarid seed-growing areas of the western United States was practically free from fungus infection, while a large percentage of the seed produced in eastern North America was more or less infected with *Ascochyta* spp. and other fungi.

Greenhouse and field tests with healthy and diseased seed showed, in general, a decreased percentage stand of plants from diseased seed as compared with that from healthy seed. The treatment of seed with organic mercury dusts was found more or less beneficial in increasing the percentage stand of plants, and the benefit was greater when the percentage of seed infected per sample was high and when the seed was planted under soil conditions adverse to rapid germination. Treatment of diseased seed proved of value in reducing the amount of foot rot injury caused by *M. pinodes* and *A. pinodella,* but showed no beneficial results in controlling the spread of *A. pisi* from infected seed to the aboveground parts of the plant.

Inoculation experiments showed that some varieties of canning, market garden, and field peas were more susceptible to injury than others.

The physiology of the sugar beet nematode, Heterodera schachtii, from the standpoint of control [trans. title], B. NEBEL (*Kühn Arch., 12 (1926), pp. 38–103*).—It is considered as possible, by making appropriate use of positive stimuli, to control, for agricultural purposes, *H. schachtii.*

Evidence of a factor associated with actively functioning tissues which gives to sugar-cane plants resistance to the invasion of fungi and other microorganisms, H. A. LEE (*Jour. Gen. Physiol., 9 (1926), No. 3, pp. 381–386, figs. 2*).—It is concluded from evidence briefly detailed that there is a factor, or a set of factors, in actively growing plants which confers upon such plants resistance to the invasion of low-grade fungi and other organisms. This supposed factor is discussed, with implications.

[Tobacco disease investigations in Wisconsin] (*Wisconsin Sta. Bul. 396 (1927), pp. 104–107, figs. 3*).—Studies by G. H. Conant and J. Johnson are said to show that strains of tobacco which are resistant to root rot (*Thielavia*

basicola) have the ability to rapidly build up cork tissue and thus check the advance of the fungus in the roots. When grown in warm soils (82° F. or more), susceptible strains develop cork cells almost as rapidly as resistant ones, and as a result escape serious damage by the fungus.

Investigations and observations by Johnson and W. B. Ogden have shown that tobacco mosaic is becoming more common than formerly and that the infection takes place in the seed bed or in the field. Studies of the disease are said to have indicated that the virus persists for a long period of time in cured leaf or in crop refuse. The origin of serious outbreaks of the disease has been traced to the mosaic virus overwintering in curing sheds and field refuse and a subsequent soil infestation, followed by an infection of the seedlings in the plant beds or in the field. The disease may be spread mechanically in ordinary cultural practices.

Yellows, a serious disease of tomatoes, M. Shapovalov (*U. S. Dept. Agr., Misc. Pub. 13 (1928), pp. 4*).—The author presents arguments for the adoption of the name yellows for a serious disease of tomatoes in the western part of the United States instead of other names that have been used, such as western blight, yellow blight, summer blight, etc. Yellows is said to be a virus disease related to curly top of sugar beets, and it is transmitted by the beet leafhopper. Preliminary experiments are reported to indicate that shading tomato plants reduced the disease.

Blister canker (*Iowa Sta. Rpt. 1927, p. 40*).—Continuing investigations previously reported (E. S. R., 56, p. 849), coal tar and asphaltum paints were found to be superior to lead paints for covering wounds made in cutting out blister cankers. It is said that these paints did not check or peel off under widely varying temperatures.

Peach leaf-curl, H. H. Wedgworth (*Miss. State Plant Bd. Quart. Bul., 7 (1927), No. 1, pp. 16–18, fig. 1*).—Peach leaf curl (*Exoascus deformans*), favored by a cold, wet period followed by a warm spring and also by the proximity of large bodies of water, is said to be controlled by one thorough application of any good fungicide.

Strawberry xanthosis (yellows), a new insect-borne disease, A. G. Plakidas (*Jour. Agr. Research [U. S.], 35 (1927), No. 12, pp. 1057–1090, pl. 1, figs. 13*).—A detailed account is given of an investigation on the etiology and transmission of a strawberry disease, a preliminary account of which has been noted (E. S. R., 58, p. 657).

The disease has been observed in California, Oregon, and Washington, but it is reported to have been most destructive in the central coast region of California. Further investigation has shown that the disease is transmitted from infected to healthy plants by the strawberry aphid, *Myzus fragaefolii*. The red spider, *Tetranychus telarius*, is not now considered capable of its transmission. No relation was found between xanthosis and curly top of sugar beets. Temperatures of 80° F. and above were found to mask the symptoms of disease partially or completely.

Extensive cytological and histological studies of the host plant as related to the disease are described.

Specific and varietal resistance to the disease are discussed. The beach strawberry (*Fragaria chiloensis*) and hybrids in which this species enters are said to be resistant, while *F. californica* is quite susceptible. Some commercial varieties are reported to be highly resistant, while others are severely attacked.

Roguing and breeding for disease resistance are suggested as means of control.

Observations on the treatment of fungus diseases, A. C. TUNSTALL (*Indian Tea Assoc., Sci. Dept. Quart. Jour., 1926, No. 4, pp. 157–169*).—As a result of investigations during many years on the control of various diseases of tea plants, the vigor of the plants themselves is being more and more clearly shown to constitute a most important factor in case of such disease as brown blight, red rust, and Thyridaria. Unsatisfactory pruning is a negative factor in case of *Poria* sp. and other common wood destroying fungi. For other diseases, fungicidal treatment has been found necessary, and this was sufficient in case of Bordeaux mixture when properly prepared, of Burgundy mixture if constant stirring was used, or of lime sulphur, which is easy both to prepare and apply.

An account of this work gives details, with discussion, as to diseases, treatments, methods, and results.

Spraying [for tea plant diseases] at Sylee, C. R. HARLER (*Indian Tea Assoc., Sci. Dept. Quart. Jour., 1926, No. 4, pp. 143–156*).—On account of the seriousness, which has recently come to be realized, of the losses due to diseases of leaf and stem in the tea industry, particularly brown blight, gray blight, red rust, and those caused by *Nectria* sp. and by *Corticium* spp., spraying was started in January, 1926. The present account deals with that experience as regards areas, materials, appliances, effects, and costs. It is thought that, though in two instances indicated spraying gave large acre increases, others were less (if at all) profitable, especially where careful pruning had previously been practiced.

Vanilla root rot, C. M. TUCKER (*Jour. Agr. Research [U. S.], 35 (1927), No. 12, pp. 1121–1136, figs. 7*).—A root rot of the vanilla plant in Porto Rico, caused by *Fusarium batatatis vanillae* n. var., is described. The fungus, which is soil-inhabiting, attacks the roots, causing growth to stop, and the plant is finally destroyed. Injury to the roots during cultivation appeared to favor the development of the desease.

A technical description of the new variety is given.

Pecan diseases in Mississippi, D. C. NEAL (*Miss. State Plant Bd. Quart. Bul., 7 (1927), No. 1, pp. 4–8, figs. 3*).—The most important pecan disease in Mississippi, scab (*Fusicladium effusum*), now recognized as a limiting factor in many parts of the State and as threatening the industry elsewhere, is here dealt with as regards conditions, symptoms, control, varietal resistance, and the tendency of the fungus to adapt itself to varieties formerly considered practically immune.

By proper application of fungicides during the winter and summer months and by practicing orchard sanitation, the scab disease may be controlled. Directions, given in detail, refer principally to lime sulfur in schedule form.

Control of hyacinth yellows [trans. title], [E.] VAN SLOGTEREN (*Meded. Leden Ver. "De Hyacinth," Nos. 1 (1926), pp. 7; 2 (1927), pp. 2*).—Of the tested means at hand, some of which are indicated, for control of hyacinth yellows, none has yet proved entirely satisfactory.

ECONOMIC ZOOLOGY—ENTOMOLOGY

Nematodes of pathological significance found in some economically important birds in North America, E. B. CRAM (*U. S. Dept. Agr., Tech. Bul. 49 (1928), pp. 10, figs. 8*).—This account deals with eight parasitic nematodes discovered recently in North America. They include *Capillaria annulata* in turkeys and chickens; *Amidostomum anseris* in domestic geese; *Dispharynx spiralis*, *Ornithostrongylus quadriradiatus*, and *Trichostrongylus pergracilis* in pigeons and other birds; *Echinuria uncinata* and *E. parva* n. sp. in ducks and geese; and gapeworm (*Cyathostoma brantae*) in wild geese.

Entomology in the Southern States, R. W. Harned (*Jour. Econ. Ent., 21 (1928), No. 1, pp. 59–84*).—This is the presidential address delivered at the annual meeting of the American Association of Economic Entomologists held at Nashville, Tenn., in December, 1927, in which a brief résumé is given of entomology in the 11 southern cotton States, together with a study of the distribution of entomologists throughout the United States. It also deals with the relation of insects to economic and industrial progress in the Southern States, and some of the important entomological achievements in the region.

[Report for 1925 on entomology at the Alabama Station] (*Alabama Sta. Rpt. 1925, pp. 13, 14*).—This continues work previously noted (E. S. R., 58, p. 450).

In work with the cabbage webworm on collards, by J. M. Robinson, the best control was obtained from the use of calcium arsenate at the strength manufactured to control boll weevils. Sodium fluosilicate was somewhat less effective.

Entomology (*Iowa Sta. Rpt. 1927, pp. 33–38, 57, 58*).—Brief reference is made to the corn ear worm, which in some regions of the State infests from 20 to 75 per cent of the ears of field corn and from 50 to 100 per cent of the ears of sweet corn; the stalk borer, which does a large amount of damage to various crops throughout the State; the smartweed borer (*Pyrausta ainsliei* Hein.), frequently mistaken for the European corn borer, infestations of which were quite general over the eastern half of the State; the lotus borer (*P. penitalis* Gr.), which was collected in large numbers and used as a host for *Habrobracon brevicornis* Wesm., a foreign parasite of the European corn borer; the beet webworm, which on corn confines its feeding habits largely to the silk and thus interferes with fertilization; white grubs; the apple curculio (*Anthonomus quadrigibbus* Say); the codling moth spraying service; insecticides; cutworms; wheat insects; and a new flower pest, the flower webworm *Homeosoma electellum* Hulst. The smartweed borer and the Biden's borer (*Epiblema otisana* Clem.), as well as the lotus borer, serve as hosts for the European corn borer parasite *H. brevicornis*.

Brief reference is made to honey flow conditions in 1926, a test for nectar v. water, inversion of sugar in nectar, and reduction of water in nectar. The several corn stalk borers are also briefly considered.

Insects—Both friend and foe to the farmer (*Wisconsin Sta. Bul. 396 (1927), pp. 91–103, figs. 8*).—The first part of this report deals with apicultural work conducted, including a brief discussion of the relation of the winter stores to the health of the bee colony during the winter period of confinement (E. S. R., 57, p. 364) and the cause of fermentation or souring of honey. G. E. Marvin, E. B. Fred, and W. H. Peterson have found that the yeasts, five strains of which were isolated, are the important causative factors in the souring of honey, since honey heated to 160° F. apparently does not ferment due to the killing of the yeasts. One of the isolated yeasts appears to be the same species determined by a German investigator. The other four are apparently new. All five of the yeasts ferment glucose, levulose, and mannose, and three of them ferment maltose. They belong to the groups Zygosaccharomyces and Saccharomyces. Fermentation can be prevented by keeping the honey at temperatures below 53°.

In control work with the potato flea beetle by C. L. Fluke, Bordeaux mixture applied at ordinary strength (4–4–50) was not highly efficient, but when put on at double strength the flea beetles and leafhoppers were both held in check. Particularly effective control was obtained from the application of nicotine-

Bordeaux dust, consisting of dolomite 35 per cent, monohydrated copper sulfate 20 per cent, hydrated lime 35 per cent, and nicotine sulfate 10 per cent.

Turnips were found by Fluke to be a cheap and effective trap crop for the cabbage maggot.

Reference is made to successful control of the hemlock spanworm (*Ellopia fiscillaris* Gn.) by the application of arsenical dust with the airplane, accounts of which have been noted (E. S. R., 58, p. 664).

The cherry aphid (*Myzus cerasi* Fab.) is said to be the most important insect enemy of the cherry industry in Wisconsin. Both Derrisol and nicotine sulfate have been found by A. A. Granovsky to control the aphid effectively when applied in dilutions of 1 part to 800 parts of water.

A brief discussion is given of the European corn borer and its meaning to Wisconsin, followed by accounts of the onion maggot and poisoned bait for the control of cutworms on tobacco.

Insect pests of canning crops in 1927, H. Glasgow (*New York State Sta. Circ. 100 (1928), pp. 7*).—This is an account of control measures for the several more important insect enemies of canning crops in the State in 1927, including the cherry fruit fly, carrot rust fly, spinach leaf miner, and wireworms.

It was found that the concentration of arsenic for control of the cherry maggot and curculio if accompanied by thorough spraying may safely be reduced considerably below the amount commonly used. The influence of neglected plantings on maggot control was shown by a small well-sprayed orchard, not over one-fourth of an acre, which adjoined a much larger one that had not been sprayed for 10 or 12 years, the infestation of which ranged from 80 to 100 per cent. In 1926, when there was a normal crop of cherries, the infestation of the sprayed orchard ranged from 2 to 8 per cent, while in 1927, with a yield much below normal, the infestation increased to from 8 to 40 per cent.

Analyses were made to determine the influence that different canning operations might have in removing a second spray applied late in the season. It was found that when properly timed there is little danger during normal seasons of an excessive amount of arsenic carrying through on the fruit at the time it is delivered at the factory. In exceptional seasons when rainfall is light during the ripening period or when the second maggot spray has been applied later in the season than recommended, an appreciable amount of spray deposit may still adhere to the cherries when they are delivered at the plant. Of the various operations through which the cherries pass at the plant the greatest removal of spray deposit seems to be accomplished in the washing vats. No solvent other than water appears to be necessary to remove the bulk of the deposit. This is not dissolved but is merely softened by the water, after which it is removed mechanically by the cherries rubbing against each other in the process of handling in the washing vats.

It has been found that carrots planted after the first of June ordinarily escape injury. If such late-planted carrots are harvested by the first to the middle of September they should escape serious injury by the carrot rust fly.

Screening with cheesecloth used against the cabbage maggot, when applied before egg laying commenced and removed within a week before harvesting, gave good results against the spinach leaf miner.

Some insect pests of nursery stock in Connecticut, W. E. Britton and M. P. Zappe (*Connecticut State Sta. Bul. 292 (1927), pp. 113–173, pls. 20, figs. 27*).—Brief practical accounts are given of the important pests of nursery stock in Connecticut. Tables are given for their identification, followed by brief accounts of each, under the headings of general feeders, insects injuring fruit stock, insects injuring deciduous shade and forest trees, insects injuring shrubs and vines, insect pests of evergreen trees and shrubs, and insects injuring perennial plants, respectively.

Injection experiments for controlling insects, W. O. Hollister and H. L. Jacobs (*Jour. Econ. Ent. 21 (1928), No. 1, pp. 198–201*).—The authors here discuss the methods, apparatus, and materials used in injection experiments in an attempt to control borers. Aloes, aloin, thymol, and acid fuchsin were used in 1927 with varying effects upon the trees and negative effects upon the borers.

The relative toxicities of arsenicals and fluorine compounds to various organisms, S. Marcovitch (*Jour. Econ. Ent., 21 (1928), No. 1, pp. 108–114, figs. 2*).—The author finds that for insects and lower organisms sodium fluosilicate is more toxic than sodium arsenite. Since fluorine appears to affect the precipitation of essential calcium from the tissues, the meager calcium content of the lower organisms may account for their susceptibility to fluorine compounds. To man and the higher animals, however, the arsenicals are at least nine times more toxic than sodium fluosilicate and thirty times more toxic than sodium fluoride. The relative toxicities of arsenical and fluorine compounds to *Culex quinquefasciatus* and the velocity of fatality are shown in chart form.

Fumigation tests with certain aliphatic chlorides, R. C. Roark and R. T. Cotton (*Jour. Econ. Ent., 21 (1928), No. 1, pp. 135–142*).—In tests made of 21 aliphatic chlorides against rice weevils in flasks half filled with wheat, the more promising being also tried against larvae of the clothes moth, black carpet beetles, and furniture beetles in a 500 cu. ft. fumigating vault, none of these materials injured the germination of wheat. Several appear promising as cheap, effective fumigants of low fire hazard.

Results of three years' work with dust sprays in Missouri, K. C. Sullivan (*Jour. Econ. Ent., 21 (1928), No. 1, pp. 131–134*).—The author concludes that in general it is necessary to make twice as many applications of the dusts as the liquid in order to obtain comparable results in combating the codling moth. The sulfur-lead dusts gave better control of this pest than the copper-lead dusts. The indications are that the sulfur-lead dusts may be used as a supplement to the liquid sprays with very good results.

Testing commercial insecticides, L. Haseman (*Jour. Econ. Ent., 21 (1928), No. 1, pp. 115–117*).—The author points out that in the present extensive efforts to improve old and devise new insecticides, which should be encouraged, the many new materials appearing on the market should be thoroughly tested before they are advertised and sold as insecticides.

Preventing insect damage to stored seed grain, W. P. Flint and J. C. Frankenfeld (*Jour. Econ. Ent., 21 (1928), No. 1, pp. 143–147, fig. 1*).—In the investigation conducted the authors found that a mixture of 0.05 fluid oz. of crude creosote to 1 lb. of hydrated lime, mixed with the wheat at the rate of 0.25 oz. to 1 lb. of wheat, gave practically complete protection from insect damage and did not injure the germinating qualities of the wheat.

Organic mercury compounds for the control of insects in stored seeds, J. L. Horsfall (*Jour. Econ. Ent., 21 (1928), No. 1, pp. 147–150, pl. 1*).—The author's experiments showed that organic mercury dusts, now used in the control of certain seed-borne fungi, can be used as a protective measure against bean weevils in beans and angoumois grain moth in corn at the rate of 1 part of the dust to 384 parts of the seeds by weight.

Chemical changes in dusting mixtures of sulphur, lead arsenate, and lime during storage, H. S. Swingle (*Jour. Agr. Research, 36 (1928), No. 2, pp. 183–192*).—The author considers the dark color of an old sulfur-lead-arsenate-lime dust to be due to the formation of black lead sulfide during storage, the probable reactions being represented as follows:

$$3Ca(OH)_2+3S\rightarrow 2CaS+CaSO_3+3H_2O$$
$$CaS+PbHAsO_4\rightarrow CaHAsO_4+PbS.$$

Varying quantities of calcium arsenate are formed in different dusts, depending largely upon the extent of these reactions. The darker the dust, the more calcium arsenate there is present.

All hydrated lime not reacting with sulfur or lead arsenate is converted into calcium carbonate within one year or less. The results of chemical analysis indicate that little or no change in insecticidal or fungicidal value during storage should be expected. There is some increase in danger of injuring the plant from the use of old dusts; the darker the dust, the greater the danger of injury.

Analyses of sprayed apples for lead and arsenic, A. HARTZELL and F. WILCOXON (*Jour. Econ. Ent., 21 (1928), No. 1, pp. 125–130, fig. 1*).—In continuation of work on arsenical residues (E. S. R., 57, p. 855), apples grown at Yonkers, N. Y., that had received the standard spray schedule, comprising 5 applications of lead arsenate (4 lbs. to 150 gal.), during the season of 1927, showed on analysis an average of 0.912 mg. of metallic lead per kilogram of fruit and a maximum of 1.80 mg. per kilogram. The arsenic trioxide found in the samples averaged 0.099 mg. per kilogram of fruit with a maximum of 0.193 mg. per kilogram, this maximum being considerably below the limit adopted by the Royal Commission on Arsenical Poisoning in 1903 (1.429 mg. per kilogram). There were 33.24 in. of rainfall from the time the first spray was applied until the date the fruit was picked.

A power-driven grasshopper catcher, W. C. O'KANE (*Jour. Econ. Ent., 21 (1928), No. 1, pp. 201, 202*).—The author describes a catcher consisting of a frame 14 ft. long and 2 ft. high, carrying a burlap bag of the same length and height, and 4 ft. deep. This was so suspended in front of a Ford chassis that the lower edge of the frame touched the ground. Driven back and forth across fields, the bag caught small grasshoppers by the bushel and stopped a serious infestation.

Some preliminary notes on the use of sodium arsenite dust and spray in the control of the mormon cricket (Anabrus simplex Halde.) and the lesser migratory grasshopper (Melanoplus atlanis Riley), R. L. SHOTWELL and F. T. COWAN (*Jour. Econ. Ent., 21 (1928), No. 1, pp. 222–230*).—The authors report upon work with sodium arsenite, both as a dust and as a spray, to control *M. atlanis* and the mormon cricket in Montana. Experiments were made to determine the effectiveness of this material as a barrier against migrating swarms of these insects. Excellent results were obtained, justifying further work on the use of this arsenical.

Tarnished plant bug injury to strawberries, L. HASEMAN (*Jour. Econ. Ent., 21 (1928), No. 1, pp. 191, 192*).—This plant bug was a source of serious injury to the late crop of blossoms and developing strawberries in several fields in southwestern Missouri following the severe freeze in 1927. In some fields the entire crop was destroyed.

Some observations upon the biology and control of the potato leafhopper (Empoasca fabae Harris), D. M. DELONG (*Jour. Econ. Ent., 21 (1928), No. 1, pp. 183–188, fig. 1*).—An account of studies of the life history and bionomics of this pest and means for its control.

The Cicadellidae (Homoptera) of Virginia, L. A. STEARNS (*Virginia Sta. Tech. Bul. 31 (1927), pp. 21, fig. 1*).—The author here presents a systematically arranged list of the Cicadellidae occurring in Virginia, with the localities, dates of collection, and collectors. He lists 269 species and varieties, representing 48 genera, about two-thirds of which were collected by the author personally.

Hibernation of the cotton flea hopper, H. J. REINHARD (*Texas Sta. Bul. 377 (1928), pp. 26, figs. 9*).—This is a report upon hibernation studies of the

cotton flea hopper (*Psallus seriatus* Reut.) during the winters of 1925–26 and 1926–27 at College Station, Tex.

The average period of hibernation was found to extend from October 1 to May 1. In 1926 emergence began on March 7 and continued over a period of 13 weeks, while in 1927 it began on February 16 and extended over a period of nearly 20 weeks. In the spring of 1926, 73 per cent of all the insects emerged from April 5 to April 26, while in 1927 79 per cent of the total emergence was completed from March 17 to April 7. There was found to be a definite relation between the time of maximum emergence and the extent of injury to cotton. Normally the heaviest emergence of insects from hibernation occurs before young cotton is up in the field, and little or no injury to the crop is the result. When climatic conditions delay emergence of the insects from hibernation in the spring and cotton is planted at the average date, conditions are favorable for extensive injury to the crop by this pest.

Data are presented on emergence of the insects from 19 species of winter host plants that were collected locally and in several other localities in the State. During 1926–27 goatweed at College Station and primrose at Wharton contained the greatest number of cotton flea hopper eggs, averaging about 215 insects per plant. Fourteen new winter host plants of the insect have been discovered, which include many of the most common weeds, with a wide range of distribution over the State.

Lubricating oil emulsions for the control of pear psylla, F. Z. Hartzell and F. L. Gambrell (*New York State Sta. Circ. 98 (1928), pp. 4*).—This is a brief practical account. Experiments during the past two seasons have indicated that when carefully prepared and properly applied the lubricating oil emulsions offer a supplementary method for combating the pear psylla. An account is given of cold-mixed emulsions and commercial preparations, with a discussion of the time of application. Emphasis is placed upon the importance of having the oil on the trees before any, or at least many, of the eggs have been deposited.

Two spruce Chermes infest Michigan spruce, E. I. McDaniel (*Michigan Sta. Quart. Bul., 10 (1928), No. 3, pp. 128–131, figs. 3*).—This is a brief, practical account of the spruce gall aphid (*Chermes abietis*) and the aphid *C. similis*, which are attracting attention in Michigan through the attack upon ornamental conifers. Miscible oils diluted to about 1 to 20 or a 2 per cent oil emulsion applied before growth starts in the spring gave satisfactory control, as has nicotine sulfate at the rate of 1 pint, 40 per cent strength, to 100 gal. of water and 4 lbs. of laundry soap, when applied just before the aphids have inclosed themselves in galls.

Differential effects of constant humidities on Protoparce quinquemaculatus Haworth, and its parasite, Winthemia quadripustulata Fabricus, H. M. Hefley (*Jour. Econ. Ent., 21 (1928), No. 1, pp. 213–221, figs. 2*).—In the studies conducted, in which tobacco worm larvae, both parasitized and unparasitized by the tachinid *W. quadripustulata*, were subjected to different constant humidity percentages at constant temperature during the pupal period of both host and parasite, the effects of the moisture on the length of the pupal period and the viability were noted. It was found that as the humidity increased the viability of the host decreased, while that of the parasite increased. Both host and parasite showed a maximum rate of metamorphosis near 73.4 per cent humidity at 27° C. (80.6° F.).

Notes on amyl salicylate as an attrahent to the tobacco hornworm moth, A. C. Morgan and S. C. Lyon (*Jour. Econ. Ent., 21 (1928), No. 1, pp. 189–191*).—The authors have found amyl salicylate to incite a decided feeding response in tobacco hornworm moths (*Phlegethontius carolina*), inducing a natural attrac-

tion to artificial flowers. Large numbers of tobacco moths and other Sphingidae were caught in traps baited with it. Amyl benzoate was also found to be very attractive.

Insecticidal control for the sugarcane borer, W. E. HINDS and H. SPENCER (*Jour. Econ. Ent., 21 (1928), No. 1, pp. 193–198*).—The authors report that the work of three seasons at the Louisiana Experiment Station (E. S. R., 58, p. 258) has yielded consistent results showing that it is possible with a water-soluble dust like sodium silicofluoride to destroy at least half of the sugar cane borer larvae occurring on the exterior or burrowing through the interior of the stalks of corn or sugar cane, which are the principal host plants of this species in Louisiana. With many of the more than 50 materials tested thus far there has been a degree of burning of foliage of corn which is serious, but on cane, which is much more resistant to chemical burn, a number of materials have been found safe and effective enough to justify extensive field applications which may at least supplement other measures in controlling this pest.

The fall army worm, P. LUGINBILL (*U. S. Dept. Agr., Tech. Bul. 34 (1928), pp. 92, figs. 49*).—This is a monographic account of this pest, which includes a review of the literature in connection with a list of 67 references. The first part of the bulletin takes up the biology of the insect, particularly its life history and habits, with technical descriptions of the several stages; the second part deals at length with control measures; and the third part with natural enemies, particularly hymenopterous and dipterous parasites.

The fundamental phases of European corn borer research, D. J. CAFFREY and L. L. HUBER (*Jour. Econ. Ent., 21 (1928), No. 1, pp. 104–107*).—It is pointed out that 5 years of experimental research work with this pest in the Corn Belt have indicated that the ultimate solution of the problem is associated apparently with mechanical measures, parasites, insecticides, and cultural practices.

Results of the ten million dollar corn borer clean-up campaign, W. H. LARRIMER (*Jour. Econ. Ent., 21 (1928), No. 1, pp. 93–96, fig. 1*).—This is a brief summary of information on the control work conducted against the European corn borer under the special appropriation made by Congress.

Corn borer research and the ten million dollar clean-up campaign, D. J. CAFFREY (*Jour. Econ. Ent., 21 (1928), No. 1, pp. 89–93*).—This is a brief review of the research work conducted with the European corn borer and the application of accumulated data in the control work conducted during the year.

Corn borer control and the ten million dollar clean-up campaign, L. H. WORTHLEY (*Jour. Econ. Ent., 21 (1928), No. 1, pp. 230–234*).—This is an account by the administrative officer on the control work conducted during the spring of 1927.

The correlation between soil fertility and European corn borer accumulation, L. L. HUBER and C. R. NEISWANDER (*Jour. Econ. Ent., 21 (1928), No. 1, pp. 118, 119*).—It is pointed out by the authors that the degree of infestation of corn by this pest depends in large measure on the stage of development attained by the corn at the period of moth flight. The rate of development of corn is greatly influenced by the fertility of the soil, and other factors being equal a variation in soil fertility may be expected to influence indirectly the accumulation of the insect.

The status of the European corn borer in Canada (1927), L. S. MCLAINE and H. G. CRAWFORD (*Jour. Econ Ent., 21 (1928), No. 1, pp. 86–88*).—A review of the corn borer situation in Ontario and Quebec, where it continued to spread in 1927.

A study of the biology and control of the red-banded leaf-roller, W. S. HOUGH (*Virginia Sta. Bul. 259 (1927), pp. 29, figs. 7*).—This is a report of a study of a lepidopteran, *Argyrotaenia (Eulia) velutinana*, the larva of which

eats into the skin and produces conspicuous, irregular, corklike scars on the fruit, especially apples. In May most of the larvae were found on the apple foliage, but in August and September most of the worms fed on the fruit. An account of this insect by Frost at the Pennsylvania Experiment Station has been noted (E. S. R., 54, p. 458). In certain orchards of northern Virginia as high as 10 to 14 per cent of the apples have shown injury due to this worm. It is a problem in orchards where timely spraying has reduced other insect injury to the minimum, since as high as 2 to 5 per cent of the fruit may not uncommonly be scarred by an outbreak.

Three and a partial fourth generation were observed by the author at Winchester. The winter is passed in the pupal stage, largely in old leaves beneath the trees. The moths emerge and are active from the time the green tips show in the apple buds until apple blossom time. The first brood of larvae commences to hatch out while the trees are in bloom, the second brood larvae in late June and July, and the third brood larvae in August and September. A fourth brood hatched out in September, 1925. The average length of the life cycle for the 4-year period from 1924 to 1927 was 64.6 days for the first generation and 45.7 days for the second.

Parasitism was found to be a very important factor in suppressing outbreaks of the larvae, 9 of the 19 species listed having been recorded from Virginia. Control experiments in the laboratory indicated that the spraying of both sides of the foliage is more important than the amount of lead arsenate applied in excess of 3 lbs. to 100 gal. of water. Spraying experiments following the regularly recommended schedule in May and June resulted in the reduction of leaf roller injury to less than 1 per cent, where check trees showed from 3.4 per cent to 6.8 per cent of the fruit injured. The application of four arsenical sprays is considered advisable in most Virginia orchards, the first being the petal-fall spray, the second the 3-weeks spray, the third the 5-weeks spray, and the fourth the 7-weeks spray.

[Biology and control of the oriental peach moth] (*Connecticut State Sta. Bul. 291 (1927), pp. 99, 100*).—Brief reference is made to further investigations of this moth (E. S. R., 57, p. 160), three broods of which appeared in 1927. The parasite *Macrocentrus ancylivora* Roh. was reared in considerable numbers in one orchard. Work on the artificial rearing of the egg parasite *Trichogramma minutum* Riley is in progress.

Fish oil as an adhesive in control of the grape berry and codling moths, H. L. Dozier (*Jour. Econ. Ent., 21 (1928), No. 1, pp. 121–125, pls. 2*).—In this contribution from the Delaware Experiment Station a brief report is given on preliminary work with fish oil as a sticker of lead arsenate used with Bordeaux mixture and dry lime sulfur. Great possibilities are indicated for its use in the early pre- and after-blossom sprays in controlling the grape berry moth and in the calyx and first cover sprays on late apples in control of the codling moth. On account of its sticking the lead arsenate on the fruit for such long periods, caution is given against using it in the later sprays.

Status of the parasites of the Hessian fly, Phytophaga destructor (Say), in Pennsylvania, Maryland, and Virginia, C. C. Hill and H. D. Smith (*Jour. Agr. Research [U. S.], 36 (1928), No. 2, pp. 151–155*).—The data here presented are based upon material collected for 10 consecutive years from widely separated localities in the wheat-growing regions of Pennsylvania, Maryland, and Virginia, from Lycoming County, Pa., on the north, to Augusta County, Va., on the south.

The average annual parasitism of the spring generation for this period and in this region was 62 per cent. The average total mortality amounted to 96 per cent. Eighteen species of parasites were found to attack the Hessian fly

in this region, of which the most abundant of the spring generation was *Platygaster vernalis*. Next to this one in order of abundance came *Eupelmus allynii*, *Merisus destructor*, *Pleurotropis epigonus*, *M. febriculosus*, and *Tetrastichus carinatus*. The remaining parasites attacking the Hessian fly of the spring generation were comparatively scarce.

The fall generation in this region was found to be normally parasitized only by *Platygaster hiemalis*. The average annual mortality of the Hessian fly from this source during the years from 1914 to 1922 amounted to 28 per cent. In 1923 records showed an average of 55 per cent for the State of Pennsylvania.

In this section of the country the two species *P. hiemalis* and *P. vernalis* were the most efficient parasites. *P. hiemalis* should be ranked first in importance, owing to its abundance and to the fact that if it were absent there would be no other parasite to attack the fly of the fall generation. The effectiveness of the remaining parasites, with the exception of *P. herrickii*, is somewhat offset by the likelihood that they may prey on one another and on the Platygasters.

It is pointed out that the complete control of the Hessian fly by parasites can not be expected, although in the regions under observation they are an important factor in checking its increase.

Some notes on the Mexican bean beetle problem, N. F. Howard (*Jour. Econ. Ent., 21 (1928), No. 1, pp. 178–182, fig. 1*).—The distribution of this pest is reported upon in connection with a map which shows that in 1927 it reached the Province of Ontario as well as the great bean producing States of Michigan and New York.

Magnesium arsenate or calcium arsenate and lime have proved to be superior to sodium fluosilicate in combating this insect. Analyses of sprayed beans indicate that there is no danger from the use of these poisons when applied as recommended. Native parasites have not aided materially in suppressing this pest in the United States.

Precipitation as a factor in the emergence of Epilachna corrupta from hibernation, J. R. Douglass (*Jour. Econ. Ent., 21 (1928), No. 1, pp. 203–213, fig. 1*).—The author reports that a three years' study of the emergence of the Mexican bean beetle has shown that there is a definite relation between precipitation and the emergence of the beetle, and that the percentage emerging is influenced directly by the temperature during the period of rainfall. It was also apparent that heat alone is not sufficient stimulus to produce emergence, as no beetles emerged on some of the hottest days during the season, and that the period of emergence is governed by a combination of the two factors. Emergence rarely occurs when the mean temperature is below 55° F., and reaches its maximum at a mean temperature of 58 to 69°. Beetles in hibernation respond to the effect of artificial precipitation during the emerging season.

The Mexican bean beetle, R. Cecil (*New York State Sta. Circ. 96 (1928), pp. 12, figs. 8*).—A practical summary of information on this pest and means for its control in New York State, where it first appeared in Erie County in August, 1927. A map illustrating the distribution and spread of this beetle in the eastern United States is included.

A preliminary report on the toxic value of fluosilicates and arsenicals as tested on the plum curculio, O. I. Snapp (*Jour. Econ. Ent., 21 (1928), No. 1, pp. 175–177*).—In work conducted at the U. S. Peach Insect Laboratory, Fort Valley, Ga., sodium fluosilicate without lime both as dust and at the rate of 2 lbs. to 50 gal. of water, was the most toxic to the plum curculio of all the insecticides tested. This insecticide without lime was also found to be very toxic to peach foliage and fruit. Lime corrected the burning effect of sodium

fluosilicate, but these tests showed that it also largely destroyed the toxicity as an insecticide for the plum curculio. Arsenate of lead with lime, either as dust or as a spray, was found to be more toxic to the curculio than any of the insecticides tested except sodium fluosilicate without lime. The relative toxic value of the other insecticides tested against the plum curculio was found to have the following order, the most toxic being placed first: Barium arsenate, tricalcium arsenate, zinc arsenate, magnesium arsenate, manganese arsenate, aluminum arsenate, sodium fluosilicate with lime, calcium fluosilicate compound, and scorodite.

Dispersal of the cotton-boll weevil, Anthonomus grandis Boh., F. A. Fenton and E. W. Dunnam (*Jour. Agr. Research [U. S.], 36 (1928), No. 2, pp. 135–149, figs. 9*).—This is a report of studies conducted at Florence, S. C., in 1924 and 1925 in the course of an investigation of the biology of the boll weevil. It is pointed out that this pest has a pronounced habit of dispersal by flight during the summer months, either from one part of a field to another or between fields.

"Flying began on July 17 in 1925, but not until August 26 in 1924. The weevils commence to fly earlier in heavily infested fields than in those only slightly infested, the tendency being to leave the former and fly to the latter. Most of these insects fly during the morning, unless it happens to be too cool or rainy, when dispersal takes place in the afternoon provided the temperature rises or it clears off. More weevils are in flight at the beginning of the migratory movement than later. Males seem to be more active than females, more being caught on the screens. While the weevils may fly when the maximum temperature is between 60 and 80° F., the most favorable conditions are between 80 and 100°. There are days when the maximum temperature is favorable, however, and no weevils are in flight. This factor is of secondary importance and acts only after the impelling instinct to fly has been awakened.

"Such factors as degree of minimum relative humidity, number of squares on the plants, number of weevils in the field, direction of moderate winds, or emergence of a definite generation of weevils have little influence on the extended flight activities of this species. There is, however, a distinct relationship between degree of infestation in a field and weevil flights. When the percentage of infestation reaches a certain point, which has not yet been determined, these insects become restless and fly. At first their flights are short ones, from row to row, or from one part of a field to another. Later, however, the more heavily infested fields are deserted for those which have been only slightly infested because of poisoning or a low early infestation by overwintered weevils."

Oviposition of the boll weevil in relation to food, D. Isely (*Jour. Econ. Ent., 21 (1928), No. 1, pp. 152–155*).—While the larvae of the boll weevil feed and develop either in squares or in bolls of cotton, the adult weevils prefer the squares for food. Not only are the longevity and the period of oviposition of weevils fed upon squares greater than those of weevils fed exclusively upon bolls, but squares or very small bolls are essential for reproduction. In the latter part of the season, if the formation of squares stops oviposition soon ceases. This requirement of squares for reproduction limits the number of weevils which may go into hibernation in any locality and is a factor in the local distribution of the overwintered weevils the next year.

The preparation of a special light sodium fluosilicate and its use as a boll weevil poison, H. W. Walker (*Jour. Econ. Ent., 21 (1928), No. 1, pp. 156–164, figs. 4*).—The author reports that the lack of covering power in commercial sodium fluosilicate has been overcome by incorporating from 10 to 20

per cent colloidal silica with the sodium fluosilicate during the commercial process of manufacture. The resulting special light sodium fluosilicate, containing at least 80 per cent Na_2SiF_6, causes no economic plant injury and is a quicker weevil killer than commercial calcium arsenate. Under certain field conditions, however, it does not adhere to the plant so well as calcium arsenate. It is hoped this lack of adherence under extremely moist conditions can be overcome by the incorporation of a small amount of adhesive during the process of manufacture. Barium fluosilicate similarly prepared is about as effective as the sodium salt.

The preparation of special calcium arsenates containing less than 40 per cent arsenic as As_2O_5 and their use as boll weevil poisons, H. W. WALKER (*Jour. Econ. Ent., 21 (1928), No. 1, pp. 165–173, figs. 4*).—"A special calcium arsenate containing only about 20 per cent arsenic calculated as As_2O_5 was found to be equally as effective a boll weevil control as commercial calcium arsenate in extended cage and field tests. The material caused no plant injury. This special calcium arsenate was prepared by heating precipitated chalk and white arsenic (As_2O_3) in the presence of excess air at a temperature of 650° C. for about one hour. In this manner it was possible to prepare a calcium arsenate containing any desired percentage of arsenic as As_2O_5 up to 57.6 per cent, the theoretical for normal calcium arsenate, $Ca_3(AsO_4)_2$. The conversion from the trivalent to the pentavalent state is practically complete, and there is scarcely any free lime formed under these conditions. Any arsenic lost in this process is recoverable on a commercial scale. The particles of the special calcium arsenate containing only 20 per cent arsenic as As_2O_5 consisted of an inert core of calcium carbonate covered with a coating of substantially 100 per cent normal calcium arsenate."

It is pointed out that this direct oxidation method of preparation is adaptable for arsenates other than calcium.

Second biennial report of apiary inspection, 1925–1927, F. L. THOMAS and S. E. MCGREGOR (*Texas Sta. Circ. 50 (1928), pp. 11, figs. 2*).—This is the third published report of apiary inspection work in Texas (E. S. R., 53, p. 57; 55, p. 159). Good progress is said to have been made in the eradication of American foulbrood. An average of 24,808 colonies have been inspected annually, this disease being found in about 1 per cent. Apiaries belonging to 31 beekeepers were freed of the disease and liberated from quarantine during the biennium. During the past 7 years inspections have been made in 107 counties. Foulbrood disease was found in 45; it has been eradicated from 21 counties, and in the remaining 24 counties where the disease now occurs only about 2 per cent of the colonies were found to be infected, and these were destroyed.

United States grades, color standards, and packing requirements for honey (*U. S. Dept. Agr. Circ. 24 (1927), pp. 32, fig. 1; Sup., chart; insert, pp. 2*).—This is a revision of and supersedes Department Circular 410, previously noted (E. S. R., 57, p. 562). A wall chart giving the requirements for the more important grades of honey is issued as a supplement, together with a leaflet on standard labels or stamps for United States honey grades.

Taxonomic status of the deciduous-fruit Paratetranychus with reference to the citrus mite (P. citri), E. A. MCGREGOR and E. J. NEWCOMER (*Jour. Agr. Research [U. S.], 36 (1928), No. 2, pp. 157–181, figs. 6*).—This is a detailed report of rearing experiments, including transfers between citrus and deciduous fruits and cross mating of forms from both host plants. The studies have led to the conclusion that the citrus mite (*P. citri* McG.) and the European red mite (*P. pilosus* Can. & Fanz.) are entirely distinct species. Practically all the evidence at hand favors this conclusion. It is also concluded that the citrus mite is distinct from the deciduous fruit forms of Paratetranychus found in

the United States. It is pointed out that the only evidence indicating that the deciduous fruit and citrus forms are not more than races of one species is the fact that they are rather similar in general appearance and have similar habits. Ample evidence that the citrus and deciduous fruit forms are distinct species is considered to have been found in their anatomical differences, failure to interbreed, difference in coloration, different oviposition habits, and different habitat.

A list of 20 references to the literature is included.

ANIMAL PRODUCTION

[Nutrition studies at the Alabama Station], W. D. SALMON (*Alabama Sta. Rpt. 1925, pp. 9, 10*).—The results of two experiments are reported.

Effect of minerals on growth and reproduction.—Continuing this study (E. S. R., 58, p. 460), it was found that the addition of cod-liver oil and dried meat to the basal ration of corn and peanut meal did not improve the diet for rats when superphosphate (acid phosphate) was used, nor did increasing the superphosphate to 3 per cent of the total diet cause any improvement. The addition of enough sodium bicarbonate to neutralize the free acid in superphosphate allowed the rats to raise young which grew to maturity and reproduced on this neutralized ration.

Vitamin B in the excreta of rats on a diet low in this factor.—The feces of rats on a diet low in vitamin B were found to be rich in this factor, although there was no evidence that the vitamin was produced by mold growth on the excreta. It is concluded that rats should be caged on raised screens to prevent ingestion of excreta if errors in vitamin B determinations are to be avoided.

[Animal nutrition studies at the Iowa Station] (*Iowa Sta. Rpt. 1927, pp. 27–30*).—Continuing the study of mineral requirements of animals (E. S. R., 56, p. 863), it was found that the maximum nontoxic dose of sodium fluoride was less than 0.025 per cent of the diet of rats. Larger amounts of calcium fluoride could be tolerated, depending upon the amount of other calcium present in the ration.

Diets deficient in the antirachitic vitamin cause alkalinity in the intestinal tract, followed by rickets and death. The ultra-violet rays of sunlight lower the alkalinity of the intestinal tract, as do also cod-liver oil and cholesterol exposed to sunlight. The lowered alkalinity increases the utilization of the bone-forming materials in the ration. It is suggested that peroxide formation in the vitamin-carrying substances causes the formation of acid in the intestinal tract.

Factors influencing quality and palatability of meat (*Iowa Sta. Rpt. 1927, p. 55*).—In this study of beef it was found that feeder animals shrank more during the 24 hours' prekilling fast than did fat animals and that younger animals shrank more than older ones. The dressing percentages increased as the animals increased in age and were consistently higher as they improved in condition. For 48 hours after slaughter the shrinkage of all carcasses was practically the same regardless of age or sex, but it was inversely proportional to the degree of finish. The degree of shrinkage was practically the same after 21 days' storage, except that heifer carcasses shrank less than steer carcasses.

In finished animals the proportion of lean to fat decreased from the first to the last rib. In a 2-year-old steer the proportion on a cut between the fifth and sixth ribs was 2:1, between the eighth and ninth ribs 3:2, and between the eleventh and twelfth ribs 2:3. The heifer carcasses seemed to carry more intermuscular fat at the same degree of finish.

In scoring roasts a decided preference was shown for those from the 2-year-old animals. The flavor of the less desirable roasts was improved by 21 days of

cold storage. Roasts from heifer carcasses have not been as well liked as those from steer carcasses.

[Feeding experiments with beef cattle at the Wisconsin Station] (*Wisconsin Sta. Bul. 396 (1927), pp. 30, 32–37, 79, 80, fig. 1*).—The results of some experiments, several of which have been previously noted (E. S. R., 56, p. 762), are reported.

Chopped alfalfa hay for beef cows.—J. G. Fuller and B. H. Roche found that feeding chopped alfalfa hay to beef cows with nursing calves at foot resulted in an average daily gain of 0.32 lb. per head in comparison with 0.01 lb. for similar cows and calves on uncut hay. Little difference was noted in the gains of the calves on the two rations.

Fattening crossbred v. purebred calves for baby beef.—In experiments by Fuller a lot of crossbred Angus-Holstein calves, one of purebred Holstein calves, and one of purebred Angus calves were fed for 189 days on the same ration. The average daily gains in the respective lots were 1.97, 2.26, and 2.15 lbs. The cost per 100 lbs. of gain was $12.31, $11.03, and $10.23 in the respective lots. The crossbred group sold for $11.50, the Holstein group for $9.50, and the Angus group for $12.25 per hundredweight.

Linseed and cottonseed meal for fattening steers.—In experiments by F. B. Morrison, Fuller, and Roche the average of two years' results in feeding calves showed that a protein supplement composed of linseed meal and cottonseed meal, equal parts, is worth $53.26 per ton in comparison with linseed meal at an average price of $51.02 per ton when used as the sole supplement. These tests indicate that the value of cottonseed meal for fattening calves is greatly improved when fed in combination with linseed meal.

Timothy mixed with sweet clover improves palatability.—Preliminary work has shown that cattle will eat pasturage composed of one-fourth timothy and three-fourths sweet clover more readily than they will eat sweet clover alone.

Winter feeding beef breeding cows, C. N. Arnett and R. C. McChord (*Montana Sta. Bul. 211 (1927), pp. 10*).—The results of five experiments in wintering beef cows (E. S. R., 55, p. 562) at the Fort Ellis Farm, Mont., are reported. Various rations were fed each winter to grade cows of beef breeds bred between July 15 and September 15, whose calves had been weaned in the fall. Barley and oat straw and hay made up of one-half timothy and one-half alfalfa were the roughages used.

It was found that cows that were strong and fat at the close of the grazing season could be successfully wintered on straw alone, provided the winter was moderate and the feeding season short. Supplementing the straw ration with 5 to 10 lbs. of hay prevented extreme loss in weight during the winter period and brought the cows to the pasture season in good breeding condition. One lb. of cottonseed cake had approximately the same feeding value as 5 lbs. of hay in supplementing straw, but 1.5 lbs. of oil meal was not sufficient to bring thin cows through a hard winter in good condition when used to supplement straw. Mature cows and yearlings maintained their weight during the winter on 40 lbs. of sunflower silage per head per day plus free access to straw.

The wintering feed should be plentiful enough to bring cows up to the grazing season with a reserve of condition and strength. Of the winter rations tested, none had any apparent effect on the weaning weight of the calves.

Sorgo silage, sorgo fodder, and cottonseed hulls as roughages in rations for fattening calves in the Southwest, W. H. Black, J. M. Jones, and F. E. Keating (*U. S. Dept. Agr., Tech. Bul. 43 (1928), pp. 24, figs. 7*).—This is another account of work previously noted from the Texas Experiment Station (E. S. R., 58, p. 65).

Rutabagas versus corn silage for breeding ewes (*Wisconsin Sta. Bul. 396 (1927), pp. 30, 31*).—Continuing this study by F. B. Morrison and F. Kleinheinz (E. S. R., 56, p. 763), two lots of ewes were fed equal amounts of corn silage and rutabagas, 2.5 lbs. per head daily. A grain mixture at the rate of 0.5 lb. per head daily was fed after the eighth week. This amount was increased to 0.75 lb. the last 15 days for the ewes receiving rutabagas, but in spite of this the ewes fed corn silage made 12.7 lbs. greater gains during the trial. There was little difference in the vigor of the lambs born in the two lots, but those from the ewes fed corn silage seemed slightly stronger at birth.

[Experiments with swine at the Alabama Station] (*Alabama Sta. Rpt. 1925, pp. 9, 11, 12*).—Results of experiments in continuation of those previously reported (E. S. R., 58, p. 463) are noted.

Soft pork project, W. D. Salmon.—A group of 24 pigs averaging 26.4 lbs. in initial weight were fed for 42 days on whole peanuts, during which time they made an average daily gain of 1.17 lbs. per pig. Part of them were then changed to a ration of 5 parts of corn and 1 part of peanut meal. Sixteen weeks' feeding on this ration failed to make the carcasses hard.

Velvet bean ration for brood sows, E. R. Miller and W. D. Salmon.—Two gilts from a sow that had been fed a ration of 25 per cent of velvet beans and 75 per cent of normal ration were continued on this until after breeding, when 1 received 25 per cent of cooked velvet beans and the other 25 per cent of raw velvet beans. The gilt on the cooked beans farrowed 7 pigs and raised 4 to a weight of 30.6 lbs. each at 8 weeks of age. The other sow farrowed 4 pigs, all of which died in the first week. Adding yeast to the velvet bean ration for the first 75 days of the gestation period and then changing to a normal ration gave no better results than velvet beans alone. Three sows run on velvet bean pasture for 60 days after breeding and then fed a normal ration in dry lot raised 21 pigs which averaged 31.5 lbs. at 8 weeks of age.

[Swine feeding and breeding experiments at the Iowa Station] (*Iowa Sta. Rpt. 1927, pp. 17, 18, 21*).—The results of two experiments in continuation of those previously noted (E. S. R., 56, p. 864) are briefly reported.

Hogging-down corn to best advantage.—Eight lots of 15 pigs each, weighing approximately 106 lbs. each, were used in this trial. One lot received husked corn, tankage, and minerals on rape pasture, and the other 7 lots were fed in different fields of standing corn. One lot receiving standing corn and a mineral mixture required 777 lbs. of feed to make 100 lbs. of gain in comparison with a requirement of 418 lbs. of feed for pigs in a similar field where soy beans had been planted with the corn and a mineral mixture fed. Other supplements proved more economical than standing corn and minerals, and hogging-down corn was more economical than feeding husked corn to pigs on rape pasture.

Different breeding systems with swine.—Purebred Poland China sows were "double mated" with purebred Poland China and Duroc Jersey boars. The resulting pigs were either purebred or crossbred. They were carried through the suckling period as mixed litters and fed out separately after weaning. The crossbred pigs weighed more at weaning time, reached market weight sooner, and required less feed per 100 lbs. of gain than the purebred pigs.

[Swine feeding experiments at the Wisconsin Station] (*Wisconsin Sta. Bul. 396 (1927), pp. 31, 32*).—The results of several experiments by F. B. Morrison and J. M. Fargo are briefly noted, continuing previous work (E. S. R., 57, p. 765).

Rations for pigs.—Pigs on a ration of shelled corn and skim milk on pasture made an average daily gain of 1.29 lbs. at a cost of $7.18 per 100 lbs. of gain, while pigs receiving a mixture of tankage and linseed meal, equal parts, instead

of skim milk made an average daily gain of 1.34 lbs. at a cost of $6.60 per 100 lbs. of gain. Decreasing the daily allowance of skim milk below 4.1 lbs. per head resulted in reduced gains, and increasing the allowance did not increase the gains but did increase the cost.

Another series of trials showed that a ration of corn, tankage, and linseed meal produced an average daily gain of 1.32 lbs. at a cost of $6.21 per 100 lbs. of gain, while when corn germ meal replaced the linseed meal the average daily gain was 1.22 lbs. and the cost of 100 lbs. of gain $6.35.

Feeding fall pigs.—Three trials have been conducted in which two lots of fall pigs have been started on a ration of corn, tankage, linseed meal, and chopped alfalfa. This ration was continued in one lot until the pigs reached 100 lbs. in weight, when the linseed meal and alfalfa were discontinued. The check lot remained on the original ration, on which they made an average daily gain of 1.15 lbs. at a cost of $7.38 per 100 lbs. of gain. The other lot made an average daily gain of 1.17 lbs. at a cost of $6.99 per 100 lbs. of gain.

Rations for the production of bacon.—A ration of two-thirds barley and one-third corn fed with tankage, linseed meal, and chopped alfalfa reduced the gain and increased the cost of gain in comparison with a ration in which corn was the sole grain. The carcasses of the barley-fed pigs showed the better quality of finish for bacon hogs.

Minerals for growing and fattening pigs.—The results of three trials in which bone meal was added to the standard ration showed an average increase of 0.01 lb. in the average daily gain and an increase in the feed cost per 100 lbs. of gain of 15 cts. Other minerals gave similar results.

Comparison made of protein supplements for hogs, W. E. J. Edwards and G. A. Brown (*Michigan Sta. Quart. Bul., 10 (1928), No. 3, pp. 136–138*).—Five lots of pigs averaging approximately 57 lbs. each at the beginning of the test were fed to an approximate final weight of 200 lbs. All lots received shelled corn and free access to water and a mineral mixture composed of 45 lbs. of steamed bone meal, 20 lbs. of pulverized limestone, and 30 lbs. of salt. The protein supplements fed were lot 1 tankage 3 parts and alfalfa meal 1 part, lot 2 tankage and alfalfa hay, lot 3 tankage 2 parts and linseed meal 1 part, lot 4 tankage 2 parts, linseed meal 1 part, and alfalfa meal 1 part, and lot 5 tankage 2 parts, linseed meal 1 part, and alfalfa hay.

The number of days required to reach approximately 200 lbs. in the respective lots were 129, 111, 129, 131, and 119. The total amount of feed required to produce 100 lbs. of gain and the cost of feed for each 100 lbs. of gain were in approximately the same ratio as the number of days required to reach 200 lbs. in weight.

Alfalfa hay produced more rapid gains and required less feed per unit of gain than either alfalfa meal or linseed meal. Alfalfa meal made practically the same daily gain, but required somewhat more feed per unit of gain than did linseed meal. Adding linseed meal to tankage and alfalfa meal reduced the rate of gain and increased the feed requirement slightly. Adding alfalfa hay to tankage and linseed meal increased the rate of gain and decreased the feed requirements much more than when alfalfa meal was added to the mixture. The addition of linseed meal to tankage and alfalfa hay did not improve the ration either in producing gains or in economy.

Fattening hogs on squash and pumpkins, H. McDonald and J. Sotola (*Washington Col. Sta. Bul. 222 (1927), p. 13*).—A group of 8 pigs averaging 138 lbs. each at the beginning of the test gained 34.5 lbs. each on a daily ration of 6.37 lbs. of grain and 29 lbs. of raw pumpkins per pig during a 28-day period (E. S. R., 56, p. 566). A second group with an initial weight of 167.9

lbs. per head gained 42.9 lbs. each in the same time on a ration of 8.1 lbs. of grain and 8.41 lbs. of pumpkins per pig per day.

Preparation of corn for yearling brood sows, J. M. EVVARD, Q. W. WALLACE, and C. C. CULBERTSON (*Iowa Sta. Bul. 245 (1927), pp. 139–167, fig. 1*).—The value and efficiency of different methods of corn preparation for carrying yearling brood sows through the winter were determined by the effect upon the size, vigor, strength, character of bone, and hair coat of the offspring. Forty purebred and crossbred sows that had farrowed and suckled one litter were divided into 4 equal lots. The sows were kept in dry lot and received 0.6 lb. per head daily of a protein supplement composed of equal parts of wheat middlings, linseed oil meal, and tankage. Lot 1 received ear corn, lot 2 corn-and-cob meal, lot 3 shelled corn, and lot 4 ground corn, all hand fed and in such a manner that each animal received 4 lbs. per head daily of dry matter in the form of corn grain on a shelled-corn basis. Two purebred Hampshire boars were used for breeding. The weights immediately before and after farrowing and the weight of litters were used in determining the final weights.

For 120 days of the test all lots were intact, and the average daily gains during this period were 0.7, 0.71, 0.7, and 0.6 lb., respectively. The average daily gains for the respective lots up to final weight before farrowing were 0.66, 0.66, 0.67, and 0.61 lb. The rations fed had little or no effect upon the weight lost at farrowing time, since this loss is proportional to the birth weight of the litter. There was little difference in the pigs farrowed, the rations having no apparent effect upon their development. Ground corn in rate and cost of gains proved uneconomical, and corn-and-cob meal was no more satisfactory in producing gains than ear corn or shelled corn. It is deemed evident from this test that any preparation of corn other than shelling as a feed for brood sows is uneconomical.

Some results of soft-pork investigations, II, O. G. HANKINS, N. R. ELLIS, and J. H. ZELLER (*U. S. Dept. Agr. Bul. 1492 (1928), pp. II+50, figs. 9*).—This publication, supplementing part 1 bearing the same title (E. S. R., 55 p. 264), contains results of experiments conducted jointly by the Department and the cooperating experiment stations of Arkansas, Georgia, Indiana, Mississippi, North Carolina, and South Carolina. The work with "oily" feeds, such as peanuts and soy beans, and other factors influencing the firmness of pork has been continued from the preceding report.

The investigations now deal with the most desirable method of handling these softening feeds and to control the other factors in such a fashion that the pork produced will be firm. It was shown that as the gain produced on peanuts increased the subsequent gain on corn and tankage necessary to make a firm carcass also increased. Gains produced by peanuts on 115-lb. pigs requires more corn and tankage feeding to make the carcass firm than equal gains on 85-lb. pigs. Soy beans either grazed or fed in dry lot will produce soft pork. However, if grazed with a supplementary ration of 2.5 per cent shelled corn with or without minerals and making gains such that the last 125 lbs. or more has been produced on corn and tankage a carcass of satisfactory firmness is produced. Pigs that have been fed rice bran and tankage for 8 weeks do not produce firm carcasses, even though the subsequent gain on corn and tankage is twice that on the softening feed. When the gain made on corn and tankage ration was 1.79 times that made on rice polish-tankage ration the carcasses produced were graded medium soft. On the other hand, when brewers' rice replaced the corn in the hardening ration firm carcasses were produced provided the gains made on brewers' rice were twice those made on rice polish.

[Feeding tests with horses at the Wisconsin Station] (*Wisconsin Sta. Bul. 396 (1927), pp. 28, 29, fig. 1*).—The results of two experiments are briefly noted.

Fermenting feed for horses.—Ten teams of work horses were used in this test by J. G. Fuller, B. H. Roche, and Wolberg. One horse of each team received a ration of timothy hay and oats, while the team mate received 33 per cent less hay and oats, both of which had been fermented by the Piercy process. The horses receiving the fermented feed lost weight steadily, and increasing the allowance of processed oats to 20 or 12 per cent less than the standard ration did not prevent loss. After 13 weeks of feeding, the amount of processed feed was increased to the same amount as the standard. At the end of 20 weeks the horses receiving the standard ration had gained 318 lbs., while those on fermented feeds weighed somewhat less than their initial weight. The results secured do not justify the expense, labor, and extra time involved in feeding fermented feeds.

Chopping timothy hay for work horses.—The results obtained in this test by Fuller and Roche were practically identical with those previously reported (E. S. R., 56, p. 766).

[Poultry experiments at the Wisconsin Station] (*Wisconsin Sta. Bul. 396 (1927), pp. 47–53, figs. 2*).—Results of some experiments are noted in continuation of previous work (E. S. R., 56, p. 567).

Permeability of glass substitutes for the ultra-violet ray.—Experiments by E. B. Hart, H. Steenbock, S. W. Kletzien, H. Scott, J. G. Halpin, and O. N. Johnson have shown that where glass substitutes have had 10 minutes' daily exposure to the rays from a quartz mercury lamp the transmission of ultra-violet light has been practically as good as direct irradiation. Three minutes per day and as low as 3 minutes per week have brought about an improved calcium assimilation in comparison with ordinary window glass, but not as effective assimilation as that secured with direct irradiation.

Studies with laying pullets.—White Leghorn pullets receiving sunlight through ordinary window glass gave a 40 per cent hatch in February, 13 per cent in March, and 0 in April, while similar pullets treated for 30 minutes daily with ultra-violet light gave a 78 per cent hatch in February, 63 per cent in March, and 78 per cent in April. In a pen in which the glass windows were opened on sunny days, the February hatch was 58 per cent, March 39 per cent, and April 72 per cent. The corresponding percentages of hatches for birds under Cel-O-Glas were 58, 39, and 72, and under Vitaglass 57, 47, and 80, respectively. Replacing the window glass with common white cloth gave the following hatches: February 44 per cent, March 28 per cent, and April 33 per cent, and feeding 5 per cent of cod-liver oil to pullets kept behind closed glass windows resulted in a 63 per cent hatch in February, 30 per cent in March, and 55 per cent in April. After May 1 all pullets were given access to direct sunlight. It was apparent that those kept in pens where part or all of the ultra-violet light was shut out developed a condition comparable to rickets, and a considerable amount of summer sunlight was required to permit them to reach high egg production.

What part of the chicken's body is activated by light?—Halpin, Johnson, Hart, and Steenbock found that irradiating various portions of the bodies of laying hens resulted in a continuation of the rate of production and a normal hatchability, except in the case where only the body itself was irradiated. Birds kept out of direct sunlight and with no irradiation produced an average of only 21.5 eggs per bird for seven months and gave a zero hatchability after the third month.

The calcium phosphorus ratio in poultry nutrition.—Experiments by Hart, Steenbock, Kletzien, Halpin, and Johnson indicated that the calcium-phosphorus ratio in the ration of chicks can be varied as much as 7 to 1 without affecting the bone development, provided there is a plentiful supply of the antirachitic factor in the diet.

Cod-liver meal as a source of vitamin A and vitamin D.—It has been demonstrated that cod-liver meal is an effective source of vitamin D but not of A. A ration containing 1 per cent of this product was sufficient to prevent leg weakness in chicks, but did not prevent the common symptoms of vitamin A deficiencies.

How much cod-liver oil should be given laying hens?—Repeated tests by Halpin and Johnson have shown that when 4 to 5 per cent of cod-liver oil was incorporated in the mash fed laying hens favorable results were obtained. Using more than 5 per cent of the oil often caused hens to stop laying in December and January.

Milk substitutes and barley in the Wisconsin chick ration.—In tests by Halpin, Johnson, and Hart, a mortality of 30 per cent occurred when meat scrap was substituted for milk in the ration of chicks. One-fourth and one-half meat scrap in the ration caused a death rate of 6.66 per cent, dried milk 3.5 per cent, and liquid milk 0. Chicks 16 weeks old on liquid milk were thrifty and well-grown. Those on dried milk weighed 10 per cent less and brought 20 per cent less on the market, while those on meat scrap weighed 30 per cent less and were unthrifty in appearance and thin fleshed.

Barley can be substituted for yellow corn in the chick ration if a liberal supply of alfalfa leaf meal is added to furnish vitamin A.

[Poultry experiments at the Iowa Station] (*Iowa Sta. Rpt. 1927, pp. 24, 25*).—The results of three experiments are noted.

Type as a basis for selecting pullets for egg production.—It was found that external characteristics, such as maturity, type, and vigor, can be used as a basis of selection of pullets regardless of the record of the dam, but that greater increase in production followed the use of pedigree records combined with selection for vigor and vitality.

The value of some glass substitutes.—Most glass substitutes are more valuable than ordinary window glass for radiating ultra-violet light. Glass Cloth did not admit sufficient rays to prevent leg weakness in chicks, but Cel-O-Glass, Flex-O-Glass, Wire Glass, and Glass Fabric admitted enough to prevent leg weakness up to 10 weeks of age. During the winter months window glass was not sufficient in preventing leg weakness, and it is during this period that the use of glass substitutes is beneficial.

Oyster shell, clam shell, and limestone as a source of calcium carbonate for laying hens.—Laying hens fed oyster shell as a source of calcium carbonate laid an average of 104 eggs per hen in a period from April 1 to Sepetember 15, those receiving limestone 104.6 eggs, and those receiving clam shell 83.6 eggs. The limestone used was very hard and quite low in magnesium. The amount of supplement consumed was in proportion to the number of eggs laid.

Value of some of the glass substitutes in growing chicks, R. L. Cochran and H. A. Bittenbender (*Iowa Sta. Bul. 246 (1928), pp. 170–184, figs. 14*).—The data presented in this bulletin are more detailed accounts of work noted above. The value of glass substitutes depends upon the addmittance of at least 12 per cent of the beneficial rays of the sun, as measured by the lithophone test, for preventing leg weakness. Recommendations are made for the proper use of glass substitutes.

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Net correlations of characters concerned in fecundity, F. A. Hays and R. Sanborn (*Massachusetts Sta. Tech. Bul. 12 (1927), pp. 195–204*).—In concluding this series (E. S. R., 58, p. 766) the five inherited traits concerned with production have been correlated with annual production. The partial correlations between age at first egg, length of winter pause, winter clutch size, total days broody, and annual persistency and annual production were −0.0238 ±0.0177, −0.5487±0.0128, +0.4944±0.0101, −0.5630±0.0097, and +0.7501 ±0.0063, respectively.

No relationship was found to exist between annual production and age at first egg. There was a significant relationship between annual production and length of winter pause, winter clutch size, and total days broody, but it is most intimately associated with annual persistency. The multiple correlation +0.8642 shows that these five traits show a high degree of correlation with annual production and largely control it.

The hatchability and livability of 300-eggers (*Washington Col. Sta. Bul. 222 (1927), pp. 43, 44*).—The average hatchability of eggs from ten 300-egg hens was 65 per cent in comparison with the same percentage for the hatcheries of the State. The average fertility of the eggs laid by these hens was 88 per cent.

Raising chicks at a profit, L. E. Card (*Illinois Sta. Circ. 329 (1928), pp. 15, figs. 5*).—This is a revision, with data brought up to date, of a circular previously noted (E. S. R., 53, p. 71).

DAIRY FARMING—DAIRYING

[Experiments with dairy cattle at the Iowa Station] (*Iowa Sta. Rpt. 1927, pp. 21–23*).—The results of some experiments are briefly reported, several of which are continuations of those previously noted (E. S. R., 55, p. 569).

Minerals for dairy cattle.—When allowed free choice of a variety of minerals dairy cows showed a decided preference for raw and steamed bone meal. Since deodorized bone meal was not eaten to any extent, it is evident that the odor of the product plays at least a small part in its selection. No beneficial effects in health or general vigor were noted as a result of mineral feeding, nor did it prevent abortion or difficulties in breeding.

Milking machines.—A three years' study of milking machines has brought out the following points:

The machine does not influence the amount of milk produced, but does increase the tendency for udder troubles when not properly handled. From 91 to 96 per cent of the milk is obtained in the first five minutes, and to prevent trouble the remaining milk should be stripped by hand. Great care must be used in handling the machines to keep the bacterial count low. The amount of sediment is usually less in the machine-drawn milk. An average saving of 54 per cent in time required for milking (exclusive of care of equipment) is effected by the use of machines, and the greatest economy in milking is obtained where a large number of cows are milked.

Influence of environmental temperatures upon fat test.—A preliminary study has indicated that the fat tests vary inversely with the temperatures inside and outside of the barn, lowering in all cases as the temperature rises.

Digestive trials with silages.—A study of the chemical composition of silages showed that the protein content of corn silage was 2.61 per cent, corn-soy bean silage grown together in the field 2.41 per cent, and corn-soy bean silage mixed at filling time to 25 per cent soy beans 2.84 per cent. These results indicate that the value of mixing corn and soy beans to increase the protein content of silage is not as great as has been commonly supposed.

Use of corn gluten feed for dairy cows.—Corn gluten feed as a protein supplement for dairy cows was always effective in increasing the milk flow, but was not always economical when fed with alfalfa hay. When timothy hay was used the corn gluten feed increased the return over feed cost 3.5 per cent.

[**Experiments with dairy cattle at the Washington Station**], E. V. Ellington and J. C. Knott (*Washington Col. Sta. Bul. 222 (1927), pp. 18–21*).—The results of three experiments are briefly noted, continuing earlier work (E. S. R., 56, p. 569).

Relationship of the physical characteristics of the cow's mammary system to production.—Two purebred Holsteins and 2 purebred Jersey cows well advanced in lactation and having apparently normal well-balanced udders were so milked during a 2-day period that the milk from each quarter was drawn into a separate container. The milk was weighed and tested for fat and solids-not-fat. The milk from the various quarters was quite uniform, and the greatest variation in production was between the front and rear quarters.

Influence of methods of milking on quality and quantity of milk produced.—Four cows were milked over a 16-day test divided into 2-day periods in such a manner that the combination of quarters milked at one time varied. Milk from each quarter was drawn into a separate container, and strippings were kept separate from the other milk. All samples were weighed and tested for fat, total solids, and solids-not-fat. The results so far obtained do not indicate that the milking of alternate quarters has a material effect upon the relative production of these quarters.

Relation between length of gestation period, birth weight, and sex of dairy calves.—Records of the station herd showed that the gestation period for three breeds of dairy cattle on 53 female calves averaged 277.9 days and on 52 male calves 281.7 days. In all cases the male calves had an average higher birth weight than the female calves.

Similar data obtained from the herd at the Washington State Penitentiary showed that 54 male calves were carried an average of 280.4 days and 48 female calves 278.7 days. Of the male calves 32 were carried more and 22 less than 280 days, and of the female calves 22 were carried more and 26 less than 280 days.

[**Experiments with dairy cattle at the Wisconsin Station**] (*Wisconsin Sta. Bul. 396 (1927), pp. 37–43, 76, figs. 2*).—Results of experiments in continuation of work previously noted (E. S. R., 56, p. 771) are briefly reported.

[*Rations and sunlight for calves*].—Experiments by F. B. Morrison and I. W. Rupel have shown that feeding a gruel composed of 250 lbs. each of finely ground corn, flour wheat middlings, and ground oats, hulls sifted out, 120 lbs. of linseed meal, 100 lbs. of soluble blood flour, and 10 lbs. of salt, steamed bone meal, and ground limestone, with alfalfa hay and a dry concentrate mixture of corn, oats, and bran, 30 parts each, and linseeed meal, 10 parts, produced an average daily gain of 1.54 lbs. per head with calves which had received only 400 lbs. of whole milk from birth. Attempts to improve the ration by the addition of 10 per cent tankage or blood meal or by raising the protein level proved unsuccessful. Exposing to sunlight showed no advantage over feeding in unlighted sheds.

[*Effect of sunlight and artificial light on production*].—Continuing the work of exposing cows to sunlight led to the conclusion by E. B. Hart and H. Steenbock that the mid-summer falling off in production of heavy milking animals is due to depletion of their lime supply as much as to heat and flies. Sunlight had no effect in changing the utilization of lime in the ration during this period.

Irradiating cows for from 30 to 60 minutes daily with ultra-violet light on various portions of the body did not improve the antirachitic properties nor the calcium or phosphorus content of the milk. There was no improvement in the assimilation of lime in the ration. Feeding cod-liver oil, however, has improved the potency of the milk in its calcifying powers.

Hay curing and antirachitic properties.—Experiments by Hart and Steenbock have shown that hay cut and cured away from sunlight has no antirachitic properties. The lime equilibrium of milk goats has been maintained by feeding a regular ration of field-cured alfalfa hay, but the amount ordinarily fed to dairy cows is not sufficient to maintain a lime balance. Treating alfalfa hay with ultra-violet light before feeding has caused milking goats to change from a negative to a positive lime balance.

Pasture crops for yearling dairy heifers.—Two years' results with 24 dairy heifers from experiments by Rupel and G. B. Mortimer have indicated that sweet clover pasture is not as palatable as a mixed pasture of timothy and red and alsike clover grown in rotation. Even when supplemented with a small allowance of grain, sweet clover just maintained the animals' weight. Sweet clover furnished feed for a longer period than did the mixed pasture.

Comparison of purebred and grade dairy cows, J. C. McDowell (*U. S. Dept. Agr. Circ. 26 (1928), pp. 7, figs. 2*).—A comparison of the records of 29,397 purebred and 71,745 grade cows of four breeds showed that the purebred cows consumed 23 per cent more feed and produced 10.6 per cent more milk and 6.7 per cent more butterfat per cow per year than the grades. The yearly income per cow was 9.7 per cent greater for the purebred cows. Up to 13 years of age the purebreds excelled the grades in milk production and to 11 years in butterfat production and return over feed cost. After these ages the grades slightly excelled the purebreds.

The author suggests that the reason the purebreds did not excel the grades more than the figures show was in part due to closer culling of the grades, but mainly to the constant use of selected purebred sires in the production of the grades.

Pruebred dairy sires, W. E. Wintermeyer (*U. S. Dept. Agr. Leaflet 16 (1928), pp. 4, figs. 4*).—The advantages of the use of purebred dairy sires in raising the production of the average dairy herd in the country are described.

[Experiments with dairy products at the Iowa Station] (*Iowa Sta. Rpt. 1927, pp. 31, 32*).—The results of two experiments are noted.

Studies on bacterial flavors and odors of milk.—In this study on starters it has been found that the temperature at which milk to be made into starter is pasteurized influences the rate of coagulation. Under the same conditions of inoculation and incubation, pasteurizing at 140° F. for 30 minutes causes milk to coagulate slower than when pasteurized at 180° for 30 minutes. Overripening a starter had no effect on the rate of coagulation of the milk into which the starter was put, but it caused an undesirable flavor and aroma, and these defects were transferred to subsequent inoculations.

Effect of homogenization on milk, cream, and ice cream.—Samples of cream and ice cream mixes variously treated were studied microscopically (E. S. R., 55, p. 873). Cooling after homogenizing had no effect upon the size of fat globules, nor was there any apparent relationship between the size of the globules and the fat content of the cream. The size of clumps appears to be determined during the process of homogenizing. There was no definite relationship between the pressure of homogenizing and the degree of clumping, nor does aging increase the size of clumps. Different creams with the same fat content show variations in the clumping of fat particles.

Agitation during freezing of ice cream mixes breaks down the size of the clumps. Homogenizing with a single valve increases the amount of clumping with increase in pressure, while the two-stage valve decreases the clumping. The single stage also increases viscosity with increase in pressure, while the two-stage valve decreases viscosity. As the clumping increased, the viscosity also increased. No relationship could be determined between surface tension of the mix and the body and texture of the ice cream.

[Experiments with dairy products at the Wisconsin Station] (*Wisconsin Sta. Bul. 396 (1927), pp. 88, 89, 90*).—Several experiments are briefly noted, continuing previous work (E. S. R., 56, p. 773).

Influence of freezing of cheese on quality.—The freezing point of American cheese was found by H. H. Sommer and J. L. Sammis to vary from 6 to 24° F., due to some extent to variations in moisture and salt content. The older the cheese the lower was its freezing point. The texture, body, and paraffin coating were affected by freezing, causing a crumbly texture, a tendency to undergo surface cracking, and a flaking off of the paraffin coating. Flavor is not impaired by freezing.

[*Ice cream investigations*].—Sommer found that there is no apparent relationship between the acidity of an ice cream mix and its whipping ability or overrun. Ripening a mix to increase acidity or adding neutralizers has no beneficial effect if the ingredients are of good quality. Neutralizers may have a harmful effect upon the flavor and may cause a dull grayish appearance in the finished product.

Commercial ice cream improvers were found to consist of starches as a carrier for protein-coagulated enzymes or to be wholly gums. Used in unaged mixes, they improve the whipping quality and the texture of the ice cream, but in properly aged mixes no improvement from their use was noted.

Citrated starters in butter making.—Experiments by H. L. Templeton and Sommer have shown that the desired ripened cream flavor in butter with a low acidity and good keeping quality may be obtained by using a starter composed of the sour-milk organism, *Streptococcus lactis*, and a citric acid fermenter, either *S. citrovorous* or *S. paracitrovorous*.

Can washing and sterilizing by mechanical can washers.—In a study by W. B. Sarles and Sommer of milk cans as a source of bacteria, it was found that allowing cans to stand 24 hours with the lids on and with condensation water present would increase the bacterial count of milk placed in them as much as 130,000 per cubic centimeter. Allowing the cans to dry with the lids off was effective in keeping down contamination. A thorough rinsing with cold water just before using removed from 50 to 75 per cent of the bacteria and with hot water from 89 to 93 per cent, while a hypochlorite solution rinse was practically 100 per cent efficient.

The relation of milk solids not fat to overrun and quality of ice cream, P. S. Lucas and W. J. Roberts (*Michigan Sta. Tech. Bul. 86 (1927), pp. 16, figs. 2*).—Four mixes of the same composition except as to percentage of milk solids-not-fat formed a series in this experiment. The percentage of milk solids-not-fat was 6, 8, 10, and 12 per cent in the respective mixes, the other ingredients being 10 per cent of fat in all mixes, 15 per cent sugar, 0.5 per cent of gelatin, and 31, 33, 35, and 37 per cent of total solids, respectively. Twenty groups or series were frozen to secure the data presented. Each mix of 25 lbs. was pasteurized at 145° F. for 30 minutes, viscolized at 110° at 1,500 lbs. pressure, and aged 48 hours. Freezing was done under uniform conditions and an overrun of as near 70 per cent as possible obtained in all mixes.

It was found that as the milk solids-not-fat in the mix increased the apparent viscosity increased, each increase of 2 per cent in milk solids-not-fat causing an approximate increase of 25 per cent in viscosity. Increasing the percentage of milk solids-not-fat had little or no effect upon the overrun, but did increase the specific gravity and lower the freezing point of the mix. Ice cream containing 10 per cent of fat and 6 per cent of milk solids-not-fat was very light, fluffy, and coarse in texture. Increasing the serum solids to 8 per cent improved the quality but not to the point of a desirable product. Ice cream having 10 per cent of milk solids-not-fat was the most desirable product, retaining its smoothness of texture and firmness of body even after periods of storage. When the percentage of serum solids was increased to 12 per cent the resulting product had a hard and brittle body and became sandy when allowed to stand for any length of time.

Creamery inspection in New Jersey (eighth annual report), G. I. Ball (*New Jersey Stas. Bul. 465 (1928), pp. 8, fig. 1*).—The usual report of the creamery inspection in New Jersey for the year ended June 30, 1927 (E. S. R., 57, p. 76).

VETERINARY MEDICINE

Manual of bacteriology, R. Muir and J. Ritchie (*London: Humphrey Milford, Oxford Univ. Press, 1927, 8. ed., rev., pp. XXIV+821, pls. 6, figs. 211*).—This is the eighth revised edition of the work previously noted (E. S. R., 27, p. 76). An extensive classified bibliography is included (pp. 761–804).

[Report of the division of veterinary science of the Washington Station], J. W. Kalkus and C. E. Sawyer (*Washington Col. Sta. Bul. 222 (1927), pp. 48–52*).—Reporting upon studies of abortion in cattle, it is stated that the methods of segregation and herd management as outlined in Bulletin 196 (E. S. R., 54, p. 870) have yielded continued good success. This plan has been in operation for a period of nearly 4 years without a single case of *Brucella abortus* infection occurring. In transmission work, uterine discharges and portions of placenta from reacting previous aborters have been inoculated into guinea pigs after normal parturition with negative results in about 90 to 95 per cent of the cases. That there is grave danger and that disastrous results may follow in the wake of the 5 to 10 per cent infection is shown by an experience in which 8 abortions occurred in a herd within 4 and 8 months, respectively, after the parturition of 2 cows that had been introduced into the negative reacting herd without application of the test. Within about 7 months all but 1 of the 16 animals in the herd had given positive reactions.

In immunity work, the most promising results were obtained from the use of live cultures injected subcutaneously into heifers 2 months before they were bred, although this method of immunization is considered far from being completely satisfactory.

The work conducted suggests the possibility of producing an immunity by udder inoculation of open heifers rather than by subcutaneous inoculation.

An attempt was made to destroy the abortion organism harbored in the udders of infected cows through the administration of neutral acriflavine. Tests made of the milk of the first cow 2 days and 9 days, respectively, after injection of the dye solution showed the presence of live abortion organisms.

In work with red water of cattle a total of 20,910 gm. of oxalic acid was administered to one heifer in 852 doses from April 10, 1924, to August 16, 1926, without causing the development of red water.

Only through research can animal disease be controlled (*Wisconsin Sta. Bul. 396 (1927), pp. 54–63, 85, 86, fig. 1*).—Reference is made to the results obtained by six different laboratories in conducting agglutination tests for

bacillary white diarrhea infection on samples from the same Wisconsin hens, the details of which are given in tabular form. A compilation of the reports received shows a wide variation, there being only 5 of the 38 cases with the same findings. Studies conducted have shown that the eggs from infected hens do not hatch nearly as well as those from noninfected hens. The difference in the hatching of eggs from reacting hens and from nonreacting hens was 7.2 per cent. In a comparison made of the two diagnostic tests it was found that the pullorin test in its present stage of development is not so accurate as the agglutination test.

It is stated that on July 1, 1927, State funds became available to indemnify owners of cattle which reacted to the johnin test for Johne's disease. Experiments by B. A. Beach, E. G. Hastings, and H. L. Mansfield with 15 sheep demonstrated the possibility of satisfactorily employing sheep for determining the disease-producing ability of several of the related acid-fast bacteria.

In an attempt to determine whether infectious abortion is more prevalent in herds of poorly nourished cattle, a ration inadequate for proper nourishment was compared with one containing sufficient nourishment without obtaining evidence of any adverse influence.

In elimination work with infectious abortion by herd testing, success was found to be due to disposal promptly of all low milk-producing, barren, and diseased cows; removal of calves at birth or shortly afterwards; development of acquired immunity against the established infection through continued contact, and of age immunity from the cattle becoming older—the disease being one primarily of heifers; and enforcement of strict quarantine measures, which prevented the introduction of new and more virulent strains of the abortion organism and reduced the opportunity of reinfection. The work conducted during the year with infectious abortion is summarized as follows:

"No relation was found to exist between retained afterbirths and the abortion rate; likewise, sterility and the abortion rate. Breeding first calf heifers too soon after calving appeared to reduce their resistance to the infection. It will probably be wise to allow them a longer rest period between calvings than mature cows. The bull is often responsible for failure of cows to conceive. One bull that showed only 23 per cent conceptions had 27 per cent of those conceptions abort. A suprisingly large number of these were nonreacting cows. Nonreacting aborters usually abort from some other cause than infection with the abortion organism. Moreover, this cause is not transmitted in the same manner as is *Brucella abortus* Bang. From the evidence, it seems reasonable to conclude that the cause is often a genital infection of the bull which he transmits at the time of service. In clean herds, of the abortions that occur, about 5 per cent have been shown to be due to other causes than infection with the abortion bacillus. Some reacting cows produce healthy calves, which are capable of developing into valuable breeding animals, so promising calves from reacting dams may be developed. Following the vaccination against abortion infection with live culture vaccine, the abortion rate usually drops to about 6 per cent and stays at that point. Clean herds have about this abortion rate on the average."

In work in heritable resistance to infectious abortion the following conclusions are considered justifiable:

"The offspring of the different lines in the resistant group have shown a high percentage of resistance. This fact seems to indicate that resistance to abortion infection in rabbits is transmitted by inheritance from parent to offspring. A small percentage of susceptible animals, however, has continuously cropped out from these apparently resistant lines—a fact which would indicate that no individual as yet has been obtained that is homozygous (pure)

for resistance to infectious abortion. The offspring of the different lines of susceptible animals have been found to be uniformly susceptible and have consistently produced susceptible offspring. This fact seems to indicate that susceptibility to abortion is recessive. A few crosses between animals from resistant lines with those from susceptible lines have been made. The first filial generation (F_1) resulting from this cross has shown a preponderantly high percentage of resistant animals, which again indicates the dominance of resistance over susceptibility. The data are as yet not sufficient for the formulation of any definite theory as to the number of hereditary factors involved."

In the study of inherited skin defects of calves by F. B. Hadley and L. J. Cole, the same defects have been found to occur in calves born in the Netherlands. This condition, which was found in herds having certain blood lines, has been designated scientifically as epithelio-genesis imperfecta neonatorum bovis.

No lesion tuberculin reacting animals were found to represent 20 per cent of the reacting animals in a group of 20 Wisconsin counties where area tuberculin testing has been conducted. Reference is also made to a procedure worked out by W. D. Frost for the detection of the human type of hemolytic streptococci in milk and their differentiation from the many harmless bovine types that are common in nearly all milk samples.

Rapid macroscopic agglutination for the serum diagnosis of Bang's abortion disease, I. F. Huddleson and E. Abell (*Jour. Infect. Diseases, 42 (1928), No. 3, pp. 242–247, fig. 1*).—This report upon further work with the rapid macroscopic agglutination test for *Brucella abortus* infection supplements the account previously noted (E. S. R., 57, p. 672). It is pointed out that further study has shown the antigen previously recommended to be too sensitive, and that this can be eliminated by increasing the concentration of the antigen. There was also found to be a considerable difference in the titer of a few samples of serums. The use of a heated, standardized suspension of *B. abortus* in 12 per cent sodium chloride solution with different amounts of undiluted serum on the glass cover of an especially lighted box afforded a rapid macroscopic test for specific agglutinins. The results obtained with this rapid method in several thousand tests indicate that its accuracy and specificity are equal to those of any other method.

A rapid method of testing cattle for infectious abortion, L. E. W. Bevan (*Vet. Jour., 84 (1928), No. 632, pp. 72–75*).—The author has modified the abortoscope method (E. S. R., 55, p. 72; 58, p. 577) so that a more rapid diagnosis, after the manner employed by Huddleson and his associates (see above), is obtained. The procedure found to give the desired results is as follows:

Blood collected from the ear into the loop in the usual way is added to the suspension in the abortoscope and mixed thoroughly by shaking. A small quantity of the mixture is then shaken out on a microscope slide, and spread out into a round pool about the diameter and depth of a sixpenny piece. The slide is then heated over an alcohol lamp or even a burning match, flocculation taking place almost immediately if the blood has come from an infected animal, but with no flocculation if the serum of the animal does not contain the specific agglutinins. With a normal blood the mixture remains homogeneous, but with a "positive" blood the bacteria clump together in a very characteristic manner, so that they appear as small granules of varying size distributed throughout the diluting fluid.

The practical importance of this procedure lies in the fact that the whole test described can be carried through and a definite diagnosis arrived at within less than 5 minutes after collection of the blood.

Contagious abortion in cattle (*North. Ireland Min. Agr. Leaflet 13, rev. (1928), pp. 5, fig. 1*).—A revision of a previous report (E. S. R., 57, p. 182).

Observations on Anaplasma marginale (Theiler) in cattle of California, W. H. Boynton (*Cornell Vet., 18 (1928), No. 1, pp. 28–48, figs. 3*).—This disease of cattle, which first came to attention in California in December, 1925, in a herd of dairy cows near Pinole, Contra Costa County, has since been observed in seven counties of the State, all of which are free from Texas fever. It has been determined by microscopic findings, autopsy, and transmission experiments by blood injection.

"The incubation period, i. e., the first appearance of the marginal bodies in the red blood cells after large injections of infected blood, is approximately 18 days. It is from 6 to 8 days after the first appearance of the marginal bodies before the infected animal begins to show physical symptoms and a temperature reaction. The marginal bodies are most abundant during the febrile period. In some instances, nearly 50 per cent of the red cells are infected. Severe anemia, jaundice, constipation, marked muscular tremors and weakness, rapid, wiry pulse, sonorous respiration, impaired eyesight, inappetence, fever, and rapid emaciation are the most pronounced symptoms in severe cases. The mortality has been high among those animals that manifested physical symptoms. Anaplasmosis is apparently more fatal among heavy producing milk cows than among dry dairy cows.

"The exact mode of transmission of *A. marginale* among cattle in California is not definitely known, but the large horse fly, *Tabanus punctifer* O. S., may be considered as a factor in some localities. Blood from a recovered cow which showed no detectable evidence of the disease produced anaplasmosis when injected into a susceptible animal."

Scours in suckling pigs, D. A. Boardman (*Cornell Vet., 18 (1928), No. 1, pp. 76, 77*).—The author reports briefly upon the use of formaldehyde as a therapeutic agent in this affection of pigs. He concludes that 0.5 oz. in the feed three times a day to the average sized sow of 250 lbs. will prevent or cure the disease in her litter of pigs.

A study of bacteria isolated from cases of bovine mastitis, H. Barton (*Macdonald Col., School Agr. Rpt. 1926–27, pp. 11, 12*).—In a study of the etiology of udder inflammations in Quebec, intended as a foundation for therapeutic experiments, the milks from 13 cases were examined bacteriologically. The conditions prominent in these cases included septic metritis, enlargement of udder, tumor of supramammary gland, septicemia, and abscess formation. The organisms met with were identified as *Bacterium abortus* in 3, *Escherichia neapolitana* 3, *E. foetida* 1, *E. acidi-lactici* 1, *Streptococcus mastitidis* 1, *Staphylococcus albus* 1, *S. epidermidis* 1, *Micrococcus freudenreichii* 1, *M. candicans* 2, *Eberthella pyogenes* 1, *Bacillus lactimorbus* 1, and *B. silvaticus* 1. It is pointed out that 6 of the 12 species are generally considered pathogenic.

Protection against bovine tuberculosis by BCG vaccine [trans. title], C. Guérin, A. Richart, and M. Boissière (*Ann. Inst. Pasteur, 41 (1927), No. 3, pp. 233–253*).—The authors report upon BCG (Bacillus Calmette Guérin) vaccination work conducted at Gruville, Canton of Valmont, France, from 1921 to 1927. Of 30 BCG vaccinated bovines born and raised under infected con-

ditions, none had contracted the disease up to the time at which for economic reasons they were slaughtered. Twenty of the 30 were born of tubercular or suspected tubercular dams and were nourished during their early months with the unboiled milk of their dams.

The "lunger" disease of sheep, H. WELCH and H. MARSH (*Montana Sta. Bul. 210 (1927), pp. 8*).—This is a practical account of a disease of sheep, investigations of which have been under way for more than 10 years (E. S. R., 54, p. 379).

This so-called lunger disease is a chronic pneumonia that is quite prevalent in range sheep in the Northwestern States, the loss in infected bands in Montana averaging about 2 per cent annually. Advanced cases of the disease are recognized by rapid, labored respiration, so violent that it affects the whole body and causes a nodding motion of the head. Sheep showing typical symptoms lose flesh and die within a few months, none having been known to recover. It was observed most commonly in ewes over 4 years of age, but it occurs in 2-, 3-, and 4-year-old sheep and in bucks and wethers as well as in ewes. While as yet no definite cause has been assigned to the disease, it is believed to be of bacterial origin, an irritation of the respiratory tract brought on by conditions under which sheep are managed being a predisposing cause.

The removal and marketing of all the infected sheep is recommended, since there is nothing in the nature of the disease that renders the meat unfit for use. By culling out and shipping the lunger sheep to market in October and again at shearing time a fair market value can be obtained and the great loss that would otherwise follow be avoided.

Diminished plasma buffer value in pregnancy disease of ewes, D. J. HEALY and F. E. HULL (*Cornell Vet., 18 (1928), No. 1, pp. 73–75*).—This is a contribution from the Kentucky Experiment Station.

Determinations of the cH of areated plasma from normal sheep were made. The cH varied from pH 8.36 to pH 8.50 with an average of pH 8.42, or after the addition of an equal volume of N/50 HCl from pH 6.43 to pH 6.95 with an average of pH 6.77. The buffer value expressed as Van Slyke's $\frac{dB}{d\ pH}$ ratio varied from 0.37 to 0.51 with an average of 0.44.

In the areated plasma from three cases of pregnancy disease of sheep the cH averaged pH 8.40, and after the addition of an equal volume N/50 HCl the C averaged pH 5.65. The buffer value, expressed as above, varied from 0.24 to 0.30 with an average of 0.26.

The anemias of the sheep and the goat in Algeria [trans. title], A. DONATIEN and F. LESTOQUARD (*Arch. Inst. Pasteur Algérie, 5 (1927), No. 2, pp. 188–213, figs. 10*).—The subject is discussed under the headings of parasitic anemias, including distomatosis and gastrointestinal strongylosis; endoglobular hematozoal anemias; bacterial anemias, including pasteurellosis and anemias due to the Priesz-Nocard bacillus; and pernicious anemia. A discussion of differential diagnosis and of prophylaxis is included.

Bacillary white diarrhea of chicks, R. GRAHAM and E. A. TUNNICLIFF (*Illinois Sta. Circ. 328 (1928), pp. 8, figs. 5*).—This is a revision of Circular 273, previously noted (E. S. R., 50, p. 285). An outline of the Illinois plan for the prevention and control of bacillary white diarrhea as administered by the State department of agriculture is included.

Breeding poultry for resistance to fowl typhoid (*Iowa Sta. Rpt. 1927, p. 61*).—In breeding work, 107 additional White Leghorns, weighing from 2 to 3 lbs., were tested with massive doses of virulent fowl typhoid culture, of which 40, or approximately 36 per cent, died after varying periods of from 5 to 40

days. This is said to be a decrease of about 8 per cent in the mortality observed during the previous year. The birds, however, showed considerable reaction to the disease. The survivors of the previous year's stock were mated, and the chicks hatched from such stock are being tested against similarly bred chicks from untested stock.

Further observations on the life history of the eye worm of poultry, J. W. Fielding (*Aust. Jour. Expt. Biol. and Med. Sci., 4 (1927), No. 4, pp. 273–281*).—This account is based upon studies conducted in continuation of those previously noted (E. S. R., 56, p. 879).

It is concluded that the eggs of the eye worm normally hatch in the gut of the cockroaches, one larva having been seen to emerge from the egg 2 days after the last possible ingestion of eggs by the insect. Larvae were noted in the gut 6 days after the last possible ingestion of eggs, and were found in the body cavity 10 to 13 days after the initial feed, or 6 to 9 days after the last ingestion of eggs. Seventeen days after the initial feed, encapsulated larvae were found which were approximately twice the size of newly hatched larvae. It was found that the larvae were not infective 46 days after experimental feeding of the insect, but were 52 days after, and that the female begins laying eggs 38 days after entering the definitive host, thus making the cycle of the parasite complete in approximately 13 weeks, though under more favorable conditions this time may probably be somewhat reduced. On introducing infected cockroaches to pigeons the latter became infected. Worms introduced into the eye of a guinea pig were capable of continuing their development, but when introduced into the mouth of this animal they were incapable of reaching the eye.

The known distribution of the eye worms *Oxyspirura parvovum* and *O. mansoni* and the Surinam roach supports the conclusion that there is a direct association between them.

Studies of this parasite by Sanders at the Florida Experiment Station have been noted (E. S. R., 57, p. 381).

Coccidiosis, W. K. Picard (*Nederland. Indische Bl. Diergeneesk., 39 (1927), No. 6, pp. 468–475; Fr., Ger., Eng. abs., p. 475*).—Investigations conducted by the Veterinary Institute at Buitenzorg have shown coccidiosis to be a common disease in the native poultry and to cause serious losses, particularly in chickens and young doves.

AGRICULTURAL ENGINEERING

Agricultural engineering, B. J. Owen (In *Agricultural Research in 1925. London: Roy. Agr. Soc. England, 1926, pp. 44–73*).—In this contribution from the Institute of Agricultural Engineering, University of Oxford, a review is given of the progress of agricultural engineering, particularly in Great Britain, during the year 1925. It contains sections on testing agricultural machinery, history of agricultural implements, land improvement, power, agricultural implements and machinery, and after treatment of crops.

Agricultural engineering, B. J. Owen (In *Agricultural Research in 1926. London: Roy. Agr. Soc. England, 1927, pp. 74–120*).—This review covers the subjects noted above for the year 1926.

[Agricultural engineering studies at the Iowa Station] (*Iowa Sta. Rpt. 1927, pp. 9–12*).—The progress results of studies on the treatment of silo walls, masonry barn construction, prepared roofing, dairy barns and equipment, air requirements of poultry, the horse as a motor, and corn harvesting are presented.

It was found that a cement wash and asphalt paint, when properly applied, are satisfactory in making silo walls impervious and are economical.

In the study of dairy barn floors it was found that concrete and rubber block floors have shown the least wear.

In the study of air requirements of poultry (E. S. R., 56, p. 881), the results indicate that air supply in itself is of secondary importance. Temperature, relative humidity, and rates of air movement exercise a much greater influence on health and vitality than does air purity. Furthermore, it has been shown that air purity has little influence upon hatchability of the eggs produced. On the other hand it has been shown that cold and sudden changes in temperature have an almost immediate influence in reduced production.

[Irrigation investigations at the Irrigation Substation], C. C. WRIGHT (*Washington Col. Sta. Bul. 222 (1927), pp. 69–71*).—The progress results of water measurement, irrigation, evaporation, and alkali reclamation experiments are presented briefly (E. S. R., 56, p. 576). In the evaporation experiment it was found that the more water the soil contained the greater was the amount lost by evaporation.

Silt in the Colorado River and its relation to irrigation, S. FORTIER and H. F. BLANEY (*U. S. Dept. Agr., Tech. Bul. 67 (1928), pp. 95, pls. 3, figs. 12*).—A large amount of information of a preliminary nature is presented on the subject. It is pointed out that the Colorado River basin, with its varied physical features, is nearly as large as the State of Texas. The economic remedial measures feasible of application to the control of silt in the basin are (1) the storage of silt in a large reservoir located near the lower end of the canyon section, supplemented by the storage of silt in smaller reservoirs located on tributary streams, (2) the forming of settling basins and the installation of desilting structures at or near the intakes of diverting canals, and (3) the exercise of efficient control over the growth and maintenance of native grasses and other vegetable covering.

The silt transported by the Colorado River consists of finely pulverized rock with a variable proportion of organic matter. Normally the specific gravity of this silt is 2.65, but the weight per unit of volume varies within wide limits. The finer silt, or that which passes a 200-mesh sieve, may be transported long distances in both natural and artificial channels if the mean velocity of the current exceeds two-thirds of a foot per second with a fair uniformity of silt content throughout any vertical section. Thus any velocity that is practical for an irrigation canal will carry in suspension most of the finer silt of the Colorado River.

It has been found that formulas applicable to the transportation of silt in the channels of foreign countries, particularly those of India, do not seem to apply to the water channels of the lower basin of the Colorado River. As closely as it can be estimated the normal quantity of silt transported annually to the lower end of the canyon section is 253,628,000 tons, or 137,000 acre-ft.

The opinion is expressed that the most feasible and economical means of solving the silt problem of Imperial Valley is to impound the river silt behind a high dam. It is estimated that about 20 per cent of the total load of silt in the Colorado River at Yuma, Ariz., is bed silt.

Delivery of irrigation water, W. A. HUTCHINS (*U. S. Dept. Agr., Tech. Bul. 47 (1928), pp. 48, figs. 11*).—Data are reported from a study of the delivery methods and other important phases of the management of nearly 100 irrigation enterprises in 13 of the 17 Western States. Projects of four principal types were included, namely, mutual companies, irrigation districts, commercial companies, and Federal projects. Districts and mutual companies together included about 75 per cent of the total.

Farmers' purchase agreement for deep well pumps, B. D. Moses and L. S. Wing (*California Sta. Bul. 448 (1928), pp. 46, figs. 3*).—The purpose of this bulletin, which is a contribution from the station, the California Farm Bureau Federation, and the California Committee on the Relation of Electricity to Agriculture, is to present a new form of contract for the purchase of deep-well pumps. The text of the form is given.

Tests show divining rod worth nothing, J. W. Gregory (*Water Works, 67 (1928), No. 2, pp. 81, 82*).—The results from different sources of tests of divining rods for locating underground water supplies are summarized. These indicate as a whole that the divining rod has no merit in this connection.

The movement of water in soil and the action of drainage [trans. title], O. Solnař ([*Czechoslovakia*] *Min. Zeměděl., Sborn. Výzkumn. Úst. Zeměděl. No. 25 (1927), pp. 89, figs. [19]; Ger. abs., pp. 70–79; Fr. abs., pp. 80–88*).—Studies are reported which indicate that rain water penetrates the soil mainly when the soil is cultivated, and that the differences of temperature between the soil and the air are of the greatest importance in soil moisture movement. Vertical movement occurs only when sufficient heat is present to furnish the necessary energy, this being limited by the depth at which daily variations in temperature have an effect. Such depths therefore indicate the logical depth of drainage, which has been found to be about 1 meter under the soil and climatic conditions tested. It was found of no advantage to place drains at a greater depth than that which limits the effect of daily variations in temperature.

It was further found that a determination of the spacing of drains on the basis of depth is not correct. Apparently the moisture in soils is regulated by the diffusion of gases, the greater the pore space in soil the more intensive being the diffusion. The water content of pores hinders the diffusion of gases. This is particularly important in clay soils, in which the greater part of the capillary pore space is filled with water on account of the greater water capacity. For this reason the drain spacing must be small in clay soils in order to permit the influence of diffusion to reach a maximum. Lighter soils, containing a greater number of noncapillary pore spaces which are not filled with water, permit a more extensive diffusion of gases. The action of drainage is therefore more intensive, and a greater spacing of drains can be used.

Damp outer walls and the moisture given off by them [trans. title], H. Bernstein (*Gsndhts. Ingen., 50 (1927), No. 32, pp. 585–588, figs. 5*).—Experiments with brick, limestone, and concrete walls, dry and saturated, are reported, the purpose being to determine the absorptive powers for moisture of these materials and their ability to give off moisture in a room of known temperature, humidity, and air movement. The brick was found to absorb twice as much moisture as the concrete and half again as much moisture as the limestone. However, the percentage of voids filled in the brick was considerably less than that of those filled in the cement. Several different methods of measuring the escape of moisture from the walls were used, the apparatus of which is described. The data are presented graphically and no conclusions drawn.

Effect of shape and character of coarse aggregate on strength of concrete, F. C. Lang (*Concrete [Chicago], Cement Mill Ed., 32 (1928), No. 3, pp. 37, 38, figs. 6*).—An account is given of tests of a variety of aggregates to determine their behavior in concrete. With the same water-cement ratio the slumps for various aggregates were, for smooth gravel 6⅝ in., commercial gravel 4¾ in., limestone 4 in., trap 2¼ in., and sandstone 4⅝ in. The smooth gravel gave the lowest results in both compression and transverse tests, and the

28-day results shown by sandstone in the transverse test were low. The slump test indicated that the smooth gravel can be used with less water.

Windmills in the light of recent investigations [trans. title], A. BETZ (*Naturwissenschaften, 15 (1927), No. 46, pp. 905–914, figs. 9*).—Analytical studies conducted at the University of Göttingen of the windmill as a source of power are reported.

The results indicate the special importance of the wind wheel sail and that the power output of a wind wheel of a given diameter is not increased by an increase of the sail surface so much as by an increase in the total diameter of the wheel. The most favorable value of the sail surface is given, and it is shown that the sail area must be smaller the greater the speed of revolution of the wind wheel. The most desirable speeds are limited by the rapidly increasing energy losses with increasing speed.

Electricity helps lift the load from bended backs (*Wisconsin Sta. Bul. 396 (1927), pp. 21–27, figs. 2*).—A progress report is given of investigations on the use of electricity in agricultural operations (E. S. R., 56, p. 781), including feed grinding and silage cutting. Data on the cost of operating an individual electric light plant are also included, together with data on saving labor in haymaking and storing.

Regulation of quality and standardization of testing methods [trans. title], ULRICH (*Technik Landw., 8 (1927), No. 2, pp. 32–36, figs. 10*).—This is an analytical discussion of testing methods which apply particularly to materials used in the construction of farm machinery.

Investigations of air cleaners for motor plows and traction machinery [trans. title], R. DÜLL and A. GORSLER (*Technik Landw., 8 (1927), No. 11, pp. 244–252, figs. 22*).—Tests of different types of air cleaners for internal-combustion engines used in traction machinery are reported and discussed. In general the majority of the air cleaners tested which are in common use were found to be fairly satisfactory. For the special service conditions imposed on motor plows and farm tractors it was found that the oil-moistened cleaner with centrifugal action gave the best results.

A study of fundamental factors influencing the traction of wheel tractors, J. W. RANDOLPH and M. L. NICHOLS (*Alabama Sta. Rpt. 1925, pp. 12, 13*).—A progress report of a study previously reported (E. S. R., 57, p. 475).

The greatest factor in the transmission of force from any lug is thought to be the tractor's taking the fullest advantage of the arch action of the soil. The resistance to shear determines the tractive value of a soil. If the soil is confined by a rim the shear area is increased by bringing the line of shear more nearly parallel to the surface of the ground, the shear angle of unconfined soil being 45°. With a given width of rim the output increases up to a maximum as the weight carried by the wheel is increased up to a certain point. With a further increase in weight the output decreases. The highest efficiency is produced with a weight on the wheel just sufficient to force the lug into the soil, and the output increases with the width of the rim under these circumstances.

Testing set-up experiments on fertilizer distributors [trans. title], W. MERTENS (*Technik Landw., 8 (1927), No. 2, pp. 28–31, figs. 11*).—A description is given of a new testing stand for fertilizer distributors, and some test results with different fertilizers are reported and discussed.

The combined harvester-thresher in the Great Plains, L. A. REYNOLDSON, R. S. KIFER, J. H. MARTIN, and W. R. HUMPHRIES (*U. S. Dept. Agr., Tech. Bul. 70 (1928), pp. 61, figs. 18*).—Data on the use of the combine in the Great Plains region are presented, indicating that this machine has given general satis-

faction for wheat harvesting in the region. Combines most generally used in the Great Plains region have cuts of 12, 15, or 16 ft., and each is equipped with an auxiliary engine and is drawn by a tractor. The number of acres cut per hour were found to range from 1.6 for the 8-ft. machines to 4.5 for the 20-ft. machines. On the average 0.6 gal. of gasoline per acre was used in the auxiliary engine. A tractor with a drawbar rating of 15 h. p. was most generally required on combines with an auxiliary engine. The fuel used in the tractors on combines equipped with an auxiliary engine averaged 0.8 gal. per acre.

For all combines depreciation averaged 44 cts. per acre. There was no apparent relation between the acres cut annually and the estimated life of the machine.

For small acreages the expense of harvesting with a combine was found to be greater than with either a binder or a header. Where 60 or more acres are to be harvested with a binder, or 100 or more with a header, the small combine may prove more economical than these machines. Where 300 or more acres are to be cut, the fixed charges of the combine are reduced, and the machine is then operated at the lowest cost.

The average harvesting loss with combines was found to be 2.6 per cent of the total yield as compared with 3.3 per cent for a header and 6.1 per cent for a binder. The average threshing loss with combines was 1.9 per cent of the grain threshed as compared with 1.2 per cent for the stationary thresher.

The work was done in cooperation with the Texas, Oklahoma, Kansas, Nebraska, and Montana Experiment Stations.

The combine harvester operated in Michigan, E. E. Sauve (*Michigan Sta. Quart. Bul., 10 (1928), No. 3, pp. 82–86, fig. 1*).—Cost data on harvesting with the combine under Michigan conditions are presented and discussed.

Orchard spraying and spray equipment, W. S. Hough (*Virginia Sta. Bul. 260 (1928), pp. 12, figs. 4*).—Practical information on orchard spraying and on the selection, operation, and use of spraying equipment is presented. Special attention is devoted to nozzles and nozzle arrangement.

Value of building insulation to reduce heat losses, E. N. Sanbern (*Jour. Amer. Soc. Heating and Ventilating Engin., 34 (1928), No. 3, pp. 197–207, figs. 6*).—Data are presented on different insulating practices, indicating the saving which may be attained. It is pointed out that the best way to install insulation from the standpoint of efficiency of heat transmission is to place it in the center of an air space so that it will divide the air space into two smaller dead air spaces.

Insulating value of building materials, F. E. Fogle (*Michigan Sta. Quart. Bul., 10 (1928), No. 3, pp. 97–104, figs. 9*).—Data on the insulating of various building materials are presented, with particular reference to their use in farm structures.

Buildings and equipment for the dairy farm, F. D. Cornell, jr. (*West Virginia Sta. Circ. 49 (1928), pp. 47, figs. 39*).—Practical information is given on the planning and construction of buildings and equipment for dairy farms in West Virginia, together with working drawings.

RURAL ECONOMICS AND SOCIOLOGY

[Investigations in agricultural economics at the Iowa Station, 1926–27] (*Iowa Sta. Rpt. 1927, pp. 6–9*).—Investigations not previously noted are reported upon as follows, continuing previous work (E. S. R., 56, p. 885):

[*Grain trade*].—In the three years beginning December 1, 1923, 1924, and 1925, from 13 to 16 per cent of the corn produced was shipped from local

markets. The receipts at local markets for the three years were 5,000,000, 9,000,000, and 3,000,000 bu., respectively. In 1924 and 1925, 31 and 27 per cent, respectively, of the oats crop was shipped from local markets. The receipts were negligible.

[*Direct packer buying of hogs*].—Most of the packers' purchases are made from local buyers. Shipping by local buyers direct to packers, or to reload stations of packers, or buying for certain packers is increasing.

[*Type of farming*].—The percentage of land in corn varied from 8 to 57 per cent in different townships, averaging about 35 per cent. The percentage of tillable land and the price of corn and its products are the greatest factors affecting the acreage. The ratio of pasture to crop-growing land is a major factor influencing the type of livestock enterprise.

[*Index of farming costs*].—Indexes of farm products prices and farm production costs (1910–1914=100) for Iowa were 1910, 102 and 91, respectively; 1919, 219 and 191; 1920, 189 and 211; 1921, 104 and 149; and 1926, 141 and 161.

[Investigations in agricultural economics and rural sociology at the Wisconsin Station, 1926–27] (*Wisconsin Sta. Bul. 396 (1927), pp. 10–20, figs. 3*).—Results of investigations are presented as follows:

[*Cooperative marketing*].—The sales data of 27 cooperative creameries around Sparta, Wis., showed that the difference between quotations for Chicago Extras for tub butter and the prices received by the creameries decreased from approximately 3.5 cts. in 1921 to within 0.5 ct. in 1925. The sales program of about 450 cooperative creameries in the northwest from 1923 to 1925 resulted in their butter being distributed to 80 instead of 3 markets. The shipments of the Minnesota creameries to New York decreased about 33 per cent, while those of Wisconsin plants increased about 40 per cent. The shipments to Chicago increased 20 and 2 per cent, respectively. It was found that operating costs per pound of butter decreased and prices received per pound increased as the size of the creamery increased, being 2.2868 cts. less and 1.7221 cts. more, respectively, for plants shipping over 1,350,000 lbs. than for those shipping less than 150,000 lbs.

[*Land taxation*].—A study in Lincoln County showed that from 1890 to 1925 taxes per acre have increased from 17 cts. to $1.21 on farm land, from 11 cts. to $1.64 on virgin timber land, from 12 to 43 cts. on second-growth land, and from 12 to 34 cts. on barren cut-over land. The maximum for the several types of land during the period were farm $1.43 in 1921, virgin timber $2.08 in 1920, second growth 54 cts. in 1923, and barren cut-over 46 cts. in 1923. The book value of tax certificates owned by 14 counties in the northern part of the State increased from $1,107,484.30 to $1,405,669.70 during 1926.

[*Farm organizations*].—A study of 351 local community organizations in 5 counties showed that the period between the rise and the decline of most of such organizations is "decidedly less than 5 years." A chart is included showing the average length of life of several types of such organizations.

The long-time outlook for American agriculture, E. A. Duddy (*Jour. Business Univ. Chicago, 1 (1928), No. 1, pp. 97–106*).—The outlook for American agriculture over a period of from 10 to 25 years is discussed, and the conclusion reached that "the outlook for the immediate future is one of continual shifting and readjustment in agriculture."

The year ahead in South Carolina agriculture, W. C. Jensen, B. A. Russell, and A. M. Carkuff (*South Carolina Sta. Bul. 246 (1928), pp. 62, figs. 4*).—This bulletin presents an analysis of the agricultural outlook for different South Carolina farm products for the year 1928, describes the type-of-farming areas of the State, and discusses farm organization for the greatest profits in the several areas.

Farm practices under corn-borer conditions, J. W. Tapp, G. W. Collier, and C. R. Arnold (*U. S. Dept. Agr., Farmers' Bul. 1562 (1928), pp. 11+21, figs. 10*).—This publication "discusses the character of the problem in different parts of the infested area; indicates the control practices best adapted to different conditions; and points out the factors farmers should consider in deciding whether to reduce their corn acreage."

Production and marketing of Spokane Valley farm products, G. Severance and N. W. Johnson (*Washington Col. Sta. Bul. 221 (1927), pp. 61, figs. 5*).—The results are presented of an investigation of the complete farm records of 113 farmers for the crop year 1925, of 75 additional enterprise records secured to determine the normal details and cost of producing different crops grown under irrigation in the Spokane Valley, and of market information secured from commission men, retailers, and State and Federal officers. The area, climate, and agricultural development of the valley are described. The investment, the distribution of incomes and expenses, and the labor incomes of the farms surveyed are analyzed; and the cost of production and the man labor per acre for different operations, and the effects of yield and price on net returns are determined for the leading crops.

The average labor incomes (farm income less interest on investment) from the 113 farms were found to be —$1,171.54 for all orchard farms, $80.70 for all truck farms, —$378.33 for truck-orchard farms, $299.10 for truck-poultry farms, and —$503.84 for truck-poultry-orchard farms. The labor income from all farms averaged —$350.81.

The organizations are given for five profitable and five unprofitable farms, the labor incomes from which ranged from $1,051.65 to $1,983.08 for the profitable farms and from —$1,306.79 to —$1,602.30 for the unprofitable farms.

Small-fruit farming in British Columbia: An economic study, G. H. Harris (*Brit. Columbia Dept. Agr. Bul. 101 (1927), pp. 39*).—The results are presented of an economic study of small-fruit farms in the coast districts of British Columbia extending over the years 1921 to 1925, inclusive, and including from 85 to 135 farms each year. Acreages, production, prices, investments, receipts, income, and other factors are considered.

An introduction and critical review by F. M. Clement is also included.

A survey of poultry-farms in British Columbia, 1921–1925, W. J. Riley, E. A. Lloyd, and V. S. Asmundson (*Brit. Columbia Dept. Agr. Bul. 102 (1927), pp. 52, figs. 12*).—This report analyzes the capital investment and describes the returns made from commercial poultry farms in British Columbia. It is based on 409 records covering the period from January 1, 1921, to October 31, 1925, inclusive, the records being obtained from farms representative of the average conditions in the Lower Fraser Valley and on Vancouver Island.

Progress report on cost of production route in Choctaw County, Mississippi, 1926, L. E. Long and H. W. Reynolds (*Mississippi Sta. Bul. 243 (1927), pp. 18*).—This is a continuation of the study previously noted (E. S. R., 56, p. 784).

Taxes on Michigan's rented farms, 1919–1925, R. W. Newton (*Michigan Sta. Tech. Bul. 91 (1928), pp. 34, figs. 5*).—The results of a study of information from the owners of 1,133 rented farms in the Lower Peninsula of Michigan, presented in this bulletin, showed that during the period 1919–1925 (1) taxes averaged 52 per cent of the net rents before deducting taxes, varying from 29.9 to 70.5 per cent for different years; (2) the net rents before paying taxes varied from $2.17 to $4.31 per acre, while taxes varied from $1.29 to $1.53 per acre, and, with the exception of 1925, taxes increased in the years when net rents went down; and (3) the ratio of average taxes to average rents for

the seven years varied from 46 to 92 per cent in different sections of the area, and as much as 33 per cent between different counties in the same section.

A study of the taxes paid on 233, 288, and 451 farms in 13 counties in central and lower Michigan in 1919, 1922, and 1925 showed that the taxes on 90, 42, and 81 farms amounted to 25 per cent or less; those on 59, 84, and 131 farms from 25.1 to 50 per cent; those on 43, 68, and 107 farms from 50.1 to 100 per cent; and those on 23, 61, and 75 farms from 100.1 to 200 per cent of the net rents, before deducting taxes, in the respective years, while on 18, 33, and 56 farms there were deficits before paying taxes.

The average value per acre of Michigan farm land decreased from $87 in 1920 to $82 in 1925. During the period taxes per acre decreased from $1.49 to $1.46, and net rents, after deducting taxes, from $1.50 to $1.23. The percentage of farm land in the State delinquent for taxes increased from 10.6 per cent in 1910 to 20.8 per cent in 1925, and that of lands in 39 agricultural counties from 2.5 to 8 per cent. During the year ended March 15, 1926, 60.65 farms per 1,000 changed ownership, of which 4.61 were forced sales for delinquent taxes.

Comparisons are made of the relation of taxes and rents in Michigan, Indiana, Missouri, and Colorado, and of the relation of taxes paid and net profits of Michigan agricultural corporations and different types of nonagricultural corporations.

[Accident insurance for agricultural laborers in France] (*Jour. Off. Répub. Franç., 59 (1927), No. 300, pp. 13020–13052*).—Tables are given showing the wages fixed by the prefects of the several departments of France as a basis for compensation in case of accident under the law of December 15, 1922.

Agricultural cooperation in New York State, J. F. Booth (*Sci. Agr., 8 (1928), No. 6, pp. 376–385*).—This article is based upon a survey of existing associations and a study of records of inactive associations, conducted during 1925 and 1926 under the auspices of the department of agricultural economics and farm management, Cornell University. Data are presented as to the date of incorporation, membership, volume of business, financing, management, methods of promotion, and reasons for ceasing operations. The advantages of the sale of capital stock to raise capital over the use of certificates of indebtedness, especially certificates maturing each year, are discussed.

A comparison of 21 cooperative cheese factories and creameries organized between 1895 and 1913 by farmers themselves and 17 promoted by promoters shows that the average term of operation was 9.7 and 5.3 years, membership 39 and 34 persons, investment per member $57.01 and $122.36, and the average loss per member $29.60 and $85.20, respectively, for the two types of organizations.

An international organization of national farm associations, A. Hobson (*U. S. Dept. Agr., Bur. Agr. Econ., 1927, pp. 11*).—This is a mimeographed article describing the attempts to form an international organization of agricultural associations, and the present International Commission of Agriculture. The regulations of the commission are included.

The farmer and his market (*London: Ernest Benn, 1927, pp. [4]+115*).—This is a report on the marketing of home-grown food, prepared by the Land and Nation League at the request of the Liberal Land Convention, held in February, 1926. The status of such markets and the causes of the present conditions are discussed and remedies suggested.

World grain trade before and after the war [trans. title], K. Ritter (*Veröffentl. Preuss. Hauptlandw. Kammer, No. 9 (1926), pp. [3]+343, pls. 9*).—The production, home needs, exports, and imports of the various conutries of the world are analyzed.

Wheat-pool cost and price comparisons, J. G. KNAPP (*Jour. Business Univ. Chicago, 1 (1928), No. 1, pp. 131–136*).—This paper points out the unreliability of comparisons between the costs of and the prices obtained by the wheat pools and by nonpool marketing in the United States.

Cooperative marketing of grain in western Canada, J. F. BOOTH (*U. S. Dept. Agr., Tech. Bul. 63 (1928), pp. 116, figs. 15*).—The development of the Canadian grain industry; the attempts at regional organization; the organization, financing, management, and operation of the cooperative elevators; Government control and its effects; and the development, organization, management, operation, financing, costs of operation, policies, and progress and accomplishments of the wheat pools since 1923 are described and discussed. A comparison is made of cooperative grain marketing and the settings for wheat pools in the United States and Canada. An appendix contains contracts and agreements used by the Canadian pools.

Cooperative marketing of livestock in the United States by terminal associations, C. G. RANDELL (*U. S. Dept. Agr., Tech. Bul. 57 (1928), pp. 112, figs. 30*).—This bulletin deals primarily with terminal cooperative commission associations, and is based upon data obtained from the records, auditors' reports, and annual statements of such associations. It includes a history of the development of terminal cooperative commission associations; discusses the operation of services rendered by, management problems of, accomplishments of, and the working program for such associations; and describes the organization, operation, and management of Farmers' Union Livestock Commission associations, the National Live Stock Producers Association and its agencies, and the independent cooperative commission agencies.

Milk marketing in Pennsylvania: Shipping station operations, R. W. BARTLETT and W. E. GREGG (*Pennsylvania Sta. Bul. 219 (1928), pp. 43*).—The results are given of an economic analysis of the 1925 plant operations of 52 milk-shipping stations in the territory tributary to Pittsburgh, Philadelphia, and Scranton, Pa., and New York City. Tables are included showing the labor requirements as influenced by volume of milk handled, method of shipment, and method of refrigeration; the distribution of labor and labor costs; space requirements, costs, and distribution; equipment requirements; power requirements; process, receiving, office, cooling, and cleaning costs; and other data.

The volume of milk handled, the method of shipment, and the method of refrigeration were the chief factors affecting costs. A comparison of ten stations using mechanical refrigeration, shipping in tanks, and averaging 475,230 gal. shipped per station per year, and ten similar stations shipping an average of 1,127,120 gal. per year showed that to have shipped the larger quantity the smaller stations would have required 247 hours more labor, 1,926 sq. ft. more space, $12,409 per 1,000 gal. more equipment investment, and 231 more horsepower hours of power, being 2.2, 35.8, 45.5, and 41.1 per cent, respectively, more than the larger plants. Labor and space requirements were 1,531 hours, 646 sq. ft., and 60.2 and 45.7 per cent greater for handling the same volume in can-shipment stations than in tank-shipment stations. To handle the same volume required 454 hours of labor, $3,347 worth of equipment, and 152 h. p. hours of power in mechanical refrigeration plants, as compared with 2,285 hours of labor and negligible equipment investment and power requirements in ice-and-water refrigeration plants.

Preparing strawberries for market, R. G. HILL (*U. S. Dept. Agr., Farmers' Bul. 1560 (1928), pp. [2]+22, figs. 19*).—Information is given regarding picking, grading, packing, and shipping strawberries.

Crops and Markets, [March, 1928] (*U. S. Dept. Agr., Crops and Markets, 5 (1928), No. 3, pp. 73–112, figs. 3*).—Tables, graphs, notes, reports, and summaries are presented covering cold storage holdings; acreages of crops; pro-

duction, stocks, prices, etc., of crops, feeds, seeds, livestock and livestock products, and dairy and poultry products; agricultural employment and wages; price movements of agricultural products; the price situation; and world agriculture

Special tables and reports are included on the planting intentions on March 1, 1928, and their relation to the agricultural outlook, and on farm stocks of grain, March 1, 1928, and merchantable corn in the United States, 1890–1928.

Crop report regulations, 1928 (*U. S. Dept. Agr., Misc. Pub. 17 (1928), pp. 4*).—Extracts are given from the laws and regulations governing the publication of reports and the information utilized in compiling such reports concerning acreages, conditions, yields, farm reserves, or quality of products of the soil grown within the United States.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

Opportunities before students of agricultural colleges, E. H. Shinn (*U. S. Dept. Agr., Ext. Serv. Circ. 69 (1928), pp. 12, fig. 1*).—This is a mimeographed article based upon reports from 19 deans of State agricultural colleges. The reports showed that from 8 to 50 per cent, or an average of 27.8 per cent, of the graduates in the several States were farming; from 2 to 12 per cent, averaging 5.8 per cent, were in research work; from 12 to 37 per cent, averaging 24 per cent, were teaching; from 3 to 26 per cent, averaging 8.4 per cent, were in extension work; from 4 to 24 per cent, averaging 10.4 per cent, were in business related to farming; and from 8 to 46 per cent, averaging 23.6 per cent, were engaged in miscellaneous work.

Some data are also given as to the relative profits made by farmers having different amounts of school and college training.

Workers in subjects pertaining to agriculture in State agricultural colleges and experiment stations, 1927–1928, M. A. Agnew (*U. S. Dept. Agr., Misc. Pub. 12 (1928), pp. III+139*).—The usual list (E. S. R., 56, p. 790).

FOODS—HUMAN NUTRITION

The Japanese quince, C. P. Lathrop and W. L. Walde (*Fruit Prod. Jour. and Amer. Vinegar Indus., 7 (1927), No. 4, pp. 14–18, figs. 2*).—The fruit of the Japanese quince is recommended for preserving purposes to supply a non-flavored fruit or fruit juice very high in *l*-malic acid and pectin to combine with fruits such as apple, cherry, European quince, and plum or prune, which contain *l*-malic acid as their essential acid but not in sufficient amounts to bring out the best flavor. As noted in an earlier publication (E. S. R., 56, p. 589), the addition to fruits or fruit juices of small amounts of the acid native to the fruit has been found to improve their flavor for jellies and preserves.

Descriptions of the varieties of Japanese quince best adapted for fruit production and data on the composition of the fruits of the Japanese and European quince and their products are included.

Investigations on the utilization of cull avocados, W. V. Cruess and E. Harrold (*Fruit Prod. Jour. and Amer. Vinegar Indus., 7 (1927), No. 2, pp. 12–14, 20, fig. 1*).—From the results obtained in experiments which have been conducted since 1914 in the Fruit Products Laboratory, University of California, on the preservation and utilization of surplus avocados, methods are suggested for the preservation of the sweetened pulp in freezing storage and subsequent use in ice cream, for the use of sliced avocados in cocktail sauce acidified with vinegar, of finely ground pulp in mayonnaise, and of coarsely ground pulp with ground sweet cucumber pickle, mayonnaise, and vinegar in sandwich spread.

Formulas for the mayonnaise sandwich spread are given. Dehydration and canning have proved unsatisfactory methods of preserving avocados.

Improvements in the processing of salted almonds, W. V. CRUESS (*Fruit Prod. Jour. and Amer. Vinegar Indus., 7 (1928), No. 5, p. 29*).—A new method of preparing salted almonds commercially, with the elimination of the oil-cooking process, is described briefly.

After the usual blanching, dry salt is mixed thoroughly with the almonds while still moist, after which the almonds are dried at 165 to 180° F. and then heated at about 400° for approximately 10 minutes. The product is said to be of much better keeping quality and of as good a flavor as the oil-cooked salted almonds.

Protective tubes for thermocouples for determining heat penetration in processed foods, K. L. FORD and A. G. OSBORNE (*Indus. and Engin. Chem., 19 (1927), No. 12, pp. 1345, 1346, figs. 6*).—Attention is called to the possibilities of error in heat penetration determinations with thermocouples protected by metal tubes, owing to the heat conductivity of the tubes. Data are given on the conductivity effect of various thermocouple tubes in different media, and Bakelite is suggested as the most suitable material for such tubes.

Heat penetration in relation to pasteurization, M. A. JOSLYN (*Fruit Prod. Jour. and Amer. Vinegar Indus., 7 (1927), No. 2, pp. 9–11, figs. 4*).—This summary of recent investigations at the Fruit Products Laboratory of the University of California on the rate of heat penetration in fruit juices and sirups in different containers includes a discussion of the precautions necessary to minimize breakage during pasteurization in glass containers, and of the factors affecting the rate of heat penetration, such as the size and shape of the container and the thickness and conductivity of its walls and the viscosity of the juice or sirup and its rate of change with temperature. The viscosity of the fruit juices or sirups was greatly increased by increasing the concentration of the pectin and to some extent by increasing the sugar concentration. The addition of acid, when it did not cause jellying, decreased the retarding effect of pectin.

Microorganisms in the canning industry (*Iowa Sta. Rpt. 1927, p. 26*).—The spoilage in canned corn known to the trade as "sulfur stinker spoilage" has been shown to be of bacterial origin. As it does not produce swellers or springers, there is no means of detecting the presence of spoilage until the cans are opened. It has been found, however, that if the can is punctured and gently heated over a flame, a piece of lead acetate paper placed over the puncture will turn black in the presence of spoilage. Rapid cooling and cold storage of the cans have been found to prevent spoilage of this type.

Yeasts as cause of spoilage of canned apples, A. G. LOCHHEAD (*Canada Expt. Farms, Div. Bact. Rpt. 1926, pp. 4, 5*).—Spoilage in commercially canned sliced apples in a fruit canning factory in British Columbia was traced to yeasts rather than to any heat-resistant organism. It was concluded that the cause of the trouble was insufficient processing due to slow heat penetration.

A new bacterium is found to plague the pea packer, E. J. CAMERON (*Canning Age, 9 (1928), No. 3, pp. 217–219, figs. 5*).—Following the report of sulfide spoilage of commercially canned peas, a systematic bacteriological examination of possible sources of contamination at the beginning of the canning season the following year led to the discovery that the wooden hot water tank furnishing water to the brine and blancher systems was badly infected with spores of the organism responsible for spoilage of this type. The replacement of the wooden tank by one of metal and thorough cleaning and sterilization of the rest of the apparatus brought about practically complete elimination of the contaminating organisms.

Recent progress in nutrition, M KOEHNE (*Jour. Home Econ., 19 (1927), Nos. 11, pp. 623–628; 12, pp. 679–685*).—This is a critical review of recent literature on research in various phases of human nutrition, including glandular, muscular, and nerve metabolism, the relation of diet to growth, diet and body fat, the relation of the protein of the diet to the production of kidney lesions, iron assimilation and anemias, protein requirements for growing children, and the precursor of vitamin D. A list of 58 references to the literature is included.

Citric acid in milk for infant feeding (*Wisconsin Sta. Bul. 396 (1927), pp. 89, 90*).—For acidifying cow's milk for infant feeding, H. L. Templeton and H. H. Sommer have found citric acid to be preferable to lactic acid on account of less difficulty in obtaining a curd of the desired degree of fineness and because citric acid can be prepared in tablet form. The results obtained in preliminary feeding trials have been satisfactory.

Vitamin content of foods in relation to human nutrition (*Iowa Sta. Rpt. 1927, pp. 61, 62*).—In this progress report it is stated that leaf lettuce grown out of doors has been found to be an excellent source of vitamin A and somewhat richer in vitamin B than the same variety grown indoors. Radishes were found to be relatively deficient in vitamin B.

A study of antimony trichloride as a possible quantitative reagent for vitamin A, F. WOKES and S. G. WILLIMOTT (*Analyst, 52 (1927), No. 618, pp. 515–524, figs. 5*).—Continuing their investigation of color tests as a possible means of determining vitamin A (E. S. R., 57, p. 690), the authors have made a quantitative study of the reaction between antimony trichloride and vitamin A in cod-liver oil, including the effect upon the reaction of purity of reagent, nature and purity of solvent, time, temperature, concentration of reagent, and concentration of vitamin. As a result of this investigation a standard quantitative procedure for the determination is recommended. It is considered that of the series of color changes blue-yellow-red, with intermediate shades, blue is the color which is probably characteristic of the active vitamin and the one to be used in the color measurement. It has been found that the reaction, which is probably a condensation, can be retarded by dehydration of the solvents, and chloroform dried over anhydrous calcium chloride has been selected as the best solvent. The reaction is considered to be a chemical one, with a temperature coefficient of approximately 2.

A note on antimony trichloride and some factors affecting its sensitivity as a reagent for vitamin A, F. WOKES and J. R. BARR (*Pharm. Jour. and Pharm. [London], 4. ser., 64 (1927), No. 3321, pp. 758–760*).—This is a brief report of the portion of the investigation noted above dealing with the purification of the antimony trichloride and chloroform to be used in the color tests for vitamin A.

The multiple nature of vitamin B, S. L. SMITH (*Jour. Home Econ., 20 (1928), No. 4, pp. 241–244*).—Attention is called to the confusion in nomenclature of the two factors now known to be present in vitamin B, and arguments are presented in favor of F and G to denote the heat-labile antineuritic and the heat-stable (possibly antipellagric) factors, respectively. A brief review is included of the literature on the relative distribution of F and G in various food materials.

The effect of ultra-violet light on the vitamin C content of milk [trans. title], A. HOTTINGER (*Klin. Wchnschr., 6 (1927), No. 38, pp. 1793–1797, fig. 1*).—Studies are reported on the content of vitamin C and vitamin D as determined by preventive tests on guinea pigs and rats, respectively, of a special raw milk for babies, sweetened and unsweetened Nestle's milk, and German and Swiss brands of dried milk, nonirradiated and irradiated. The two brands of dried

milk were prepared by the same vacuum process, but differed in that the German brand contained added sugar while the Swiss brand did not.

The raw milk protected guinea pigs against scurvy in doses of from 50 to 100 cc. daily, while sterilized milk and unsweetened condensed milk gave practically no protection in 100-cc. amounts. The sweetened dried milk afforded complete protection, while the Swiss brand afforded almost no protection. A special dried milk without sugar prepared by the German firm was also without protection.

Irradiation appeared to have no effect on the vitamin C content, the tests corresponding with the nonirradiated milk, nor did a short period of boiling affect either the antiscorbutic or the antirachitic properties of the irradiated milk.

Some constituents of citrus fruits, S. G. Willimott and F. Wokes (*Pharm. Jour. and Pharm.* [*London*], *4. ser., 64 (1927), No. 3321, pp. 770–773, figs. 2*).— Data, some of which have been noted previously, are summarized on the distribution in the juice and outer peel (flavedo) of the orange, lemon, and grapefruit of vitamins A, B, and C (E. S. R., 55, p. 593; 56, p. 409), and of oxidizing enzymes (E. S. R., 57, p. 489); the analytical constants and vitamin A content, as determined by chemical and biological tests, of the rind oils; and changes in the structure, reaction, and enzyme and sugar content of the fruit during ripening.

Points of special interest are a tendency in citrus fruits for vitamin B to be concentrated mainly in the flavedo and vitamin C in the juice; a marked difference in the vitamin A content in both the flavedo and juice of the three varieties, oranges containing the most and grapefruit the least; and the absence of oxygenase and the presence of peroxidase in both flavedo and juice and an inverse ratio of peroxidase and vitamin C, orange juice containing the least and grapefruit the highest concentration.

Orange rind oil is reported to be "an exceptionally rich vegetable source of vitamin A, comparable with some of the most potent animal sources." The vitamin A content of lemon oil has not yet been determined, and that of grapefruit is reported to be very low. The nonvolatile residue of the oils gave positive antimony trichloride and arsenic trichloride tests in the case of orange oil, doubtful in lemon oil, and negative in grapefruit oil.

In the lemon it has been found that the reaction of the fruit tissues before development is almost neutral (pH 6). As growth proceeds acidity develops in both peel and juice, but much more rapidly in the juice, until the fruit is about half grown, when it becomes constant at about pH 4 in the peel and from 2.5 to 2.2 in the juice.

Data on the reducing sugars in the orange before and after hydrolysis show a steady increase during the ripening process.

Some less appreciated constituents of orange juice, S. G. Willimott (*Pharm. Jour. and Pharm.* [*London*], *4. ser., 64 (1927), No. 3321, pp. 773–775*).— Following a review of the literature on the vitamin content of orange juice, a preliminary report is given of a study of the content of vitamins A, B, and D in the juice obtained from ripe Sunkist oranges by peeling the fruit carefully to prevent contamination with the rind and filtering the juice through muslin and then filter paper. Analyses of the juice thus obtained gave the following results: Total solids 12.08 per cent, reducing sugar (before hydrolysis) 5.30, reducing sugar (after hydrolysis) 10.85, protein (N×6.25) 0.64, fat 0.10, ash 0.44 per cent, Lovibond units (tintometer reading in ½ in. cell) 39.5 yellow, 5.8 red, 3.8 blue, reaction (pH) 4.2–4.6, sp. gr. 1.0509, and peroxidase tests negative.

In the vitamin A tests, 5 cc. of the fresh juice was found to be adequate for good growth and the cure of xerophthalmia in rats receiving irradiated choles-

terol to provide an ample supply of vitamin D. Definite but not strongly positive tests were obtained with arsenic trichloride and antimony trichloride on the juice after color removal by charcoal. Preliminary results in the vitamin B studies indicated that 7.5 cc. daily supplies sufficient vitamin B, an amount slightly lower than that reported by Osborne and Mendel (E. S. R., 43, p. 765). As judged by fecal pH tests, the orange juice contained no vitamin D.

The vitamins of orange juice, S. G. WILLIMOTT (*Biochem. Jour., 22 (1928), No. 1, pp. 67–76, figs. 3*).—This is the complete report of the study noted above from a preliminary report. The final conclusions concerning the vitamin A and D content of orange juice are the same as in the preliminary report, but a continuation of the vitamin B tests has shown that it is safer to accept 10 cc. rather than 7.5 cc. as the minimum adequate dose of vitamin B.

[The vitamin C content of tomatoes] (*Wisconsin Sta. Bul. 396 (1927), p. 45*).—In this summary, without experimental data, of studies conducted by A. L. Marlatt, B. Clow, et al., on the effect of various factors on the vitamin C content of tomatoes, it is reported that ripe tomatoes are much richer in vitamin C than green tomatoes even when the tomatoes are ripened in the dark after removal from the vines. Tomatoes canned by the cold pack method with processing in a water bath were found to be as potent in vitamin C as raw tomatoes up to about 9 months after canning, but to be considerably less potent after storage for 15 or 20 months. Immature or fully-grown green tomatoes canned by the cold-pack method contained more available vitamin C per unit weight than the same kind of tomatoes fed raw. Green tomatoes pickled with the usual presoaking in salt water contained less vitamin C than the original tomatoes. Greenhouse tomatoes were as rich in vitamin C as the same variety grown out of doors.

Vitamins in canned foods.—VI, Strawberries, E. F. KOHMAN, W. H. EDDY, and N. HALLIDAY (*Indus. and Engin. Chem., 20 (1928), No. 2, pp. 202–204, figs. 2*).—In continuation of the series of studies previously noted (E. S. R., 55, p. 793), it is reported that strawberries are as rich as canned tomatoes in vitamin C and that there is no appreciable destruction of this vitamin in the commercial canning process usually employed. From a limited study of the vitamin A and B content, the conclusion is drawn that strawberries are only about one-fortieth as rich as tomatoes in vitamin A and one-fourth as rich in vitamin B. Strawberries thus appear to be a rich source of vitamin C, a fairly good source of vitamin B, and a poor source of vitamin A.

Research findings on corrosion and vitamin destruction, E. F. KOHMAN (*Canning Age, 9 (1928), No. 3, pp. 227–231, figs. 11*).—This paper contains a brief summary of the investigations conducted under the auspices of the National Canners' Association on the vitamin C content of canned apples (E. S. R., 53, p. 566), peaches (E. S. R., 55, p. 794), and strawberries (see above), with special emphasis on the relation of oxygen to destruction of vitamin C and the means required with different fruits to exhaust the oxygen present in the fruit before canning if losses of vitamin C are to be prevented.

It is pointed out that a similar relationship exists between the oxygen content of fruit and the corrosion of cans, and recent studies on factors involved in corrosion are summarized. It is of interest that in colored fruits canned in stainless steel the color is preserved better than in enameled cans.

A preliminary report is included on the vitamin content of tomato concentrate. No appreciable loss in vitamins A and B was found to take place during the concentration, but some loss in vitamin C. This loss is not, however, in proportion to the concentration. Tomato pulp is thus considered to be somewhat richer in vitamin C than raw tomatoes, weight for weight, and several times richer in vitamins A and B.

Biological values of certain types of sea food.—II, Vitamins in oysters (Ostrea virginica), D. B. Jones, J. C. Murphy, and E. M. Nelson (*Indus. and Engin. Chem., 20 (1928), No. 2, pp. 205–210, figs. 8*).—This paper reports the second of a series of studies which are being conducted at the Bureau of Chemistry and Soils, U. S. D. A., on the biological properties of shellfish (E. S. R., 54, p. 408). The method of sampling the oysters and data on their content of vitamins A and B have been noted from another source (E. S. R., 56, p. 793).

In the vitamin D tests, the line test method was used in curative experiments on rats fed the Steenbock rachitic ration 2965. Five gm. of oysters induced slight calcification of the long bones in 10 days, about half calcification in 15 days, and complete calcification of the metaphyses in 20 days. Under similar conditions 4 mg. of a good grade of cod-liver oil brought about approximately the same degree of calcification. The antirachitic potency of oysters is thus about 1/200 that of cod-liver oil.

In the reproduction experiments, cooked oysters, dried and ground, were used in the following ration: Oyster meal 26, salt mixture 5, Crisco 20, cornstarch 49, cod-liver oil 4.3, and yeast 5.7 parts. On this ration the rats grew fairly well, and the females produced litters, but very few of the young were reared. The rats of the second generation were practically infertile.

In the concluding discussion, attention is called particularly to the destruction of vitamins A and B in oysters on dehydrating at 40° C. under reduced pressure, the method used in preliminary tests in an attempt to obviate the difficulties in weighing the fresh material. Suggested explanations for this destruction are possible bacterial or enzyme action or a deleterious action of one or more of the metallic constituents of the oyster.

The detection and estimation of vitamin A and of vitamin D in cod-liver oil and various food products, F. Wokes and S. G. Willimott (*Pharm. Jour. and Pharm. [London], 4, ser., 64 (1927), No. 3321, pp. 752–757, figs. 4*).—This is the report of an investigation of the reliability of various methods for the quantitative determination of vitamins A and D by animal and chemical tests. Some phases of the study have been noted from a preliminary report (E. S. R., 56, p. 411).

As noted previously (E. S. R., 58, p. 87), an acetone-ether extract of dried spinach is recommended as a satisfactory source of vitamin A for use in vitamin D experiments. Attention is called to the fact that the rickets-producing diets commonly used by American workers contain less than 3 per cent of fat, while those used by British workers contain from 15 to 17 per cent of fat. In the experiments reported on the examination of the spinach extract as a source of vitamin A uncontaminated by vitamin D the high-fat type of diet was used, and no difficulty was experienced in obtaining deficient calcification and change in reaction of the feces.

A further study of the Zucker method of detecting vitamin D deficiency by the alkalinity of the feces has led to the conclusion, as noted from another report (E. S. R., 57, p. 789), that with suitable precautions the method is of quantitative application. The importance is suggested of following the fecal pH in connection with the line test to establish more definitely its quantitative value. An attempt to apply the test clinically to children under treatment for rickets did not, however, yield very clear-cut results, chiefly, it is thought, on account of difficulty in controlling the diet. The question of the possible effect of bacterial activities in the intestines on the reaction of the feces was tested for rats with the conclusion that the nature of the bacterial flora does not modify the fecal reaction.

The studies on the applicability of the color tests for vitamin A have been noted from other sources (E. S. R., 57, p. 690). For colorless materials the test is considered much more accurate than biological tests.

Attention is called to the work of Steinle and Kahlenberg (E. S. R., 55, p. 611), showing that cholesterol, when treated with antimony pentachloride under certain conditions, gives a blue color similar to that given by antimony trichloride or arsenic trichloride on cod-liver oil, and that cholesterol when irradiated may give a similar color test with antimony trichloride, but in more stable form. The possibility is suggested that vitamins A and D may be derivatives of the same parent substance.

The hydrogen ion concentration of the faeces of rachitic children, T. REDMAN (*Biochem. Jour., 22 (1928), No. 1, pp. 14–21, figs. 7*).—This is the detailed report of the attempt noted in the foregoing paper of Wokes and Willimott to follow the clinical course of rickets in children by determinations of the H-ion concentration of the feces. The pH values, which were determined in all cases by the quinhydrone electrode, showed no definite correlation with the different stages of the disease.

Does storage impair anti-rachitic vitamin in egg yolk? (*Wisconsin Sta. Bul. 396 (1927), p. 46*).—In this progress report of a study by E. Woods and B. Clow of the effect of storage on the vitamin content of eggs, it is noted that in curative and preventive tests with egg yolk constituting 2 per cent of a ration containing no other source of vitamin D the requirements of this vitamin for rats seemed to be adequately met, and that eggs stored in water glass for from 6 to 9 months showed no appreciable loss in vitamin D.

TEXTILES AND CLOTHING

The textile research associate plan at the Bureau of Standards, Washington, D. C., C. W. SCHOFFSTALL (*Textile World, 73 (1928), No. 10, pp. 21–24, figs. 6*).—A review of the principles of the plan and results obtained by representatives of the several textile associations cooperating with the bureau.

The prospective development of Peru as a sheep-breeding and wool-growing country, A. F. BARKER (*Leeds, Eng.: Jowett & Sowry, 1927, pp. XI+174, pls. 8, figs. 144*).—The status and prospects of the industry in Peru is reviewed, with accounts of breeding work, manufacturing value of Peruvian and Improved Peruvian wools (E. S. R., 58, p. 95), llamas, alpacas, and vicunas as wool producers, and native textile industries. Various technological data on wool are appended.

A simplified method for estimating oil in textiles, H. R. HIRST (*Jour. Textile Inst., 18 (1927), No. 12, pp. T606, T607*).—In the method outlined, from 12 to 20 gm. of the fibrous material are cut into small pieces and placed in a wide-mouthed 8-oz. bottle having a well ground stopper; 200 cc. of dry acetone are added and allowed to stand for 24 hours with occasional shaking; and 100 cc. of the liquor are withdrawn, filtered if necessary, evaporated to dryness in a weighed bottle in a stream of carbon dioxide gas (if considered necessary), and cooled in a desiccator and weighed. The weight multiplied by 2 gives the total oil in the sample. Recovered acetone distilled over calcium chloride is satisfactory for reuse. The method has given good results for the estimation of small quantities of oils and fats in textile analysis.

The use of ultra-violet rays in textile chemical investigations [trans. title], M. NOPITSCH (*Melliand Textilber., 9 (1928), Nos. 2, pp. 136–138; 3, pp. 241–244; 4, p. 330*).—The color reactions to ultra-violet light are described for silk, wool, raw and mercerized cotton, different types of rayon, and undyed fabrics; for dyes on the several fibers and fabrics; and for such textile chemicals as oils, sizing material, fatty acids, and fatty acid esters.

The measurement of the resistance of flax yarns to wear, G. F. New (*Jour. Textile Inst., 18 (1927), No. 12, pp. T595–T605, figs. 3*).—The technique and application of wearing tests on flax yarns are described from the results of experiments under the auspices of the Linen Industry Research Association.

A satisfactory type of wear test for yarns is obtained by rubbing stationary yarn specimens carrying tension pieces with hardened surfaces of steel cylindrical in cross section. The angle of contact between the yarn and the rubbing surface and the tension in the yarn exert a considerable effect on the number of oscillations withstood, and in comparing a series of yarns or sizes by this test these factors must be suitable for the materials. A set of standard conditions for the testing of all varieties of materials seems impracticable.

An increase in fiber quality as estimated in the trade, in yarn twist, or in preparing treatment within ordinary limits was found to give a yarn with a higher resistance to wear. Boiling a yarn decreased its wear resistance, while sizing increased it very greatly. The extent of the increase due to sizing may amount to 50 fold. The wear resistance of the green yarn and of the boiled yarn remains almost stationary at humidities between 40 and 60 per cent and then rises progressively up to 90 per cent humidity. In the lowest portion of the humidity range the presence of the starch size greatly increases the resistance of yarn. The wear resistance of the sized yarn falls off as humidity rises from 40 to 80 per cent and then rises sharply. Certain variations and the fact that the protective power of the size against the effects of wear is lowest over the humidity range most favorable for weaving support the view that some factor in addition to resistance to wear may be of importance in weaving.

The action of formaldehyde on wool, S. R. and E. R. Trotman and J. Brown (*Jour. Soc. Dyers and Colourists, 44 (1928), No. 2, pp. 49–52*).—Experiments on wool fabric showed that wool treated with paraformaldehyde was very similar to that treated with formaldehyde. The moisture content of air-dried paraformaldehyde wool was found considerably lower than that of untreated wool, while in the case of formaldehyde wool the difference was not so marked.

No change seemed to occur in the nitrogen content during treatment with formaldehyde or paraformaldehyde. The resisting power of formaldehyde wool to the action of alkalies appears to surpass that of paraformaldehyde wool, in the case of formaldehdye wool approaching 100 per cent in efficiency. Formaldehyde wool seemed to take up more alkali than untreated wool. Up to a concentration of 0.5 per cent sulfuric acid boiling for 1 hour had no effect on the nitrogen content and no nitrogen passed into solution, although losses and decomposition occurred above this concentration.

While formaldehyde wool has a somewhat lower shrinkage than the untreated wool when subjected to normal washing, when milled no difference in either shrinkage or felting can be detected. There was no difference between treated and untreated fabric either in the percentage of damaged fibers or in the weight lost during chlorination. Formaldehyde wool has a greatly reduced affinity for neutral dyeing acid dyestuffs. The protection against the action of bacteria was very marked, even in samples washed with hydrogen peroxide.

Experimental results described in this paper and the supposition put forward in regard to the structure of the protein suggest that the properties of formaldehyde wool are due primarily to the displacement of the peptide equilibrium in favor of the enol-form, and that this latter is more resistant to decomposition by acids and alkalies than the corresponding keto-form. With rise in temperature the enol-form tends to revert to the keto-form, and the behavior of formaldehdye wool runs more or less parallel to that of untreated wool.

Other experiments in the same laboratory have been reported by Bell (E. S. R., 57, p. 95).

United States Government master specification for stitches, seams, and stitching (*U. S. Dept. Com., Bur. Standards Circ. 283 (1926), pp. 52, figs. 139*).—This specification specifies the formation of the stitches, seams, and stitching used in United States Government work, outlines the characteristics of seams, and indicates the suitability of the various types of stitches according to the type of seam or stitching and the operation for which used.

HOME MANAGEMENT AND EQUIPMENT

The economic thickness of building insulation, M. S. WUNDERLICH (*Jour. Amer. Soc. Heating and Ventilating Engin., 34 (1928), No. 3, pp. 189–196, figs. 4*).—Data on the economic thickness of insulation of dwellings are presented, indicating that the saving with 1-in. insulation in the ceiling, with coal costing $17.00 per ton, is slightly greater than the saving with 0.5-in. insulation in the side walls. With coal at $9.00 per ton the saving with 1-in. insulation in the ceiling is slightly less than that with the 0.5-in. insulation in the side wall, while with coke at $12.50 per ton the saving is the same.

This is taken to indicate that with a higher fuel cost the insulation in the ceiling should be increased over that indicated as compared with side walls, and that with a lower fuel cost the thickness of the ceiling insulation should approach that of the insulation of the side wall. It follows, therefore, that with the average cost of fuel the ratio of 0.5-in. insulation in the side walls to 1-in. insulation in the ceiling is a well-balanced insulated job.

The warm-air heating research residence in zero weather, V. S. DAY (*Ill. Univ. Engin. Expt. Sta. Circ. 15 (1927), pp. 27, figs. 13*).—A description is given of the research residence used in the warm-air furnace studies at the University of Illinois, together with some of the results obtained.

It was found that with a well-designed warm-air heating system a good degree of uniformity of temperature between various rooms can be obtained, moderate temperatures at the registers of around 135° F. in the coldest weather being characteristic. The rapid turnover of the air contents of the house, combined with the admixture of fresh air, constitutes a valuable ventilation feature of warm-air heating. High over-all efficiencies and satisfactory relative humidity can be obtained. In this case the net loss of heat from the chimney was 11 per cent.

Experience with electric stoves, O. E. Robey (*Michigan Sta. Quart. Bul., 10 (1928), No. 3, pp. 110–112, fig. 1*).—Data on the operation of three electric stoves are briefly presented.

MISCELLANEOUS

Thirty-ninth Annual Report [of Alabama Station, 1925], M. J. FUNCHESS ET AL. (*Alabama Sta. Rpt. 1925, pp. 17*).—This contains the organization list and a report on the work and publications of the station for the fiscal year ended June 30, 1925. The experimental work not previously reported is for the most part abstracted elsewhere in this issue.

Forty-ninth Report of the Connecticut Agricultural Experiment Station, 1925, W. L. SLATE, JR., ET AL. (*Connecticut State Sta. Rpt. 1925, pp. IX+721+93T+XXXV, pls. 26, figs. 212*).—This contains the organization list, a report of the board of control for the fiscal year ended October 31, 1925, a financial statement for the fiscal year ended June 30, 1925, and reprints of Bulletins 270–281 and Tobacco Substation Bulletin 6, all of which have been previously noted, and the following Bulletins of Immediate Information: Nos. 51, Regulations Concerning the Transportation of Nursery Stock in the United States and Canada, compiled by W. E. Britton; and 52, A New Pest of Lawns, 53, The

Asiatic Beetle Quarantine; and 54, The Gipsy Moth Quarantine, all by W. E. Britton.

Fiftieth Report of the Connecticut Agricultural Experiment Station, 1926, W. L. SLATE ET AL. (*Connecticut State Sta. Rpt. 1926, pp. XVII+599+58T+LI, pls. 21, figs. 50*).—This contains the organization list, a report of the board of control for the year ended October 31, 1926, a financial statement for the fiscal year ended June 30, 1926, and reprints of Bulletins 282–289 and Tobacco Substation Bulletins 7 and 8, all of which have been previously noted, and the following Bulletins of Immediate Information: Nos. 55, The Asiatic Beetle Quarantine, and 56, The Japanese Beetle Quarantine, both by W. E. Britton; 57, Regulations Concerning the Transportation of Nursery Stock in the United States and Canada, compiled by W E. Britton; 58, The Japanese Beetle Quarantine, and 59, The European Corn Borer Quarantine, both by W. E. Britton; and 60, Regulations for Carrying out the Provisions of the Law Concerning Concentrated Commercial Feeding Stuffs.

Report of the director [of Connecticut State Station] for the year ending October 31, 1927, W. L. SLATE (*Connecticut State Sta. Bul. 291 (1927), pp. 89–111, figs. 10*).—The work of the station during the year is briefly reviewed. The experimental work reported not previously noted is abstracted elsewhere in this issue.

Annual Report [of Iowa Station], 1927, C. F. CURTISS and W. H. STEVENSON (*Iowa Sta. Rpt. 1927, pp. 63*).—This contains a report on the work of the station, including a financial statement for the fiscal year ended June 30, 1927. The experimental work recorded not previously noted is for the most part abstracted elsewhere in this issue.

Thirty-seventh Annual Report [of Washington College Station], 1927, E. C. JOHNSON ET AL. (*Washington Col. Sta. Bul. 222 (1927), pp. 80*).—This contains the organization list, a report on the work of the station, and a financial statement for the fiscal year ended June 30, 1927. The experimental work reported is for the most part abstracted elsewhere in this issue.

[Biennial Report of West Virginia Station, 1923–1924], H. G. KNIGHT ET AL. (*W. Va. State Bd. Control Bien. Rpt., 8 (1923–24), pt. 2, pp. 439–474*).—This contains a financial report for the fiscal years ended June 30, 1923 and 1924, and reports of the director and heads of departments on the work of the station during the biennium.

Forward steps in farm science: Annual report of the director, [Wisconsin Station, 1927], compiled by N. CLARK (*Wisconsin Sta. Bul. 396 (1927), pp. 136, figs. 34*).—This contains the organization list, an account of the activities of the station, a list of the station publications of the year, and a financial statement as to the Federal funds for the year ended June 30, 1927. The experimental features not previously reported are for the most part abstracted elsewhere in this issue.

Michigan Agricultural Experiment Station Quarterly Bulletin, [February, 1928], edited by R. S. SHAW and A. J. PATCH (*Michigan Sta. Quart. Bul., 10 (1928), No. 3, pp. 77–147, figs. 34*).—In addition to articles abstracted elsewhere in this issue, this number contains the following: Electrically Operated Incubator Satisfactory, by O. E. Robey; Michigan Farmers Find Sweet Clover Valuable, by C. R. Megee; Care Now Necessity in Flock Management, by G. A. Brown; and Adopt New Policy of Legume Culture Distribution, by W. Giltner.

NOTES

Arkansas Station.—The new tile barn under construction at the station farm is described as an innovation in barn planning, representing a unit type development designed by the department of agricultural engineering. The barn will have 30 cow stalls, 3 cow pens, and 4 calf pens, and will measure 36 by 100 ft. The oak lumber used was sawed from logs cut from the station timber lot.

Michigan Station.—*Science* notes that Dr. A. J. Patten, chemist for 22 years, has resigned to engage in commercial work.

Minnesota University and Station.—The greenhouse equipment at University Farm has been increased by the addition of eight units, each 18 by 25 ft. These are to be used in research in plant genetics, plant physiology, plant pathology, and farm crops. Artificial lights are to be provided so that two generations of small grain or corn can be brought to maturity within the year, thus making it possible to hasten the development of new varieties and to complete more quickly the tests for winter hardiness and cold resistance.

Gopher Countryman notes that Dr. Hamilton P. Traub, instructor and assistant in horticulture, has been appointed chief of the division of horticulture in the Texas Station.

Mississippi Station.—The appropriations made by the State legislature for the biennium 1928–1929 aggregate $513,900. This includes $223,000 for the main station and allotments of $46,700, $46,200, $162,500, $28,000, and $7,500 for the substations at Holly Springs, Poplarville, Stoneville, Raymond, and McNeill, respectively. The appropriation for the main station includes $100,000 for an administration building, $53,000 for support and maintenance, $5,000 for a small gin and warehouse, $5,000 for two greenhouses for experimental agronomy and horticulture, $10,000 for repairs, barns, and fences, $30,000 for special pecan investigations, and $20,000 for additional land for the departments of animal husbandry, agronomy, and horticulture. The appropriations for the substations were largely for maintenance but included allotments for the purchase of additional land as follows: At Holly Springs $8,000, at Poplarville $7,500, and at Stoneville $53,000.

Ohio State University and Station.—Paul Gerlaugh, animal husbandry specialist in the university, has been appointed chief of the department of animal industry in the station vice Dr. G. Bohstedt, whose resignation has been previously noted. H. W. Batchelor, assistant soil biologist in the department of agronomy, and A. E. Perkins, assistant chemist in the department of dairying, have been made associates in their respective departments of the station.

Utah College and Station.—P. V. Carden, farm economist, has been appointed director of the station, succeeding William Peterson, who will continue as director of extension.

Virginia College and Station.—*Science* notes that Dr. F. D. Fromme, professor of botany and plant pathology and plant pathologist, has been appointed dean of the College of Agriculture in the University of West Virginia and director of the West Virginia Station.

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EXPERIMENT STATION RECORD

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The death on June 17 of Edwin T. Meredith, Secretary of Agriculture from February 2, 1920, to March 3, 1921, removes from the world's activities at the early age of 51 years an able and ardent champion of American agriculture and country life. Called to head the Department at a critical period of its history, he gave to its service a distinctively dynamic and sympathetic leadership. In little more than a year's time he succeeded in the face of great difficulties in greatly stimulating and reinvigorating the Department's work, strengthening the morale of its personnel, broadening its contacts, and widening its support as an essential agency serving the needs of the entire Nation. Necessarily these notable achievements were brought about with the active cooperation of many people, but to an unusual degree they represented a personal accomplishment.

Secretary Meredith came to the Department relatively young in years and in experience in governmental affairs, but singularly well equipped in appreciation and understanding of both agriculture and business. Born and brought up on an Iowa farm, he began the publication of an agricultural paper soon after leaving college and continued in that field throughout his life. This work gave him an intimate acquaintance with farm people, so that not only did he know their needs but he could interpret their views to others convincingly and well. In addition he had also seen service as a director of the Federal Reserve Bank of Chicago, the U. S. Chamber of Commerce, and the National Association of Advertising Clubs, and as a member of the Board of Excess Profit Advisors of the Treasury Department, of President Wilson's Industrial Conference of 1919, and of other bodies. These duties had brought him a broad outlook and many valuable contacts, so that what he had to say received unusual attention in nonagricultural circles.

This duplication of interests was very fortunate, for during his term of office a liaison officer was not infrequently needed between agriculture and industry. At the time of his installation as Secretary, for example, he was importuned as to plans that the Department might have to reduce the high cost of living. This was an acute question in 1920, and one which he readily admitted was related

to agriculture, but in his initial statement he took sharp issue with the view that it was essentially an agricultural problem. "If the whole country," he said, "all business and all labor does not recognize this as a common problem, and do those things which give the farmer a fair compensation for his efforts, do those things which make farming remunerative, pleasant, and as attractive as other lines of endeavor, the conditions will not improve. On the contrary, more and more will the young men leave the farm, more and more will the older men become discouraged, and less and less will there be of farm produce to divide among the whole people for their sustenance, and higher and higher will go the price of that which is produced."

Yet he made it clear that "the farmers of America are willing and anxious to meet the cost of living as a mutual problem. They seek the cooperation, support, and sympathy of the business world, and receiving it they will do their part and more. All of us working to this end are strengthening and making permanent agriculture, the very foundation of our whole structure, and therefore doing well for our country as a whole."

The conception of agriculture as a national rather than a mere class interest ran characteristically throughout his many public addresses, as did also his earnest advocacy of a better understanding between agricultural and nonagricultural groups. Thus, in speaking before the Association of Land-Grant Colleges in 1920, he stated that "it seems to me that, on the whole, we have given too little attention to public opinion as it relates to agricultural problems. . . . Generally speaking, the consumer thinks that agricultural institutions, including the colleges and the Department, are maintained for the benefit of the farmer and for his benefit alone. This, of course, is not true. These institutions are serving, with a high measure of efficiency, the whole people, urban as well as rural. . . . One of the tasks ahead of us is to see that such an understanding is conveyed to the public; that it is demonstrated to the people in the cities, as well as those in the rural districts, that the funds devoted to agriculture are not used in the interest of the farmer alone but in the interest of the consumer as well."

Throughout his service, Secretary Meredith's immediate concern was the problem of upbuilding and strengthening the Department, and to this he devoted himself with unbounded energy and zeal. His single report as Secretary stands to-day as an intensely human document, with large stress on such needs as the retention of personnel, the construction of additional buildings, a more effective organization, and more adequate funds. He formulated an ambitious program and pleaded earnestly and persistently for its acceptance. Not all of his recommendations were adopted, but progress was made in many directions. One of his specific attainments was the authorization

of the appointment of a director of scientific work for the Department to exercise immediate supervision over its research projects, as well as a director of regulatory work to perform a similar service in its inspection duties.

As regards research, Secretary Meredith took a strong stand as an earnest advocate, both as carried on in the Department and by the agricultural experiment stations. In his annual report he deplored the retardation of the stations' programs because of the insufficiency of funds, warning that "unless there comes from these institutions a steady and abundant flow of new knowledge which can be utilized to meet pressing problems, agricultural advancement will slow down and our system of agricultural education through colleges, schools, and the extension service will deteriorate."

His address before the Association of Land-Grant Colleges discussed the matter further and in considerable detail. "We must be frank enough with ourselves," he said, "to recognize the fact that fundamental research has not gone forward as rapidly as our best interests demand, and it seems to me that the time has come for us—the colleges and stations and the Department—to see that it is given and retains the proper place in our respective organizations. I am sure that nowhere has the importance of research been consciously minimized, but, in the exigencies of war and its aftermath, a situation has come about which, I think you will agree, amounts to neglect of this basis of agricultural progress. The rapid growth of extension work, the value of which I fully appreciate, has contributed to this result. We have been so busy with extension, so amazed also at the rapidity of its growth and application, that we have not found time to give to research, during the past few years, the careful planning and deep thought that it should receive. Unless we are to permit an insidious undermining of the whole structure that we have reared through six decades of tireless work, we must have a larger number of thoroughly trained and experienced investigators to give their time exclusively to research. Upon the agricultural college rests the responsibility of training the agricultural leaders and investigators of the future; they must provide the men and women needed by the experiment stations and the Department of Agriculture for the prosecution of their activities. There is a community of interest, therefore, among these three agencies in dealing with this great problem, and in seeing to it that there is constantly available an increasing number of well-trained and thoroughly grounded men and women to carry on the work intrusted to them."

As has been intimated, the period of Secretary Meredith's service was one of transition and uncertainty. The war stimulus and enthusiasm had gone, its tremendous financial burdens were beginning to be acutely felt, class consciousness was redeveloping as a source

of friction and misunderstanding, and the way out was not clear. In such an era it meant much to the nation that the Department of Agriculture had at its helm a man of positive convictions, magnetic personality, broad contacts, and sympathetic understanding. Though brief in years, his timely leadership will long be remembered.

From the viewpoint of agricultural education the passage of the Capper-Ketcham Act providing additional Federal aid for cooperative extension work in agriculture and home economics was one of the notable achievements of the recent session of the Seventieth Congress. This measure, so termed because sponsored in the Senate by Hon. Arthur Capper of Kansas and in the House of Representatives by Hon. J. C. Ketcham of Michigan, was approved by President Coolidge on May 22, 1928. It was promptly made effective by an initial appropriation, carried in the Second Deficiency Appropriation Act, of $980,000 for use during the fiscal year ending June 30, 1929, so that its benefits will be immediate and substantial.

The new law is supplementary to the Smith-Lever Act of 1914, and specifically provides that its appropriations are to be in addition to and not in substitution for the appropriations authorized by that act or otherwise annually granted for cooperative agricultural extension work. Its clear intent is to provide for the further development of the extension work with farm men, women, and children already under way, and its passage will greatly facilitate a more symmetrical expansion of the existing extension system.

The need for such an expansion may be readily visualized if it is recalled that although there are in the United States approximately 2,800 counties in which agriculture is of sufficient importance to justify the employment of county agents, there were prior to the passage of the act not more than 2,200 counties which were actually so provided. Furthermore, only about 950 counties were employing county home demonstration agents and only about 135 counties had separate county club agents. In other words, the system was regarded as less than one half completed. Not all of the counties, to be sure, are thought to be ready for a full staff of workers under present conditions, but it has been felt by those most familiar with the situation that systematic provision should soon be made for 700 additional agricultural agents, at least 1,500 county home demonstration agents, and approximately 1,650 club agents and assistant agents to carry on the boys' and girls' 4–H club work. Further provision for negro agents has also been regarded as essential in various localities.

For some time it has been apparent that the chief factor limiting development in these directions has been the insufficiency of funds. The Smith-Lever appropriations reached their maximum of $5,880,000 per annum in 1923, and since that date there has been prac-

tically no increase in the number of county agricultural and home demonstration agents, although the contributions from non-Federal sources have been steadily increasing. Roughly speaking, of the total funds available for cooperative agricultural extension work in the States, aggregating slightly over $20,000,000 per annum, the entire Federal contribution has of late constituted 38 per cent, that of the States 27 per cent, and that of the counties 35 per cent. Put in another way, the States and counties have been contributing $1.94 for each dollar supplied by the Federal Government. Much variation has existed among the States in this regard, but in a number of cases this ratio has been far exceeded, as in the case of Massachusetts, for which it is 11:1, and in New York 5:1.

As previously stated, the initial appropriation under the new act is $980,000 for the fiscal year ending June 30, 1929. This is allotted equally among the 48 States and the Territory of Hawaii, each of which thus receives $20,000. For the following and each succeeding year the total expenditure authorized is increased to $1,480,000, the additional $500,000 per annum being subject to the allotment and offset provisions of the original Smith-Lever Act. This portion of the appropriation therefore will be divided among the States and Hawaii in the proportion which the rural population of each bears to the total rural population of the United States, provided that each makes available from State, Territorial, college, county, local, or individual sources a like amount to be used for the same purposes as the Federal funds.

In general the new appropriations authorized are governed by the same conditions as the earlier legislation, but there are three important innovations. One of these is a provision that not less than 80 per cent of the appropriations must be used for payment of salaries of extension agents "in counties of the several States to further develop the cooperative extension system in agriculture and home economics with men, women, boys, and girls." A second restriction provides that the funds "shall be so expended that the extension agents appointed under its provisions shall be men and women in fair and just proportions."

The third divergence is in the inclusion of Hawaii as a beneficiary. Hitherto no Smith-Lever funds have been available for this Territory, although for several years a proviso has been carried in the agricultural appropriation acts permitting the use of not to exceed $10,000 of the appropriation for the support of the Hawaii Experiment Station in agricultural extension work, and the same provision is made in the appropriation act recently enacted for the fiscal year 1929. The new policy, however, conforms to that established in an act approved May 16, 1928, extending to Hawaii not only the Smith-

Lever Act but the Hatch Act and all legislation supplementary to each of these measures. The immediate effect of this legislation is to place the Territory on full parity with the States as regards extension funds.

In the States the increased resources accruing from the Capper-Ketcham Act will doubtless prove of great benefit. The total appropriations authorized, including the offsets required, will aggregate for the fiscal year 1930 and thereafter about $2,000,000 per annum. This additional sum should go far to meet the needs of the many counties already on record as desiring extension workers which they have been unable to secure because of the shortage of Federal or State funds. A recent estimate of this group lists as needed 117 white and 22 colored county agricultural agents, 194 white and 25 colored home demonstration agents, and 107 club agents, and there are doubtless many other counties in which additional workers will be warmly welcomed. It is anticipated that much of the immediate expansion will be in the work with farm women and farm boys and girls.

Aside from the addition of Hawaii the measure became law without changes from the form originally introduced, occasioned little debate, and was passed without a record vote in either branch of Congress. The virtual unanimity of approval which this procedure denotes indicates a tacit acceptance of the agricultural extension enterprise as an integral part of the educational system of the Nation. It constitutes both a vote of approval of the beginnings which have already been made and a recognition of the benefits which may be expected from the more adequate provision for the work which has now been made. From many points of view the passage of the act is very gratifying and encouraging, and to the extent that its appropriations will permit it should mean a marked advance toward the ultimate goal of rendering available to every farm man, woman, boy, and girl who desires it the information that the agricultural colleges, the experiment stations, and the Federal Department of Agriculture have ready for their use.

The recent holding of the Second National 4–H Club Camp on the grounds of the U. S. Department of Agriculture has again focused attention on this important phase of the extension enterprise. Like its predecessor in 1927, the camp assembled a selected group of boys and girls from the various States for several days of addresses, sightseeing, camp life, and similar activities. It served as a tangible recognition of outstanding achievement in the club work of the year, but it was also an opportunity for Department people and others to become acquainted with these young people from all over the country

and such of their leaders as had accompanied them and to learn at first hand more about the club work and its possibilities.

The number of participants in the camp was about 150, coming from some 39 States and made up for the most part of delegates of 2 boys and 2 girls from each State. An even wider representation was obtained than formerly, including groups from the distant States of Washington and Arizona. The camp was in operation from June 21 to 26, and offered a varied program in which there were skillfully mingled instruction, demonstration, patriotic inspiration, and entertainment, including the broadcasting of the first national 4–H Radio Night.

The necessary restriction of the camp as to numbers makes the task of selecting so few from a total membership of over 600,000 one of some difficulty, and doubtless a large number are eliminated with excellent records and great worthiness. At the same time the keenness of the competition intensifies the distinction to those so fortunate as to be designated, and the possibility of attainment of this honor adds zest to the routine of the clubs and encourages persistence in their everyday activities. On the whole the conception of a national encampment of the sort seems to have been a happy one, and its unique privileges constitute a reward to be earnestly sought for and long cherished if secured.

The larger question of what the 4–H club work itself may mean to the Nation was brought out during the encampment by several speakers, but particularly by Dr. C. W. Warburton, Director of Extension, in his address of welcome. After recounting the early days of individualism and self-sufficiency in farming and country life, he emphasized as the coming need the development of cooperation, the spirit of teamwork, and the ideal of mutual helpfulness. In these clubs he saw an agency where boys and girls could easily and naturally learn to work together, unhampered by the prejudices and conservatism of an older generation. These organizations, therefore, hold unique possibilities as potential agencies for the dissemination of improved methods and the stimulation of broader thinking and the inculcation of better living. Thus far their usefulness has been restricted by the relatively small amount of attention that could be given to their formation and guidance. This condition the Capper-Ketcham Act, if accepted and supplemented by the States as has been done with other extension legislation, seems likely to remedy to a substantial degree and with corresponding benefit.

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RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

Annual reports on the progress of chemistry for 1927, edited by C. SMITH (*Ann. Rpts. Prog. Chem.* [*Chem. Soc., London*], *24* (*1927*), *pp. X+367, figs. 3*).—This differs little in general form from the preceding reports of this series (E. S. R., 57, p. 201).

Textbook of the chemistry of foodstuffs, J. TILLMANS (*Lehrbuch der Lebensmittelchemie. Munich: J. F. Bergmann, 1927, pp. XVI+387, figs. 67*).—This is a comprehensive treatise, summarizing, in the first section, the German laws with respect to the composition, labeling, and sale of food products, and covering in the remaining nine sections the general components of foods. Section 2 deals with proteins, fats, carbohydrates, mineral constituents, and such other substances as the enzymes, organic acids, glucosides, and tannins; section 3, with nutrition theory; section 4, animal food substances; section 5, the fats and oils; section 6, vegetable food products; section 7, the alkaloidal accessories, among which are included tobacco as well as coffee, tea, and chocolate; section 8, alcoholic accessories; section 9, condiments; and section 10, water.

The fats and oils: A general view, C. L. ALSBERG and A. E. TAYLOR (*Food Research Inst.* [*Stanford Univ.*], *Fats and Oils Studies No. 1* (*1928*), *pp. VIII+103*).—"In no one place does the information desirable for an understanding of the fat and oil trade as it affects agriculture and industry seem to have been collected in a form so simple as to be intelligible to those without technical training. To supply such a presentation is the object of this initial study." Its contents are as follows: Nature and sources of fats and oils; properties of fats and oils; fats and oils technology; conditions and trends of production; conditions and trends of consumption; international trade in fats and oils; and concluding observations.

Plant products, S. H. COLLINS and G. REDINGTON (*London: Baillière, Tindall & Cox, 1926, 2. ed., pp. XIII+262, figs. 3*).—This is a second edition, retaining the general plan of the first (E. S. R., 40, p. 421), though extensive revision has been made within each of the four sections. "No particular effort is made to give encyclopedic completeness of information, but the aim has been to give a fair conspectus of a large subject, with an appended bibliography for those who are able to pursue their studies further. . . . The volume covers the cycle from factory to fertilizer, from fertilizer to field, and from field to factory once more."

Formaldehyde, L. BANINO and E. SEITTER, rev. by A. MENZEL (*Der Formaldehyd. Vienna and Leipzig: A. Hartleben, 1927, 2. rev. ed., pp. VIII+330, pls. 2, fig. 1*).—This second edition covers the commercial preparation of formaldehyde from methyl alcohol, from formic acid and its salts, from methane, from ethylene, from methyl chloride, from carbonic oxide, and from acetaldehyde; other modes of formation; the properties of formaldehyde; its polymeric modifications; its testing according to the German pharmacopoeia; its detection and

quantitative determination; formaldehyde in quantitative and qualitative analysis and in synthesis; the action of formaldehyde on proteins; the properties of formaldehyde with respect to various inorganic substances and in electrolysis; the application of formaldehyde in tanning technique; formaldehyde in the production of plastic masses and artificial resins; and its application in paper making, in dyeing, and in dye printing, and in the production of silk and artificial silk, in the fermentation industries, in the beet sugar industry, in photography, in the purification of the benzene hydrocarbons, and in many other applications.

Critical concentrations of bioses, G. L. PESKETT (*Soc. Expt. Biol. and Med. Proc., 25 (1928), No. 5, pp. 340–343*).—By varying simultaneously the size of the seeding and the concentration of various bios preparations, the author has demonstrated that there is a definite or critical concentration of bios at which a small seeding will produce as large yields in terms of cell counts as a large seeding and below which there is a large divergence in the cell concentration. The critical concentration of Beta-bios was from 0.075 to 0.05 mg. per cubic centimeter, and that of a crude alcoholic extract of yeast from 0.03 to 0.025 mg. For Alpha-bios a critical concentration has not been established, although the greatest growth took place at a concentration of 0.025 mg. per cubic centimeter.

The isolation of a Beta bios, R. W. KERR (*Soc. Expt. Biol. and Med. Proc., 25 (1928), No. 5, pp. 344, 345*).—The author reports the fractionation of yeast autolyzate into three specifically distinct fractions, one of which contains Bios M. P. 223 (E. S. R., 53, p. 204), referred to now as Alpha-bios, another which yields a homogeneous product hitherto undescribed and to which the name Beta-bios is given, and a third which yields a concentrate to which the name Gamma-bios is given.

The essential feature of the separation of Beta-bios is the formation of an insoluble barium salt preliminary to the separation of Alpha and Gamma bioses by electrodialysis. The barium salt is decomposed with sulfuric acid, basic impurities are eliminated by silver and mercuric sulfate and phosphotungstic acid, and nonnitrogenous acids are removed by extraction with acetone. The physical and chemical characteristics of the purified bios are summarized briefly.

On the chemical constituents of yeast-extract, S. OHDAKE (*Jour. Agr. Chem. Soc. Japan, 3 (1927), No. 7–8, pp. 98–122*).—In an attempt to isolate the antineuritic vitamin, the author has obtained a tannin fraction from an alcoholic extract of yeast by precipitating with a concentrated tannin solution, dissolving the precipitate in dilute acetone, decomposing it with barium hydroxide, filtering, removing the excess barium hydroxide, and evaporating in vacuo. From this crude tannin fraction five separate fractions were obtained, the first in the form of crystals separating out from the concentrate on standing and the others by precipitation with 80 per cent alcohol, 50 per cent acetone, and absolute acetone, and final concentration of the remaining mother liquor, respectively. The fraction precipitated by absolute acetone is the crude oryzanin with well-known antineuritic properties.

Analyses of the other fractions, none of which showed any appreciable antineuritic potency, are reported. Among the substances isolated are two unknown bases with the empirical formulas $C_3H_6N_2$ and $C_6H_8N_2O$, respectively. The latter differs only slightly in physical and chemical properties from the compound of high antineuritic properties isolated by Jansen and Donath (E. S. R., 57, p. 489), and which is said to have the formula $C_6H_{10}N_2O$. The chief differences are that the compound of the present study gives no diazo reaction and its hydrochloride has a lower melting point.

The influence of chimosin on the albumin of milk [trans. title], Iâ. S. Zaĭkovskiĭ (J. Zaykowsky) (*Trudy Vologodsk. Moloch. Khoz. Inst.* (*Arb. Milchw. Inst. Wologda*) *Bûl. 51 (1925), pp. 14*).—Various preparations of milk proteins were investigated with respect to their specific rotation in order to find a similarity or dissimilarity between casein and paracasein. The preparations from milk were made as follows: Milk at 35° C. was treated with rennet, the curdled material was washed with water, one part being dissolved in a small amount of sodium bicarbonate, treated with ammonium oxalate to eliminate the calcium, filtered, and N/10 acetic acid added to the filtrate. The precipitate was filtered, washed with water, and twice redissolved and reprecipitated. After the last washing with water the precipitate was washed with alcohol and with ether, and dried in the air. The second portion of the curdled material was treated in a similar manner, but instead of sodium bicarbonate the solvent was a 5 per cent sodium acetate solution. The ash content of the first portion (sodium bicarbonate as a solvent) was 1.05 per cent, of the second portion 1.18 per cent. No traces of calcium could be found in the ash.

The protein which remained in the whey were also precipitated by two methods. One portion of the whey was heated to 90° and saturated with sodium chloride. The precipitate was dissolved with sodium bicarbonate and reprecipitated as outlined above. A second portion of the whey was treated with alcohol, and the precipitate was dissolved and reprecipitated as above. The product obtained from the heat treatment contained 1.29 per cent of ash, from the alcohol 0.8 per cent.

All the preparations obtained were investigated for their specific rotations. The highest rotation was obtained with casein. The paracasein (either from the sodium bicarbonate or sodium acetate treatmet) and the precipitate obtained from whey treated with alcohol gave identical degrees of rotation. The product from the whey obtained by heating gave a decidedly lower degree of rotation.

On the supposition that rennet induces chemical changes in casein, several experiments on the influence of prolonged treatment of milk with rennet were made. Changes were noted in the acidity of the casein solution, its rotatory properties, its precipitation with calcium chloride, the acidity of the whey after precipitation with calcium chloride, and the rotatory activity of the whey.

The data in the appended tables show that the acidity at first increases and then drops. The amount of N/10 calcium chloride necessary to precipitate casein changes, passing through a defiite minimum. At the end of the experiment no precipitation could be obtained with calcium chloride. The angle of rotation was high in the whey treated with calcium chloride.

A study of the rate of drying of wheat flour, starch, and gluten, E. A. Fisher (*Cereal Chem., 4 (1927), No. 3, pp. 184–206, figs. 5*).—Flour, starch, and crude powdered gluten were exposed over concentrated sulfuric acid in a closed vessel arranged to provide constant temperature and means for the periodic weighing of the flour without either removing the sample from the drying vessel or otherwise disturbing the process or the conditions of the drying.

"When rates of drying $\left(-\frac{dw}{dt}\right)$ are plotted against moisture content (w) the rate curves are all of the same type and consist of three parts separated by more or less sudden changes of direction. Down to 6 per cent w the curve is linear and on extrapolation would cut off an intercept, c_1, from the horizontal axis. At about w=6 per cent a sudden change of direction occurs, and

between 6 per cent and 2.5 per cent the rate curve is again linear and on extrapolation would cut off an intercept, c_2, from the horizontal axis, c_2 being less than c_1. Along these two linear portions of the curve the rate of drying can be accurately expressed by the equations:

$$(1) \quad -\frac{dw}{dt} = k_1 (w - c_1),$$

$$(2) \quad -\frac{dw}{dt} = k_2 (w - c_2).$$

There is some evidence to suggest that c_1 (and possibly c_2) may be characteristic of each flour and may be connected with the amount of gluten present in the flour. Below w=2.5 per cent, the rate curve bends round to the origin, drying becoming extremely slow. It is inferred that along this portion of the curve the really hygroscopic moisture is given off."

Notes on the use of Ostwald viscometers for flour suspensions, H. J. Denham, G. W. S. Blair, and G. Watts (*Cereal Chem., 4 (1927), No. 3, pp. 206–220, figs. 5*).—The recent neglect by cereal chemists of the Ostwald capillary viscosimeter in favor of the various types of rotating cylinder instruments is noted, and is considered attributable, in part at least, to Sharp and Gortner's observation (E. S. R., 51, p. 803) of the gradual "fall back" in the time of flow of any given flour suspension, this apparent dropping off of the viscosity having led to the impression that the readings were of doubtful value. The authors of the present communication find, however, that this "viscosity fall back" is, when extrapolated to zero time, a constant for any given flour, and is at least partially correlated with the strength of that flour. Ostwald viscosimeters of widely differing bore were found to give, when properly calibrated with liquids of known viscosity, strictly comparable results on flour suspensions, provided (1) that the results are expressed as actual viscosities rather than as times of flow relative to those of water, and (2) that the vicosimeter be so designed as always to give laminar or stream line flow, as distinct from turbulent flow, at the viscosity of the liquids under examination.

The theory of the flow viscosimeter is briefly analyzed on the basis of Poiseuille's law and the individual viscosimeter formula derived therefrom. The calculation and experimental determination of the critical velocity, only below which Poiseuille's law holds, is also discussed; and the design of viscosimeters is then considered upon the above outlined bases. The experimental work presented covers the two subjects of viscosity fall back and viscosity temperature coefficients.

The tendency of the viscosity of flour suspensions to decrease on standing was found to be a definite colloidal phenomenon due neither to repeated shear nor to proteolysis, but probably to syneresis occurring in the suspensoid. The addition of citric acid changed the slope of the fall back curve and produced a similar change in the syneresis of washed out gluten; other anions at the same and citric acid at higher pH values gave sigmoid rather than straight line curves. An empirical equation relating the temperature coefficients with the concentration was obtained from the study of the viscosity of flour suspensions as affected by temperature, and it was found that the slope of the curve derived for this equation appeared to be independent of the colloidal properties of the flour used.

The concentration of glutenin and other proteins in various types of wheat flour, E. Grewe and C. H. Bailey (*Cereal Chem., 4 (1927), No. 3, pp. 230–247*).—Noting, in a brief review of the literature, various attempts to cor-

relate glutenin-gliadin ratio with the baking qualities of flour, the present contribution from the Minnesota Experiment Station reports the determination in straight grade or patent flours milled from hard spring, hard winter, soft red winter, and Pacific coast white wheats of the glutenin content, as given by the Sharp and Gortner method (E. S. R., 51, p. 803) and by the Blish and Sandstedt method (E. S. R., 54, p. 309), of the ratio of the glutenin to the total crude protein and to the sum of glutenin and gliadin; and the making of baking tests, estimations of dough extensibility, viscosity determinations, diastatic activity tests, counts of the relative numbers of large, intermediate, and small starch grains, and determinations of heats of imbibition of dried starch preparations, together with the calculations of the degree of correlation among various of these characteristics.

The glutenin determinations by the two methods were in satisfactory agreement. Baking tests by three different methods did not agree with the results of loaf volume measurements. The coefficient of correlation between crude protein and loaf volume was 0.678±0.091. The coefficient of correlation of extensibility and loaf volume was 0.671±0.076. Constant *b* computed from viscosity determinations involving several concentrations of flour acidulated with lactic acid was found not correlated with the results of the baking tests. The diastatic activity of the flours ranged from the production of 90± mg. of maltose per 10 gm. of flour in 1 hour at 27° C. to 290± mg. of maltose. The coefficient of correlation of the diastatic activity with the loaf volume was 0.384± 0.080. There was no correlation between the starch grain size and the result of baking tests, nor between the size of starch granules and the diastatic activity of the flour.

The preparation and analysis of the various proteins of wheat flour, with special reference to the globulin, albumin, and proteose fractions, W. F. Hoffman and R. A. Gortner (*Cereal Chem., 4 (1927), No. 3, pp. 221–229*).—This contribution from the Minnesota Experiment Station reports the isolation of gliadin, glutenin, leucosin, and small amounts of a possible globulin from a single sample of patent wheat flour with a view to the comparison of the chemical and physical properties of these proteins as occurring in the same sample. No proteose could be detected.

It was found that the extraction of wheat flour with 5 per cent potassium sulfate solution and 10 per cent sodium chloride solution did not yield similar fractions. Marked differences were observed in the substances dissolved and the amount of proteins that could be separated from such solutions. The nitrogen distribution by the Van Slyke method (E. S. R., 26, p. 22) was determined for each of the preparations isolated. Besides the proteins, the flour sample examined yielded a gum which was isolated in apparently a pure condition. This gum did not color blue with iodine nor did it reduce Fehling's solution until after acid hydrolysis. The authors consider the presence of a true globulin in certain samples of wheat flour to be problematical.

Some factors influencing the experimental baking test, R. S. Herman and V. M. Hart (*Cereal Chem., 4 (1927), No. 3, pp. 157–183, figs. 30*).—As a result of an extensive experimental study of the data obtained and which are here presented in part in 28 tables and 30 photographic figures, the authors conclude that the experimental baking test, despite its highly empirical character "is the most valuable method for determining flour characteristics."

Both the uniformity of the results and their interpretation, however, were found subject to the influence of variations in technique, in methods, apparatus, and mechanical treatment, and in bread formula. Observed examples of these influences included effects of the size and shape of the fermenting jars and

baking pans, the character of the water used, the punching schedule, the thoroughness of the punching, differences in the time and speed of mixing, the placement of the dough crease, the use of varying proportions of nondiastatic or of highly diastatic malt extracts, of milk powder, of mineral salts and shortening, of cane sugar and Cerelose, of salt, and of pan grease, the freshness and type of yeast, the fermentation and proofing periods, and the oven temperatures.

Determining soil moisture rapidly and accurately by methyl alcohol, G. J. Bouyoucos (*Jour. Amer. Soc. Agron., 20 (1928), No. 1, pp. 82, 83*).—Following a study of a large number of liquids the author finds absolute methyl alcohol the most powerful dehydrating agent tested, and superior to ethyl alcohol, which was first used in the method here noted. "By the use of methyl alcohol the moisture content of soils can be determined as absolutely as by the oven method," and its desirability is emphasized. The procedure required is said to be the same as that previously prescribed for the use of ethyl alcohol.

A laboratory apparatus for the measurement of carbon dioxide evolved from soils, F. W. Marsh (*Soil Sci., 25 (1928), No. 4, pp. 253–261, figs. 3*).—"This apparatus is simple of operation and very compact, 20 units (sufficient for making duplicate determinations on 9 soils and maintaining 2 controls) occupying a bench space of only 3 by 7 ft. This space accommodates not only the units themselves but also a thermograph, a filling apparatus, a 10-liter potassium hydroxide solution reservoir, a 2.5-liter distilled water container, a meter, a scrubbing system, and suction flasks. Determinations may be made by any of the usual absorption methods, liquid absorbents and either the absorption device . . . described or any similar device being used."

Results of duplicate 72-hour runs on beet, corn, wheat, cowpea, soy bean, and 2 grass soils and on 2 controls are given in milligrams of carbon dioxide evolved in the passage of the aerating current over 500 gm. and through 1,000 gm. of the soil.

Analytical methods used in lime determination [trans. title], N. A. Tananaev (*Nauch. Zap. Gosud. Èksper. Inst. Sakh. Promysh. [Kiev], 4 (1927), No. 5, pp. 158–172*).—This is a comprehensive review of the methods used in determining the lime constituents.

On the electrometric titration of the platinum metals [trans. title], W. D. Treadwell and M. Zürcher (*Helvetica Chim. Acta, 10 (1927), No. 2, pp. 281–285, fig. 1*).—Pointing out the inconveniences and inaccuracies of a number of proposed volumetric methods for the determination of the platinum group of metals, the authors describe preliminary experiments on the determination of these metals and of gold by potentiometric titration with titanous chloride. The titration curves of the single metals and of some pairs of these are shown in an accompanying figure.

SOILS—FERTILIZERS

An introduction to the scientific study of the soil, N. M. Comber (*New York: Longmans, Green & Co.; London: Edward Arnold & Co., 1927, pp. 192, figs. 26*).—This is essentially a condensed version of the author's lectures to agricultural students, vocational and academic, and is intended to be amplified "with an industrial bias to diploma students and with an academic bias to degree students" in actual teaching practice. Its contents are as follows: Introduction—the soil and the plant; soil genetics—the mineral matter, the organic matter, and the soil formation processes; soil particles; soil colloids; soil water; soil air; soil temperature; the absorptive properties of soils; soil

nitrogen; the mineral plant food in soils; the classification of soils; the artificial treatment of soil; and the literature of soil science and its use.

The chemistry of soil and fertilizers, E. Burban (*Chimie du Sol et des Engrais. Paris: Maurice Mendel, [1926?], pp. 230, figs. 11*).—This is a brief monograph which treats of the physicochemical technique of cultivated soils. The scope of the book is indicated by the chapter headings: The general properties of soils and the needs of plants, the analysis of cultivated soils, the improvement of cultivated soils, and ideas of general chemistry of interest in agriculture. A short introduction presents the modern concept of the soil as a living mass, and the conclusion notes the author's purpose to bridge the considerable gap between agricultural practice and "agrologic science."

Soil survey of Clermont County, Ohio, A. E. Taylor et al. (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1923, pp. III+715–748, fig. 1, map 1*).—Clermont County comprises 297,600 acres in southwestern Ohio. Its surface is characterized by deep narrow valleys and level interstream areas, with a much broken and hilly tract extending several miles back from the Ohio River and along the East Fork Little Miami River. The larger stream valleys are at some points from 200 to 400 ft. deep. Drainage is in general good, but the eastern half of the county includes many rather extensive level interstream areas having extremely slow natural run-off.

The more extensive soil types found in the present survey, made in cooperation with the Ohio Experiment Station, are reported as Rossmoyne silt loam which, with a dark phase, covers 27.4 per cent of the county area; Clermont silt loam 23.6 per cent; Fairmount silty clay loam 18.0 per cent; and Cincinnati silt loam 11.6 per cent. A total of 21 types, grouped in 13 series, are mapped and described.

Additional data on the geology of the Province of Voronezh from material obtained by deep boring [trans. title], A. A. Dubiánskiĭ, (*Zap. Voronezh. Selsk. Khoz. Inst. (Mém. Inst. Agron. Voronèje), 5 (1926), pp. 149–175*).—From borings made in connection with the digging of wells the author obtained material to a depth of 200 meters (656 ft.). This material was studied from the standpoint of the geological deposits as they appear in the profile. The data are of value for that and adjacent regions.

Electrodialysis of soils.—II, Choice of electrodes, H. Humfeld and A. O. Alben (*Jour. Amer. Soc. Agron., 20 (1928), No. 1, pp. 36–50, figs. 13*).—Continuing a study previously noted (E. S. R., 58, p. 717), this contribution from the Iowa Experiment Station presents a review of the literature in which electrodialysis is shown to have been used for many purposes, the kinds of cells, types of membranes, and forms of electrodes varying considerably. Results of experiments in which were used various combinations of electrodes of platinum, copper, carbon, tungsten, and molybdenum are here reported. A copper gauze cathode and a platinum gauze electrode on the acid side gave the highest dialysis rate, but the cheapest satisfactory combination consisted of a copper gauze cathode and a three-wire platinum anode. Anodes of carbon, tungsten, and molybdenum proved unsatisfactory.

Colloid properties of peat [trans. title], A. V. Dumanskiĭ (Dumanski) (*Zap. Voronezh. Selsk. Khoz. Inst. (Mém. Inst. Agron. Voronèje), 5 (1926), pp. 61–80, fig 1*).—The following properties were investigated: (1) The ability of peat to form with water an emulsion and the stability of it; (2) the behavior of such emulsions; the separation of a more dispersed system, i. e., the hydrosol of peat and its properties; (3) the swelling of the dry peat mass; and (4) the ability of peat to liberate water.

There were two distinct lots of peat, one containing a high calcium oxide content (46 per cent of the ash), the other a low calcium oxide content (10

per cent of the ash). The first type goes readily in suspension, and 35 per cent of the peat mass is capable of remaining suspended. The second type forms no emulsion in water. The particles in suspension are charged electronegatively and move in an electric field toward the positive pole with the speed of 0.000024 cm. [per second?] at a 1-volt drop of potential between electrodes 1 cm. apart.

For the study of the water-retention power of the peat, 50 cc. of a mixture of peat and water was poured on a funnel and filtered under a pressure of 3 atmospheres. The residue was then dried in the air and finally in a drying oven.

Neutral and acid salts and acids coagulate the hydrosol formed from peat. Alkali and carbonates of alkali metals peptize the hydrosol. The valency of the cations determines the power of the salts to coagulate the hydrosol, and the order is sodium, magnesium, and aluminum, with the following values for coagulation: Sodium 1, magnesium 14, and aluminum 2,700. Acids coagulate the hydrosols. The hydrosol of iron hydroxide with its positive charge also coagulates the hydrosol from peat. The coagulated substances show adsorption properties. Freezing has also a coagulating effect.

Review of recent German researches on the relation of the moisture conditions and mechanical composition of soils [trans. title], I. I. Zauerbreĭ (J. Zauerbray) (*Izv. Nauch. Melior. Inst.* (*Jour. Sci. Inst. Amelior.*), *No. 13* (*1926*), *pp. 1–43, figs. 6*).—This is a continuation of an extensive analytical review of the subject. The author analyzes the Kopecky method for determining the mechanical composition of soils, giving abundant examples both from the actual trials and from theoretical considerations. He also describes the apparatus in detail and gives directions for conducting the analyses. In the same way the methods for the study of the mechanical analyses of soils by settling and decantation are analyzed. The Atterberg method is taken as the most representative of this type. The author also analyzes the methods which use the settling only as a criterion for the mechanical analyses of soils, using the Zunker method as a representative of this class.

The movement of soil compounds and the influence of calcium [trans. title], K. K. Gedroĭts (*Nosovsk. Selsk. Khoz. Opytn. Sta.* [*Bul.*] *43* (*1926*), *pp. 18, fig. 1.*) The author analyzes the effects of liming on the soil as a means against the destructive action of atmospheric precipitation. This probem is of special importance in the podsol and forest-steppe soil zones. He shows how the H ions from the dissociated water in the presence of carbon dioxide may reach a concentration of 0.0001 gm. per liter (0.1 milliequivalent). The entrance of the H ions into the absorbing complex, notwithstanding the high coefficient of replacement and absorption of the H ion, is prevented if the soil contains soluble salts. Thus a concentration of 0.29 per cent of sodium chloride gives 10 milliequivalents of sodium. Such a high concentration of sodium, even with a low coefficient of replacement and absorption, prevents the H ions from entering the complex capable of base exchange. In the presence of lime the dissociation of the water is decreased, and the amount of calcium ions present is sufficient to prevent the entrance of the H ions.

The H ions entering the humus disperse it; much organic matter is thus lost, and it may be preserved only by the addition of lime, since the calcium humates are less dispersed or are coagulated.

In regions with much rainfall and with a low soluble salt content, the addition of lime is indispensable. The amount may be calculated from the total amount of H ions possible from the total rainfall and the amount of water percolating through the soil.

There is the possibility of saturating a soil with the calcium cation only. Under such conditions the humus fraction becomes unavailable, and the movement of nitrogen is impeded, since this fraction is not attacked by microorganisms. In order to make this fraction soluble, a replacement of calcium by a cation which disperses this fraction is important. The addition of sodium salts will liberate the nitrogen. Any sodium salt is efficient for that purpose.

Solodization (dealkalization) of soils [trans. title], K. K. Gedroĭts (*Nosovsk. Selsk. Khoz. Opytn. Sta.* [*Bul.*] *44 (1926), pp. 49, pls. 2*).—In solonetz (alkali soils) the humus is being leached out because of the high dispersion of the complex saturated with sodium. The aluminosilicate complex capable of base exchange is also being destroyed from the same cause. Such a condition in alkali soils brings about a new soil formation which is morphologically similar to podsol soils of various degrees of podsolization. There is a series of essential differences between the degraded solonetz and the primary podsols. The conditions of the processes of their formation as well as the inherent properties of the formations differ. First of all a degraded solonetz is a secondary soil, which differs from the secondary podsols inasmuch as it is formed from solonetz only. A degraded solonetz is therefore directly connected with the alkalinity of the soil and originates because of the alkali property of the soil. A degraded solonetz is the final stage in the evolution of the salinized soils (solonchak).

The destructive effects on the humus and the aluminosilicate complex in the solonetz result in the formation of compounds not encountered in podsols and thus they vary. For these and other reasons (primarily from the standpoint of genetic relationships), the author suggests the naming of degraded solonetz by a special name. The peasant population calls these soils "solodi" and the process is to be called "solodization."

In alkali soil with no calcium carbonate in it the process of solodization goes on faster, and the soil loses the humates and aluminosilicate complex saturated with sodium. In such soils the inactive portion of the humus remains, there is an increase in the sols of the silica, while the sesquioxides move downward and leach out. Amorphous silica is found in excess. The author shows this by a series of experiments and a large number of analyses. In podsol soil no amorphous silica is found.

The process of solodization (destruction of black alkali soils—dealkalization) has not been studied much, especially in soils containing calcium carbonate.

The soil as a culture medium for agricultural plants [trans. title], K. K. Gedroĭts (*Nosovsk. Selsk. Khoz. Opytn. Sta.* [*Bul.*] *42 (1926), pp. 66, pls. 2, figs. 8*).—Chapter 1 discusses the fundamental properties of the soil, differentiating in the mineral portion two groups of salts, the complex and the simple. To the former belong aluminum and iron silicates, which are insoluble; to the latter belong the carbonates, sulfates, and phosphates of the various cations, which are more or less soluble. These are fundamental characteristics of the soil. The organic portion of the soil is another inherent characteristic. The next of importance is the property of the composition of the complex capable of absorbing cations. Under this the author distinguishes the fine soil particles lower than 0.0001 mm. in size. Another fundamental property is the mechanical composition of the soil.

Chapter 2 discusses the fundamental properties of the soils of the Nosovka Experiment Station.

Chapter 3 discusses the alkali soils of the region and the genesis of the nonalkali soils. The author considers the ultramechanical analyses of the fraction lower than 0.01 mm., the colloidal properties of this fraction such as specific surface, surface energy, state of aggregation, coagulation of colloids, optical

properties of colloidal solutions, soil complex capable of absorption, physico-chemical absorption properties of soil colloids, and composition of absorbed cations in chernozem. The mode of formation of solonchak (salinized) and solonetz (black alkali), changes from sol to gel in the process of formation of these soils, their physical properties and the relation of these properties to the absorbed cations are also analyzed. The distinguishing characteristics of alkali soils and methods of amelioration are given.

Chapter 4 discusses the agronomic properties of the Nosovka chernozem, the response of such soils to different fertilizers, the vegetation experiments conducted, field experiments, and effects of rotations on soil properties.

Chapter 5 discusses the relation between agronomic properties and climate and weather.

The effect of green manures and crop residues on soil reaction, W. G. SACKETT, A. KEZER, I. W. FERGUSON, and J. C. WARD (*Colorado Sta. Bul. 324 (1928), pp. 31*).—The work here reported was undertaken with a view to the correction of the harmful effects of the excess nitrate accumulation in certain Colorado soils, this condition having been noted in a number of previous publications of the station (E. S. R., 45, p. 117; 52, p. 622). The following are noted as the objectives of the investigation: (1) To determine the effect of different crops, crop sequences, cultural practices, and fertilizer treatments upon the development of soil nitrates, (2) to formulate methods for the control of excessive nitrate production by employing the results obtained from (1), and (3) to determine the crops best suited to soils containing excessive nitrates.

The experimental control method consisted essentially in the addition to the soils of such acid-fermenting organic matter as alfalfa hay, barley straw, corn fodder, green barley, and green cane. The first three were applied, finely ground, by sowing them in shallow furrows. On account of the use, to a limited extent, of commercial fertilizers in the truck-growing sections of the State, dried blood, superphosphate (acid phosphate), and sulfur were included among the treatments. Daily samples from each plat were taken to a depth of 4 in., air dried, and ground to pass a 100-mesh sieve. These samples were examined for H-ion concentration colorimetrically, extracts of 15 gm. of the soil having been secured by suspension in 70 cc. of conductivity water. Electrometric checks on the determinations agreed so closely with the colorimetric results as to be considered identical for all practical purposes. The soil is described as a silt loam containing 3.184 per cent of calcium carbonate.

It is concluded that, although it was found possible to increase very slightly the H-ion concentration of the soil under consideration by means of green barley used as a green manure, the reaction remained always within the pH range optimal for both nitrogen fixation and Azotobacter growth. "In the light of our results, we must conclude that the green manures, crop residues, and commercial fertilizers used in this experiment have no value as a source of acid for increasing the hydrogen-ion concentration of a soil rich in calcium carbonate where it is necessary to increase that concentration from pH 7.7 to 6.0 in order to limit the growth of Azotobacter, and consequently are of no benefit in the control of nitrogen fixation by Azotobacter."

Nitrification in the soil of the experimental fields of the Nosovka Agricultural Experiment Station and the rôle of clover in its improvement [tran. title], V. G. TARANOVSKAÏA and F. N. GERMANOV (*Nosovsk. Selsk. Khoz. Opytn. Sta. [Bul.] 45 (1927), pp. 48, figs. 25*).—The results of six years of microbiological studies are summarized as follows:

(1) The chernozem of the Nosovka Station differs from the neighboring chernozem soils by (a) a slow nitrification and (b) unstable processes of

nitrification whereby nitrate formation is impeded during the late fall and in the spring. (2) The poor physical and physicochemical properties of the soil hinder the exchange of gases in the soil. (3) The unsatisfactory physical and physicochemical properties are due to (a) the impoverishment in easily transformable humus (in the presence of a high dust fraction and the absence of a coarse fraction) creates a structureless condition because of the lack of the cementing materials, and (b) the highly dispersed condition of the colloidal particles of the soil which is a result of the leaching out of calcium and the unsaturation with bases. (4) Because of the above the energy of nitrification in the soils is in a certain degree related to the meteorological condition during the year, being the lowest during the season of heavy rainfall. (5) The latter is a result of the antagonism between air and moisture; the highly developed capillarity in the structureless dusty chernozem causes the antagonism. (6) The latter relationship, under ordinary weather conditions, appears yearly in the form of an extended depression of nitrification late in the fall and in the spring. This depression brings about an alternation of minima; in fall the limiting factor is phosphorus and in the spring it is nitrogen. (7) In years of lower than normal rainfall the relationship of moisture and air brings about an increase in the formation of nitrates and a more pronounced action of the phosphates. (8) The latter phenomenon may be associated with the periodic fluctuations of the action of phosphates on chernozem, namely, in the energy of the nitrifying processes in the soil as related to the degree of moisture. (9) The increase in nitrifying capacity when clover is planted and the increase in bacterial numbers in the lower layer are due to the improvement in structure and physicochemical properties of the soil.

Ammonification in Yahola soils, H. F. Murphy (*Jour. Amer. Soc. Agron., 20 (1928), No. 2, pp. 89–92*).—This is a study of the effects of various combinations of liming and manuring treatment on ammonification in Yahola very fine sandy loam and is a contribution from the Oklahoma Experiment Station, continuing previous work on this subject (E. S. R., 56, p. 21). Limestone and calcium oxide at various rates, with or without 8-ton applications of manure, were used. Results are reported as milligrams of ammonia formed from 5 gm. of dried blood added to 100 gm. of soil, during an incubation period of seven days at room temperature and under optimum moisture conditions.

"All of these comparisons go to show that ammonification, while no doubt of importance, is quite a variable biological activity."

Aerobic fermentation of cellulose under the influence of the soil microflora in the zone of the plant root system [trans. title], A. I. Rokitskaĭa (A. Rokitzkaïa) (*Izv. Nauch. Melior. Inst.* (*Jour. Sci. Inst. Amelior*), *No. 13 (1926), pp. 168–208, figs. 30*).—Fifty gm. of soil taken from the root zone of pea and cabbage plants was placed in a uniform layer on the bottom of a 400-cc. Erlenmeyer flask. Two strips of Swedish filter paper, 7 cm. long and 1 cm. wide, were placed on the surface of the soil and 15 cc. of distilled water added, care being taken to wet the filter paper. The cultures were incubated at 23.6° C. (74.48° F.) and observations made on the color changes and general appearance of the filter paper.

The differences in rate of change in appearance and of final disappearance of cellulose in the same soil from the root zones of different plants were very marked. The pea soil started the cellulose decomposition earlier (2 weeks), but the cabbage soil completed the decomposition 12 days ahead of the pea soil. The character of decomposition also differed in the two soils. Microscopic examinations revealed differences in the flora.

Similar examinations were made on the soils from the root zone of the following plants: Two kinds of beets, potatoes, pumpkins, eggplants, sunflowers, cabbage, tomatoes, parsley, onions, mangels, oats, clover, dill, celery, radishes, turnips, lettuce, poppies, carrots, and cucumbers. In this series the incubation temperature was 19.5° C. A detailed description of the macro- and microscopic observations of each soil is given. In the summary table the rate of fermentation of cellulose is recorded for 18 plants. Cabbage and turnip soils decomposed the cellulose the fastest (in 1 month and 13 days), and the potato soil in 5 months and 24 days.

Farm trials of artificial manure, W. A. Albrecht and E. M. Poirot (*Jour. Amer. Soc. Agron., 20 (1928), No. 2, pp. 123–132, figs. 4*).—Straw was prepared for conversion into artificial manure by the addition through the thresher at the rate of 150 lbs. per ton of straw of a starter chemical composed of ammonium sulfate 45 per cent, 10-mesh limestone 40 per cent, and superphosphate (acid phosphate) 15 per cent. When the prepared straw was placed in flat shallow piles it was found possible under the conditions obtaining at the Missouri Experiment Station to depend on rainfall for the moisture necessary to the decomposition. It was also found possible to convert the straw of one wheat crop into artificial manure of good quality in time for use as a winter top-dressing for the next crop. The product secured in the experiments here reported increased the yield and improved the quality of wheat crops to which it was applied, and a photograph of sweet clover from the stubble crop, in which the yield produced by lime, superphosphate, and barnyard manure is shown to be markedly better than that produced by the minerals alone, shows also the sweet clover resulting from the artificial manure with superphosphate and lime, which appears as a greater proportional improvement over the results from barnyard manure than is the last named over the results from minerals alone. At the present cost of the process for nitrogen it is considered that the preparation and use of artificial manure would be economically successful under ordinary farming conditions.

Fertilization of peat soil [trans. title], H. von Feilitzen (*Svenska Mosskulturför. Tidskr., 40 (1926), No. 3, pp. 193–216, figs. 15*).—The experiments which have been carried out by the agricultural societies in cooperation with the State Agricultural Eperiment Laboratory in the various districts, or the so-called local field experiments, "do not limit themselves . . . to experiments on solid ground soil. Even on the cultivated peat soils, in the course of years, a very large number of such field experiments have been carried out, principally with a view to ascertaining the fertilizer requirements of these soils with respect to various crops."

Appended tables are arranged to give a view of the extent of the experiments for the years 1921–1924 and to show the numbers of experiments with each of a number of crops on clay, sand, loam, and peat soils. Similar information is presented in the form of a diagram, and a map shows the distribution of the 412 peat soil experiments, together with that of a considerable number of experiments on other soil types. The conclusions are summarized as follows:

"(1) Fertilizer experiments on green fodder oats in Norrland have yielded large results for the fertilizer applied, which has paid for itself decidedly well. Complete fertilizing with all three plant nutrients has in the majority of cases given the best yields. (2) Fertilizer experiments on oats to ripening have shown good results for the phosphoric acid fertilizer and even for a moderate potash application. Additions of nitrogen have not here paid for themselves. (3) Fertilizer experiments on turnips gave large results for phosphoric acid and potash, but produced almost insignificant results with

nitrogen fertilization. Here the simultaneous application of stable manure partly covered the fertilizer requirement. (4) Fertilizer experiments on grassland have given very good results on peat soil for phosphoric acid, potash, and nitrogen fertilizing. The nitrogen fertilizers concerned deviate somewhat from the older idea, according to which a nitrogen fertilizer on this soil is generally considered superfluous. (5) The averages obtained by the statistical analysis of the foregoing experimental material should not be generalized but only applied as a guide for the most suitable fertilization for a given crop on peat soil."

Nitrogenous fertilizers and soil acidity, I, II, W. H. Pierre (*Jour. Amer. Soc. Agron., 20 (1928), No. 3, pp. 254–279*).—These two papers, contributions from the Alabama Experiment Station, present the results of a detailed quantitative investigation of the effects of commonly used nitrogenous fertilizers upon the reaction of the soil and practicable means for the prevention of the development of excess acidity from this cause.

I, *Effect of various nitrogenous fertilizers on soil reaction* (pp. 254–269).—In the first group of experiments it was sought (1) to determine the effect of the various sources of nitrogen on the soil H-ion concentration, (2) to determine the increase or decrease of exchangeable hydrogen brought about by nitrogenous fertilizers, and (3) to obtain figures expressing the relative effects of these fertilizers upon the soil reaction. For these purposes field and greenhouse experiments, reported in detail, were performed with Norfolk sandy loam and Cecil clay loam soils.

It was found that all of the substances tested had some effect upon the soil H-ion concentration. Sodium nitrate, calcium nitrate, and calcium cyanamide decreased it, while ammonium sulfate caused the greatest increase, and was followed in order by ammonium phosphate, Leunasaltpeter, ammonium nitrate, and urea. The relative figures for acidity in unleached soils were, with ammonium sulfate taken as 100, Leunasaltpeter 65, ammonium phosphate 51, urea 28, and ammonium nitrate 28. After leaching, a condition believed more accurately to represent field conditions, the figures were, on the same basis, 83, 75, 53, and 50, respectively. Exchangeable hydrogen was increased, on the basis of the effect of ammonium sulfate taken as 100, by ammonium phosphate 100 to 104, Leunasaltpeter 68 to 76, ammonium nitrate 42 to 55, urea 42 to 50, calcium nitrate —39, sodium nitrate —42 to —55, and calcium cyanamide —55. It had been calculated on the basis of theoretical considerations that the order of effect on soil acidity should be ammonium sulfate 100, ammonium phosphate 100, Leunasaltpeter 75, urea 50, and ammonium nitrate 50, so that the figures found are considered in good agreement with the theory.

II, *The use of fertilizer combinations, lime, and basic slag in correcting the acidity formed by various nitrogenous fertilizers* (pp. 270–279).—The objects of this second part of the investigation are stated as follows: (1) To determine proportions in which acid-forming nitrogenous fertilizers can be combined with physiologically basic fertilizers to avoid altering the soil reaction, (2) to determine the quantity of lime necessary to correct the effects of acid-forming fertilizers, and (3) to secure a like relative evaluation with respect to the various acid-forming fertilizers for basic slag. Pot experiments were employed for these purposes, the same two soils being used as in the first part of the work above noted. The same sources of nitrogen were considered, the physiologically basic forms being tested, together with lime and basic slag as correctives for the acidity developed by the ammonium salts, urea, etc. H-ion concentration and exchangeable hydrogen were determined as in the first group of experiments in the variously treated soils.

Sodium nitrate and ammonium sulfate in the proportion, on the basis of the nitrogen content, of 75:25 formed a mixture which left the soils at their original reaction, this proportion agreeing well with that calculated from theoretical considerations. The acidity resulting from the use of ammonium sulfate was corrected by precipitated calcium carbonate when used in the proportion of 1.2 lbs. of the latter to 1 lb. of the former. The nitrogen equivalent of 1 lb. of ammonium sulfate required in the cases of ammonium phosphate, Leunasaltpeter, urea, and ammonium nitrate 1.0, 0.9, 0.6, and 0.6 lb. of precipitated calcium carbonate, respectively. The physiological acidity of 1 lb. of ammonium sulfate was found to require 2.2 lbs. of basic slag, and it is considered evident from these experiments that the use of basic slag as a source of phosphorus is a practical means of correcting acidity developed by acid-forming nitrogen sources.

Influence of various nitrogenous fertilizers on availability of phosphate, J. F. Fudge (*Jour. Amer. Soc. Agron., 20 (1928), No. 3, pp. 280–293*).—This contribution from the Wisconsin Experiment Station is a study of the influence of various sources of nitrogen on the availability of phosphate in soils from plats of the sources of nitrogen experiments of the Alabama, Rhode Island, and New Jersey Experiment Stations. The experimental procedure consisted of determinations of (1) the concentration of inorganic and total phosphates in the displaced soil solution, (2) concentration of inorganic and total phosphates in 1:5 water extract, and (3) concentration of inorganic phosphate in 1:5 carbon dioxide solution extract in the cases of the soils from the first two stations, three other determinations having been added in the case of the New Jersey Experiment Stations' soils as follows: (a) Determination of the inorganic phosphate removed by continued leaching, (b) determination of the phosphate absorbed from a solution of monopotassium phosphate, and (c) determination of the phosphate removed from the soil by wheat seedlings according to Neubauer's method (E. S. R., 53, p. 319). Results obtained by all these methods agreed in indicating that physiologically basic fertilizers increased the phosphate availability, while acid-forming fertilizers decreased it, as compared with the availability as determined on check plats unless lime was applied. Liming greatly increased the availability of the phosphate in all plats and corrected the detrimental effect of the acid-forming nitrogenous fertilizers.

A short geological sketch on limestone [trans. title], V. N. Chirvinskiĭ (*Nauch. Zap. Gosud. Èksper. Inst. Sakh. Promysh.* [*Kiev*], *4 (1927), No. 5, pp. 144–150*).—The author reviews (1) the formation of limestone, (2) forms of limestone, (3) mineralogical and chemical composition, (4) physical properties, and (5) the age and the deposits of limestone in the Ukraine.

A bibliography on concentrated fertilizers and fertilizer materials, W. H. Ross (*Washington, D. C.: Natl. Fert. Assoc., [1928], pp. [1]+39*).—This is a classified bibliography prepared by the concentrated fertilizer laboratory of the U. S. D. A. Bureau of Chemistry and Soils. Its major subdivisions are (1) periodical literature—preparation, chemical and physical properties, methods of analysis, field and pot tests, and general, and (2) patents—United States patents and German patents.

AGRICULTURAL BOTANY

[Carnegie Institution of Washington] laboratory for plant physiology, D. T. MacDougal et al. (*Carnegie Inst. Wash. Yearbook 26 (1926–27), pp. 149–164*).—This report deals with the work of the department for the year (E. S. R., 57, p. 814) under the group headings of growth, photosynthesis and metab-

olism, studies in atmospheric oxidation, the hydrostatics of trees, and ecology. Results of certain studies are outlined below.

Factors or agencies affecting growth, especially in trees, D. T. MacDougal (pp. 149, 150.)—The activity of protoplasm in cell division, accretions to living material, and distention of cells is said to be determined by the degree of hydration of the jellies of the cell colloids, temperature, and supply of food material. Correlations are discussed.

An automatic dendrometer, D. T. MacDougal (pp. 150, 151).—The structure and operation are outlined of an automatic dendrometer, the simplicity of which it is claimed will make it possible to take observations at numerous points on the surface of a tree trunk. With slight modifications in the support, variations in thin stems of small plants may be measured.

Dendographic records of a poplar, D. T. MacDougal (pp. 151, 152).—Growth measurements on a poplar, *Populus macdougalii*, which had been carried on at the Desert Laboratory in 1920–1922 were resumed in 1926. Growth continued from March 1 to October 25, the diameter increasing from 123 to 140 mm. Irrigation maintained adequate soil moisture. The activity of this tree represents the maximum seasonal activity of a perennial plant in such a desert climate.

The course of growth in the tree-cactus, D. T. MacDougal (p. 152).—The last series of dendrographic measurements of growth in a tree cactus, continuous since 1924, showed daily variations which are detailed. Root growth (length and thickness) starts at much lower temperatures than are necessary for trunk growth. The trunk of *Carnegiea gigantea* expands in the daytime and shrinks at night.

Changes with age of long-lived cells, D. T. MacDougal (pp. 152, 153).—Observations on cells of the medulla of the Arizona tree cactus which may divide, grow, or distend for at least a century have been extended to the barrel cactus (Ferocactus), the medulla cells of which enlarge for about 10 years, then live for perhaps a century without changes in volume or form due to compression. The least variation with age was found in the lipoids or fatty substances of the cells.

Further studies on the structure and composition of old cells of Carnegiea, J. B. Overton (pp. 153, 154).—Some features of the cells of the medulla of the giant cactus (*C. gigantea*), in which the cells actively alive have grown a century, have been described by MacDougal (E. S. R., 56, p. 516). From a preliminary study of the cytological features which these cells show during their long existence it appears that the more solid components of the cells, especially carbohydrates, are depleted with age in the formation of cell walls, which become very thick, laminated, and pitted in case of the older cells. Other characters are detailed, with later findings as regards crystals present in the older cells.

Rôle of lipoids in permeability, D. T. MacDougal and V. Moravek (pp. 154, 155).—A cell constructed of colloidal materials present in protoplasm and its inclosing membranes has been used extensively in the measurement of the passage of water, electrolytes, and organic substances through layers of biocolloids. A method was perfected by which colloidal cells were made with lipoid films through which both oils and watery solutions might pass. A most striking result was that by which artificial cells filled with sugar solutions maintained their acidity when immersed in wide range acidity or alkalinity. A suggested explanation supposes that a layer is formed highly impermeable to H, OH ions, but more permeable to ions of the common metals.

Preparation and properties of leaf pigments.—1. Carotin, H. A. Spoehr, J. H. C. Smith and W. G. Young (pp. 156, 157).—A series of experiments has been

carried out to determine whether formaldehyde is formed by the photo-oxidation of carotin in a stream of pure oxygen. Neither dry nor moist oxygen in glass or quartz apparatus exposed to sunlight from 24 to 48 hours gave positive reactions indicating formaldehyde.

Transformations of carbohydrates in plants—conversion of starch into sucrose, H. A. Spoehr and W. Newton (pp. 158, 159).—Attempts to determine the first carbohydrate formed in photosynthesis have not yielded definite results. The transformations in the leaf are deemed too complex to permit the unraveling of the complex of reactions. The carbohydrates principally concerned are glucose, fructose, sucrose, maltose, and starch, and the chief difficulty has been to explain the conversion of starch into sucrose. It has been thought that in the plant glucose can be converted into fructose, and that this may unite with glucose to form sucrose. The involved reactions are indicated. Experiments conducted to determine whether such a series of reactions actually occurs in the potato have been carried out under widely varying conditions, from which it is concluded that the reactions do not represent the actual course of the carbohydrate transformations. The experiments thus far carried out indicate that sucrose is formed directly from starch, or at least without intermediate glucose formation.

Additional observations on stem anatomy and sap conduction, J. B. Overton and G. M. Smith (pp. 159, 160).—The results of preliminary experiments by Overton have been noted (E. S. R., 57, p. 815). The observations were based upon sections of freshly cut water-saturated wood, immediately after removal from the acid fuchsin, a method which it is thought may lead to erroneous conclusions because of the oozing and spreading of the dye on the freshly cut surface. This experimental error has been overcome by means indicated. As previously stated, sections of the willow show that practically all the annual layers retain their power to conduct, but that the individual conducting elements of the xylem possess unequal conducting capacities, conduction being mainly in the late summer wood of any annual layer near the terminal parenchyma.

There is also a zonation of the dye in the walnut, the stain traveling chiefly in the late summer wood and in the portion of the spring wood immediately outside. The zonation of the dye in both species was explained by the presence of tyloses in spring wood of the current or of the previous year at all levels from the apex to the base of the tree. These conclusions were based upon studies of the young branches. A further topographical survey, based on sections cut at various levels of a 12-year-old walnut stem, shows that for the first 3 or 4 years there is a tylosing of vessels in the spring wood of the current or of the previous year. The causes of stoppage of conduction in early summer wood are being sought for in the vertical distribution of tyloses in the vessels.

Formation of tyloses in amputated stems, G. M. Smith (pp. 160, 161).—Observations on stumps of Salix and Juglans, amputated in the summer of 1926, show the usual tylosing of exposed vessels. Topographical anatomical surveys of these stumps a year later show correlation between the movement of the transpiration stream and the development of tyloses after amputation. This correlation is found both in stumps bearing branches below the plane of amputation and in stumps bearing no branches but developing shoots from adventitious buds after amputation. Evidences and inferences are discussed. Experiments with sealed ends of Juglans branches do not confirm the observation that hermetical sealing of amputated branches prevents the formation of tyloses below the cut surface.

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Exudation and "root pressures," J. B. Overton (pp. 161, 162).—Defoliation experiments on small trees containing a small total gas body have been continued so that the tension on the water columns may be diminished or removed, and the effect of water in the soil in contact with the roots observed. Though the moisture about the roots affects somewhat the suction or pressures shown by manometers attached to the branches, irrespective of temperature changes, not all the pressure variations can be ascribed to root activity. Apparently such pressure variations depend not only upon the amount of water in contact with the roots, but also upon the amount of the plant left for the experiment. It appears from experimentation briefly described that the manometric variations shown by stumps are not to be ascribed entirely to the activity of living cells of the root, to cells in the neighborhood of the wound, to changes in the hydrostatic system due to transpiration and evaporation from the lenticels, or to expansion or contraction of the enclosed gas body. It is thought that the suction shown in the manometer is due largely to hydration of the tissues and their constituents. It appears evident that the amount of available water in the soil affects swelling and consequent manometric measurements, and that the hydration of plasmic masses and the capillary filling of the vessels and other wood cells are important factors affecting pressures as manifested in manometers attached to bore holes or to stems and branches.

Composition of gases in trunks of trees, D. T. MacDougal (pp. 162, 163).—In the sap stream the proportion of oxygen is invariably less and that of carbon dioxide always greater than in the air, and the sum of the two is less than that in the atmosphere; the conditions suggesting that the deficit is made up by such gases as methane or carbon monoxide. Water insoluble terpenes are always present in the gases of the pine, and determinations show them to be present in gases of willow, oak, and poplar to about 1:1,000. These substances retard the absorption of oxygen by phosphorus in the analyses, possibly materially also in the protoplasmic mass.

The results of a series of analyses support the conclusion that the carbon dioxide content is an index of the degree of growth activity. Some of these results are given for *Quercus agrifolia, Salix lasiolepsis, Populus macdougalii,* and the Monterey pine.

Soil conditions in relation to desert vegetation, F. Shreve and J. L. Doughty (p. 163).—"One of the most clearly marked cases of vegetational differentiation in the desert valleys near Tucson has been used in a further investigation of the possible rôle of soil conditions in underlying such differences in the natural plant cover. Soils were used from seven localities, in four of which the vegetation is a pure or nearly pure stand of Covillea, while the other three are adjacent areas without Covillea, and bearing a different type of vegetation in each case. Representative soil samples of the first and second foot were collected from the several areas and were examined for calcium, magnesium, sulfates, carbonates, bicarbonates, chlorine, and sodium, and some of the samples were extracted by means of water saturated with carbon dioxide. Results are briefly indicated. "The soils on which Covillea is found show no tendency to bake, while the soils in the other areas bake very hard, despite the low clay content."

[Carnegie Institution of Washington] studies on ecology, F. E. Clements (*Carnegie Inst. Wash. Yearbook 26 (1926–27), pp. 305–337*).—The work of the year, as here reported on the same general plan as previously (E. S. R., 57, p. 818) under the title of ecology, and as distributed under the topics ecogenesis, experimental phylogeny and taxonomy, factor and function, climax and succession, bioecology, and paleo-ecology, includes, under more specific titles, reports or other statements on Adaptation, by F. E. Clements, C. Whitfield, and L. Gard-

ner (pp. 305, 306); Method of Adaptation Transplants, by F. E. Clements, C. W. Penland, C. Whitfield, and L. Gardner (pp. 306–308); Acclimatization Gardens, by F. E. Clements, H. M. Hall, J. E. Weaver, C. W. Penland, J. V. G. Loftfield, A. G. Vestal, B. C. Tharp, H. T. Darlington, and M. W. Evans (pp. 308, 309); Experimental Morphogeny, by F. E. Clements, F. C. Bowman, and E. S. Clements (pp. 309, 310); Hybridization in Nature, by C. W. Penland and F. E. Clements (pp. 310, 311); Experimental Phylogeny and Taxonomy, by H. M. Hall, D. D. Keck, and W. M. Heusi (pp. 311, 312); Taxonomy of Haplopappus, by H. M. Hall (pp. 312, 313); A Synthetic Study in the Phylogeny of Ceanothus, by H. E. McMinn, R. W. Chaney, and H. M. Hall (p. 314); Experimental Mycology, by F. E. Clements, C. L. Shear, and E. S. Clements (pp. 314, 315); New Instruments, by F. E. Clements and G. W. Goldsmith (pp. 315, 316); Extensions of the Phytometer Method, by J. E. Weaver and F. E. Clements (p. 316); Climatic Cycles and Tree Growth, by A. E. Douglass (pp. 316, 317); Grassland, Chaparral, and Soil Texture (pp. 317, 318) and The Net Moisture-Equivalent of Stony Soils (p. 318), both by A. G. Vestal; Experimental Vegetation in the Knysna Forests, by J. Phillips (pp. 318, 319); The Photosynthate Method, by F. L. Long, F. E. Clements, C. L. Haupt, and J. D. Waldie (pp. 319, 320); Stomatal Behavior in the Giant Cactus, by F. L. Long (pp. 320, 321); Factors Involved in Opening and Closing Flowers, by G. W. Goldsmith and A. L. Hafenrichter (pp. 321, 322); Root Development of Vegetable Crops, by J. E. Weaver and W. Bruner (p. 322); Growth and Regeneration in Subtropical Forests, by J. Phillips (pp. 322, 323); Community Functions, by F. E. Clements (pp. 323, 324); Plant Competition, by F. E. Clements, J. E. Weaver, and H. C. Hanson (pp. 324, 325); Research in Forest Influences, by E. I. Kotok, C. J. Kraebel, W. C. Lowdermilk, and F. E. Clements (pp. 325, 326); Origin and Structure of the Alpine Climax, by F. E. Clements and C. W. Penland (p. 326); Limiting Factors of Forest, Chaparral, and Grassland, by F. E. Clements, A. G. Vestal, and J. V. Simon (pp. 326, 327); Extent and Nature of the Coastal Prairie, by F. E. Clements and B. C. Tharp (p. 327); Associes of Padre Island and Vicinity, by B. C. Tharp (pp. 327, 328); Research in the Deciduous Forest and Grassland Formations, by J. E. Weaver, J. Aikman, A. E. Holch, T. L. Steiger, W. Bruner, and H. J. Cottle (pp. 328, 329); Succession in the Coastal Plain of North Carolina, by B. W. Wells (p. 330); Succession in an Upland Grass-Sedge Bog, by B. W. Wells and I. V. Shunk (p. 330); Succession and Forest Types in the Knysna Region, by J. Phillips (p. 330); Climaxes and Successions in the "Campia" of Roumania, by A. Borza (p. 331); Concepts and Objectives in Bioecology, by F. E. Clements and V. E. Shelford (pp. 331, 332); Comparison of Marine and Terrestrial Biomes, by V. E. Shelford (p. 332); Bioecology of Subclimax Sagebrush, by A. O. Weese (pp. 332, 333); Grazing Research in Arizona, by F. E. Clements, G. A. Pearson, C. K. Cooperrider, M. J. Culley, R. F. Copple, W. P. Taylor, C. T. Vorhies, and W. G. MacGinnies (pp. 333, 334); Rodents and Erosion on the Roosevelt Watershed, by C. K. Cooperrider, R. F. Copple, and W. P. Taylor (pp. 334, 335); Grazing and Forest Reproduction, by G. A. Pearson (p. 335); Grazing Research in Colorado, by H. C. Hanson, W. S. Ball, and A. M. Lute (pp. 335, 336); and Correlation of Ecology and Paleo-ecology, by F. E. Clements and R. W. Chaney (pp. 336, 337).

GENETICS

Pericarp studies in maize, II, III (*Genetics, 9 (1924), No. 5, pp. 442–453; 13 (1928), No. 2, pp. 111–120, figs. 2*).—Further investigations (E. S. R., 52, p. 222) at Cornell University are reported.

II. *The allelomorphism of a series of factors for pericarp color*, E. G. Anderson.—An extensive series of pericarp color types in corn was shown to be

allelomorphic or closely linked in inheritance. The evidence seemed to favor allelomorphism. A large number of genes, including two series of highly mutable genes, appeared to be included in the series. The genes could not be arranged into a simple graded series, being grouped into several diverse series.

III. *The frequency of mutation in variegated maize pericarp*, E. G. Anderson and W. H. Eyster.—When somatic mutations to red in variegated corn pericarp were classified as to the area affected and the near-self (heritable) and dark-crown (nonheritable) series of mutations were recorded separately, the dark-crown mutations were found to be about 3.8 times as frequent as the near-self mutations affecting equal areas. Both series of mutations showed an increasing rate of mutation during the period of ontogeny covered by the studies.

Glossy seedlings in maize, H. K. Hayes and H. E. Brewbaker (*Amer. Nat., 62 (1928), No. 680, pp. 228–235*).—Genetic studies with corn at the Minnesota Experiment Station revealed two new glossy seedlings, gl_2 and gl_3, other than that located in the linkage group *Bn-sl-*gl_1*-ra*. Intercrosses of gl_1, gl_2, and gl_3 gave normal seedlings in F_1 and 9 normal: 7 glossy in F_2. In inheritance gl_2 appeared to be independent of the aleurone factor pairs *Cc*, *Rr*, and *Aa*, and of the endosperm factors *Wx wx*, *Sh sh*, *Su su*, and *Yy*. Also, gl_2 was linked with the factor pair for flinty v. floury endosperm with a recombination percentage of about 30.

A summary statement of studies not reported in detail indicated that flinty v. floury is independent in inheritance with the factor pairs, namely, *Yy*, Gl_1 gl_1, *Sl sl*, *Gg*, *Ra ra*. The flinty-floury factor pair gave independent inheritance also with factor pairs for Minnesota No. 13 virescent seedling v. normal, sorghum tassel v. normal, and brown midrib v. normal. These three characters have been studied extensively with known linkage groups without a close linkage relation becoming evident.

The effects of a lethal on the heterozygote in maize, P. C. Mangelsdorf (*Jour. Heredity, 19 (1928), No. 3, pp. 123–131, figs. 2*).—An inbred strain of corn carrying the lethal factor de_7 (E. S. R., 55, p. 428), described as a defective seed mutation but apparently otherwise normal, was crossed with another inbred strain which seemed homozygous in all its factors. Of the F_1 plants from this combination the plants (*DeDe*) homozygous for the dominant allelomorph of the lethal factor were slightly superior to those (*Dede*) heterozygous for the lethal factor in height of plant at five different periods of development, in earliness of blooming, and in length and weight of ears. These facts suggest that this recessive lethal factor has an effect, extremely slight in the heterozygous condition. Elimination of deleterious recessives as a means of improvement is discussed briefly.

A preliminary note on the occurrence of haploids in Crepis, L. Hollingshead (*Amer. Nat., 62 (1928), No. 680, pp. 282–284, fig. 1*).—Haploid plants (n=3) of *C. capillaris* were observed in studies at the University of California.

The "outside-in" Oenothera flower, a new morphological type produced by the interaction of two recessive Mendelian factors, G. H. Shull (*Natl. Acad. Sci. Proc., 14 (1928), No. 2, pp. 142–146*).—This is a contribution from Princeton University.

Linkage with crossing-over between rubricalyx buds and old-gold flower color in Oenothera, G. H. Shull (*Natl. Acad. Sci. Proc., 14 (1928), No. 2, pp. 147–149*).—The study reported was carried on at Princeton University. See also an earlier note (E. S. R., 56, p. 521).

Improvement of Phormium tenax (*New Zeal. Jour. Agr., 36 (1928), No. 2, pp. 112–115*).—Studies by J. S. Yeates on varieties representative of both species

of Phormium showed that the chromosome number is the same in all, 16, and that the behavior of the chromosomes is regular throughout. Desirable qualities in *P. tenax* are described, and a plan for improvement work is outlined.

Do potato varieties degenerate in warm climates? J. Bushnell (*Jour. Heredity, 19 (1928), No. 3, pp. 132–134, fig. 1*).—Evidence cited in this contribution from the Ohio Experiment Station is in accord with the view that degeneration of potatoes is entirely due to diseases rather than to any direct effect of high temperature itself upon the hereditary complex.

Studies on the inheritance of sterility in rice, J. Ishikawa (*Jour. Col. Agr., Hokkaido Imp. Univ., 20 (1927), No. 3, pp. 79–201, pls. 4*).—Sterile, partial sterile, and semisterile plants, mutants arising in a strain of Toyokuni rice, differed phenotypically only in degree of sterility, meiosis was normal, and their haploid number was found to be 12. Sterile, which behaved as a monohybrid recessive to normal, would be regarded as male sterile, since considerable abortion occurred in the pollen grains and the anther could not dehisce, although the ovules were perfect and functional. Partial sterile segregated into ratios of about 7 true breeding fertiles to 1 segregating partial sterile. About 40 per cent of the spikelets were sterile in this type. Abortion of the microspores and megaspores was not observed in partial sterile, and pollen grains germinated as well as in the normal plant. Partial sterile appeared to be a monohybrid involving a lethal factor. Semisterile segregated into 1 fertile: 1 semisterile. Semisteriles in the progenies segregated into the same ratio. Semisterile appeared to be heterozygous for two factors, *A* and *B*. The micro- and megaspores, which lacked both factors, were sterile, and those which possessed both factors were also abortive. Therefore, half of the gametes of semisterile were abortive, and fertiles thrown by semisterile evidently possessed either *A* or *B*. Remains of neither the embryo sac nor cavity could be found in the abortive ovules.

Spontaneous origin of an aberrant rice plant, Magatamaine [trans. title], M. Kondō and S. Fujimoto (*Ber. Ōhara Inst. Landw. Forsch., 3 (1927), No. 4, pp. 421–424, pls. 2*).—Magatamaine, which arose as a mutation in the Shinriki rice variety, has more slender and longer panicles than the parent, and its panicles and branches remain erect when fully mature. The kernel of the mutant is spindly and rather crooked and the dehulled grain very low in quality and useless. The character appeared to be a monofactorial recessive to Shinriki. Sterile plants appeared frequently among the progeny of the mutant.

A study of (P. B. 119 × C. A. C. 87) F_1 hybrid and other sugar cane seedlings and their parents, E. M. Morales (*Philippine Agr., 16 (1928), No. 9, pp. 543–556, figs. 6*).—Studies on P. B. 119 sugar cane, P. B. 119 naturally-selfed seedlings, C. A. C. 87, and F_1 of P. B. 119×C. A. C. 87 revealed a high degree of variability in a number of agronomic characters in the naturally selfed seedlings and the hybrids, particularly in the latter. Tonnage, erectness and number of stalks, and percentage of total solids seemed to be improved by crossing, and the P. B. 119 naturally-selfed seedlings surpassed the parent in tonnage, stalk height, internode length, and number of millable stalks. Asexual offspring of certain selected seedlings were found superior to the parent plants in tonnage, average stalk diameter, and number of millable and unmillable stalks.

Inheritance of awns in crosses involving Sevier and Federation wheats, G. Stewart (*Jour. Amer. Soc. Agron., 20 (1928), No. 2, pp. 160–170*).—Data obtained at the Utah Experiment Station in studies involving a cross between pure lines of Federation and Sevier and a cross between a pure line of Federation and Sevier×Dicklow confirmed the theory previously advanced for

the cross (E. S. R., 56, p. 520), namely, two factors for awns so linked as to yield F_1 gametes in the ratio of 1.8:1:1:1.8, i. e., about 35 per cent of crossing over. The studies have indicated that each of the two factors, *Aa* and *Tt*, when present separately produces a different although somewhat equal major effect.

Immunity of Hope wheat from black stem rust inherited as a dominant character, J. A. Clark and E. R. Ausemus (*Jour. Amer. Soc. Agron., 20 (1928), No. 2, pp. 152–159, fig. 1*).—Hope, a hard red spring wheat derived from a cross of Marquis wheat on Yaroslav emmer, has been practically immune in the field from attacks of black stem rust and also immune from or highly resistant to certain other wheat diseases. Under field conditions at Mandan, N. Dak., in 1927, susceptibility in resistant×susceptible crosses, not including Hope wheat, was inherited as a dominant character. Other data showed that the immunity of Hope wheat in immune×resistant and in immune×susceptible crosses is inherited as a dominant character.

The origin of certain thornless blackberries and dewberries, H. M. Butterfield (*Jour. Heredity, 19 (1928), No. 3, pp. 135–137, figs. 2*).—As a matter of record information is presented upon the origin of the Cory thornless blackberry, Austin thornless dewberry, and Burbank thornless berry. In experiments conducted by the author the Cory thornless crossed with the Austin thornless yielded about 25 per cent of thornless progeny which closely resemble the pollen parent, Austin thornless. One plant was practically free of pubescence on either side of the leaves. At the time of writing none had fruited.

Notes on thornless blackberries, G. M. Darrow (*Jour. Heredity, 19 (1928), No. 3, pp. 138–142, figs. 4*).—Supplementing the preceding paper, the author states that neither the Cory thornless nor the Austin thornless are hardy in the eastern United States. Grown from root cuttings the Cory thornless becomes thorny, indicating a chimeral origin with the probability that the mutating tissue simply overgrows the normal thorny tissue. On the other hand, the Austin thornless comes true from root cuttings.

A. E. Longley found 7, 28, 14, and 14 chromosomes, respectively, in the Burbank thornless, Austin thornless, Oregon Evergreen, and Himalaya. These numbers are held by the author to explain the failure to secure fertile progeny in a cross between Burbank thornless and Oregon Evergreen and the success secured in crossing Oregon Evergreen with Himalaya. A thornless blackberry, *Rubus canadensis*, occurring in eastern North America and bearing edible fruits was found by Longley to have 21/2 chromosomes, a number usually associated with first generation hybrids. Brainerd and Peitersen (E. S. R., 44, p. 237) found that 85 per cent of the pollen of this species was imperfect, casting further doubt on its acceptance as a distinct species.

Chromosome-mutant types in stocks.—II, Putting a tramp chromosome to work, H. B. Frost (*Jour. Heredity, 19 (1928), No. 3, pp. 104–111, figs. 3*).—Pointing out the fact that double flowered stocks, highly desirable from a horticultural viewpoint, are completely sterile and are grown from seed of single flowered forms that are heterozygous for the recessive double character, the author states that in the Snowflake variety a certain single flowered type characterized by slender leaves and an extra chromosome is a peculiarly prepotent parent of double flowered plants. Apparently the extra chromosome of this variation carries the locus of the genes which determine the character of the flowers.

The genetics of sexuality in animals, F. A. E. Crew (*Cambridge, Eng.: Univ. Press, 1927, pp. X+188, figs. 37*).—The more fundamental phases of sex determination are presented under the chapter headings of the mechanism of sex determination, the physiology of sexual differentiation, sex reversal in the

adult individual, the mode of inheritance of sex-dimorphic characters, and the sex ratio.

A qualitative indicator for the testis hormone, C. R. Moore (*Soc. Expt. Biol. and Med. Proc., 24 (1927), No. 9, pp. 847, 848*).—In tests with guinea pigs at the University of Chicago, the author found that the spermatozoa present in the epididymis after the testis from that side was removed retained their power of motility when properly stimulated for a period of two months or longer provided the opposite testis was present. In animals in which both testes were removed the capacity for motility of spermatozoa in the epididymis was retained for less than 30 days. It is suggested that the length of retention of spermatozoon motility may be used as an indicator of the presence of the testis hormone.

Other work is also cited to indicate that cytological changes in the epididymis may afford a more rapid indicator of the presence of the hormone of the testis.

FIELD CROPS

Forty years' experiments with grain crops, C. A. Zavitz (*Ontario Dept. Agr. Bul. 332 (1927), pp. 98, figs. 11*).—The activities and methods of the field husbandry department of the Ontario Agricultural College are reviewed, with reports of investigations over more or less extended periods comprising crop rotations; variety, cultural, and seeding experiments with cereals, particularly oats, legumes, flax, and miscellaneous crops; and trials of crop mixtures for grain and forage.

Oats and barley in central Montana, R. W. May (*Montana Sta. Bul. 209 (1927), pp. 24, figs. 8*).—Experiments on the Judith Basin Substation, in cooperation with the U. S. Department of Agriculture, have shown midseason oats to outyield and weigh more per bushel than early oats. Markton, Silvermine, and Lincoln are indicated as outstanding varieties. Oats seeded April 12 have averaged 49.7 bu. per acre, April 29 40.6 bu., and May 16 26.7 bu. Seeding tests suggested a 6-pk. acre rate for large grained varieties and 5 pk. for the small grained sorts.

Recent barley tests indicate Horn as best for dry lands, Hannchen a good substitute for Horn, White Smyrna for late seedings, and Trebi for irrigation. Two-rowed barleys have outyielded and weighed more than 6-rowed varieties. April 12 seedings averaged 33.4 bu. per acre, April 29 29.7 bu., and May 16 21.8 bu. per acre. About 5 pk. per acre appears to be the most satisfactory rate.

Data cited indicate that the barley acreage should be increased, replacing some of the oats acreage. Important varieties of both cereals are described briefly.

Tillering and culm weight of modern wheat and barley varieties [trans. title], H. Raum (*Pflanzenbau [Berlin], 3 (1927), No. 23, pp. 357–363*).—The average tillering, weight of grain per spike, and weight of straw per culm are tabulated for 15 varieties and strains of winter wheat and for 47 sorts of spring barley studied in 1924, 1925, and 1926.

A chemical study of a new system of grass land management for increased protein production, F. T. Shutt (*Canad. Chem. and Metall., 11 (1927), No. 12, p. 322*).—Experiments at the Central Experimental Farm at Ottawa, wherein unfertilized plats in a uniform grass area, chiefly meadow foxtail, were cut at intervals of 7, 14, and 21 days and as hay and aftermath, demonstrated that the yield of dry matter was greatest from the hay crop, whereas the greatest quantity of total digestible dry matter and digestible protein were produced on the plat cut every 21 days. Indications were that grasses cut or

grazed often enough to be physiologically young, but not retarded in growth, supply more digestible organic matter and protein than hay from plats of the same area.

Forage plants in the Don Region [trans. title], N. I. PUSHKAREV (*Rostovo-Nakhichevan. na Donu Oblastn. Selsk. Khoz. Opytn. Sta. Biul. 242 (1927), pp. 91, fig. 1; Eng. abs., pp. 88–90*).—The comparative forage values of native and exotic crops, including grasses, sorghum, corn, alfalfa, fodder beets, and cucurbits, and legume-cereal mixtures are discussed at length from the results of extensive trials at the Rostov (Don) Agricultural Experiment Station. The merits of certain crops and combinations for silage and seed production are also indicated.

Impermeable seed of alfalfa, A. M. LUTE (*Colorado Sta. Bul. 326 (1928), pp. 36, pl. 1, figs. 5*).—Climate, altitude, maturity, drying, seed coat injury, and individual plant difference were studied as to their influence on the impermeable or hard seed content of alfalfa. The progress of and some significant observations in this work have been noted earlier (E. S. R., 57, p. 328).

Impermeable alfalfa seeds kept between moist blotters at 20° C. (68° F.) became permeable in periods of from 4 months to a year, although lots differed in the rate of decrease. The percentage of impermeable seeds in a lot, as determined by blotter tests, was reasonably constant. The germination of impermeable alfalfa seeds in the soil was increased by high temperatures, and more of such seed germinated there than in blotters at 20°.

Hand-threshed seed contained more impermeable seeds than did machine-threshed seed. Machine threshing appeared to scarify seeds having the smallest degree of impermeability. One-half of the impermeable alfalfa seeds become permeable in 3.5 years of storage, and all in 11 years. No relation was apparent between altitude and production of impermeable seed, and for a given field the percentage in machine-threshed lots varied from year to year. The percentage of impermeable seeds increased with maturity and varied for individual plants. Such plants produced seeds varying in permeability in successive years. Individual stems of the same plant differed in their production of impermeable seed.

Microscopic studies did not reveal any mechanical or structural difference in permeable and impermeable seed. That there is some change in the chemical composition of the palisade following heating was suggested by the ready penetration of dye in treated seed. The behavior of the cuticle to dyes indicates a homogeneous film over the surface of the seed. The impermeable layer in the seed coat is at the outer end of the palisade cells.

When seed germinating 69 per cent and with 29 per cent of impermeable seed were subjected to from 35 to 80° for different periods, the best results were had at 75° for from 3 to 6.5 hours, but 60° for 2 hours also gave good results. A marked increase in germination resulted from exposing seed, 30 per cent of which was impermeable, to 80° dry heat for 1 hour.

Barley growing, H. D. HUGHES and L. C. BURNETT (*Iowa Sta. Circ. 109 (1928), pp. 8, figs. 3*).—Barley, suggested as the most promising available crop to replace a part of the present large oats acreage in Iowa, resembles oats in its cultural needs, fits into rotations, furnishes feed and market grain, and is a good nurse crop, and it surpasses oats in acre value and grain yields. The soil, climatic, cultural, and harvesting requirements of barley are outlined, with notes on standard varieties and new, smooth awned varieties.

Differential response of barley varieties to manuring, F. G. GREGORY and F. CROWTHER (*Nature [London], 121 (1928), No. 3039, p. 136*).—Fertilizer combinations varying in amounts of phosphorus, nitrogen, and potassium were sup-

plied to five barley varieties in pot cultures. Analysis of the data (total dry weight of tops) revealed differences in efficiency in the use of fertilizers by these varieties, and showed that for different varieties tested over the same range of fertilizer combinations it is not always the same nutrient constituent which in minimum has the most marked effect on relative yield. The results appeared to suggest that varietal trials must be combined with fertilizer tests to be complete. Varieties might be developed to meet the needs of different soil types.

Japan and Korean clovers, J. S. Cutler, S. C. Hartman, W. E. Weaver, and W. Mahan (*Ohio Sta. Bimo. Bul., 13 (1928), No. 2, pp. 49–52*).—The characteristics, adaptation, cultural requirements, and use of Japan clover (*Lespedeza striata*) and Korean clover (*L. stipulacea*) are described from tests and observations in cooperation with the U. S. Department of Agriculture. Both summer annuals, they are suitable only for pasturing in Ohio, being adapted primarily to southeastern Ohio, especially in counties bordering the Ohio River. They thrive on acid soils of low fertility, although lime and phosphorus markedly increased the amount of growth on most soils in the region. The seed is usually broadcast over old pasture sod in winter or very early spring at the rate of 4 lbs. per acre.

Growth and distribution of Japan clover in Ohio, M. V. Bailey (*Jour. Amer. Soc. Agron., 20 (1928), No. 2, pp. 118–122, fig. 1*).—Investigations by the Ohio State University demonstrated that the distribution of Japan clover (*Lespedeza striata*) was not limited in the State by soil acidity even though liming increases its growth. Available phosphorus was more effectual than acidity in this respect. Japan clover has come into Ohio as a pasture plant rather than as a hay crop. The spread of the plant in extreme southern Ohio seemed limited by natural distribution of the seed, while farther north artificial seeding and length of growing season were limiting factors. Artificial inoculation was apparently not needed, and the crop was found on a wide range of soil types.

No correlation was apparent between the pH value of the soil and the total ash of the stems and leaves of Japan clover, nor was the calcium content of the stems and leaves closely correlated with the pH value of the soil. A tendency was noted for the total ash to increase with the maturity of the plant. The percentage of nitrogen and protein content of the crop seemed to depend more on the stage of maturity of the plant than on the degree of soil acidity.

Corn experiments, 1927, E. B. Ferris (*Mississippi Sta. Circ. 76 (1927), pp. 7, figs. 4*).—Corn experiments reported on for 1927 included fertilizer trials, fertility tests, seed treatments, rotations, and variety tests. An acre application of superphosphate (acid phosphate) 300 lbs., sodium nitrate 320 lbs., and potassium chloride 50 lbs. gave the highest net profit. Home mixed fertilizers were superior to factory mixed goods for corn. Untreated seed corn gave yields approximating those from seed treated with organic mercury compounds for root and ear rots. Corn alone made 40.1 bu. per acre and with cowpeas 33.7 bu., with soy beans 27.2 bu., and with velvet beans 29.4 bu.

Corn variety and fertilizer experiments, W. B. Rogers and J. D. Warner (*South Carolina Sta. Bul. 248 (1928), pp. 38, figs. 3*).—In varietal trials with corn during the period 1921–1927, inclusive, Paymaster, Douthit Prolific, Goodman Prolific, and Hastings Prolific led in tests at Clemson College; Pee Dee No. 5, Coker Garrick, Douthit Prolific, and Brunson led at Florence; and Hastings, Douthit, and Goodman, all prolifics, averaged highest at Summerville.

Cooperative fertilizer tests with corn on representative soil types in the Piedmont and Coastal Plain showed the yield to depend largely on the quantity of nitrogen applied. Applications of superphosphate (acid phosphate) affected yields only slightly, and only the light sandy soils responded to potassium. Increases in yields in direct proportion to the quantity of complete fertilizer applied seemed due to the increase in the nitrogen added thereby.

Effect of hail injury on the development of the corn plant, G. H. DUNGAN (*Jour. Amer. Soc. Agron., 20 (1928), No. 1, pp. 51–54, fig. 1*).—Corn plants at the Illinois Experiment Station were whipped with a wire brush in such a manner as to simulate hail injury. A light treatment inflicted at the time of tassel emergence reduced the grain yield only 2.7 bu. an acre. Similar treatment 1 week later when the plants were in tassel and ear shoots were emerging but no silks were showing reduced the yield 9.9 bu. A severe hail storm, represented by jerking off the blades, was very destructive to corn yields, especially when it occurred at the early silk stage. The same treatment at later growth periods produced a less damaging effect, and the yield reduction was progressively less as the treatment was applied still later in the plant's development.

Reports [on cotton investigations] received from experiment stations, 1926–1927 (*London: Empire Cotton Growing Corp., 1928, pp. 251, pls. 25, figs. 23*).—Supplementing previous work with cotton (E. S. R., 57, p. 330), reports are rendered from Biloela, Queensland; Barberton and Candover, South Africa; Bremersdorp, Swaziland; Gatooma, Southern Rhodesia; Shambat, Anglo-Egyptian Sudan; Serere, Uganda; Makwapala and Port Herald, Nyasaland; Daudawa, Nigeria; Sigatoka, Fiji; and the cotton entomologists of Queensland and Nyasaland.

Cotton map of Peru, 1926 crop [trans. title], M. MONTERO BERNALES (*Vida Agrícola, 5 (1928), No. 50, pp. 118, 119, pl. 1*).—The cotton-producing districts in Peru are indicated. The commercial movement and internal consumption and varietal distribution are shown graphically, with data on production, staple, quality, and picking and ginning times in the different valleys.

A critical comparison of the factors inhibiting the development of three species of cotton in Southern Nigeria, F. D. GOLDING, O. B. LEAN, and T. LAYCOCK (*Nigeria Agr. Dept. Ann. Bul., 6 (1927), pp. 5–69, pls. 4*).—Further studies (E. S. R., 55, p. 637) dealt with factors inhibiting the development of Allen (*Gossypium hirsutum*), Ishan (*G. vitifolium*), and Meko (*G. peruvianum*) cottons grown at Ibadan and Adio. Observations on bud shedding, flower production, boll shedding and development, and the incidence of insects showed the general superiority of the native Ishan variety.

Comparative observations on the pests of cotton at Ilorin, Northern Nigeria, O. B. LEAN (*Nigeria Agr. Dept. Ann. Bul., 6 (1927), pp. 127–143*).—Observations on the Allen, Ishan, Ilorin, and Kabba cottons grown on soils with different specific conductivities gave indications that a higher percentage of buds and bolls were shed, more flowers were produced, and more bolls matured where the specific conductivity was high. Study of bolls shed and harvested showed that bacterial disease caused more damage where the specific conductivity was low. Bollworms appeared also to cause more damage under these conditions, while the cotton stainers were more active where the specific conductivity was high, probably because more stainers were attracted to plats where most flowers were produced and the shade cast by the more luxuriant foliage protected the nymphs. Where the specific conductivity was high the flowering, and consequently the bolling, was delayed, causing a greater number of bolls to mature after the decrease of the stainer attack so that the final yields were higher and the percentage of clean seed cotton was greater. On all varieties the cotton stainer damaged the most locks, but on the Allen cotton

bollworms probably caused more actual damage, and it seemed likely that bollworms have been largely responsible in years when the crop failed.

Some results of flax breeding [trans. title], E. F. Simola (*Statens Lantbruksförsöksverks. [Finland], Vetensk. Pub. 3 (1926), pp. 50, fig. 1; Ger. abs., pp. 46–50*).—This report of the progress of breeding work with flax in Finland in 1924 and 1925 indicates outstanding lines of flax, and presents significant data on important stem and seed characters, seed and straw yields, maturity, retting and hackling losses, character of fiber, composition of the seed, and quality of the oil.

Effects of nitrates on composition of the potato, W. P. Headden (*Colorado Sta. Bul. 325 (1927), pp. 96, figs. 2*).—Further studies (E. S. R., 51, p. 533) on the reaction of potatoes in growth, yields, composition, and quality to an excessive supply of nitrates in the soil are reported on, with detailed discussion of the nitrate problem.

Potatoes grown under conditions of excessive soil nitrogen were characterized by luxuriant growth of vine and poor yields and when cooked were soggy and yellow, with an unpleasant flavor and strong odor. Compared with other potatoes, the Colorado potatoes examined contained less starch and more nitrogen and ash, and the ash was poorer in phosphoric acid but richer in potash than that in other potatoes.

Potatoes planted after potatoes and grain in Delta County, Colorado, on land with from 2,100 to 2,300 parts of nitrates per million and after alfalfa on land with less than 375 parts per million made 20, 75, and 140 sacks per acre, respectively. Fair tubers were grown after the alfalfa, whereas those after grain and potatoes were poor in quality and depressed in starch content. All of the tubers were high in ash, especially those after potatoes.

A brief discussion of the effects of excessive nitrogen on the potato, by H. G. MacMillan, is also included.

Source, character, and treatment of potato sets, W. Stuart, W. C. Edmundson, P. M. Lombard, and G. W. Dewey (*U. S. Dept. Agr., Tech. Bul. 5 (1927), pp. 36, figs. 11*).—With Irish Cobbler potatoes at Norfolk, Va., and Presque Isle, Me., 1.5-oz. basal sets outyielded apical sets in primes and in total yield. Apical 2-oz. sets gave somewhat larger yields of primes and at Presque Isle greater total yield. Both sizes of Green Mountain apical sets outyielded basal sets. As the weight of the set increased, there appeared a greater response from the apical than from the basal set.

In trials at Presque Isle sets from normal sized Irish Cobbler and Green Mountain tubers gave a slightly higher percentage of germination than those from oversized tubers, although the latter gave somewhat larger average yields of primes.

At Norfolk and at Caribou, Me., mature seed averaged higher in primes and total yield than immature seed. Both medium mature and immature Irish Cobbler seed stock gave larger yields than mature stock at Presque Isle, and the percentage of disease was larger in immature seed when immaturity was obtained from late plantings, and the reverse held when immaturity resulted from early harvesting. Rural New Yorker No. 2 seed immature from early harvesting at Greeley, Colo., gave slightly larger yields than mature seed. Significant gains were obtained at Jerome, Idaho, with immature seed of Peoples, Charles Downing, and Russet Burbank over mature seed.

Green sprouted seed of the last two varieties at Jerome made fair increases in both primes and total yield over ungreened seed. However, with this exception, the departmental studies presented did not support the contention that the green sprouting of seed potatoes necessarily increased their productivity or that the practice is profitable.

A bibliography is appended.

Relation of tuber maturity and of storage factors to potato dormancy, J. T. Rosa (*Hilgardia [California Sta.], 3 (1928), No. 4, pp. 99–124, figs. 9*).—Observations in 1925, 1926, and 1927 on White Rose, Idaho Rural, and Irish Cobbler potatoes dug at from 4 to 5 stages of maturity showed that the dormant period was the shorter in the harvest stage nearest maturity and the average number of stems increased with the maturity of the tubers. The rate at which mature tubers sprouted increased rapidly with the length of storage before cutting and planting, whereas tubers harvested immature emerged from dormancy more slowly. Although the temperature at which potatoes were stored appeared to influence the rate of emergence from dormancy, claims by others as to the hastening of sprouting by cold storage were not substantiated. Storage at 4° C. evidently retarded sprouting somewhat compared with storage at from 20 to 23° when plantings were made in the early or middle portion of the dormant period. Storage at from 20 to 30° had a marked accelerating effect upon subsequent sprouting as compared to lower temperatures.

The humidity of the storage affected dormancy but slightly at a very low temperature, 4°, or at a high temperature, 30°, whereas at an intermediate temperature, 22°, tubers stored under moist conditions sprouted much more rapidly after they were cut and planted. A study of sections of eyes showed that the bud primordia develop during the later stages of tuber growth and even during the dormancy period if the tubers are stored at temperatures favorable for growth. The rate of sprout development increases toward the end of the dormant period. The normal duration of the dormant period was observed to differ for potato varieties.

In efforts to prevent the seed piece decay prevalent when the planting is made during hot weather, the amount of decay was increased and the dormancy of the sets was prolonged by cutting several days before planting and allowing the cut surface to become suberized. Lots stored at 4°, which became only slightly suberized, and those stored at 22° in wet sawdust decayed least and sprouted somewhat quicker than the check.

Effects of chemical treatments on dormant potato tubers, J. T. Rosa (*Hilgardia [California Sta.], 3 (1928), No. 4, pp. 125–142, figs. 2*).—A number of experiments reported on were designed largely to determine effective methods for the stimulation of sprouting in dormant seed potatoes (E. S. R., 53, p. 636).

In concentrations of from 1:400 to 1:2,200 of air ethylene had a slight effect upon the rapidity of sprouting of dormant, nearly mature, moderately suberized tubers treated in the gas chamber for 4 weeks after harvest. The sprouting of fully mature White Rose tubers was hastened after ethylene treatment for only 6 days, while Idaho Rurals showed maximum stimulation after treatment for 15 days.

Ethylene chlorohydrin was very effective for treating these varieties, especially the former, at 14- and 21-day periods after harvest. Treatment with this material by (1) the gas method on whole tubers and (2) by soaking cut sets in a 0.5 per cent solution for 1 hour markedly stimulated sprouting without toxic effects, whereas (3) dipping cut sets in 3 per cent or stronger solutions with overnight storage in a closed container resulted in a great increase in the decay of the sets after planting. Treatment of large tubers with ethylene chlorohydrin by method 1 at different stages during storage did not give consistently different results, although with small tubers planted whole the most marked stimulation followed the treatment at harvest when the tubers were only moderately suberized. With method 1 for large tubers well suberized, the most effective concentration is 0.75 cc. per liter of space in a room at from 20 to 25° C. with a fan to hasten volatilization and to distribute the gas uniformly.

Ethylene dichloride was very effective, especially on Irish Cobbler, either as a gas on whole tubers or in solution for cut sets, the first method seeming the more practical. Between 0.2 and 0.4 cc. per liter of space seems best for a 24-hour exposure on large tubers.

Tests with ethylene chlorohydrin, ethylene dichloride, and ethyl bromide indicated that treatment of small, mature tubers planted whole is much less effective than similar treatments upon large tubers cut before planting.

Ethyl bromide and sodium nitrate gave fair results as stimulants but had certain objectionable qualities. With cut sets planted in hot weather, sodium thiocyanate and ammonium thiocyanate were toxic in 2 and 3 per cent solutions and in 1 per cent solution were nontoxic and without much effect.

Canadian certified seed potatoes: Rules and regulations governing their production, J. Tucker (*Canada Dept. Agr. Pamphlet 84, n. ser. (1927), pp. 11, figs. 2*).—Rules and regulations governing the production of certified seed potatoes in Canada are set forth.

The tillering of rice (Oryza sativa).—I, Influence of rate of irrigation and light on tillering [trans. title], S. Fukaki (*Bul. Sci. Fakult. Terkult., Kjûŝu Imp. Univ., Fukuoka, Japan, 2 (1927), No. 5, pp. 340–365, figs. 3; Ger. abs., pp. 364, 365*).—Shinriki rice received various quantities of irrigation water and several degrees of natural illumination in studies at Kyushu University. The maximum number of tillers were put forth in a soil saturated or only slightly submerged. Insufficient or excessive water reduced tillering. The number of tillers and rapidity of tillering were depressed by reducing the light. The crop per plant estimated on the basis of dry weight of grain, number of kernels, and grain: straw ratio increased with increase in tillering, although the number of spikeless culms also increased. Too thick planting seemed prejudicial to tillering.

Notes on the cultivation of sisal, with special reference to Ceylon, G. Harbord (*Ceylon Dept. Agr. Bul. 81 (1927), pp. 15, pls. 11*).—Sisal culture and fiber preparation are described, with data on production costs and observations on the possibilities of the industry in Ceylon.

Some causes of the injurious after-effects of sorghums and suggested remedies, J. P. Conrad (*Jour. Amer. Soc. Agron., 19 (1927), No. 12, pp. 1091–1111*).—An attempt is made to explain the depressed yields of crops following sorghum as compared with those after other crops, e. g., corn, on the assumption that sorghum roots are relatively higher in sugars than roots of other crops.

Analyses at the California Experiment Station showed that the roots of sorghums contained from 65 to over 1,500 per cent as much sugar as corn roots. The quantities of sugars present in the surface foot of soil on 1 acre were estimated to be about 550 lbs. after Honey sorgo, 200 lbs. after Double Dwarf milo, and 35 lbs. after corn. Dried milo roots added to Yolo loam soil depressed nitrification when decaying and at first lowered the quantity of nitrates below that present in the soil at the start. Wheat and barley after milo made a noticeable response to nitrogenous fertilizers in both total crop and grain production. These results, considered with the findings of others, suggested that sorghum injury to following crops may be due to the competition between microorganisms and the crops for available plant foods, resulting in one or more elements becoming limiting factors for plant growth.

Among remedies suggested are the reduction of sugar entering the soil by pasturing or removing stalks and stubble, thinner stands, and planting sorghums whose roots develop only low percentages of sugar; promoting rapid decomposition of sorghum roots; and planting a good legume crop after sorghums.

Evidence was had that sorghum grown without irrigation may deplete the soil moisture much more than some other crops, or to such an extent that small grain following in a season with subnormal rainfall may suffer. Using nitrogenous fertilizers under such conditions might serve to aggravate the injury.

[Premature seed formation in sugar beets] (*Zuckerrübenbau, 10 (1928), No. 1, pp. 21, figs. 2; rev. in Facts About Sugar, 23 (1928), No. 7, p. 154*).—This number contains brief articles by Säuberlich, H. Wagner, Wadsack, R. Müller, Piekenbrock, and Roemer which discuss various aspects of bolting or the premature or annual seed production of sugar beets, a phenomenon quite noticeable in 1927.

Review of the above group of papers suggests that early planting and minimum temperatures early in the growing season may be responsible for the high percentages of bolters. Varieties differ in their inclination toward bolting, the high sugar strains tending to run to seed more than high yield strains. Heavy applications of nitrogen, particularly of quickly available materials, seemed to have a certain influence, although much less than time of planting and variety. Bolters caused trouble at the slicing stations, requiring heavier knives, often reduced yields, and contained a lower percentage of sugar than normal beets.

[Sugar cane investigations in Queensland, 1926 and 1927], H. T. Easterby (*Queensland Bur. Sugar Expt. Stas. Ann. Rpt. 26 (1925–26), pp. 3–18, 29–82; 27 (1926–27), pp. 1–18, 33–84*).—Experimental work with sugar cane was continued in 1926 and 1927 along lines similar to those noted earlier (E. S. R., 56, p. 37).

The influence of the concentration of chlorine on the development of the sugar cane [trans. title], O. Arrhenius (*Arch. Suikerindus. Nederland. Indië, 36 (1928), No. 5, pp. 90–100, figs. 4; Eng. abs., pp. 98–100*).—Growing the sugar cane varieties P. O. J. 2878 and P. O. J. 2883 in sand-water cultures showed the limit for chlorine (added to the solution as sodium chloride) to be about 0.06 per cent of the soil solution. The permissible chlorine content appeared to vary with the water-holding capacity of the soil, i. e., sugar cane could stand a much greater salt concentration in clay than in sand. The chlorine content of cane grown in the more concentrated solutions was not extremely high. Leaching and draining the soil with plentiful irrigation is advised to prevent harmful effects from the chlorine.

[Tobacco experiments in Quebec], J. E. Montreuil (*Canada Expt. Farms, Farnham (Que.) Sta. Rpt. Supt. 1926, pp. 21, figs. 5*).—Plant bed, fertilizer, variety, cultural, and rotation experiments with tobacco are reported on in detail for 1926. Noteworthy observations have been recorded by Slagg from another source (E. S. R., 58, p. 135).

Characters of common wheat in plants with fourteen chromosomes, W. P. Thompson (*Roy. Soc. Canada, Proc. and Trans., 3. ser., 21 (1927), Sect. V, pp. 273–277*).—Although investigations with hybrids between wheats with 14 chromosomes (emmer type) and those with 21 (vulgare type) have led to the opinion that the distinctive characters of common wheat are carried in the extra 7 vulgare chromosomes and that it will be impossible to produce stable combinations of characters of the two types since intermediate chromosome numbers disappear in later generations, such a combination of characters is actually possessed by Black Persian wheat, commonly cultivated in Armenia and Georgia. While it has several distinctively vulgare characters, its chromosome number is 14. Similar combinations have also been produced by crossing. Evidently the genes for vulgare characters are not confined to the 7 extra vulgare chromosomes. See also earlier notes (E. S. R., 57, pp. 31, 822).

The history and present status of wheat production in Canada, L. H. Newman (*Canada Dept. Agr. Pamphlet 89, n. ser. (1928), pp. 10*).—The development and status of wheat growing in Canada is reviewed, with descriptions of outstanding varieties brought forward by institutions and individuals.

The origin of seed [trans. title], L. François (*Ann. Sci. Agron. Franç. et Étrang., 45 (1928), No. 1, pp. 48–55, fig. 1*).—The latest and evidently final contribution to this series (E. S. R., 58, p. 433) is principally concerned with the distribution of *Centaurea collina* in southern France.

Germinating dormant seeds of sweet clover, Abutilon avicennae, and other plants [trans. title], N. I. Pushkarev and T. G. Motrenko (*Rostovo-Nakhichevan. na Donu Oblastn. Selsk. Khoz. Opytn. Sta. Biul. 230 (1927), pp. 17+[1], figs. 3; Eng. abs., p. [1]*).—Trials of different methods to facilitate the germination of hard seeds demonstrated the value of sulfuric acid treatment for the purpose. Its best results with sweet clover seed followed application of a solution of 1.78 specific gravity for from 10 to 20 minutes and with *A. avicennae* seed for from 1 to 1.5 hours. The germination of the sweet clover rose from 11 to 84 per cent and the *A. avicennae* from 14 to 88 per cent. Scarification gave the best results of the mechanical methods tested.

Killing field bindweed with sodium chlorate, W. L. Latshaw and J. W. Zahnley (*Kansas Sta. Circ. 136 (1928), pp. 15, figs. 11*).—The characteristics of field bindweed or wild morning glory are described, and practical instructions are given for the control of the weed with sodium chlorate spray (E. S. R., 58, p. 433).

One hundred lbs. of sodium chlorate crystals dissolved in 100 gal. of water will suffice for one treatment of 1 acre of bindweed. Two or more applications are needed to kill the weed. For small patches dry sodium chlorate may be broadcasted at the rate of 1 lb. per square rod for each application, preferably when the soil is moist and when plants are wet with dew.

Johnson grass as a weed, M. W. Talbot (*U. S. Dept. Agr., Farmers' Bul. 1537 (1928), pp. II+10, figs. 4*).—This is a revision of and supersedes Farmers' Bulletin 279 (E. S. R., 18, p. 936), entitled A Method of Eradicating Johnson Grass. The regions where the grass is a pest are indicated, the way in which this grass spreads is described, and control methods are outlined.

HORTICULTURE

Practical horticulture for the Pacific slope, H. K. Dickson and H. L. Holmes (*San Francisco: Harr Wagner Pub. Co., 1927, pp. VII+343, figs. 105*).—A text for high school students and practical orchardists.

Further results with Growell pots, J. E. Knott (*Market Growers Jour., 42 (1928), No. 8, p. 327*).—Tests at the Pennsylvania State College failed to show any advantage, as measured in growth of tomato plants, for the peat pot over the old-fashioned baked clay pot; in fact, under comparable treatments the clay pots were significantly superior. Since peat pots cost nearly as much and are good for but one season, the author questions their value in plant propagation.

The culture of greenhouse plants, edited by C. Bonstedt et al. (*Allendorffs Kulturpraxis der Kalt- und Warmhauspflanzen. Berlin: Paul Parey, 1927, 5. rev. ed., pp. VIII+474, pls. 32, fig. 1*).—With plant materials arranged alphabetically, information is given on the specific cultural requirements of each.

The asparagus industry in California, H. A. Jones and W. W. Robbins (*California Sta. Bul. 446 (1928), pp. 105, figs. 43*).—A comprehensive discussion treating of the physiology of growth and reproduction, relation of sex to yield, composition of the plants and the use of fertilizers, propagation, planting, cul-

ture, factors limiting yield, varieties, harvesting, preparation for market, canning aspects, and control of pests.

Early cabbage, W. B. MACK (*Pennsylvania Sta. Bul. 221 (1928), pp. 22, figs. 3*).—A comprehensive discussion upon the production of early cabbage, taking up the economic importance of the crop, present production, varieties and strains, methods of plant growing, planting, fertilization, rotations, liming, control of insects and diseases, and general marketing considerations. Experimental results obtained at the station and in other States are cited. In a test conducted by W. B. Nissley, of the extension service, upon 10 strains of Copenhagen market cabbage there was found a wide variation in earliness and yield. In general, the early maturing strains were the high producers. Germination also varied sharply with the strains. Neither muck nor sand, alone or in combination, was as satisfactory for plant growing as when loam was added. Reference is again made to station investigations (E. S. R., 57, p. 436) in which it was shown that phosphorus was the most valuable single element and potassium the least valuable element in cabbage production, and that superphosphate (acid phosphate) is the best carrier of phosphorus.

Distance of planting sweet corn to increase yields, R. MAGRUDER (*Ohio Sta. Bimo. Bul., 13 (1928), No. 2, pp. 68–72*).—Studies conducted at Marietta and Wooster indicated that up to certain limits increasing the area of soil per corn plant increased the average weight and the number of ears per plant, but that the largest number of marketable ears and the largest yields per given area resulted from moderately close planting. Soil fertility and soil moisture were found to be limiting factors. In the case of Early Adams very little increase in the size of ear and in the number of ears per plant was obtained beyond 400 and 425 sq. in. of soil per plant, respectively. With Stowell Evergreen these maxima were not reached at 630 sq. in., the greatest soil area utilized.

Effect of phosphorus in the form of acid phosphate upon maturity and yield of lettuce, F. J. CRIDER (*Arizona Sta. Bul. 121 (1927), pp. 115–142, figs. 11*).—Records taken at the Yuma Experiment Farm upon the growth, time of maturity, size, weight, and compactness of head of New York market lettuce growing upon a soil which analyzed 0.095 per cent of phosphates showed striking results from the application of phosphorus fertilizers. At the time of the first general cutting, 107 days after planting (December 14), plats receiving superphosphate (acid phosphate) alone or in combination with other fertilizers yielded a large proportion of mature heads as compared with none or very small percentages for the control and nonphosphate plats. A combination of superphosphate and blood meal gave the best results of any treatment. However, this combination in excessive amounts increased the size and looseness of the heads at the expense of earliness. In amounts greater than 300 lbs. per acre superphosphate produced no additional stimulus to early maturity or size of heads. Under the conditions of the experiment from 100 to 300 lbs. per acre each of superphosphate and of blood meal gave the most satisfactory results. Lettuce following alfalfa outyielded but was later in ripening than lettuce following cotton. The results suggest to the author that the natural phosphates in Arizona soils are not readily available and should be supplemented with applications of superphosphate.

Muskmelon production, J. W. LLOYD (*New York: Orange Judd Pub. Co.; London: Kegan Paul, Trench, Trübner & Co., 1928, pp. 126, pls. 11*).—A handbook of general cultural considerations.

Dry ice for the refrigeration of fruits, W. A. RUTH (*Ill. State Hort. Soc. Trans., 61 (1927), pp. 191–197*).—A general discussion bringing out the fact that up to the present time solid carbon dioxide has not proved to be a satisfactory

refrigerant for fruits and vegetables on account of the danger of freezing and of injury to the products from exposure to high concentrations of carbon dioxide.

What can the grower do to increase the "set" of fruit? M. J. DORSEY (*Ill. State Hort. Soc. Trans., 61 (1927), pp. 205–215*).—Describing briefly the physiology of pollination and fruit setting, the author discusses the bearing of various factors—weather, nutrition, varietal relationships, and bees on successful pollination. Of these factors, weather alone is beyond the control of the fruit grower.

Pollination studies concerning the Hale peach and the Scarlet Pippin apple, F. S. LAGASSÉ (*Amer. Soc. Hort. Sci. Proc., 24 (1927), pp. 101–105*).—Studies at the University of Delaware upon flowers of the J. H. Hale peach showed this variety to be self-unfruitful but capable of satisfactory pollination by Ray, Belle, Hiley, Elberta, and June Elberta. The results of the study led to the suggestion that under Delaware conditions the J. H. Hale peach should not be planted in isolated large blocks. Experiments with 16-year-old Scarlet Pippin (Crimson Beauty) apple trees indicated that this variety is only partially self-fruitful and should be interplanted with some other variety. Yellow Transparent, Red Astrachan, and Nero were all successful pollinizers for Scarlet Pippin, but Yellow Transparent is deemed preferable on account of its higher commercial value.

Pentosan content in relation to winter hardiness in the apple, W. A. DELONG (*Sci. Agr., 8 (1928), No. 8, pp. 512–523*).—Determinations at Macdonald College, Quebec, of the pentosan content of the tops and roots of a number of apple varieties of known hardiness and of seedlings of very hardy apples and crabs showed, contrary to the observations of Hooker (E. S. R., 46, p. 443), that the least hardy forms had the greatest pentosan content as determined by the official HCl-phloroglucinol method. The inconsistencies were such, however, as to prevent the drawing of a definite conclusion. No positive correlation was recorded between pentosan content and total loss of moisture or rate of loss of moisture at 75° C. (167° F.). The top portions of trees contained about 30 per cent more of the pentosan fraction than did the roots, yet the moisture loss from the two tissues was practically equal. In most cases the top tissues lost water faster than the root tissues.

The discrepancy between results obtained by the HCl-phloroglucinol and the fermentation-copper reduction method was not found due to any appreciable extent to substances precipitable by phloroglucinol and soluble in 95 per cent alcohol at 60°. The small alcohol soluble fraction of the phloroglucide precipitate is probably derived from hexoses rather than from methyl pentosans, since it gave color reactions characteristic of hydroxymethylfurfural. The results of the study bear out observations reported by Hildreth (E. S. R., 57, p. 239).

Investigations of apple roots at Olney, Illinois, W. A. RUTH and C. E. BAKER (*Ill. State Hort. Soc. Trans., 61 (1927), pp. 418–432*).—Citing the frequent occurrence of extended dry periods in southern Illinois during the growing season, the authors discuss the significance of such periods as related to fruit growing. Certain observations made at Urbana on the roots of young apple trees showed more growth rings than could be accounted for by the age of the trees, suggesting that dry periods at various times stopped growth. Similar observations were made on the trunks of apple trees at Olney.

Contrary to expectation the prolonged saturation in midsummer of the soil about apple trees had no perceptible effect on foliage or fruit, the watered trees appearing exactly like the controls. As noted in an earlier paper (E. S. R., 58,

p. 234), shading materially reduced the water loss from the soil. An examination of root growth on various sides of the tree showed an average of twice as many surface roots above ⅛ in. in diameter on the shaded side. These differences did not hold below the 6-in. layer.

Profit and loss in pruning mature apple trees, R. E. MARSHALL (*Michigan Sta. Spec. Bul. 169 (1928), pp. 39, figs. 23*).—That pruning of old, vigorous bearing apple trees, despite increasing the percentage of A grade fruit, may actually decrease total yields and total returns was shown in studies conducted in apple orchards located in various sections of the State. Furthermore, the decrease in yields held over into subsequent years. The increase in the percentage of A grade apples following pruning was found due principally to a gain in the size of fruits rather than in number of fruits. The application of nitrogenous fertilizers, sodium nitrate or ammonium sulfate, materially increased total yields and also the size of fruits at a much lower cost per bushel. Fruit thinning may be expected to increase the amount and proportion of larger sized apples without material reduction in total yield. Pruning had no appreciable benefit in the control of insects and fungus pests but did lessen slightly the percentage of limb rub injury in Jonathan apples.

The results of the study indicate that pruing of bearing apple trees should be very light and should consist primarily in removing dead and weak growth. Pruning is deemed a necessary orchard practice but should not be employed with the expectation of increasing yields and making the orchard more profitable. Any orchard practice that materially decreases yield in order to effect an improvement in size may be unprofitable unless there is a wide difference in the selling price of the different grades. An earlier paper covering part of this study was previously noted (E. S. R., 58, p. 38).

Spraying a young orchard: Cost of labor and material, C. W. ELLENWOOD (*Ohio Sta. Bimo. Bul., 13 (1928), No. 2, pp. 65–68, fig. 1*).—Records taken in a young nonbearing Baldwin, Stayman Winesap, and Wealthy apple orchard planted in 1922 showed that in the years 1924–1927, 2, 4, 4, and 5 applications averaging 0.4, 0.97, 1.15, and 1.56 gal. per application were required, respectively, to keep the foliage in a vigorous growing condition. The total costs per tree per season were 2.8, 12.7, 8.3, and 17.93 cts., the variability from year to year being due to the inclusion of nicotine sulfate in the second and the fourth years.

Dusting vs. spraying in the apple orchard, N. J. GIDDINGS, A. BERG, and E. C. SHERWOOD (*West Virginia Sta. Bul. 209 (1927), pp. 28, figs. 2*).—Investigations extending over a period of 8 years in commercial orchards in different locations in the State indicated that dusts, at least as now prepared, are not effective for controlling severe outbreaks of apple scab. The almost incessant winds in the hilly orchard areas constituted a serious handicap to the successful application of dust. However, it is believed that under conditions of slight scab infection or upon resistant varieties dust should give satisfactory control.

Records taken on leaf infection showed that infections of both leaf spot and scab were generally very light on the oldest three leaves of the terminal shoots, indicating that under West Virginia conditions both leaf spot and scab should be satisfactorily controlled by thorough applications of fungicides beginning in the pink or cluster bud stage.

The pear and its culture, H. B. TUKEY (*New York: Orange Judd Pub. Co.; London: Kegan Paul, Trench, Trübner & Co., 1928, pp. 125, pls. 11*).—A small handbook relating to the growing of the pear.

Pear variety test, A. B. FITE and F. GARCIA (*New Mexico Sta. Bul. 165 (1928), pp. 39, figs. 11*).—Data taken in a pear orchard of 72 varieties planted in 1909 and removed in 1925–26, after being practically destroyed by blight, led to the observation that the pear is one of the longest lived and hardiest fruits in

the section and would, if it were not for blight, be one of the most satisfactory. Rating the varieties according to resistance to blight, Lincoln followed by Kieffer, Vermont Beauty, Early Sugar, Lyerlie, and Seckel were most resistant, and Forelle followed by Glout Morceau, Le Conte, Souvenir du Congres, and Comice the least resistant. Apple buds lived for several years on pear stocks and bore good crops. The apple scions, however, outgrew the stock, and the fruits produced were smaller and later ripening than those of trees on apple roots. Protected Bartlett pear blossoms matured 9 per cent of fruit as compared with 42 per cent for openly exposed blooms. Winter Nelis, Bosc, Comice, and Anjou were found good pollinizers for Bartlett. Phenological and yield records are presented for the varieties, brief descriptions given of the fruit of many kinds, and a selected list of desirable varieties is offered.

The importance of stocks in Kieffer pear growing, H. B. TUKEY (*Jour. Heredity, 19 (1928), No. 3, pp. 112–114, fig. 1*).—The success of an unusually vigorous and fruitful Kieffer pear orchard located in the Hudson River Valley is believed to be due to the fact that the trees are growing on their own roots. Diameter measurements on two adjacent rows of trees, one own rooted and the other on French pear roots, showed consistently larger growth, greater uniformity, and lower mortality for the own-rooted trees.

A note on light versus heavy pruning of young peach trees, J. H. GOURLEY (*Ohio Sta. Bimo. Bul., 13 (1928), No. 2, pp. 72–74*).—Comparing light thinning with severe cutting back in an Elberta peach orchard planted in 1922, it was found that heavy pruning, quite irrespective of soil treatment, had resulted in decreased yields and reduced growth. In 1925 and 1926 the lightly pruned trees averaged 40 and 40.1 lbs. of fruit, respectively, as compared with 30.8 and 22.2 lbs. for the heavily pruned trees. It is emphasized that the results apply only to young trees coming into bearing.

Recent experimental work in small fruit culture at the Illinois Station, A. S. COLBY (*Ill. State Hort. Soc. Trans., 61 (1927), pp. 155–168*).—Among points brought out in this paper are that the vines of European grape varieties may be adequately protected from winter injury by laying them down and covering with straw held in place by a little soil, and that in pruning grapes it is not a good practice to leave more than 12 buds per cane. However, on fertile soils the number of canes per vine may be advantageously increased. Studies with raspberries suggested the inadvisability of planting red and black varieties near one another, since a certain form of mosaic which is mild on certain reds may become very destructive when transferred to black raspberries. Certain American varieties of grapes, particularly those of part vinifera parentage, were found to keep well for several weeks.

Grape growing in Kansas, R. J. BARNETT (*Kansas Sta. Circ. 134 (1928), pp. 32, figs. 10*).—A circular of general information relating to varieties, sites, planting, culture, training, pruning, harvesting, marketing, and pests and their control.

Preparation of eastern grapes for market, B. E. SHAFFER (*U. S. Dept. Agr., Farmers' Bul. 1558 (1928), pp. II+18, figs. 25*).—A bulletin of general information discussing the producing centers, varieties, harvesting and packing, standardization and inspection, loading on trucks and cars, etc.

The cultivation of oranges and allied fruits in the Bombay Presidency, H. P. PARANJPYE (*Bombay Dept. Agr. Bul. 95, 2. ed., rev. (1927), pp. [2]+29*).—A second edition (E. S. R., 43, p. 745).

Tea and soil acidity.—I, Water culture experiments, C. H. GADD (*Tea Quart. [Tea Research Inst. Ceylon], 1 (1928), No. 1, pp. 2–6, pl. 1*).—Observations on tea plants grown in water cultures of various pH value indicated a

preference for acid environments. The most marked influences were noted in root growth. At pH 3.5 and 4.5 sturdy roots developed, but in less acid environment no new roots appeared and the existing roots turned brown.

The cultivation experiment plots at Borbhetta, P. H. CARPENTER and H. R COOPER (*Indian Tea Assoc., Sci. Dept. Quart. Jour., 1927, No. 4, pp. 134–166, pls. 7*).—Cultural investigations with tea planted in 1916 and 1917 and given uniform treatment to the end of 1921 failed to show over the 5-year period ended in 1926 any advantage from deep cultivation, suggesting that the suppression of jungle growth was the outstanding cultural factor in crop production.

More aristocrats of the garden, E. H. WILSON (*Boston: Stratford Co., 1928, pp. XIV+288, pls. 43*).—A finely illustrated book on some of the new and older shrubs and trees of high decorative value.

Japanese flowering cherries, P. RUSSELL (*U. S. Dept. Agr. Circ. 31 (1928), pp. 8, pls. 5*).—General information is offered upon the history and botany, varieties and species, fruiting habits, methods of propagation, culture, and the control of pests.

FORESTRY

Management plans with special reference to the national forests, I. F. ELDREDGE (*U. S. Dept. Agr., Misc. Pub. 11 (1928), pp. 84, figs. 3*).—A general discussion relating to forest-management plans in general—their preparation, organization of working circles, objects of management, regulation, reports, and the application of management plans. As working examples there are appended plans for the Custer working circle, Harney National Forest; the Meadow Valley working circle, Plumas National Forest; the Woodland working circle, Pike National Forest; and the Rio Pueblo working circle, Carson National Forest.

[Silvicultural studies], P. Z. CAVERHILL (*Brit. Columbia Dept. Lands, Forest Branch Rpt. 1927, pp. B10–B14*).—Records taken on natural regeneration on cut-over lands on the Queen Charlotte Islands and the Ocean Falls district, British Columbia, showed that 80 per cent of the areas examined contained more than 500 trees per acre. Throughout the whole region the new growth was composed approximately of 31 per cent spruce, 38 per cent hemlock, and 31 per cent cedar, a desirable situation, since pulp wood is the major product. By the use of seed traps it was determined that only 15 per cent of the total hemlock and 10 per cent of the cedar seeds are carried beyond 25 chains' distance from the parent tree, suggesting that seed trees can not be relied upon for long-distance distribution. Data obtained at Malpas, Oreg., in cooperation with the U. S. D. A. Forest Service, upon the distribution of forest seeds released from kites flown at measured heights showed that wind velocity has an important influence on seed distribution. Measurements of alder trees planted in 1925 as firebreaks showed a height growth of 8 ft. on favorable sites. Volume tables are presented for lodgepole pine on three quality sites and for Engelmann spruce and balsam fir as grown in the interior of British Columbia.

An experiment in thinning loblolly pine, A. AKERMAN (*Jour. Forestry, 26 (1928), No. 4, pp. 487–499*).—Measurements taken in 1927 in thinned and unthinned loblolly pine plats laid out in the spring and autumn of 1912 in a 17-year-old stand on an abandoned field in Madison County, Ga., showed significantly in favor of thinning. Averaging the data taken on the 20 largest trees in each plat, it was found that the thinned trees had gained 2.17 in. in diameter as compared with 1.84 in. for the unthinned. Measurements of height gave similar results, most pronounced in the case of the larger diameter trees. The thinned plats increased in volume at the rate of 80.2 per cent and the controls

at 70.1 per cent. The thinning appreciably diminished the fire risk by eliminating dead trees and also reduced the number of undesirable trees in the stands. The author stresses the importance of thinning in the old field pine stands of the South and proposes a thinning program.

Timber growing and logging practice in the Lake States, R. Zon (*U. S. Dept. Agr. Bul. 1496 (1928), pp. 64, pls. 7, fig. 1*).—A further contribution (E. S. R., 58, p. 336) to a series of bulletins designed to present for the various important forest regions of the country the measures necessary for keeping forest land productive and also for producing full timber crops. There is the usual introduction by W. B. Greeley.

The forest lands of the Lake States, Michigan, Wisconsin, and Minnesota, are divided approximately into 17.7 per cent of old merchantable timber, 46.4 per cent of oncoming second growth, and 35.9 per cent of unproductive cut-over areas. About 95 per cent of the entire area is privately owned. Fire protection is deemed to be the key to keeping these forests in a productive condition. Slash is considered a distinct menace that may be best disposed of by progressive burning during logging operations.

As measures leading to the highest possible use of timberlands, the following are recommended: Selective cuttings to release the most valuable species, planting of the better soils to profitable species, and control of pests. Information is presented on the best means of handling the several forest types.

Forest fires in Minnesota, J. A. Mitchell ([*St. Paul*]: *Minn. State Forest Serv.*, [*1928*], *pp. 74, figs. 44*).—A survey, made in cooperation with the U. S. D. A. Forest Service, of the past and present forest fire situation in Minnesota, with a suggested program of protection.

Field experimentation with rubber (Hevea brasiliensis), L. Lord and L. Abeyesundera (*Ceylon Dept. Agr. Bul. 82 (1927), pp. 21*).—An analysis of statistical data obtained at Peradeniya, Ceylon, upon the individual yields of 156 Hevea trees, the open-pollinated progeny of a single high yielding parent the history of which was given by Bryce and Gadd in an earlier paper (E. S. R., 51, p. 444). The value was shown of randomized blocks with at least six replications of each treatment. A study of the experimental error in 6, 12, 18, 24, and 30 tree plats indicated the advisability of using the 24-tree plat. The statistical methods of Fisher were employed and found satisfactory. Practical suggestions are given on the handling of the latex from the experimental plats.

Experimental tapping of Hevea rubber trees at Bayeux, Haiti, 1924–25, L. G. Polhamus (*U. S. Dept. Agr., Tech. Bul. 65 (1928), pp. 32, figs. 2*).—Records taken on the individual and total production in a scattered planting of Hevea trees approximately 21 years of age and which had not been tapped for several years showed great variations in yield. A large proportion of the latex was produced by a small proportion of the trees. The highest yielding trees produced approximately 6.7 lbs. of rubber in a 9-month period. Computations showed that individual trees were quite constant in their production from month to month, and that total yields may be fairly well estimated from a single month's record. Elimination on the basis of total yield of the lowest yielding 25 trees increased the mean yield of the remaining 70 trees by 17.5 per cent. Elimination according to the yield of any one month would have increased the mean yield of the remaining 70 trees from 12.1 to 16.5 per cent. The use of the regression equation in connection with production control is discussed.

The correlation between yield and tree girth was found to be 0.166 ± 0.068, between yield and bark thickness -0.03 ± 0.07. Both girth and bark thick-

ness are deemed of little value as indexes to yielding capacity. Dry rubber measurements are conceded to be the most accurate measure of yielding capacity. Rubber content was significantly different in individual trees and was constant to a marked degree.

Bamboos and bamboo culture, B. T. GALLOWAY (*U. S. Dept. Agr. Leaflet 18 (1928), pp. 8, figs. 4*).—General information is offered on the origin of the bamboo, its introduction into the United States, its many uses, species, planting, culture, etc.

Bamboo and its uses in China, W. M. PORTERFIELD, JR. (*Chinese Econ. Mo., 3 (1926), Nos. 1, pp. 45–49, figs. 2; 2, pp. 96–100, figs. 3; 3, pp. 132–138; 4, pp. 184–190, fig. 1; 5, pp. 219–226, figs. 3; 6, pp. 266–272, figs. 5; 7, pp. 298–303, figs. 3*).—An extended discussion.

DISEASES OF PLANTS

Factors affecting the properties of a virus, H. H. MCKINNEY (*Phytopathology, 16 (1926), No. 10, p. 753*).—Experiments reported upon are said to indicate that tobacco mosaic virus of low concentration has a lower thermal destruction point than a concentrated virus. Diluted virus also loses its potency faster than concentrated virus on standing at room temperature. When tobacco and cucumber juices were used as diluting media, the potency of the virus and its thermal destruction point were depressed more than when sterile distilled water was used for making dilutions. Cucumber juice had an especially marked depressing effect on the thermal inactivation point of tobacco mosaic virus.

The studies are said to suggest that the first reduction in the potency of diluted virus is not always permanent, as in some cases an increase in potency was found on the sixth and twelfth days after dilution. However, on standing 50 days, there appeared to be a decrease in potency below any previous low point.

Some points of view on the plant virus problem, J. JOHNSON (*Phytopathology, 16 (1926), No. 10, pp. 745–751*).—A summary is given of views relating to virus diseases of plants, the specificity of viruses, insect relations, effect of environment, properties of viruses, intracellular bodies, etc.

Single-spore isolation simplified, H. N. HANSEN (*Phytopathology, 16 (1926), No. 10, p. 763*).—A simple method for obtaining single spores is described.

Some observations on ascospore discharge and dispersal of conidia of Venturia inequalis, J. E. HOWITT and W. G. EVANS (*Phytopathology, 16 (1926), No. 10, p. 756*).—Observations and experiments carried on for a period of six years are said to indicate that the average mean temperature of January, February, and March has more influence on ascospore development and spore discharge than has the average temperature of the days of April and May preceding spore discharge, or the precipitation from April 1 to the date of primary discharge.

Biochemistry of plant diseases.—VIII, Alcoholic fermentation of Fusarium lini, H. LETCHER and J. J. WILLAMAN (*Phytopathology, 16 (1926), No. 12, pp. 941–949, figs. 3*).—In continuation of studies by Anderson (E. S. R., 57, p. 348), an investigation was made regarding alcohol production by the flax wilt organism to determine the time and rate for production in saccharine solutions and to correlate, if possible, alcohol production with the pathogenicity of the organism. Several forms of *F. lini* were used, and it was found that when cultured on six different saccharine media all produced ethyl alcohol. In general, the maximum alcohol content of the liquid cultures was obtained in approximately 30 days. The alcohol production by eight forms of the fungus ranged from 0.8 to 2.99 per cent by volume 30 days after inoculation.

The two forms of the organism which were least virulent in their action on the flax plant had the least alcohol production. Acetaldehyde appeared to be one of the intermediate products formed by the fungus in fermenting sugars.

Studies on the parasitism of Fusarium lini, W. C. Broadfoot (*Phytopathology, 16 (1926), No. 12, pp. 951–978, figs. 3; abs. in Phytopathology, 16 (1926), No. 1, pp. 84, 85*).—In the abstract paper Broadfoot and E. C. Stakman report the occurrence of 8 or more physiologic forms of *F. lini.* In the later article a report is given of studies on the parasitism of 9 forms when tested on 4 differential varieties of flax. Forms 1 and 2 proved virulent to all the differential host varieties. In the order of their virulence forms 1 and 2 were the most virulent and forms 7, 8, and 9 the weakest.

Morphological variations were found in the spore size of identical forms when grown under different conditions. All 9 forms were said to be distinguished with difficulty by macroscopic examinations of the growth on different media.

The morphology and the pathogenicity of some Phytophthora mutations, L. H. Leonian (*Phytopathology, 16 (1926), No. 10, pp. 723–730, pl. 1, figs. 3*).—The investigation of some mutations of *P. omnivora* is said to indicate that the nature of fungus colonies in pure cultures, the shape of hyphae, the presence or the absence of oogonia, the shape and the size of sporangia, and the ability to produce disease on a given host are not dependable factors in the taxonomy of the genus Phytophthora.

Physiologic specialization of Ustilago nuda and Ustilago tritici, H. A. Rodenhiser (*Phytopathology, 16 (1926), No. 12, pp. 1001–1007, fig. 1*).—Studies were made of the loose smuts *U. nuda* and *U. tritici* to ascertain whether there are physiologic forms of these fungi.

As a result of his studies, the author claims that there is physiological specialization in the loose smut fungi and that the species *U. nuda* and *U. tritici* are nothing more than physiologic forms. Spore characters and effect on the host plants are the same, the principal difference between them being that *U. nuda* infects barley while *U. tritici* attacks wheat. Some of the forms of *U. tritici* were found to resemble some of those of *U. nuda* more closely than they do certain other forms of *U. tritici.* This is believed to indicate that there are probably many forms, and that the specialization is not necessarily restricted to wheat or barley. The author claims that while the differences in forms are cultural and not pathogenic, they are very pronounced and permanent. The cultural differences between forms of *U. tritici* are sometimes more pronounced than those between so-called *U. tritici* and *U. nuda.*

Physiologic specialization and mutation in Ustilago zeae, J. J. Christensen and E. C. Stakman (*Phytopathology, 16 (1926), No. 12, pp. 979–999, figs. 11; abs. in Phytopathology, 16 (1926), No. 1, p. 84*).—The authors claim that *U. zeae* comprises a group of numerous physiologic forms. Fifteen of the forms were studied in considerable detail, and it was found that they could be distinguished in culture by their rate of growth, color, topography, surface, zonation, conidial production, and margin. At least seven, and possibly eight, of the forms were recognized by their parasitic behavior on 10 selfed lines of corn. Some of the forms are said to be very virulent, others moderately so, while some are relatively innocuous. Some selfed lines of corn which had been resistant in the field for several years at the Minnesota Experiment Station were completely susceptible to at least one of the physiologic forms.

Mutants were observed frequently, and they continued to be distinct when propagated on culture media. Some forms were found to mutate readily while others did not. As a result of mutation, at least six distinct variants or

mutants were obtained in a series of transfers from a single isolation. The mutants were found to differ from the parent form not only in general appearance on culture media but also in pathogenicity.

Distinct cultural differences were observed also between collections of *Sorosporium reilianum*.

Inheritance of resistance to Helminthosporium californicum in a cross between Chevalier barley, a resistant variety, and Abyssinian, a susceptible variety, W. W. MACKIE (*Phytopathology, 16 (1926), No. 10, p. 764*).—Crosses made between Chevalier, a resistant variety, and Abyssinian, a susceptible variety, gave plants free from rusty blotch in the F_1 generation, indicating the dominance of resistance. In the F_2 generation approximately one-fourth of the plants were attacked, with the remainder free from rusty blotch, indicating an inheritance of resistance to rusty blotch in a simple 3:1 ratio.

Studies on the reaction to stem rust in a cross between Federation wheat and Khapli emmer, with notes on the fertility of the hybrid types, H. J. HYNES (*Phytopathology, 16 (1926), No. 11, pp. 809–827, pls. 4*).—An account is given of a study of the reaction to stem rust of four generations of a successful cross between Federation wheat (*Triticum vulgare*) and Khapli emmer (*T. dicoccum*).

The first generation consisted of partially sterile intermediate forms, which in the F_2 showed in varying degrees the characters of common wheat, emmer, durum, and intermediate groups. In the F_3 generation the susceptibility of different forms to two physiologic forms of stem rust was tested, and in some families all gradations were shown from complete resistance to complete susceptibility. In the F_4 generation more than 200 plants of the different classes were tested for reaction to 13 forms of stem rust, and it was found that most of the families proved to be susceptible, but some segregated for a susceptible and semiresistant type of reaction. The rust development on the hybrids is said to have varied from 50 to 100 per cent. There appeared to be no relation between head type and rust reaction.

Studies on the epidemiology of wheat stem rust in Manitoba, 1925, D. L. BAILEY and J. H. CRAIGIE (*Phytopathology, 16 (1926), No. 10, p. 755*).—Studies of spores of wheat stem rust collected by airplane at elevations of from 3,000 to 5,000 ft., correlated with field observations, are said to indicate that rust spores are carried by the wind for considerable distances from their place of origin.

Seed treatments for the control of bunt of wheat, F. N. BRIGGS (*Phytopathology, 16 (1926), No. 11, pp. 829–842*).—Nine liquid fungicides and 24 dusts were tested to determine their efficiency for the control of bunt of wheat. The experiments covered a period of four years, although some of the materials were tested for only one or two seasons. All of the more promising fungicides were tested for at least two seasons.

All the liquid fungicides, except furfural, controlled bunt satisfactorily. Severe seed injury resulted from the use of copper sulfate, but this was eliminated by dipping the wheat in limewater after the treatment with copper sulfate. Formaldehyde caused severe seed injury except in one year. There was no detrimental effect observed from the use of six commercial preparations.

Of the dusts used, six commercial products controlled bunt as well as did copper carbonate.

The author believes that liquid treatments are not likely to replace the dust treatments on the west coast of the United States because of the greater ease in handling the latter. Of the dusts used, all factors considered, copper carbonate proved the most satisfactory.

Progress report on bunchy-top of abaca or manila hemp, G. O. Ocfemia (*Phytopathology, 16 (1926), No. 11, p. 894*).—The author reports that bunchy top is a serious disease of abaca in the Philippine Islands, and it is considered to be of a virus type. The most striking characteristic of bunchy top is the crowding of the leaves into a more or less rosette arrangement, and infected plants are much stunted and produce short pseudostems. The plants appear to be susceptible to the disease at all times. Experiments using the aphid, *Pentalonia nigronervosa*, as a vector indicated that bunchy top might be transmitted from diseased abaca plants to healthy ones by this insect.

Crown wart of alfalfa in the South, J. L. Weimer (*Phytopathology, 16 (1926), No. 12, p. 1012*).—The author reports observing the crown wart of alfalfa in two fields near Muldon and in two fields near Columbus, Miss., and also in fields at Uniontown and Selma, Ala.

Hereditary abnormalities resembling certain infectious diseases in beans, W. H. Burkholder and A. S. Muller (*Phytopathology, 16 (1926), No. 10, pp. 731–737, figs. 2*).—Descriptions are given of pseudomosaic and a seedling wilt of beans, both of which appear to be inherited. Failure to find a causal organism or an infectious principle led to genetical study of the two diseases, and it was found that their mode of inheritance indicated that both were recessive characters and that two factors were involved in each case.

A new bacterial disease of the bean, W. H. Burkholder (*Phytopathology, 16 (1926), No. 12, pp. 915–927, pl. 1, figs. 3*).—A description is given of a bacterial disease of the bean that is said to differ from somewhat similar diseases caused by *Phytomonas phaseoli* and *P. flaccumfaciens*. The general symptoms of the diseases caused by the three organisms are said to be quite similar. A wilting of the entire plant, necrotic lesions on the stems and pods, mottling of the leaves, and spotting of the seed are among the symptoms produced.

Cultural studies of the causal organism revealed differences from those previously described, and the name *P. medicaginis phaseolicola* n. v. is given it. In addition to the common bean, the Lima bean and the scarlet runner bean are subject to attack.

A technical description of the causal organism is given.

Studies on the spot disease of cauliflower; a use of serum diagnosis, M. C. Goldsworthy (*Phytopathology, 16 (1926), No. 11, pp. 877–883*).—An account is given of a spot disease of cauliflower that is reported to have become important in the San Francisco Bay region of California. The disease is said to be caused by *Bacterium maculicolum* (E. S. R., 26, p. 54), and sharp frosts and the practice of allowing the heads to become overmature are believed to favor infection. Young plants failed to become infected with *B. maculicolum* when sprayed with recently isolated strains. Cauliflower heads were readily infected when the organism was sprayed upon the fleshy part. The author states that *B. maculicolum* readily incites the formation of agglutinins in the serum of rabbits when injected intravenously. The bacterium was able to persist in flasked dry soil for at least a year, and it was found naturally in soils which had not been cropped to cruciferous plants. The red bordered stinkbug (*Euryopthalmus convivus*) is said to carry the organism on its extremities and thereby acts as a disseminating agent.

What is "sore-shin"? M. Shapovalov (*Phytopathology, 16 (1926), No. 10, p. 761*).—Attention is called to the confusion that is liable to result by designating as sore shin of cotton only those injuries caused by *Rhizoctonia solani*, as studies made in California and Arizona showed that similar lesions were caused by species of Fusarium and other fungi.

Breeding lettuce for tip-burn resistance, J. B. Scherrer and T. E. Rawlins (*Phytopathology, 16 (1926), No. 10, p. 764*).—A brief account is given of breed-

ing and selection work to develop a tipburn resistant head lettuce. The varieties Iceberg (resistant) and New York (susceptible) were crossed, and the red color of Iceberg was found to be dominant, all of the F_1 plants and approximately three-fourths of the F_2 plants showing some red color. The F_2 plantings are said to have contained about one-half as many tipburned plants as the New York planting, and most of these were less severely injured than the diseased New York plants. Approximately 15 per cent of the F_2 plants were found to be very similar to the New York variety in that they had firm heads, no red color, and the New York type of leaf texture.

Powdery mildew of muskmelons in the Imperial Valley of California in 1925, I. C. JAGGER (*Phytopathology, 16 (1926), No. 12, pp. 1009, 1010*).—A severe epidemic of powdery mildew is said to have occurred on muskemelons in the Imperial Valley of California during the summer of 1925. Fungicides failed to control the disease, probably through faulty application. Dusting the plants with sulfur proved more destructive than the disease, as the fungicide burned the foliage very badly.

The fungus was not definitely identified, but it is thought to be probably *Erysiphe cichoraccarum*, which is usually found on cucurbits. No perithecia were found, and the overwintering of the fungus in the Imperial Valley was not definitely determined.

Experiments for the control of onion smut, D. R. SANDS (*Phytopathology, 16 (1926), No. 10, pp. 758, 759*).—Experiments for the control of onion smut are reported upon, in which practically the same quantities of formalin and Kalimat were applied per acre but the dilution was varied. The best results were secured where the greatest quantity of water was used, a larger number of gallons of the fungicides being applied per acre.

The influence of soil temperature and soil moisture upon white rot of Allium, J. C. WALKER (*Phytopathology, 16 (1926), No. 10, pp. 697–710, pls. 2*).—The occurrence of the white rot of onions caused by *Sclerotium cepivorum* was previously reported (E. S. R., 56, p. 351). Additional investigations have shown that infection occurred readily and the disease progressed most rapidly at soil temperatures between 10 and 20° C. In the soil used, the greatest development of the disease occurred when the soil moisture was kept at about 40 per cent of the water-holding capacity. At 20 per cent soil moisture the growth of the host was very slow, and the amount of disease was reduced. At 60 and 80 per cent the growth of the onion plant was accelerated, but infection was greatly reduced.

The author believes that in the northern onion-growing sections of the United States the most favorable soil temperatures occur during the first half of the growing season, while during the last half the daily mean soil temperature for the upper layers of soil is, for the most part, above the point most favorable for disease development. In the more southerly sections, where winter crops of onion and related plants are commonly grown, the favorable temperatures are believed to extend over a long portion of the growing season.

Net necrosis of potato, D. ATANASOFF (*Phytopathology, 16 (1926), No. 12, pp. 929–940, figs. 5*).—According to the author, net-necrosis as described by Orton (E. S. R., 30, p. 649) is not a tuber symptom of leaf roll but is a specific disease which attacks the potato plant independently of leaf roll. It is not confined to the tuber, but it also mainfests itself on the leaves, where symptoms vary with the variety from those showing the yellow mottled condition, called by Quanjer (E. S. R., 49, p. 753) Aucuba mosaic, to those showing no foliage symptoms. Plants infected with net-necrosis are said to grow normally, are vigorous, attain full size, and show no morphologic changes. Their yield is

good, and no running out of the infected plants was observed even in the fourth generation.

The author claims that net-necrosis is a tuber symptom, not of leaf roll, but of Aucuba mosaic. Spindling sprout, supposed by investigators to develop on those tubers affected with leaf roll and net-necrosis, is said to have no relation to leaf roll.

Sprain or internal brown spot of potatoes, D. Atanasoff (*Phytopathology, 16 (1926), No. 10, pp. 711–722, pl. 1, figs. 3*).—The author states that in the Netherlands under ordinary conditions internal brown spot of potatoes occurs constantly in a more or less severe form on soils primarily rich in organic matter, or heavily manured, light, sandy loam, or sandy soils, and reclaimed muck lands, but never on heavy clay soils. The causal agent of the disease is believed to enter the tubers from without, bringing about distinct pathologic changes at the point of entrance to the tuber. These consist of distinct scabbing of the tuber periderm and slight or pronounced depressions in, and deformations of, the tubers. The subsequent browning of the tuber parenchyma is said to radiate from the point of infection, which is usually visible on the outer side of the tuber. While no organism has been definitely determined as the cause of this disease, yet the evidence seems to indicate that it is due to some specific organism rather than a chemical substance. The disease is said to be easily transmitted to fresh healthy tubers by grafting portions of diseased tubers on them.

Corrosive sublimate and time of treatment in relation to yield and control of Rhizoctonia, J. E. Howitt and W. G. Evans (*Phytopathology, 16 (1926), No. 10, p. 755*).—The results of six years' experiments in treating seed potatoes with different strengths of fungicides and for varying periods of immersion are summarized, and it is shown that the strengths of corrosive sublimate and times of immersion usually recommended do not reduce the amount of Rhizoctonia sufficiently to insure satisfactory seed potatoes. It was found that much stronger solutions could be used with safety if the disinfection was done early in the spring when the potatoes were completely dormant. A solution of the strength of 1 part by weight to 500 parts of water for 2 hours practically eliminated disfigured tubers. It is said that satisfactory results can not be obtained by disinfecting seed potatoes with any strength of corrosive sublimate after the eyes have started to grow.

New and unusual diseases and injuries of tobacco, C. M. Slagg (*Phytopathology, 16 (1926), No. 10, p. 758*).—The Fusarium leaf and stem disease of tobacco, curly dwarf, injury from the residual effects of a blasting material known as Borrowite, stunting and malformation of plants due to attacks of the burdock borer, *Papaipema nitela*, and irrigation injury are reported from various localities.

Studies on the nature of the virus of tobacco mosaic, M. Mulvania (*Phytopathology, 16 (1926), No. 11, pp. 853–871*).—In order to secure information as to the nature of plant disease virus, the author investigated the effects of light, heat, animal inoculation, dialysis, and bacteria on the virus of tobacco mosaic.

The experiments showed that the virus was very resistant to the action of light. Exposure to a temperature of 80° C (176° F.) for as long as 20 days did not completely destroy it. It was not possible to recover the virus from the blood stream of a rabbit, into which it had been injected, at any time between 3 and 30 minutes, and the injection caused no detectable reaction on the part of the animal. Blood drawn from the rabbit, when mixed with plant juice containing the virus, inactivated the latter. The virus was found to

pass through certain grades of collodion sacs but not others. A slight change of reaction of the juice containing the virus to the acid side of the isoelectrical point induced the passage of the virus through sacs impervious to normal juice.

The evidence gained by the author's experiments is considered to point to the virus of tobacco mosaic as a nonliving thing, possibly a very simple colloid possessing a protein nature and having enzymatic characteristics.

Attempts to cultivate the tobacco mosaic virus, M. C. GOLDSWORTHY (*Phytopathology, 16 (1926), No. 11, pp. 873–875*).—An attempt was made to verify Olitsky's claim that the virus of tobacco and tomato mosaic can be grown in cultures (E. S. R., 53, p. 547). The results did not confirm the claim. Diluted tobacco virus did not increase its potency when incubated in the culture medium described by Olitsky.

The experiments are considered to support the findings of Mulvania (E. S. R., 54, p. 452), since there was a gradual decrease in the number of infections as the virus was diluted and in only two cases out of eight did the 1:1,000,000 dilutions give any infection. No infections occurred with greater dilutions.

Virus mixtures that may not be detected in young tobacco plants, H. H. MCKINNEY (*Phytopathology, 16 (1926), No. 11, p. 893*).—In a study of tobacco mosaic the author found a suppression of yellow mosaic in a great majority of young plants when the virus was very dilute and localized concentration of the yellow mosaic virus in the yellow areas. This is believed to indicate that a virus contamination may not be detected when the observations are confined to young plants.

Cytology of root tips from sugar beets having the curly-top disease, T. E. RAWLINS (*Phytopathology, 16 (1926), No. 10, p. 761*).—Cytological studies have shown a degeneration of the pericycle cells and several rows of adjacent cells in the root tips from sugar beets having the curly-top disease. Several types of heavily staining cell inclusions were quite regularly found in the cytoplasm of these degenerating cells, but from their amorphous nature they are considered products of the disease rather than causal organisms.

Cold chlorosis of sugar cane, J. A. FARIS (*Phytopathology, 16 (1926), No. 11, pp. 885–891, figs. 4*).—A description is given of a chlorosis of sugar cane in Cuba that is said to be caused by low temperatures. The trouble is characterized by the appearance of white bands on the leaves of certain varieties. It appears that two or three nights with temperatures of from 5 to 10° C. (41 to 50° F.), preceded by rain, are required to produce the response in susceptible varieties. Leaf splitting due to secondary fungus attacks is reported. A somewhat similar chlorosis is said to occur in Hawaii.

Transpiration of healthy and blighted tomato plants (western yellow tomato blight), M. SHAPOVALOV (*Phytopathology, 16 (1926), No. 10, p. 763*).—In a previous publication the author showed that there was a close and direct correlation between the rate of evaporation and the progress of western tomato blight (E. S. R., 56, p. 247).

It is claimed that the environment, whether artificial or natural, which tends to reduce the rate of evaporation from atmometers and the rate of transpiration from the plants is likely to reduce also the percentage of blight. The rate of transpiration of blighted plants was found to decrease progressively as the disease advanced toward its last stage, culminating in a pronounced yellowing and death of the plant.

Effect of mosaic on carbohydrate and nitrogen content of the tomato plant, P. H. BREWER, J. B. KENDRICK, and M. W. GARDNER (*Phytopathology, 16 (1926), No. 11, pp. 843–851*).—An investigation was made to determine the influence of different soil conditions on the severity of mosaic of tomato and also

the effect of the disease upon the growth of the plant and upon its carbohydrate and nitrogen content.

Different soil conditions, as shown by pot tests with fertilizers, did not greatly influence the character or severity of either of the two types of mosaic tested, streak and typical tomato mosaic. In nearly all cases the mosaic plants were characterized by a reduction in total weight and, under all conditions, by a reduction in total carbohydrate content. This reduction occurred mainly in the polysaccharides. There was, in general, no reduction in the nitrogen content, and as a rule the carbohydrate-nitrogen ratio was lower in the diseased plants.

Black end of apple, S. A. WINGARD (*Phytopathology, 16 (1926), No. 12, pp. 1011, 1012, fig. 1*).—The author reports observing a fairly high percentage of fruit on two apple trees in Montgomery County, Ala., affected by the disease of apples and pears described by Barss as black end (E. S. R., 44, p. 840). The trouble is considered due to physiological disturbances caused by an unusually hot, dry summer.

Studies of the epidemiology and control of fireblight of apple, A. N. BROOKS (*Phytopathology, 16 (1926), No. 10, pp. 665–696, fig. 1*).—In view of the common and destructive outbreaks of fire blight of apple trees in Wisconsin, t udies were made of the development of the causal organism (*Bacillus amylovorus*) and means for its control.

Wild host plants were found to be of little importance in the overwintering of the organism, but it was found to occur on apple trees in association with blighted twigs and cankers in the apparently healthy tissues adjacent to the dead areas. The most abundant production of bacterial exudate from blighted parts took place at temperatures between 65 and 85° F. and at relative humidities above 80 per cent. Fully 90 per cent of the twig infection early in the season of 1925 was traced to water-borne inoculum from exuding hold-over cankers and twigs. Several species of aphids were found feeding upon the exudate and also in the nectar of blossoms, and they are considered to be a factor in the initial infection of blossoms.

Blight infection of the apple is believed to take place through the nectaries of blossoms and possibly the hydathodes of very young leaves. All attempts to secure stomatal infection failed. Wounds also furnish the ordinary avenue of entrance to the bacteria for leaf and twig infection. Of the varieties of apple grown on a commercial scale in Wisconsin, the most susceptible to blight are said to be Yellow Transparent, McMahon, Fameuse, Wealthy, Transcendent, and Hyslop. Those showing a fair degree of resistance are Dudley, Duchess of Oldenburg, McIntosh, and Northwestern Greening. The state of vegetative vigor of the host was found to be a factor in determining the rapidity and extent to which blight developed. Even the more resistant varieties blighted severely if too heavily fertilized and cultivated so as to produce an abnormal, succulent growth.

The cutting out of blighted twigs and cankers over small areas during the dormant condition of the trees reduced the amount of blight developing early in the season, but later blossom blight was spread by pollinating insects which carried the disease in from surrounding infected plats. Treatment of active cankers by painting them with a 20 per cent solution of zinc chloride was not found to be satisfactory in checking their activity. The scraping of the epidermis from active cankers and adjacent bark and the application to the wound of Reimer's solution with the addition of glycerin and alcohol gave comparatively good results. The application of a mixture of carbol-fuchsin and gentian violet to active cankers from which the epidermis had been scraped checked the activity of the organism. Spraying for the control of

insect disseminators of blight checked the spread of the disease early in the season. These beneficial results, however, disappeared following the spread of blossom blight by pollinating insects.

Verticillium "wilt" of the raspberry, G. H. Berkeley and A. B. Jackson (*Phytopathology, 16 (1926), No. 10, pp. 755, 756*).—In a previous publication the authors reported a raspberry disease to which the name blue stem was given (E. S. R., 56, p. 354). It is now proposed to abandon this name and substitute for it wilt, as prominent symptoms of the disease are wilting and leaf casting. The cause of wilt is said to be an undescribed species of Verticillium for which the name *V. ovatum* is proposed.

Further studies on avocado fruit decays, W. T. Horne (*Phytopathology, 16 (1926), No. 10, p. 762*).—In continuation of studies of avocado fruit rots (E. S. R., 58, p. 554), the author reports the occurrence of a tough elastic rot caused by *Pythiacystis citrophthora*, a rapid dry-rot due to *Penicillium expansum*, and wine-colored rots on dark fruits due to inoculations with *Sclerotinia libertiana* and *Botrytis vulgaris*.

Notes on some tropical anthracnoses, W. T. Horne (*Phytopathology, 16 (1926), No. 10, p. 762*).—Studies at the California Experiment Station and observations in the field are said to confirm the conclusions of Clausen (E. S. R., 28, p. 749) that withertip of limes is caused by *Gloeosporium limetticolum*. This fungus did not attack any other species of citrus. An anthracnose of mango caused by *Colletotrichum* sp. and a Colletotrichum-like fungus on soursop fruits are reported.

The dry rot disease of gladioli, F. L. Drayton (*Phytopathology, 16 (1926), No. 10, p. 757*).—A dry-rot of gladiolus bulbs is described that is said to be quite different from the hard rot disease described by Massey (E. S. R., 36, p. 453)

Phomopsis juniperovora and closely related strains on conifers, G. G. Hahn (*Phytopathology, 16 (1926), No. 12, pp. 899–914, pls. 3, fig. 1*).—Studies by the author show that *P. juniperovora*, a fungus usually referred to as causing cedar blight, is widespread and infests other species of coniferous trees. A number of closely related strains of Phomopsis have been recognized, and for convenience they are placed in two groups. The forms in one group differ somewhat in their cultural characters, while the others are regarded as strains of *P. juniperovora*. Twenty-two host species are recognized for the first group and 13 additional ones for the second. Species of Juniperus, Cupressus, Thuja, Chamaecyparis, Thujopsis, Cephalotaxus, Taxus, Taxodium, Sequoia, Pseudotsuga, and Larix are subject to attack, and detailed studies were made of the fungus on these hosts. Species of Abies, Cryptomeria, and Tsuga are also said to serve as hosts, but the fungus on these was not studied in cultures. The host relationships of *P. juniperovora* and closely related strains were established by inoculation experiments.

Predisposing factors for attacks by *P. juniperovora* and related strains are said to be excessive moisture, crowding and heavy shading in seed beds, wound injuries, and unfavorable growth conditions.

A preliminary note on Fomes pinicola and Pholiota adiposa, two heterothallic species of wood-destroying fungi, I. Mounce (*Phytopathology, 16 (1926), No. 10, pp. 757, 758*).—It was found that *F. pinicola* and *P. adiposa* were bisexual, and that in both species monosporous mycelia either remained wholly sterile or produced imperfect fruit bodies which never shed spores. On the other hand, the compound mycelia formed by the union of two monosporous mycelia produced normal sporophores. Monosporous mycelia isolated from spores of fruit bodies from different localities were mutually fertile.

ECONOMIC ZOOLOGY—ENTOMOLOGY

Red squirrel damage to coniferous plantations and its relation to changing food habits, N. W. Hosley (*Ecology, 9 (1928), No. 1, pp. 43–48, pl. 1*).—The author has found that during periods of deep snow when the red squirrel's usual food supply is cut off it eats the buds of certain coniferous trees, the normal growth of which is thereby retarded. Scotch pine terminal and lateral buds, Norway spruce terminal buds and lateral branch tips, European larch lateral branch ends, and white pine terminal shoots are clipped off. Scotch pine apparently suffers most, with Norway spruce and white pine close behind. European larch recovers well from the injury. The intensity of the injury varies directly with the depth of the snow and the length of time it remains between thaws. This damage has been observed by the author in three States. The fact that it has been apparent only in recent years is explained by the lack of pine seed and hardwood mast for winter storing, which are less abundant in the present young, cut-over forests of light-seeded species, and the complete disappearance of the chestnut as a source of food.

Relation of the meadow mouse Microtus p. pennsylvanicus to the biota of a Lake Champlain island, R. T. Hatt (*Ecology, 9 (1928), No. 1, pp. 88–93*).—This is a report of studies of the relations existing between the sole mammalian species and other species of animals and plants occurring on Sloop Island, Lake Champlain.

Practical information on large-scale manufacture of Danysz' virus for use against meadow mice [trans. title], R. Regnier and J. Verguin (*Min. Agr. [France], Ann. Épiphyties, 13 (1927), No. 2, pp. 130–144, pls. 2, fig. 1*).—This is an account of the preparation and use of this virus in combating meadow mice.

Woodchuck control in the Eastern States, J. Silver (*U. S. Dept. Agr. Leaflet 21 (1928), pp. 6, figs. 5*).—This is a practical account.

Experimental feeding of oysters, G. W. Martin (*Ecology, 9 (1928), No. 1, pp. 49–55*).—The author concludes that oysters can make a substantial growth on pure cultures of plankton organisms. The results obtained are held to support the contention of other investigators that there is no proof that they are able to utilize detritus directly.

Bacteriology and chemistry of oysters, with special reference to regulatory control of production, handling, and shipment, A. C. Hunter and C. W. Harrison (*U. S. Dept. Agr., Tech. Bul. 64 (1928), pp. 76*).—This bulletin deals with the subject under the headings of the oyster industry, chemical composition of oysters, physical and chemical examination of oysters, oysters as carriers of infection, bacteriological examination of oysters, pollution of oyster beds, effect of cooking on bacterial content of oysters, restricted oyster-producing areas, hibernation of oysters, purification of oysters, floating oysters in the shell, shucking-house sanitation, washing oysters, shipping oysters, green oysters, pink oysters, and Olympia oysters. A list is given of 106 references to the literature.

Symposium: Needed lines of investigation in American entomology (*Ann. Ent. Soc. Amer., 20 (1927), No. 4, pp. 419–460*).—The contributions to this symposium are as follows: Introduction, by E. D. Ball (pp. 419–422); Taxonomy, by S. A. Rohwer (pp. 423–428); Insect Physiology, by P. S. Welch (pp. 429–436); Insect Bionomics, by R. W. Doane (pp. 436–438); Insect Ecology, by W. C. Allee (pp. 439–444); Needs in the Study of Beneficial Insects, by L. O. Howard (pp. 445–450); Economic Entomology: The Needs in the Study of Insect Injuries, by E. O. Essig (pp. 451–454); Needs in the Study of Control Measures, by W. P. Flint (pp. 454–456); and Summary, by E. F. Phillips (pp. 457–460).

The sensibility of insects to chemical stimulants [trans. title], R. POUTIERS (*Min. Agr. [France], Ann. Épiphyties, 13 (1927), No. 3, pp. 181–194, fig. 1*).—Part 1 of this account deals with the attraction of insects by chemical agents, and part 2 with the resistance of the olive fruit fly to different toxic substances.

Preliminary researches on the entomophytic fungi [trans. title], M. ARNAUD (*Min. Agr. [France], Ann. Épiphyties, 13 (1927), No. 1, pp. 1–30, figs. 17*).—The studies here reported were conducted principally with *Beauveria bassiana* (*Botrytis bassiana*) and *Beauveria densa* (*Isaria densa*), with additional work with *B. globulifera* (*Sporotrichum globuliferum*) and a *Spicaria* sp. near to *S. farinosa.*

The work is reported under the headings of influence of temperature on the development of *B. bassiana* and *B. densa;* a comparison of the development of *B. bassiana* and *B. densa* in infected caterpillars and in cultures on potato; a comparative study of *B. bassiana, B. densa, B. globulifera,* and *Spicaria* sp. on the silkworm, *Pieris brassicae,* and Agriotes; influence of the manner of administration of the spores of *B. bassiana* on the infection of the silkworm; influence of the hygrometric condition of the air on the course of the infection of caterpillars; influence of temperature in the infection and development of *B. bassiana* on the caterpillars of the silkworm and of *P. brassicae;* manner of penetration of the Beauveria and an anatomical study of infected caterpillars; and the virulence of cultures of *B. bassiana.*

Insect enemies of cork oak in Mamora Forest, Morocco [trans. title], J. DE LÉPINEY (*Min. Agr. [France], Ann. Épiphyties, 13 (1927), No. 3, pp. 145–174, pls. 2, figs. 3*).—Twenty-six insect pests are dealt with, two of which were of particular importance in 1926 and 1927, namely, the gipsy moth and the formicid *Crematogaster scutellaris.* A large part of the account (pp. 146–165) is devoted to a report of biological studies of the gipsy moth, its injury, and its natural enemies in Mamora in 1926. A list of the Coleoptera collected in fallen leaves, by A. Théry, and a list of 25 references to the literature are included.

The black cherry aphis, C. R. CUTRIGHT (*Ohio Sta. Bimo. Bul., 13 (1928), No. 2, pp. 44–48, fig. 1*).—This is a summary of information on the aphid most frequently met with on the cherry in Ohio, the damage being so noticeable that it attracts much attention. In work extending over a period of three years almost perfect control was obtained by the use of an oil spray in the dormant period followed by dormant strength lime sulfur and nicotine sulfate just before the buds opened. It is thought, however, that the lime sulfur and nicotine sulfate, if thoroughly applied before the buds burst, will effect a practical control, as has been found to be the case in other States and in Canada. The spraying of sweet cherries after the buds have opened is said to be useless, but on sour cherries, due to the fact that the aphids do not curl the leaves, it would seem possible to use a nicotine spray with fair chances of success.

A study of phylloxera infestation in California as related to types of soils, R. L. NOUGARET and M. H. LAPHAM (*U. S. Dept. Agr., Tech. Bul. 20 (1928), pp. 39, pls. 2, figs. 6*).—This is a report of a survey conducted by the Bureau of Entomology in collaboration with the Bureau of Soils with the view to determining a relationship between phylloxera infestation and various types of soils.

Following the introduction, the authors deal with the subject under the headings of history of the investigation, method employed in making the survey, characteristic growth of grapevines indicating phylloxera injury, sandy soils foster immunity to grape phylloxera, formulation of the theory, and soils of the vineyard districts in Fresno and Tulare Counties as related to phylloxera infestation. The results of the survey are given in colors on a large infolded

map, which shows the relation of phylloxera infestation to types of soil in the vineyard districts of Fresno and Tulare Counties.

Infestation appeared to be most frequent on soils of moderately heavy or heavy texture which become sticky when wet and bake and check when dry. It rarely occurred upon soils of sandy texture and of loose porous structure, even in close proximity to areas of severe and long-standing infestation. It also appeared to be particularly frequent and pronounced in flat or depressed localities, where poorly developed drainage is aggravated by the occurrence of shallow, compact, and impervious subsoils and hardpan, giving rise to a condition of shallow-rooted vines and stagnated subsoil drainage.

Spraying versus dusting to control the potato leafhopper in commercial potato fields of Wisconsin, J. E. DUDLEY, JR., and C. L. FLUKE, JR. (*Wisconsin Sta. Research Bul. 82 (1928), pp. 16, figs. 6*).—This account reports particularly upon experiments conducted at Spooner and Waupaca, Wis., from 1922 to 1925, inclusive. The work was conducted with a view particularly to determining the cost of spraying and dusting commercial potato fields for the control of the potato leafhopper (*Empoasca fabae* Harr.), which is probably the most injurious pest of the potato plant in the State, where it regularly causes serious damage.

The average increases for spraying and dusting combined varied from 22.7 bu. per acre in the two years of little hopperburn to 59.3 bu. per acre in the two years of heavy hopperburn. The average yields of all sprayed, all dusted, and all check plats when compared showed the following distinctive results: All sprayed plats 167.9, all dusted plats 163.1, and all check plats 136.4 bu. per acre. The cost of spraying and dusting for four applications per acre was $11.26 and $11.97, respectively. The yields from dusting and spraying were equal within the limits of experimental error, and the cost of dusting was little more than that of spraying.

The parasites and hyperparasites of the gipsy moth in Morocco [trans. title], C. FERRIÈRE (*Min. Agr. [France], Ann. Épiphyties, 13 (1927), No. 3, pp. 175–180*).—Two parasites of the eggs, six of the caterpillars, and two of the pupae are considered. A list of 26 references to the literature is included.

Paradichlorobenzene experiments in the South for peach-borer control, O. I. SNAPP and C. H. ALDEN (*U. S. Dept. Agr., Tech. Bul. 58 (1928), pp. 40, figs. 11*).—This account reports particularly upon paradichlorobenzene experiments in orchards conducted in the years 1921 to 1926, inclusive. Special experiments with paradichlorobenzene on the rate of evaporation and the relation of soil temperature and rainfall to borer mortality and tree injury are included.

Life-history studies showed that most of the peach borer moths emerge in Georgia during September and that gas for peach borer control is most effective at the close of the oviposition period of the moths.

"Orthodichlorobenzene, paratoluidine, and calcium cyanide were tested for peach borer control, but none of them were as safe and effective as paradichlorobenzene. Paradichlorobenzene was used on the same trees in one orchard for five consecutive years with no discernible tree injury, and resulted in almost complete eradication of the peach borers. Poor results were obtained with large doses of paradichlorobenzene for short exposures, and only fair results with small doses applied at the regular time for long exposures. The 0.75 and 1-oz. doses exposed to the trees for from 4 to 6 weeks gave excellent borer control. Paradichlorobenzene applied in central Georgia at the usual time (October 10 to 15) gave a higher borer mortality than when applied

2, 4, and 6 weeks later. Spring applications were not as effective as those made in the fall.

"No tree injury of any consequence developed from the use of paradichlorobenzene during the 1921–22 and 1922–23 seasons, only a few flecks in the bark layers of several trees being noted. Severe injury to trees 2 and 3 years old developed from the use of paradichlorobenzene during the 1923–24 season. Some of the 3-year-old trees were killed. Older trees were not injured that season, except for slight flecking of the bark layers, which apparently did not affect the vigor of the trees. During the 1924–25 season no injury resulted to 1- and 2-year-old trees from paradichlorobenzene. There was flecking of the bark layers of a few 3-year-old trees, but no injury to any of the older trees. In 1925–26 there was no injury to the 1-year-old trees, the bark layers of trees 2, 3, and 4 years old were flecked, and there was no injury to the older trees.

"Five years of experimentation with paradichlorobenzene in the Georgia peach belt showed that it is unsafe to use for borer control on 1, 2, and 3-year-old peach trees; and safe, when properly applied, on all trees 4 years of age and older.

"The following conclusions were reached as a result of experimentation with paradichlorobenzene in the laboratory: It will kill peach borer larvae as far down as 1 ft. below the soil surface when the gas is controlled by confinement in battery jars; there is no difference in the effectiveness of the gas in the different types of soil used; the lower the temperature and the higher the moisture content of the soil, the slower is the evaporation of the crystals and the action of the resultant gas on the borers; under some conditions the gas will remain in the soil over winter; under normal conditions all larvae are killed by a 1-oz. dose within a 17-day period; peach borer larvae feed to some extent after they are exposed to paradichlorobenzene gas; when applied at the recommended time under normal orchard conditions, complete evaporation of the 0.5-oz. dose usually takes place within 6 weeks, the 0.75-oz. dose within 16 weeks, and the 1-oz. dose within 27.5 weeks; and the borers 3 in. above and occasionally those 5 in. above the ring of crystals are killed by the gas."

The sugar cane moth borer in the United States, T. E. Holloway, W. E. Haley, and U. C. Loftin (*U. S. Dept. Agr., Tech. Bul. 41 (1928), pp. 77, pls. 2, figs. 25*).—This account of studies of the sugar-cane borer deals with its life history and bionomics, importance, and control measures, and includes a list of 35 references to the literature. The technical descriptions are by C. Heinrich.

Apple tree leaf roller in northern Idaho, L. E. Longley (*Idaho Sta. Bul. 157 (1928), pp. 24, figs. 8*).—This is a report largely upon experimental control work with the leaf roller in northern Idaho, commenced in the spring of 1922 and continued through 1926. Experimental work begun at the same time by Wakeland in southern Idaho has been reported in Bulletin 137 (E. S. R., 54, p. 56). Other work conducted with this pest at experiment stations in the Northwest, recently noted, include studies at the Washington Station reported by Spuler in 1922 (E. S. R., 48, p. 553) and by Melander in 1924 (E. S. R., 51, p. 158), at the Montana Station reported by Regan in 1923 (E. S. R., 49, p. 852), and at the Utah Station by Hawley in 1926 (E. S. R., 55, p. 557).

The author's work with arsenical and oil sprays is reported upon in large part in tabular form. It was found that while arsenicals have some value in reducing damage by leaf roller larvae they do not offer an efficient means of control. The acid arsenates of lead and Paris green proved more efficient than the basic arsenates or calcium arsenates. It was found that ordinary codling moth arsenical spray is not strong enough to be of great value against the leaf roller, as from 8 to 12 lbs. of lead arsenate to 200 gal. of water are

necessary for any fair control. The experiments indicate that an arsenical spray at or just before the pink blossom stage has considerable value in safeguarding setting of fruit, while another one at the calyx spray stage is necessary to prevent excessive defoliation. In general, the arsenical spray should be relied upon only when there is slight infestation or when for some reason the oil spray has not been applied or has been ineffective. Lime sulfur was found to decrease or destroy the effectiveness of the arsenical spray.

"The eggs of the leaf roller can be destroyed by a dormant oil spray. The type of oil used must be within certain specifications, which, in general, means an oil that is medium in volatility and viscosity, neither very heavy nor very light. Various types of emulsifiers may be used, and good results will be obtained from most of them. If water is very hard the calcium caseinate type of emulsion is preferable, as it is more stable under those conditions. The strength of diluted emulsion to be used is dependent on (1) thoroughness of application—where the application is very thorough a weaker emulsion may be used; (2) type of emulsion—a weaker emulsion may be used if it is of the quick-breaking type such as the calcium caseinate emulsion. In general, for leaf roller the strength of the diluted emulsion may be as low as 4 per cent of actual oil content where the emulsion is of the calcium caseinate type and application thorough. If application is less thorough and the emulsion one of the soap type, as high as 7 per cent of actual oil should be present in the diluted emulsion. Phenols have no ovicidal value in oil emulsion. Their presence is of value only in stabilizing and preserving emulsions. Oil sprays are likely to cause injury particularly of two types: Injury to leaf buds and twigs and branches and injury to blossom buds. Such injury may be caused by use of improperly emulsified or insufficiently diluted solutions. They may be intensified by a weakened condition of the trees, especially if this condition is due to excessive cold."

The breaking-up of hibernation in the codling moth larva, M. T. Townsend (*Ann. Ent. Soc. Amer., 19 (1926), No. 4, pp. 429–439*).—The author finds that the break-up of hibernation in the codling moth larva is hastened and aided by the addition of water to the tissues, such as normally takes place during rains. This water, by diluting the fluids, probably speeds up the enzyme action in the animal's body, and the result is a renewal of metabolic processes, pupation, and general activity. The frequency of soaking is of much importance.

During the exposure to rather low temperatures in winter and spring the tissues of the winter brood of codling moth larvae undergo a preparation for pupation which marks the renewal of activity in spring. The preparation process does not go on at temperatures as high as 22° C. (71.6° F.), and 10° is more favorable for it than 0°. It may be explained by assuming the presence of an autolytic enzyme in the tissues, which works best at a temperature near 10°.

The oriental fruit moth (Laspeyresia molesta Busck): Essential facts concerning its activities, present status in Ohio, suggestions for reducing infestation, L. A. Stearns (*Ohio Sta. Bimo. Bul., 13 (1928), No. 2, pp. 35–43, figs. 7*).—This is a practical summary of information on this pest based partly upon studies of the author previously noted (E. S. R., 58, p. 758). This pest is now generally distributed throughout the peach-growing areas of Ohio. The infestation is most severe along the Ohio River, especially in Hamilton County about the city of Cincinnati and in Lawrence, Gallia, and Meigs Counties; in the center of the State to the south of Columbus; and in the north in the vicinity of Sandusky, Lorain, and Elyria. It seems probable that the sale and inadequate disposal of infested peaches in the cities mentioned have resulted

in the establishment of the moth in the commercial orchards of the surrounding country.

Six species of larval parasites are already established in 11 counties in central and southern Ohio. The comparative population of the moth and its larval parasites and the trend of parasitism in a 4-year-old Elberta peach orchard without fruit in 1927 are shown. The total parasitism for the season averaged 18.7 per cent, with the seasonal trend from 6 to 31 per cent.

The effect of various chemicals on the spreading and penetration of oils in different mosquito-breeding places, J. M. GINSBURG (*N. J. Mosquito Extermin. Assoc. Proc., 14 (1927), pp. 52–63*).—This is a contribution from the New Jersey Experiment Stations reporting upon investigations carried out with a view to improving the spreading power of fuel oil used for larvicidal purposes by the addition of certain chemicals. From the various chemicals tested, it was found that tar acids having hydroxyl (OH) groups (such as phenols, cresols, and xylenols), the monohydric alcohols, pine oil, and turpentine increased the spreading power of mineral oils. Cresols and xylenols proved more efficient than the other compounds. "Results from laboratory and field tests have definitely shown that the addition of 1 gal. crude cresol containing 95 per cent cresylic acids to 100 gal. of fuel oil greatly increased the spreading and penetration of the oil on salt and fresh waters covered with dead organic matter and vegetation. Laboratory measurements have shown that a given quantity of fuel oil containing 1 per cent crude cresol covered one and one-half times as much water surface as did an equal quantity of the same oil without this chemical. The duration of the oil film was also appreciably increased by this treatment, especially on sewage beds."

New Jersey Mosquito Extermination Association, fourteenth annual meeting (*N. J. Mosquito Extermin. Assoc. Proc., 14 (1927), pp. 136, pls. 3*).—The papers presented are as follows: Lessons from the Campaign of 1926, by S. Miller (pp. 5–8); What Workers with Mosquitos Did during 1926, by L. O. Howard (pp. 8–23); The Reclamation of the Salt Marshes of New Jersey for Agricultural Purposes, by W. T. Donnelly (pp. 23–31); A Summary of Mosquito-Control Activities in New Jersey during 1926, by F. W. Miller (pp. 35–49); The Effect of Various Chemicals on the Spreading and Penetration of Oils in Different Mosquito-Breeding Places, by J. M. Ginsburg (pp. 52–63), above noted; Some Important Unsolved Problems in Mosquito Work of New Jersey, by T. J. Headlee (pp. 64–70); Proposed Solutions for Important Unsolved Problems in Mosquito Work of New Jersey, by J. B. Leslie (pp. 70–80); Memorandum on Trials with "Gambusia" in Hudson County, by L. E. Jackson (pp. 84–86); Progress of Mosquito Work in Nassau County, New York, for the Year 1926, by R. H. Sammis (pp. 107–109); Mosquito Investigations in Canada in 1926, by A. Gibson (pp. 110–115); Antimosquito Work in Connecticut in 1926, by R. C. Botsford (pp. 115–118); Mosquito Control Measures at the Sesqui-Centennial Exposition, Philadelphia, by H. Hornig (pp. 119, 120); The Campaign against the Mosquito in Chicago under the Direction of the Gorgas Memorial Institute, by E. M. Skinner (pp. 121–125); and The Year's Work against the Mosquito in Burlington, N. J., by Mrs. J. L. Shedaker (pp. 126–133).

The status of the cherry fruit fly (Rhagoletis cerasi L.) [trans. title], J. VERGUIN (*Min. Agr. [France], Ann. Épiphyties, 13 (1927), No. 1, pp. 31–42, fig. 1*).—This is a review of the present status of the cherry fruit fly, in connection with a bibliography of 30 titles.

An enemy of the rose bush, Coraebus rubi L. [trans. title], P. GÉNIEYS (*Min. Agr. [France], Ann. Épiphyties, 13 (1927), No. 1, pp. 48–78, pls. 2, figs. 8*).—This is an extended account of studies of the biology of the buprestid

C. rubi, which attacks the cane, presented in connection with a list of 48 references to the literature.

On the life-history of "wireworms" of the genus Agriotes Esch., Part IV, A. W. R. ROBERTS (*Ann. Appl. Biol., 15 (1928), No. 1, pp. 90–94, figs. 3*).—This continuation of the account previously noted (E. S. R., 48, p. 460) deals with the specific characters of the larva of *A. lineatus* L. The most reliable characters for distinguishing the larva of *A. lineatus* from the closely similar larva of *A. obscurus* have been found in the spiracles, those of the former being longer and more parallel-sided and also bearing a noticeably larger number of teeth bordering the orifices.

The decomposition of naphthalene in the soil and the effect upon its insecticidal action, F. TATTERSFIELD (*Ann. Appl. Biol., 15 (1928), No. 1, pp. 57–80, figs. 5*).—It is found that when naphthalene is incorporated thoroughly with soil it shows a fairly potent toxic action on wireworms. Uneven distribution lessens its efficiency, since owing to its low vapor pressure and consequent slow spread it produces only a small zone of toxic action.

Naphthalene is slow in toxic action, taking three or four days to kill wireworms, and as a consequence of this and of its repellent action to insects, if the chemical be unevenly distributed in the soil insects tend to move away from positions where toxic action would be exerted. The persistence of the toxic action depends upon the soil type. In soils rich in organic matter, toxicity disappears more rapidly than in soils less rich in organic matter. Toxicity persists longer in sterile soils and in sand than in unsterilized soils, and in dry than in moist soils.

"The rate of disappearance of naphthalene from soil has been determined. It depends very little upon volatilization but almost entirely upon some factor inherent in the soil, which is more active in soils rich in organic matter than those poor in organic matter, and in unsterilized soils than in sterile soils. Second and third doses of naphthalene added to the soil, when the first has disappeared, are decomposed more rapidly than the first dose."

Some observations on the leaf-mining flea-beetle Dibolia borealis Chevrolat, H. REED (*Ann. Ent. Soc. Amer., 20 (1927), No. 4, pp. 540–549, pl. 1, figs. 2*).—This is a report of studies at Ithaca, N. Y., of the plantain flea beetle, which at times causes conspicuous depredations on common plantain.

Notes on the life history and habits of the mound-building ant, Formica ulkei Emery, A. M. HOLMQUIST (*Ecology, 9 (1928), No. 1, pp. 70–87, pls. 2, fig. 1*).—An extended account of observations made by the author.

Hibernation of certain scarabaeids and their Tiphia parasites, J. W. MCCOLLOCH, W. P. HAYES, and H. R. BRYSON (*Ecology, 9 (1928), No. 1, pp. 34–42, figs. 2*).—This is a contribution from the Kansas Experiment Station. The study was made with a view to determining the depths to which larval and adult scarabaeids penetrated the soil to pass the winter.

It was found that in Kansas 89 per cent of all grubs discovered were below 6 in. and that they do not penetrate deeper than 40 in., the majority being between 6 and 20 in. With the exception of *Pinotus carolina*, which was found at 24 in., the adults of none of the species were taken as deep as were the larvae, for which 20 in. for *P. rugosa* was the maximum depth. In genera other than Phyllophaga, the adults were found below the plow line with the exception of a lone specimen of *Euphoria inda*, which was found 2 in. below the surface. Cocoons of *Tiphia* spp., an important ectoparasite of white grubs, are normally found at an average depth of 11 in., with extremes of 2 and 23 in. A study of the soil temperature indicated that most of the grubs and beetles burrow deeply enough to avoid freezing conditions.

A similar study of wireworms by the authors has been noted (E. S. R., 58, p. 263).

The bionomics of Dinocampus coccinellae Schrank, W. V. Balduf (*Ann. Ent. Soc. Amer., 19 (1926), No. 4, pp. 465–498, figs. 7*).—This is a report of studies of a braconid parasite of coccinellids.

The bionomics of Anastatus albitarsis Ashm., parasitic in the eggs of Dictyoploca japonica Moore (Hymen.), C. P. Clausen (*Ann. Ent. Soc. Amer., 20 (1927), No. 4, pp. 461–472, pl. 1*).—This is a report of studies of the eupelmid parasite of the egg masses of the saturnid moth *D. (Caligula) japonica* on deciduous forest trees in Japan. Observations were made in four localities, namely, Nagasaki in Kyushu, the southern island, Yokohama and Tokyo in Honshu, and Sapporo in Hokkaido, the northern island, thus covering in latitude a range of approximately 750 miles. The field parasitism of the eggs by Anastatus for four localities was found to range in effectiveness from 16.3 per cent at Sapporo in 1921 to 34.3 per cent at Tokyo in 1920.

Studies in arthropod hibernation.—I, Ecological survey of hibernating species from forest environments of the Chicago region, A. M. Holmquist (*Ann. Ent. Soc. Amer., 19 (1926), No. 4, pp. 395–426, pls. 2*).—Some 329 hibernating species are reported upon, which, with one exception, represent all the classes of arthropods.

On the control of red spider by means of naphthalene vaporised over a special lamp, T. Parker (*Ann. Appl. Biol., 15 (1928), No. 1, pp. 81–89, fig. 1*).—Naphthalene vapor having been shown by other investigators to be toxic to red spider (*Tetranychus telarius* L.), a suitable lamp was designed in order to better control the fumigation, and is here described. This lamp has been used under commercial conditions and has given satisfactory results. Carnations and tomatoes have been fumigated with naphthalene and satisfactory control of red spider has been secured, as is shown by the data here presented. Fumigations on a variety of greenhouse plants have also been conducted, and general observations and recommendations on naphthalene fumigation for red spider control are included.

ANIMAL PRODUCTION

[Animal husbandry investigations at the Canadian experimental stations and farms] (*Canada Expt. Farms, Rpts. Supts. 1926, Agassiz (B. C.) Farm, pp. 4–13, 35–43, figs. 8; Brandon (Man.) Farm, pp. 4–12, 51–55, fig. 1; Cap Rouge (Que.) Sta., pp. 3–17, 42–44, figs. 3; Charlottetown (P. E. I.) Sta., pp. 5–11, 50–58; Fredericton (N. B.) Sta., pp. 4–15, 54–66; Harrow (Ont.) Sta., pp. 18–20; Indian Head (Sask.) Farm, pp. 4–12, 46–48, figs. 6; Invermere (B. C.) Sta., pp. 6, 7, 27–31, figs. 2; Kapuskasing (Ont.) Sta., pp. 4–13, 52–60; Lacombe (Alta.) Sta., pp. 4–18, 63–69, figs. 2; Lennoxville (Que.) Sta., pp. 3–21, 58–63, figs. 2; Lethbridge (Alta.) Sta., pp. 6–21, 54–59, figs. 2; Morden (Man.) Sta., pp. 4–8, 51–56, fig. 1; Nappan (N. S.) Farm, pp. 4–25, 55–63, fig. 1; Rosthern (Sask.) Sta., pp. 3–14, 52–55; Ste. Anne de la Pocatière (Que.) Sta., pp. 3–19, 52–59, figs. 3; Sidney (B. C.) Sta., pp. 39–43, 59–64, figs. 2; Swift Current (Sask.) Sta., pp. 35, 36, 45*).—In these publications brief reports are given by W. H. Hicks, M. J. Tinline, G. A. Langelier, J. A. Clark, C. F. Bailey, H. A. Freeman, W. H. Gibson, R. G. Newton, S. Ballantyne, F. H. Reed, J. A. McClary, W. H. Fairfield, W. R. Leslie, W. W. Baird, W. A. Munro, J. A. Ste. Marie, E. M. Straight, and J. G. Taggart, respectively, on the results of feeding and breeding experiments with horses, beef and dairy cattle, sheep, swine, and poultry for the year 1926.

The estimation of the live weight of animals according to certain measurements [trans. title], A. P. Dmitrochenko (*Izv. Gosud. Inst. Opytn. Agron.* (*Ann. State Inst. Expt. Agron.* [*Leningrad*]), *4* (*1926*), *No. 1–2, pp. 47–54*).—Estimations of the live weight of animals from certain measurements are based on two assumptions: (1) Knowing the weight of a unit volume of the body, the weight of the body may be calculated by multiplying the number of volume units by the weight, and (2) the change in the weight of the separate parts of the body is proportional in respect to various animals. On these assumptions three methods of estimating the live weight of animals have been devised.

In horses the weight is estimated by multiplying the height at the withers by a coefficient, which is 2 when the weight is calculated in kilograms. The author shows that the coefficient 2.72 used for heights of from 150 to 160 cm. gave good results but was not accurate for heights of 180 cm.

The second method is based on the assumption that the animal represents a hollow cylinder, the thickness of whose walls remain constant. The length from the withers to the cavity between the first and second vertebrae of the tail is multiplied by the circumference of the girth. Up to 100 kg. in weight, this method is quite accurate for determining the weight of pigs.

In the third method the weight of the body is assumed to be proportional to the volume. The most common formula used in determining weight by this method is that live weight equals the area of a section of the body behind the shoulders multiplied by the length, by the weight of a unit volume of the body, and by a coefficient.

Screenings as a feed for live stock, W. G. Dunsmore (*Canada Dept. Agr. Pamphlet 87, n. ser.* (*1928*), *pp. 10*).—The results of experiments in which various kinds of screenings were fed to fattening and growing pigs, fattening steers and lambs, and dairy cattle are briefly reported.

Costs and methods of fattening beef cattle in the Corn Belt, 1919–1923, R. H. Wilcox, R. D. Jennings, G. W. Collier, W. H. Black, and E. W. McComas (*U. S. Dept. Agr., Tech. Bul. 23* (*1927*), *pp. 114, pls. 2, figs. 16*).—The Department in cooperation with the Illinois, Indiana, Iowa, Missouri, and Nebraska Experiment Stations started a study in the fall of 1918 and continued it during five consecutive feeding seasons on the cost and methods of fattening beef cattle in five representative feeding sections of the Corn Belt. The data are based on the results obtained with over 100,000 head of cattle.

Of the cattle studied 53 per cent weighed between 751 and 1,000 lbs., 24 per cent between 501 and 750 lbs., 14 per cent over 1,000 lbs., and 9 per cent less than 500 lbs. Of the entire number 86 per cent were finished in dry lot, of which almost one-half had been pastured for some time previous to intensive feeding. Fattening cattle while on grass was most common in the west-central Missouri district. Feeder cattle, weighing 900 lbs. or less, purchased in the fall, carried through the winter, and finished on grass, are more desirable than cattle weighing over 900 lbs. at the time of purchase. Limiting or feeding no grain during the winter and heavy grain feeding on pasture produced better results than heavy grain feeding during the winter and no grain during the pasture season.

Approximately 84 per cent of the total cost of 100 lbs. of gain was for feed, 6 per cent for interest on investment, 5.5 for labor, and 4.5 per cent for depreciation, taxes, etc. Calves required only 64 per cent, yearlings 75, and medium-weight cattle 87 per cent as much feed to produce 100 lbs. of gain as did the heavy cattle. The heavy cattle could be gotten in market condition sooner than the other cattle, but due to the greater cost of gain and the more definite marketing date the feeding of this type was more hazardous than that of

lighter-weight cattle. As would be expected, the rate and cost of gain varied considerably from one farm to another.

The value of manure and pork produced in cattle feeding varied but was often enough to pay all costs other than feed. Each day of fall pasture before going in dry lot was worth 3.4 lbs. of grain, 2.2 lbs. of dry roughage, and 10.7 lbs. of silage in feed required per 100 lbs. of gain when compared with strictly dry lot feeding. On the average steers approximating 900 lbs. in weight consumed 45 bu. of corn and 1,150 lbs. of legume hay per head during a 131-day feeding period and had a credit of 77 lbs. of pork.

Good steers made faster gains, required less feed per unit of gain and less margin over initial cost, and sold for a higher price per hundredweight than common steers. The necessary margin to cover fattening costs increased rather regularly with the length of time on grain feed.

Feeding cattle for beef, W. H. Black (*U. S. Dept. Agr., Farmers' Bul. 1549 (1928), pp. II+17, figs. 10*).—This publication supersedes Farmers' Bulletins 1379 and 1382 (E. S. R., 50, p. 573; 51, p. 468).

Rice meal vs. corn meal for fattening steers, H. Barton, A. R. Ness, and E. W. Crampton (*Macdonald Col., McGill Univ., Tech. Bul. 4 (1927), pp. 5–8*).—Two-year-old steers divided into 2 lots of 12 and 11 head each and averaging approximately 1,150 lbs. in initial weight were fed for 66 days to compare the value of rice meal and corn meal at Macdonald College, Canada. Corn silage and mixed alfalfa and timothy hay formed the roughage portion of the ration. Lot 1 received a grain ration of one-half rice meal and one-half corn meal and lot 2 corn meal. The amount of feed per day was limited.

The average daily gains in the respective lots were 1.21 and 1.09 lbs. The dry matter required per 100 lbs. of gain was 1,800 and 2,000 lbs., respectively. The relative gain per 1,000 lbs. initial weight per 1,000 lbs. dry matter consumed was 49.9 and 44.7 lbs., respectively, making a difference of 5.2±6.36 lbs. in favor of lot 1. The difference necessary before results could be considered significant was 20.2 lbs.

Experiments on the feeding of sorghum silage and concentrate to Scindi calves, F. J. Warth and S. K. Misra (*India Dept. Agr. Mem., Chem. Ser., 9 (1927), No. 5, pp. 125–153, figs. 5*).—Experiments to determine the consumption and digestion of rations by Scindi calves and to estimate the production value of the rations used were conducted by the Imperial Department of Agriculture, India. Sorghum silage used as the roughage was fed with the following concentrates: Wheat bran, wheat bran and peanut cake 2:1, and broken rice and peanut cake 1:1. Three groups of two calves each were fed on the above rations, the first two groups receiving a mineral supplement of lime and the last group no supplement.

Sorghum silage fed ad libitum with the above concentrates produced rapid growth and, due to the good quality of the feeds, a high rate of food consumption was obtained. The increase in live weight was adequately accounted for by digestion trials (E. S. R., 58, p. 761). Protein digestion varied according to the amount of protein present in the ration, and when wheat bran was the sole concentrate 56 per cent of the digested nitrogen was assimilated. With other rations the efficiency of protein digestion was lowered. The assimilation of P_2O_5 was proportional to the amount present in the ration. Lime assimilation was higher during the earlier stages of feeding than later. The calves receiving no lime supplement did not grow rapidly, but this was not attributed entirely to the lack of lime.

The digestibility and metabolizable energy of soybean products for sheep, T. S. Hamilton, H. H. Mitchell, and W. G. Kammlade (*Illinois Sta.*

Bul. 303 (1928), pp. 237–295).—The digestibility and metabolizable energy of soy bean hay, soy bean straw, oat straw and whole soy beans, oat straw, and soy bean straw and soy bean oil meal were determined in 1923 with 12 western lambs. The calculation of coefficients was made both directly and indirectly, and with the latter method some impossible coefficients were obtained.

In 1925 investigations were again conducted to redetermine the digestibility and metabolizable energy of whole soy beans and soy bean oil meal (E. S. R., 56, p. 367). The authors believe that the results obtained indirectly for concentrated feeds are not accurate since these concentrates exert variable associative effects upon digestion when combined with other feeds. The digestibility and energy in this second trial were determined directly for rations in which the concentrate was combined with those feeds with which it is commonly fed.

The results of the two trials are given in tabular form, together with analyses of the feeds used.

The care and management of sheep, C. V. Wilson and J. H. Rietz (*West Virginia Sta. Circ. 48 (1927), pp. 51, figs. 31*).—A popular publication dealing in a clear and constructive manner with all the phases of the sheep industry in West Virginia.

Rice meal vs. ground barley for fattening hogs, H. Barton, A. R. Ness, and E. W. Crampton (*Macdonald Col., McGill Univ., Tech. Bul. 4 (1927), pp. 1–4*).—Two lots of 10 pigs each averaging 98 lbs. in initial weight were fed for 92 days at Macdonald College, Canada. The ration, hand fed, was composed of a ground mixture of 300 lbs. of barley (lot 1) or rice meal (lot 2), 300 lbs. of screenings, 300 lbs. of Sampson feed, and 100 lbs. of 45 per cent tankage made into a slop.

The average daily gain per pig was 0.98 lb. in lot 1 and 0.87 lb. in lot 2. Slightly less feed was required in lot 1 to produce 100 lbs. of gain, but the difference was not significant. The relative gain per 100 lbs. initial weight per 100 lbs. of dry matter consumed was 15.8±0.56 lbs. in lot 1 and 13.9±1.07 lbs. in lot 2. The necessary difference in order to make the results significant was 3.58 lbs.

Butter versus oleomargarine in ricket control in pigs, E. L. Anthony (*Jour. Dairy Sci., 11 (1928), No. 1, pp. 66–68*).—Data as to the value of butter and oleomargarine in preventing rickets in pigs as determined at the West Virginia Experiment Station are reported. Two basal rations were fed, the first of which was composed of 500 lbs. of white corn, 400 lbs. of oats, 66 lbs. of tankage, and 33 lbs. of linseed oil meal, which was fed at the rate of 5 lbs. daily per 100 lbs. live weight. Basal ration 2, composed of 300 lbs. of white corn, 100 lbs. of buckwheat middlings, and 20 lbs. of tankage, was fed at the same rate. These basal rations were fed to separate lots of pigs. To the basal ration of two other lots 2 oz. of butter per 100 lbs. live weight was added daily and in two other lots 2 oz. of oleomargarine.

When oats formed a portion of the basal ration, the rachitic symptoms did not develop in the ordinary time of 112 days. Of the pigs fed basal ration 2, 50 per cent showed rachitic symptoms in 86 days. Adding 2 oz. of butter to ration 2 brought no rachitic symptoms in 112 days, but 50 per cent of the pigs receiving oleomargarine showed rachitic symptoms within 86 days. Raw and oxygenated cod-liver oil at the rate of 25 cc. per 100 lbs. live weight was fed to the rachitic pigs in the two lots showing these symptoms, and with the exception of one pig all recovered within 30 days no matter how far the rachitic condition had advanced.

Mule feeding experiments, G. S. Templeton (*Mississippi Sta. Bul. 244 (1927), pp. 31, figs. 8*).—The three experiments noted in this publication are more detailed accounts of work previously reported (E. S. R., 58, p. 67).

The study of the protein in a commercial meat product, R. W. Prange, S. M. Hauge, and C. W. Carrick (*Poultry Sci., 6 (1927), No. 6, pp. 302–307, figs. 2*).—In a biological test to determine the amino acid deficiencies of a certain meat meal product containing 70 per cent of protein and 9.2 per cent of ash, 4 lots of 18 newly hatched White Leghorn chicks were fed at the Indiana Experiment Station. The basal ration in all lots consisted of 37.15 per cent ground yellow corn, 15 per cent wheat middlings, 15 per cent wheat bran except lot 4 which received 25 per cent, 3 per cent cod-liver oil, 1 per cent salt, 14.26 per cent meat meal, and 4.59 per cent steamed bone meal. In addition lot 1 received 10 per cent degerminated white corn, lot 2 10 per cent gelatin, and lot 3 5 per cent each of degerminated white corn and specially treated casein.

Lot 4 grew more rapidly than any of the other lots and was followed in order by lots 3, 1, and 2. Gelatin was used in this test since it was known to be low in the amino acids, tyrosine, cystine, and tryptophane. The tyrosine is adequately supplied by the corn and wheat. The special treatment of the casein lowered the cystine content to such a small amount that it was a negligible factor. This process of elimination indicates that tryptophane is the amino acid deficient in this meat meal. No reasons were apparent for lot 2 growing at a slower rate than lot 1.

A garden for chickens, D. C. Kennard (*Ohio Sta. Bimo. Bul., 13 (1928), No. 2, pp. 63–65, fig. 1*).—A rotation of crops suitable for producing green feed for chickens during the late summer and fall is suggested by the author.

A statistical study of egg production in four breeds of the domestic fowl.—Part IV, White Leghorns, L. C. Dunn (*Connecticut Storrs Sta. Bul. 147 (1927), pp. 241–282, figs. 6*).—In this, the fourth of a series of studies previously noted (E. S. R., 52, p. 173), a statistical analysis of the egg records of 3,131 Single Comb White Leghorn pullets completing a year's production in the nine international egg-laying contests held at Storrs from 1911 to 1919 is presented.

Few birds laid less than 75 or more than 240 eggs per year, the average yearly egg production for the nine years being 158. There was a general tendency toward an increase in production of the lower classes and a decrease in the higher-producing classes. The coefficient of variability in production was influenced by the proportion of birds laying few or no eggs. In November about 40 per cent of the birds laid no eggs. This proportion decreased slowly during December and January, dropped to a minimum of 1 to 2 per cent during the period March through June, and then slowly rose, increasing rapidly during the molting season in September and October. A study of the distribution of production showed that about 71 per cent of the total eggs was equally divided between the spring and summer seasons, followed in order by winter and fall seasons. Fitting straight line equations to the series of percentages of production for each season showed a tendency for the production to increase during winter and fall and decrease during the spring and summer. This means that the Leghorns entered in these contests produced more eggs during the periods of high prices and became more valuable and profitable for purposes of egg production.

Relationship between body weight and egg production in the domestic fowl, C. S. Platt (*Poultry Sci., 6 (1927), No. 6, pp. 285–289, figs. 2*).—The records of 435 White Leghorns in the First International Egg Laying Contest at Vineland, N. J., were used as a basis for this study. The year was divided

into three seasons, winter, spring, and summer-fall, and the weights of the birds during these seasons were compared with the production. The body weight during the year was also compared with the annual production during both the pullet and the yearling years.

There was a positive correlation between the body weight in the spring of the pullet year and the production during this season, and a negative correlation between the maximum body weight in the yearling year and the total production for that year. The data reveal that birds weighing from 4 to 4.5 lbs. during the pullet year may be expected to produce the greatest number of eggs. Any weight in excess of this is detrimental to yearly production, even though favorable to production during the winter and spring seasons. The optimum weight during the yearling year was found to be approximately 4 lbs., indicating a greater tolerance for excess weight during the pullet year than during the yearling year.

Sanitary measures for brooding and production of pullets, D. C. KENNARD (*Ohio Sta. Bimo. Bul., 13 (1928), No. 2, pp. 59–62, figs. 2*).—Plans for the construction of brooder houses with screened floors and sun "parlors" to prevent chicks from coming in contact with soil contaminated with disease and intestinal parasites are described.

A poultry survey in Kansas, L. F. PAYNE and H. H. STEUP (*Kansas Sta. Bul. 245 (1928), pp. 52, figs. 9*).—A survey of the poultry industry in five well-recognized sections of the State led the authors to recommend better equipment and stock, the best-known methods of management, particularly those relating to the rearing of chicks, and feeding both grain and mash throughout the year for the further improvement of poultry production. The appendix contains a copy of the questionnaire used in this survey and charts showing the progress of the industry in the State from 1919 to 1926.

Fur-farming for profit, F. G. ASHBROOK (*New York: Macmillan Co., 1928, pp. XXIII+300, figs. 127*).—A treatise based largely on the personal observations and experiences of the author dealing with the principles and practices of feeding, breeding, and handling of fur-bearing animals in captivity in order to produce marketable pelts.

DAIRY FARMING—DAIRYING

Fundamentals of dairy science (*New York: Chem. Catalog Co., 1928, pp. 543, pl. [1], figs. [53]*).—A treatise by associates of L. A. Rogers, designed for advanced students and research workers in dairy science and divided into the following sections: The constituents of milk, the physical chemistry of milk and milk products, the microbiology of milk and milk products, and the nutritional value of milk and milk products and the physiology of milk secretion. This is one of the series of monographs of the American Chemical Society.

Proceedings of the annual meeting of the American Dairy Science Association held at East Lansing, Michigan, June 22, 23, and 24, 1927 (*Jour. Dairy Sci., 10 (1927), No. 6, pp. 527–532*).—After a brief résumé of the meetings held at the Michigan State College, June 22–24, 1927, the papers presented are listed by title.

Feeding dairy cattle, C. L. BLACKMAN and I. MCKELLIP (*Ohio Agr. Col. Ext. Bul. 72 [1928], pp. 32, figs. 8*).—A popular publication describing the nutrients of feeds and how cattle make use of them. The requirements of a good dairy ration and the characteristics of common dairy feeds are also described. Suggestions are made for rations for milking and dry cows and young stock and also the care and feeding of cows after calving. Appended is a table giving the average digestible nutrients in common dairy feeds.

Succulent dairy feeds, A. E. PERKINS (*Ohio Sta. Bimo. Bul., 13 (1928), No. 2, pp. 52–54*).—Various succulent feeds that may be used to replace pasture in the winter ration of dairy cattle are pointed out, together with the limitations that make their use profitable or unprofitable.

Sunflower silage vs. corn silage for milk production, H. O. HENDERSON and W. GIFFORD (*West Virginia Sta. Bul. 210 (1927), pp. 23*).—Two well-balanced groups of cows, 28 in all, were used in each of three trials to compare sunflower and corn silage for milk production. The two groups were not directly compared, but the comparison was between the two feeding periods of the same group, using the other group as a check. The same basal grain ration was fed throughout the experiment at the rate of 1 lb. of grain to 3 to 4 lbs. of milk, depending upon the fat content. The cows were allowed one week in which to become accustomed to the change in ration, after which the test began and was continued for 21 days, when the feeding was changed and the same method followed. The amount of silage used in the three trials was 35, 30, and 45 lbs. per head per day, respectively.

Cows receiving the sunflower silage produced on the average 95.8 per cent as much milk and 98.2 per cent as much butterfat as those fed corn silage. Some difficulty was experienced in getting cows to eat sunflower silage when first offered, but after a few days they ate it satisfactorily. However, it was apparently less palatable than the corn silage. The loss in body weight was slightly greater when sunflower silage was fed.

The authors believe that where sufficient silage corn can be grown no advantages will be had from growing sunflowers for silage, but that they do make a satisfactory substitute in regions where corn can not be successfully grown.

The influence of mixed feed on the milk production of cows [trans. title], N. A. POPOV (*Iaroslavsk. Zootekh. Opytn. Sta. Raboty 1926, pp. 99–102*).—Two groups of three cows each were fed at the Yaroslavl Zootechnical Experiment Station, Russia, on rations of mixed concentrates with clover hay as roughage. Ration A consisted of linseed-oil meal and oat flour 1:2, and ration B of linseed-oil meal, oat flour, and wheat bran 1:2:2.

An analysis of the fat and dry matter in the milk produced in 20 days on these rations showed no significant differences in quantity or quality. The author concludes that the cost is the determining factor in choosing one or the other of these rations.

The effect of high and low protein rations on the food value of milk for calves, C. C. HAYDEN and W. E. KRAUSS (*Ohio Sta. Bimo. Bul., 13 (1928), No. 2, pp. 55–58, figs. 2*).—Continuing the study previously noted (E. S. R., 54, p. 768), whole milk from cows receiving a ration with a nutritive ratio of 1:2 was fed to three Holstein heifer calves, and the milk from cows receiving a ration with a nutritive ratio of 1:13 was fed to a similar group of calves. For three days after birth the calves suckled their dams. They were then removed and fed whole milk twice daily, the amount being gradually increased to a maximum of 16 lbs. per head per day. When the calves were from 3 to 4 weeks old they received alfalfa hay and a grain mixture of corn meal, wheat bran, and linseed oil meal. The test lasted 6 months.

The calves receiving milk from the high protein fed cows made an average daily gain per head of 1.65 lbs., while the other group gained 1.60 lbs. The number of animals used makes this difference insignificant. The growth of the calves on the low protein milk tended to lag somewhat before hay and grain feeding started, but after that time no differences in growth were noted. All the calves remained in a healthy condition throughout the test. The au-

thors conclude that neither high nor low protein content of the ration materially affects the food value of the milk produced.

Care of the dairy calf, J. B. SHEPHERD (*U. S. Dept. Agr. Leaflet 20 (1928), pp. 8, figs. 4*).—The care of newborn calves and the feeding and manageemnt up to 6 months of age are described. The amounts of whole milk, skim milk, and calf gruels to feed at different ages are given. Dehorning with caustic, marking for identification, and the cause and control of scours and lice are discussed.

A study on the variability of the milk production of Yaroslavl cattle [trans. title], S. G. DAVYDOV and E. P. FEDOTOVA (*Ìàroslavsk. Zootekh. Opytn. Sta. Raboty 1926, pp. 27–51, figs. 8*).—In a study at the Yaroslavl Zootechnical Experiment Station, Russia, the authors analyzed the following factors in their relation to the variations in milk production: Feeding, age, time of calving, dry period, pregnancy, inheritance, and lactation period. The data were obtained from records of one herd over a period of 16 years and also from a number of peasant herds.

The coefficient of correlation for milk production as related to age was +0.583 for animals on normal feed. Production correlated better with the number of calves produced by an animal than with her age. Fall and early winter calving was the best time from the standpoint of milk production, and a dry period of 60 days before calving gave the best results. No definite conclusions have been drawn from the other factors studied.

A comparison of Guernsey sires.—III, Based upon the average persistency of fat secretion during the lactation of the daughters, C. W. TURNER (*Jour. Dairy Sci., 10 (1927), No. 6, pp. 479–500, fig. 1*).—A comparison of the average persistency of secretion of dams and their daughters was made at the Missouri Experiment Station (E. S. R., 54, p. 374). The dams' and daughters' persistency ratios were compared within groups of sires having similar daughter averages. The increase in the ratio of the daughters for each unit increase in the ratio of the dams was considered to indicate the supplementing effect of the dam on the daughter.

Straight line equations were fitted to the observed values of the form $D=a+bd$ in which D is the average persistency of the daughters, d the persistency of the dam, b the constant change in peristency of the daughters for each unit of increase in the persistency of the dams above a, the average potential transmitting ability of the sires in each group. The values obtained for b in each sire class indicated that the positive effect of the dam's persistency on the daughter's persistency of secretion is, on the average, very low.

Improving dairy herds, J. B. PARKER (*U. S. Dept. Agr. Leaflet 19 (1928), pp. 4, figs. 4*).—Three methods for improving production in dairy herds are pointed out. These methods are culling, feeding, and breeding. A brief description of the means and advantages of each of these methods is pointed out by the author.

Testing milk and cream and recording yields of dairy cows for herd improvement, L. T. MACINNES (*N. S. Wales Dept. Agr., Farmers' Bul. 161 (1927), pp. 81, figs. 15*).—A popular bulletin divided into the following parts: The economic position, organization, and control of herd-testing associations, review of official grade herd testing, 1923–24 and 1924–25, and testing milk and cream by the Babcock method.

The production of milk of low bacterial content by means of milking machines, A. T. R. MATTICK and F. PROCTER (*Jour. Hyg. [London], 27 (1928), No. 2, pp. 215–224, fig. 1; abs. in Milk Indus., 8 (1928), No. 9, pp. 39, 41*).—A study of the use of milking machines was made at the National Institute for Research in Dairying, England. Two groups of five cows each were milked

alternately by two milking units, one of which was washed and the other sterilized by steam throughout the test. Samples of milk were taken from each unit during a period of a year for bacterial analyses.

Rather confusing bacterial counts were obtained from both units until the pipe line of the apparatus was examined. It was found that the moisture condensing in the pipe and later entering the pail was a serious source of bacterial contamination. Sloping the pipes, providing drain cocks, and turning all vacuum supply taps upward overcame this difficulty. The milk from the steam-sterilized unit had better keeping qualities and, on the whole, ran lower in bacterial count than the milk from the washed unit. Steam sterilization reduced the life of the rubber parts, but not sufficiently to justify dismantling the machines in order that the rubber parts might be sterilized separately. It was observed that allowing the machine to milk the cows out was not desirable, and the authors recommended hand stripping, which was practiced in this experiment, the average amount of strippings being 0.75 lb. per cow.

Seasonal variations in the germ content of milk at Pusa, J. H. Walton (*Agr. Research Inst., Pusa, Bul. 170 (1927), pp. 12, pls. 2*).—Continuing the study of the bacterial content of the milk supply at Pusa (E. S. R., 54, p. 169), it was found that the plate and *Bacillus coli* counts varied with the season of the year. The highest counts were found during the rainy season, and the author recommends that particular attention be given to cleanliness and efficient sterilization of utensils at this time.

Copper: A common constituent of milk, animal organisms, and other food products, G. N. Quam and A. Hellwig (*Milk Dealer, 17 (1928), No. 4, pp. 48, 49*).—The authors, believing that the copper content of food products, including drinking water, in different localities has a marked influence on the copper content of milk, obtained samples from Montana, South Dakota, Iowa, and Kentucky. Care was taken to avoid contact with copper at any time by using glass and porcelain containers, ashing in furnaces equipped with aluminum tubes, and using water and reagents free from copper.

There was no significant difference in the copper content of the milk from the different localities, indicating a more or less definite requirement in the accumulation of copper in the milk. An analysis of four samples of condensed milk showed a higher concentration of copper than could be accounted for in the normal concentration of copper in cow's milk. However, no attempt was made in these analyses to compute the increase in copper content with the area of copper exposed in the condensing pans.

The butterfat of colostrum [trans. title], K. A. Kurochkin (*Ĭaroslavsk. Zootekh. Opytn. Sta. Raboty 1926, pp. 142–144*).—Samples of colostrum obtained at different milking periods were studied at the Yaroslavl Zootechnical Experiment Station, Russia. Samples of 200 cc. of top milk were mixed with 600 to 800 cc. of hydrochloric acid (sp. gr. 1.12), placed in a water bath at 90 to 95° C. (194 to 203° F.), and after 1 to 1.5 hours the separated fat was removed. The analyses of this fat indicated the presence of high molecular saturated fatty acids. Colostrum fat resembles animal fat (lard) in its chemical and physical properties, but is of a deep orange color the first 24 hours regardless of the feed.

The influence of separation and pasteurisation on the size and distribution of the fat globules in milk and cream, D. A. Beckett (*Roy. Dublin Soc. Econ. Proc., 2 (1927), No. 20, pp. 303–317, pl. 1, figs. 3*).—Samples of milk and cream were studied photographically by the author to find the effect of pasteurization and separation on the size of the fat globule. Dilutions of 1 to 5 for milk and 1 to 105 for cream were made before the drops were photographed. The

fat globules of milk upon entering the creamery had an average volume of 28 cubic microns, while the separated and pasteurized cream had an average volume of 44 cubic microns. It is deemed probable that pasteurization, by causing large globule cream, accounts for at least a part of the softness of creamery butter.

The effect of gelatin on the bacterial content of ice cream mix, A. C. Fay and N. E. Olson (*Jour. Bact., 14 (1927), No. 5, pp. 363–376*).—In a study at the Kansas Experiment Station of the bacterial content of 50 samples of gelatin, 31 grades from 8 manufacturers and the remainder from ice cream plants were analyzed. The number of bacteria ranged from 10 to 108,000,000 per gram in these samples. When used in the ordinary proportion of 0.5 per cent in an ice cream mix, these gelatins would add from 1 to 540,000 organisms per gram. Adding high-count gelatin after pasteurization or poor quality gelatin to a mix of low bacteria count may noticeably increase its plate count, but using the gelatin containing the highest count in these samples would not have increased the plate count of 85 per cent of the raw mixes analyzed at the station during the last 6 years.

Pasteurizing at 145° F. for 30 minutes reduced the bacterial count of 22 of the samples 98.87 per cent, and in only one case was a reduction of less than 90 per cent obtained with the samples containing more than 3,000 organisms per gram. Qualitative analyses of 8 samples showed that the gelatin liquefiers varied from none to 0.04 per cent, lactose-fermenting bacteria from 1 to 21 per cent, and neutral types from 79 to 99 per cent of the organisms present.

Since considerable variation was found in results when several separate analyses were made of the same samples, the authors have calculated that the probable error of duplicate plates based on 10-gm. samples was 4.6 per cent and on 1-gm. samples 8.5 per cent of the mean count.

These results led to the conclusion that when gelatin was pasteurized with the other ingredients of an ice cream mix it was a negligible source of bacterial contamination.

Bibliography on ice cream up to and including the year 1926, compiled by C. B. Sherfy and N. W. Smallwood (*U. S. Dept. Agr., Library, Bibliog. Contrib. 17 (1928), pp. XV+291*).—Selected references from all the literature dealing with ice cream and ices issued up to and including the year 1926 are listed under the following general classifications: Ice cream industry, factory, manufacture, specialties and novelties, laboratory and research, analysis and examination, food value, poisoning and epidemiology, and marketing.

VETERINARY MEDICINE

Practical bacteriology, blood work, and animal parasitology, E. R. Stitt (*Philadelphia: P. Blakiston's Son & Co., 1927, 8. ed., rev. and enl., pp. XV+937, pl. 1, figs. 211*).—This is the eighth revised and enlarged edition of the work previously noted (E. S. R., 45, p. 780).

Report of the proceedings of the thirty-first annual meeting of the United States Live Stock Sanitary Association (*Jour. Amer. Vet. Med. Assoc., 72 (1928), No. 6, pp. 695–978, figs. 8; also in U. S. Livestock Sanit. Assoc. Rpt., 31 (1927), pp. VIII+695–978, figs. 8*).—The papers presented at the thirty-first annual meeting of this association (E. S. R., 57, p. 377), held at Chicago November 30 to December 2, 1927, are as follows:

Parasitic Diseases Shared by Man and Animals, by W. A. Evans (pp. 696–707); The Address of the President, by L. Van Es (pp. 708–712); Developments in Swine Sanitation, by M. C. Hall (pp. 716–721); Swine Dysentery, by R. A. Whiting (pp. 721–728); Transmission of Hog Cholera by Means of

Feeder Hogs, by H. A. Wilson (pp. 731–744); Studies of the Agglutination and Pullorin Tests for Bacillary White Diarrhea as to the Efficiency of Each in Detecting Carriers of *Salmonella pullorum* Infection, by H. J. Stafseth and F. Thorp, jr. (pp. 745–756); Comparison of Mortality in Chicks Suffering from Bacillary White Diarrhea and Normal Chicks, by H. M. Scott, W. R. Hinshaw, and L. F. Payne (pp. 756–761); State Meat Inspection, by J. P. Iverson (pp. 764–768); The Progress New York Has Made in the Eradication of Bovine Tuberculosis, by E. T. Faulder (pp. 771–781); Skin Lesions in Tuberculin-Reacting Cattle, by L. E. Day (pp. 782–787); Practical Method of Eliminating Tuberculosis from Farm Poultry Flocks, by T. S. Rich (pp. 787–792); Some Observations on the Development of Pulmonary Tuberculosis in Lower Animals as Compared and Contrasted with Similar Lesions in Man, by H. Fox (pp. 792–809); A Campaign for Safe Milk, by H. M. Bundesen (pp. 810–812); The Kansas City System of Milk and Dairy Inspection, by O. C. Murphy (pp. 813–819); The Control and Eradication of Avian Tuberculosis by Education and Sanitary Measures, by A. J. Knilans (pp. 819–823); Bovine Tuberculosis as a Public Health Problem, by D. C. Lochead (pp. 823–841); Tuberculosis Eradication Work in the Central States, by J. A. Barger ((p. 842–845); Tattooing Hogs as an Aid in More Complete Eradication of Tuberculosis, by H. R. Smith (pp. 846–852); Results of Some Avian Tuberculosis Studies, by A. F. Schalk (pp. 852–863); A General Survey of the National Tuberculosis Eradication Work, by A. E. Wight (pp. 864–874); Legal Phases of Tuberculosis Control, by C. E. Cotton (pp. 875–878); A Report of Tuberculin-testing of Poultry Flocks in Nebraska, by C. H. Hays (pp. 880–887); The Relation of the Agglutination Test to the Presence of *Brucella abortus* in the Body of the Bovine, by I. F. Huddleson, J. P. Torrey, and E. R. Carlson (pp. 889–901); Progress of Bang Bacillus Disease Control in Pennsylvania, by M. F. Barnes and H. R. Church (pp. 901–912); Anaplasmosis of Cattle in the United States, by L. T. Giltner (pp. 919–928); What Tick Eradication Is Doing for the Cattle Industry in Florida, by J. V. Knapp (pp. 932–938); Completion of Tick Eradication in the Old Dominion State, by S. H. Still (pp. 938–940); Tick Eradication Methods Found Successful in Arkansas, by W. A. McDonald (pp. 940–943); and Are We Losing the War on Parasites of Live Stock? by M. C. Hall (pp. 946–958).

In addition, the reports are given of the secretary-treasurer (pp. 712–714) and of the committees, as follows: Report of the Committee on Poultry Diseases to the Committee on Unification of Laws and Regulations, by W. R. Hinshaw et al. (p. 715); Swine Diseases, by R. R. Birch et al. (pp. 728–731); Poultry Diseases, by W. R. Hinshaw et al. (pp. 762, 763); Meat and Milk Hygiene, by G. Hilton et al. (pp. 768–771); Abortion, by C. P. Fitch et al. (pp. 912–918); Tick Eradication, by W. K. Lewis et al. (pp. 943–945); Parasitic Diseases, by W. J. Butler et al. (pp. 958, 959); Intradermic Tuberculin Test, by W. J. Butler et al. (p. 960); Nutritional Diseases, by H. Schmidt et al. (pp. 961–967); Miscellaneous Transmissible Diseases, by A. W. Miller et al. (pp. 967–970); Policy, by M. Jacob et al. (p. 971); and Unification of Laws and Regulations, by W. F. Crewe et al. (pp. 971–974).

[Diseases of livestock in Australia] (*Australasian Assoc. Adv. Sci. Rpt., 17 (1924), pp. 680–729*).—The papers presented at the annual meeting held in 1924 are as follows: Cancer in the Domesticated Animals, by S. Dodd (pp. 680–693); Parasites of Dogs and Horses in New South Wales, from the Neighbourhood of Sydney, by I. C. Ross (pp. 693–697); Actinobacillosis in Australian Cattle, by S. Dodd (pp. 698–702); Some Causes of Sheep Mortality in Victoria, by H. E. Albiston (pp. 703–705); Dietetic Diseases of Sheep under Australian Conditions, by M. Henry (p. 706); Corynebacterial Pyaemia of Foals, by L. L.

Bull (p. 707); "Staggers" and "Shivers" in Sheep, by H. R. Seddon (pp. 707, 708); Recent Advances in Anthelmintic Medication, with Special Reference to Carbon Tetrachloride and Arecolin Hydrobromide, by I. C. Ross (pp. 708–710); Summary of Address on Rinderpest in Western Australia, by W. A. N. Robertson (pp. 710, 711); Note on the Occurrence of Coccidiosis in South Australian Sheep, by T. H. Johnston (pp. 712–714); Notes on Investigation into Some Sheep Diseases in South Australia, by L. B. Bull (pp. 715–729).

Report of chief veterinary inspector, Victoria, A. G. Knight (*Brit. Columbia Dept. Agr. Ann. Rpt., 21 (1926), pp. 51–53*).—The report of work for the year deals particularly with bovine tuberculosis.

Poisonous plants on the farm, H. C. Long ([*Gt. Brit.*] *Min. Agr. and Fisheries, Misc. Pub. 57 (1927), pp. 58, [pls. 44]*).—This is a practical, illustrated account.

Coyotillo (Karwinskia humboldtiana) as a poisonous plant, C. D. Marsh, A. B. Clawson, and G. C. Roe (*U. S. Dept. Agr., Tech. Bul. 29 (1928), pp. 27, figs. 17*).—This is a report of studies of *K. humboldtiana*, a plant growing in southwestern Texas and in Mexico, which, previous to the experiments here recorded, had been reported to produce paralysis in some domestic animals.

The experimental work has shown that it affects cattle, sheep, goats, guinea pigs, and chickens, producing a more or less complete paralysis, the effects being especially pronounced in the posterior limbs. There are reliable reports to the effect that Karwinskia poisons swine and horses also. The effect of the plant is peculiar in that the symptoms do not ordinarily appear until a considerable time after the feeding and continue for an indefinite period. In severe cases recovery seldom takes place. The reported cases of poisoning are from eating the fruit. It has been found that the leaves are also poisonous, but that the resulting symptoms are different from those produced by the fruit.

Bone chewing and carrion poisoning (Osteophagia and botulism and parabotulism), H. R. Seddon (*Aust. Vet. Jour., 3 (1927), No. 4, pp. 136–141*).—This is a discussion of the subject in connection with a list of 19 references to the literature.

Food-poisoning due to Bacillus suipestifer (sub-group II), W. M. Scott (*Jour. Hyg. [London], 25 (1926), No. 4, pp. 406–414*).—A report on four separate outbreaks, followed by an account of the identification of the organism by cultural and serological means.

A study of the regularity of egg-production of Ascaris lumbricoides, Necator americanus, and Trichuris trichiura, H. W. Brown (*Jour. Parasitol., 14 (1927), No. 2, pp. 110–119*).—This is a report of studies of the egg production of four individuals of each of these three parasites over a period of from 10 to 23 days.

Two types of oocysts of coccidia from Iowa calves, E. R. Becker (*Jour. Parasitol., 14 (1927), No. 2, p. 123*).—Microscopic examinations were made of the feces of 34 calves for the presence of protozoa. These calves varied from 1 to 4 months of age and were born either in or near Ames, Iowa. Three of the calves were found infected with coccidia of the genus Eimeria, but none of the three suffered any clinical symptoms of dysentery. The coccidia from two of the calves were of the ovoid type, with the slightly salmon tint, while those from the other calf were ellipsoidal and colorless.

Diphyllobothrium latum (Linn., 1758), the broad tapeworm of man: Experimental studies, T. Vergeer (*Jour. Amer. Med. Assoc., 90 (1928), No. 9, pp. 673–678, fig. 1*).—The investigation here reported demonstrated that this tapeworm has become established in America. The plerocercoid stage has been found in a number of species of fish in Lake Superior, including *Stizostedeon*

canadense-griseum De Kay, *S. vitreum* Mitch., *Esox lucius* L., and *Lota maculosa* Le Sueur. The Portage Lake region in the northern peninsula of Michigan, with a considerable Finnish population, is an endemic area from which infested fish range at least 20 miles into Lake Superior.

This tapeworm has been raised from the plerocercoid stage to the adult form in five dogs and one cat.

Diptera as transmitters of animal diseases [trans. title], E. Henninger (*Centbl. Bakt. [etc.], 1. Abt., Ref., 88 (1928), No. 19–20, pp. 433–461*).—This is a review of the subject in connection with a 3-page list of references to the literature.

Salivary secretions of blood-sucking insects in relation to blood coagulation, L. Lloyd (*Nature [London], 121 (1928), No. 3036, p. 13*).—In referring to the tsetse fly, it is suggested that the amount of secretion mixed with the blood is enough to delay the coagulation of mammalian blood for two to three hours at least, but the coagulin of the mesenteron is so powerful that in a matter of seconds it has neutralized the anticoagulin and formed a small clot at the posterior end of the meal. The main function of this clot appears to be that it puts a brake onto the fluid meal and holds it in the proper region of the gut while digestion begins.

Liver fluke disease in Australia: Its treatment and prevention, I. C. Ross (*Aust. Council Sci. and Indus. Research Pamphlet 5 (1928), pp. 23, figs. 9*).—This is an account of the biology of the liver fluke, the nature of this disease, and its treatment and prevention in Australia.

A note on the treatment of liver rot of cattle with carbon tetrachloride, T. H. Jones and R. F. Montgomerie (*Vet. Rec., 8 (1928), No. 14, pp. 269–271, 272*).—The authors have found the manner in which 127 young cattle, largely in a very advanced stage of the disease, responded to treatment with carbon tetrachloride to be very striking. While no attempt was made to determine the minimum efficient dose, they believe that a single administration of 5 cc. of pure carbon tetrachloride, in capsule, will clear all mature flukes from the liver of yearling cattle.

Occurrence of Onchocerca gibsoni (worm nodule) in cattle in Gippsland, Victoria, H. A. Woodruff (*Aust. Jour. Expt. Biol. and Med. Sci., 4 (1927), No. 4, p. 271*).—The author reports the detection of the occurrence of worm nodules due to this parasite on a number of farms in the neighborhood of Foster, more than one-half of a herd of 30 animals on one dairy farm having been parasitized. A survey made by D. Poole resulted in the detection of nodules in native bred and reared cattle along a strip of coast country centering around Foster about 60 miles long and extending 12 miles inland.

A study of certain organisms of the Pasteurella group with respect to specific complement fixation by ice-box method, R. B. Lal (*Amer. Jour. Hyg., 7 (1927), No. 5, pp. 561–573, figs. 7*).—The author finds the organisms of the Pasteurella group, as tested in the experiments reported, to show a certain amount of group-specific reaction, *Bacterium lepisepticum* being an exception. Certain of the organisms show marked cross reaction. Homologous strains of organisms show a high degree of specific fixation. It is concluded that while not easily distinguishable the organisms, including *Bacillus bovisepticus, B. ovisepticus, B. suisepticus, B. avisepticus,* and *Bacterium lepisepticum,* represent distinct species.

Bovine piroplasmoses in Algeria, II [trans. title], E. Sergent et al. (*Arch. Inst. Pasteur Algérie, 5 (1927), No. 3, pp. 245–468, pls. 7, figs. 46*).—This second memoir[1] deals with methods of protection against the piroplasmoses. Part 1 is

[1]Arch. Inst. Pasteur Algérie, 2 (1924), No. 1, pp. 147, pls. 18, figs. 32.

devoted to piroplasmosis caused by *Piroplasma bigeminum* (pp. 249–282), babesiellosis due to *Babesiella berbera* (pp. 283–304), anaplasmosis due to *Anaplasma marginale* (pp. 305–340), gonderiosis due to *Gonderia mutans* (pp. 341–354), and theileriosis due to *Theileria dispar* (pp. 355–436). Part 2 deals with these piroplasmoses under natural conditions (pp. 437–466).

Experimental studies of the bovine piroplasmoses of Algeria, I, II [trans. title], E. Sergent et al. (*Ann. Inst. Pasteur, 38 (1924), No. 4, pp. 273–343, figs. 42; 41 (1927), Nos. 7, pp. 721–784, figs. 23; 11, pp. 1175–1188, figs. 3*).—A more detailed account is noted above.

Reports to the International Rabies Conference, A. C. Marie, P. Remlinger, and H. Vallée (*Geneva: League of Nations, Health Sect., 1927, pp. 164*).—The following reports were made at the First International Rabies Conference, held at the Pasteur Institute, Paris, in April, 1927: Nature of the Rabies Virus (pp. 12–35), and Methods of Vaccinating Human Beings Who Have Been Bitten: Various Modifications of the Pasteur Treatment (pp. 36–69), both by Marie; Paralyses of Anti-rabies Treatment (pp. 70–128) and Local Accidents of Anti-rabies Treatment (pp. 129–136), both by Remlinger; and Anti-rabies Vaccination of Animals, by Vallée (pp. 137–158).

The rôle of Strongyloides stercoralis in the causation of diarrhea: Some observations on the condition of dogs and cats experimentally infected with this parasite, J. H. Sandground (*Amer. Jour. Trop. Med., 6 (1926), No. 6, pp. 421–432*).—The experiments conducted with *S. stercoralis* of man transmitted to the dog and cat have shown it to be associated with diarrhea, which may become chronic.

The early diagnosis of surra with special reference to temperatures, R. A. Kelser ([*War Dept. U. S.*], *Off. Surg. Gen., Vet. Bul., 20 (1927), No. 6, pp. 250–255, fig. 1*).—The author presents information in which it is concluded that for the early detection of surra in horses microscopic examination of fresh blood preparations is far more reliable than temperature taking.

Tetanus anatoxin and the protective inoculation of the horse and other domesticated animals [trans. title], G. Ramon and B. Descombey (*Rec. Méd. Vét., 103 (1927), No. 10, pp. 191–204; abs. in Jour. Compar. Path. and Ther., 40 (1927), No. 4, pp. 313–315*).—It is concluded that animals can be suitably protected for long periods against tetanus by the use of the new antigen, tetanus anatoxin. It is pointed out that the anatoxin must possess an intrinsic antigenic value, which can be estimated by its power to cause flocculation with specific serum, and be absolutely harmless to animals that are most sensitive to the corresponding toxin. Experimentally it can be shown that if a guinea pig is given subcutaneously 1 cc. of anatoxin, which is equivalent to two antitoxic units, it is capable of resisting several hundred fatal doses of toxin a month later. It requires only two injections of 10 and 30 cc. of anatoxin at an interval of a month to enable a horse to receive appreciable doses of toxin without risk. Horses can be prepared for hyperimmunization for serum production by this method.

Contribution to the experimental study of the animal variolas, I–IV [trans. title] (*Arch. Inst. Pasteur Hellén., 1 (1926), No. 3–4, pp. 361–394, pls. 2, figs. 2*).—The several contributions to this study are as follows: Fowl Pox and Vaccina, by G. Blanc and C. Melanidi (pp. 361–371), and The Sheep Pox Encephalitis (pp. 372–375), The Susceptibility of the Horse to the Sheep Pox Virus (pp. 376–381), and Goat Pox and Pustular Stomatitis of Ovines (pp. 382–394), all by G. Blanc, C. Melanidi, and M. Stylianopoulo.

Infectious abortion of cattle, C. H. Kitselman (*Kansas Sta. Circ. 135 (1928), pp. 11*).—This is a practical summary of information, arranged in the form of questions and answers.

The agglutination test in undulant fever due to Brucella abortus: A preliminary note on the value of the "abortoscope," G. R. Ross (*Roy. Soc. Trop. Med. and Hyg. Trans., 21 (1927), No. 1, pp. 57–62*).—The author presents experimental evidence to show that both *B. melitensis* and *B. abortus* can be employed as the test suspension in the diagnostic agglutination test for undulant fever due to *B. abortus*. He considers the abortoscope to be a promising method of performing the agglutination test in a simple, rapid, and reliable manner.

The abortoscope method of applying the agglutination test, J. F. D. Tutt (*Vet. Rec., 8 (1928), No. 8, p. 162*).—This is a further discussion of the abortoscope method of applying the agglutination test (E. S. R., 58, p. 577).

Johne's disease: A transmissible disease of cattle, E. G. Hastings, B. A. Beach, and H. L. Mansfield (*Wisconsin Sta. Research Bul. 81 (1927), pp. 44, figs. 12*).—This is a monographic account of Johne's disease which is accompanied by a bibliography of six pages.

On the biological properties of the acid-resistant bacillus of Johne [trans. title], A. Boquet (*Compt. Rend. Soc. Biol. [Paris], 96 (1927), No. 12, pp. 844–846*).—The author places the causative organism of Johne's disease in an intermediate subgroup of the acid-resistant bacilli.

Results obtained in johnin test on thirty-eight cattle in a herd infected with Johne's disease, W. S. Miller (*North Amer. Vet., 9 (1928), No. 3, pp. 27–29*).—A detailed account is given of the testing of a herd of 38 dairy cattle in New Jersey, including temperature records, in which four reactors were detected.

Studies in bovine lymphangitis, V. Krishnamurti Ayyar (*India Dept. Agr. Mem., Vet. Ser., 4 (1927), No. 2, pp. 103–127, pls. 8, figs. 2*).—An account of studies of the disease at the Madras Veterinary College. The results obtained in cases which did not respond to other treatment indicate that a vaccine prepared from broth cultures of the organism has a curative effect.

Note on the occurrence of Sarcocystis in the Philippine carabao (Bubalus bubalus Linn.), F. G. Haughwout (*Philippine Agr. Rev., 20 (1927), No. 2, pp. 243–247, pl. 1*).—A report of two instances of infection of the carabao with the sporozoan muscle parasite, one of which was identified by B. H. Ransom as *S. blanchardi*.

The rôle of B. oedematiens in the etiology of infectious necrotic hepatitis (braxy) of Australian sheep [trans. title], A. W. Turner and J. Davesne (*Ann. Inst. Pasteur, 41 (1927), No. 10, pp. 1078–1096, figs. 2*).—In this account the authors report upon chemical and bacteriological studies. The work of Gilruth (E. S. R., 23, pp. 185, 485; 28, p. 782), Dodd (E. S. R., 45, p. 685), and Albiston (E. S. R., 57, p. 875) is reviewed. It is concluded that the causative organism is a strain of *Bacillus oedematiens*.

Experimental reproduction of braxy of Australian sheep.—Vaccination by anacultures [trans. title], A. W. Turner (*Compt. Rend. Soc. Biol. [Paris], 97 (1927), No. 34, pp. 1527, 1528*).—It is pointed out that in the more extended account above noted the author and J. Davesne have shown the disease of sheep in Australia known as braxy or black disease (infectious necrotic hepatitis) to be due to a strictly localized infection of the liver by *Bacillus oedematiens*, first discovered by Weinberg and Seguin in the gaseous gangrene of man. The present account reports upon experimental reproduction of the disease in the guinea pig and sheep and vaccination by use of ana-(formalinized) cultures.

Swine erysipelas on the high plateaus of Algeria [trans. title], J. Sagne (*Arch. Inst. Pasteur Algérie, 5 (1927), No. 2, pp. 214–240*).—An extended account

of this affection of swine, which occurs on the high plateaus of Algeria in a form somewhat different from that met with in France.

Poultry diseases, E. L. Stubbs (*Penn. Dept. Agr. Bul. 453 (1927), pp. 37, figs. 4*).—This is a practical account of poultry diseases with remedial measures

Cytological studies on the viruses of fowl-pox and vaccinia, R. J. Ludford (*Roy. Soc. [London], Proc., Ser. B. 102 (1928), No. B 719, pp. 406–418, pls. 5*).—Cytological study of the vaccinia virus has shown: "(1) That the virus bodies produced by vaccinia in epidermal cells of the skin and cornea of the chick are exactly the same as those of fowl pox. Their structure is the same, they originate in the same manner and undergo the same development. (2) That the vaccinia virus produces in epidermal cells of the cornea of the rat inclusions closely resembling those it forms in the cornea of the chick, but differing fundamentally in the absence of the covering osmophil substance, which is so characteristic of the virus bodies of the chick. There are also formed, in cells immediately surrounding the center of the vaccinia lesion, clusters of granules (Schütz's granules) which are the result of the infection of cells of the regenerating epidermis. (3) The vaccinia virus can be transmitted from the rat cornea to the skin of the chick where it then results in the formation of the characteristic virus bodies. Vaccinia virus from the chick brings about the same result in epidermal cells of the rat cornea. (4) One strain of fowl pox was found to produce in epidermal cells of the pigeon the same type of virus bodies as in the chick, but was without action on epidermal cells of the cornea of the rat. Two strains of fowl pox produced virus bodies in the chick, but not in the pigeon. Vaccinia virus did not form any virus bodies in the skin of the pigeon."

The relation between electrical charge and the agglutinating ability of Salmonella pullorum, R. P. Tittsler and M. W. Lisse (*Jour. Bact., 15 (1928), No. 2, pp. 105–116*).—Extreme variations in the agglutinability of strains of *S. pullorum*, as observed by the senior author, led to the investigation here reported from the Pennsylvania Experiment Station.

In measuring the electrophoretic migration the use of a dye in the solution used to fill the electrode chambers facilitated the filling of the electrophoresis apparatus. Preliminary readings, made in order to determine the depth of the cell and the level of maximum velocity taken at each one-sixteenth of the depth of the cell, when plotted, reproduced the Smoluchowski curve. It is suggested that greater confidence in readings is obtained by making measurements which will span the hump of the above curve. Electrophoretic migration velocities were determined with an accuracy of 3 per cent. Eighteen strains of *S. pullorum* studied carried a negative charge. Variations of over 60 per cent in the electrophoretic migration velocities and a titer ranging from about 100 to 3,200 were obtained. In general, the sequence of decreasing electrophoretic migration velocity followed the sequence of increasing agglutinability. The use of homologous serum produced an agglutinability superior to that suggested by the charge. A relationship between electrophoresis, agglutinability, and virulence is suggested.

A list of 30 references to the literature is included.

The spirochetosis of fowls in Greece [trans. title], M. Stylianopoulo (*Arch. Inst. Pasteur Hellén., 1 (1926), No. 3–4, pp. 350, 351*).—The occurrence of this disease in Greece is recorded for the first time, it having been observed in the vicinity of Athens. The transmitting tick was identified as *Argas reflexus*. The affection had previously been recorded in other countries of the Balkan Peninsula.

AGRICULTURAL ENGINEERING

Irrigation investigations with field crops at Davis and at Delhi, California, 1909–1925, S. H. Beckett and M. R. Huberty (*California Sta. Bul. 450 (1928), pp. 24, figs. 9*).—This bulletin reports the results of certain irrigation experiments with field crops in the Sacramento and San Joaquin Valleys, California, conducted in cooperation with the U. S. D. A. Bureau of Public Roads and the Division of Engineering and Irrigation, California State Department of Public Works.

At Davis, the average maximum yield and profit were produced on alfalfa with total seasonal applications of 36 acre-in. to the acre. However, 30 acre-in. per acre is considered an economic seasonal application. Total depths of less than 24 in. annually, exclusive of rainfall, were insufficient for statisfactory yields. Depths of 48 in. or more produced smaller yields than did depths of 36 in. Variation in the number of irrigations when a total seasonal depth of 30 in. was applied caused only small differences in yield. The lighter applications, given at more frequent intervals, tended to produce the higher yields, but these did not warrant the extra labor cost.

At Delhi, the maximum yields were produced by 42 acre-in. of water to the acre. In the light soil, variations in the number of irrigations did not materially affect the yields, provided the same seasonal depth was applied.

Under field conditions at both Davis and Delhi during the period when the winter rainfall was sufficient to moisten the soil to a depth of at least 6 ft., and where the depth to the underground water table was more than 15 ft., variation in depth of application or in frequency of irrigation did not affect the root distribution of the afalfa.

Under Sacramento Valley conditions, with a seasonal rainfall of 17 in. or more, normally distributed, the increase in grain yields did not warrant irrigation. In years of deficient rainfall normal yields of grain could be produced with irrigation. Under conditions of extreme rainfall deficiency, two irrigations of from 4 to 6 acre-in. to the acre should be sufficient to produce normal yields. Irrigation of grain land before seeding produced no increase in yields in years of normal rainfall, but did so in years of deficient rainfall.

On medium soil types and in years of normal rainfall in the Sacramento Valley, the net irrigation requirements for full corn and grain sorghum crops should not exceed 12 acre-in. per acre, applied in not more than three irrigations. In years of deficient rainfall the net seasonal irrigation requirement for these crops should not exceed 18 acre-in., applied in not more than four irrigations.

Irrigation of land before seeding is advisable for corn and grain sorghum when rainfall conditions have been such that a proper seed bed can not be prepared, or where there is not sufficient moisture in the surface soil to insure a proper germination of the seed. Under the furrow method of irrigation a normal depth of irrigation is 4 acre-in. per acre for each irrigation.

Irrigation requirements of the arid and semiarid lands of the Missouri and Arkansas River basins, S. Fortier (*U. S. Dept. Agr., Tech. Bul. 36 (1928), pp. 112, pl. 1, figs. 18*).—In this report all dependable data available on water requirements of crops in the basins of the Missouri and Arkansas Rivers and adjacent territories are presented in tabular form and discussed.

Principles governing the choice, operation, and care of small irrigation pumping plants, C. N. Johnston (*California Sta. Circ. 312 (1928), pp. 28, figs. 11*).—It is pointed out in this publication that the four outstanding types of pumps now in use in California irrigation are the centrifugal, the deep-well turbine, the screw, and the plunger. Air-lift and rotary displacement

pumps are found occasionally, but serve only small irrigated areas. Centrifugal pumps are best fitted to operate in case of surface waters or shallow underground supplies. Deep-well turbine pumps are similar to the centrifugals in performance, but may be used to pump water from almost any depth.

Screw pumps may be used for both long and short lifts, and are characterized by their large capacity. The air-lift pump has as its chief asset its simplicity and lack of wearing parts. Its application to irrigation is limited to special conditions because of its low efficiency. Plunger pumps are generally used in irrigating comparatively small tracts because of their limited capacity. Their use is also limited by the fact that abrasive materials in the water supply destroy their efficiency. The rotary displacement pump has the same limitations as the plunger pump, and can be used only for surface or shallow underground waters.

The results of the study are taken to indicate that pumping-plant efficiencies should not be below 50 per cent.

Shape of the water table in tile drained land, W. W. Weir (*Hilgardia [California Sta.], 3 (1928), No. 5, pp. 143–152, figs. 5*).—Studies are reported which showed that, under widely different soil conditions and widely different spacing and depth of tile, the water table between lines of tile is practically a straight line except within a very short distance of the tile. The depth of tile or the spacing between lines of tile does materially alter the shape of the water table. The water table under certain conditions may stand above a tile line at points directly over it and yet the drainage be efficient and the tile lines only partially filled with flowing water.

Because of the flatness of the water table, it is considered probable that the major part of the lateral adjustment in the water table due to the removal of water by a drain takes place below the flow line, and in that portion of the water table above the flow line the movement is largely vertical. The depth of the tile rather than the spacing between tile lines is therefore considered to be the more important feature affecting the efficiency of a drainage system. Thus, to obtain the same efficiency in areas where the vertical pressures differ, the tile must be either deeper or closer together in the case of the greater pressure.

Public Roads, [March, 1928] (*U. S. Dept. Agr., Public Roads, 9 (1928), No. 1, pp. 24+[2], figs. 17*).—This number of this periodical contains the status of Federal-aid highway construction as of February 29, 1928, together with the following articles: Present Status of Subgrade Soil Testing, by C. A. Hogentogler, C. Terzaghi, and A. M. Wintermyer (pp. 1–8, 24); Power-Shovel Operation in Highway Grading.—Part 2, Hauling with Teams and Wagons, by T. W. Allen and A. P. Anderson (pp. 9–24); and Experimental Bituminous-Treated Earth Road Built (p. 24).

Highway bridge surveys, C. B. McCullough (*U. S. Dept. Agr., Tech. Bul. 55 (1928), pp. 76, pl. 1, figs. 45*).—This bulletin discusses the features to be included in a detailed bridge survey.

An investigation of web stresses in reinforced concrete beams.—Part II, Restrained beams, F. E. Richart and L. J. Larson (*Ill. Univ., Engin. Expt. Sta. Bul. 175 (1928), pp. 74, pls. 8, figs. 19*).—In further studies on the subject (E. S. R., 58, p. 181), the results of an investigation are reported which embodied tests of 59 restrained reinforced concrete beams of a size comparable to those commonly used in buildings and other structures. The tests were arranged to produce conditions of restraint similar to those found in continuous beams.

In beams with vertical stirrups the greatest stirrup stresses were observed at a distance from the center of the support about equal to the depth of the

beam. In beams reinforced with bent up bars the region of maximum web stresses was not very clearly defined, but generally the highest stresses in inclined bars were found when the upper bend of the bar was less than a distance from the support equal to the effective depth of the beam. The greatest stress in an inclined bar was almost invariably found in the part nearest the tension face of the beam.

The stresses in both stirrups and inclined bars were low near the section of contraflexure as compared with stresses measured elsewhere. When properly arranged, bent up bars were found to furnish effective web reinforcement. No slipping of vertical stirrups was observed in any case.

Anchorage of top reinforcing bars by bending them down and providing large hooks in the compression side of the beams generally prevented final bond failure. End anchorage did not prevent local slipping of the bars.

The values of maximum shearing stress developed in restrained beams without web reinforcement varied from 142 to 260 lbs. per square inch, although in the case of the lower values failure was by tension and bond.

The prevalence of local bond failures at low loads and the resulting formation of cracks, and of the crushing and splintering produced by bends of small radius, were taken to indicate that if high allowable shearing stresses are to be utilized in design, particular attention must be paid to matters of longitudinal tension, bond, and bearing stresses.

Notes on the relative resistance of various cements to the action of sulphate waters, T. Thorvaldson (*Engin. Jour.* [*Canada*], *11* (*1928*), *No. 3, pp. 180–183, figs. 2*).—This is a contribution from the University of Saskatchewan in which progress data on the resistance of various cements to the action of sulfate waters are presented and discussed.

The condition of field specimens of concrete exposed to alkali soils and waters examined in December, 1927 (*Engin. Jour.* [*Canada*], *11* (*1928*), *No. 3, pp. 184–192*).—The data from these examinations are tabulated and briefly discussed.

American lubricants, L. B. Lockhart (*Easton, Pa.: Chem. Pub. Co., 1927, 3 ed., pp. XI+408, figs. 22*).—The purpose of this book is to aid the user and the buyer of lubricants in a more intelligent selection of oils and greases. The point of view throughout is that of the user rather than that of the refiner. Chapters are included on crude petroleum; the refining of petroleum; refined products; friction and lubrication; lubrication of internal combustion engines, automobiles, electrical machinery, steam cylinders and steam engines, steam railways, cotton mills and other textile mills, and miscellaneous plants and machines; physical and chemical methods of testing lubricating oils; lubricating greases; methods for testing and analysis of greases; animal and vegetable oils; methods of testing fatty oils; and specifications. Two appendixes are included.

Protective metallic coatings, H. S. Rawdon (*New York: Chem. Catalog Co., 1928, pp. 277, figs. 69*).—This book is one of the American Chemical Society Monograph Series and deals with the subject of metallic coatings to prevent corrosion and deterioration of metals. It contains chapters on coating methods depending on the alloying of coating and base; electroplating; metal spraying and sprayed metal coatings; chemical treatment of metallic surfaces; zinc coating by the hot dipping or galvanizing process; zinc coating by cementation, electroplating, and other methods—comparison of coatings made by various methods; tin coatings; coatings of copper, nickel, chromium, and cobalt; coatings of lead, cadmium, and aluminum; gold and silver coatings; miscellaneous finishes; and methods of testing metallic coatings. A bibliography is included.

Power capacity and production in the United States (*U. S. Geol. Survey, Water-Supply Paper 579 (1928), pp. II+210, pls. 4, figs. 37*).—This report includes an introductory statement by N. C. Grover and special papers on The Development of Horsepower Equipment in the United States, by C. R. Daugherty (pp. 11–112); Developed and Potential Water Power in the United States and Monthly Production of Electricity by Public-Utility Power Plants, 1919–1926, by A. H. Horton (pp. 115–202); and Growth of Water-Power Development in the United States, by R. W. Davenport (pp. 205–207).

Electrical truck garden culture [trans. title], G. Lind (*K. Landtbr. Akad. Handl. och Tidskr., 67 (1928), No. 1, pp. 49–65, figs. 5; also in Meddel. K. Landtbr. Akad. Exptlfälts. Trädgårdsavdel., No. 25 (1928), pp. 17, figs. 5*).—Apparatus for the artificial heating of truck garden soils by electricity is described, and experiments on the use of this means of heating to supplement sun heat for potatoes, cucumbers, and other truck crops are reported and discussed. The results indicate that earlier maturity may be secured by this practice, particularly with cucumbers and other crops which are likely to be infested with diseases at later maturity.

Better tobacco barns, L. H. Lewis and R. E. Currin (*Clemson Agr. Col. S. C., Ext. Circ. 93 (1928), pp. 12, figs. 3*).—Practical information on the planning and construction of tobacco barns is given, together with working drawings.

American greenhouse construction, R. T. Muller (*New York: A. T. De La Mare Co., 1927, pp. VIII+143, figs. 55*).—The information presented in this book appears to have been gained primarily from the results of investigations at the Massachusetts Agricultural College. Chapters are included on essentials of a greenhouse; structural materials; types; arrangement of greenhouse range; instructions for erecting semi-iron frame houses; ventilation, painting and glazing, shading, glass, brackets, benches, beds, and walks; heating systems; boilers; fuels; frames and storage pits; and glass structures for amateurs.

Construction and arrangement of hog stalls [trans. title], Speckmann and Dettinger (*Veröffentl. Landw. Kammer Rheinprov., No. 13 (1928), pp. 9, pls. 11*).—Practical information on the subject is given from the German viewpoint.

Poultry houses and fixtures, M. A. Jull and A. R. Lee (*U. S. Dept. Agr., Farmers' Bul. 1554 (1928), pp. II+30, figs. 29*).—This is a revision of and supersedes Farmers' Bulletin 1413 (E. S. R., 52, p. 289). It gives detailed information on how to build poultry houses.

Carbon and nitrogen transformation in fresh sewage solids digestion, H. Heukelekian and W. Rudolfs (*Indus. and Engin. Chem., 20 (1928), No. 2, pp. 177–179, figs. 2*).—In a contribution from the New Jersey Experiment Stations, experiments on the carbon and nitrogen changes in the digestion of limed and unlimed fresh solids are reported.

It was found that there is no reduction in the total nitrogen content in a given volume of digesting sludge. The percentage of nitrogen of the volatile matter, on the other hand, increases as a result of the reduction in the volatile matter. The increase of carbon content of the volatile matter and the reduction of volatile matter in the unlimed material just balance each other. There is a greater reduction of volatile matter and carbon in the limed material. The most rapid rate of carbon reduction takes place after the cellulose decomposition stage, and it is suggested that cellulose decomposition products, as well as the decomposition of fats, cause this rapid reduction of carbon. It is pointed out that a greater proportion of the organic matter decomposed is gasified as a result of liming.

RURAL ECONOMICS AND SOCIOLOGY

[Rural economics investigations at the Ohio Station] (*Ohio Sta. Bimo. Bul., 13 (1928), No. 2, pp. 74–80, fig. 1*).—Results of investigations are reported as follows:

Truck movement of Ohio apples, C. W. Hauck (pp. 74–76).—A table is given showing for 23 counties for 1924 the production, carload shipments, and percentage of commercial crop shipped by rail and by truck and other means.

An index of Ohio's gross cash income from agriculture, V. R. Wertz (pp. 77, 78).—A table is given showing annual indexes, 1920–1927, of the gross cash income from meat animals, dairy products, grains, poultry and eggs, tobacco, and wool. The index numbers were computed from the estimated monthly gross cash income from the sale of hogs, cattle, calves, sheep, whole milk, butterfat, wheat, corn, oats, rye, barley, buckwheat, poultry, eggs, tobacco, and wool, and the average income for the period 1924–1926 was taken as equal to 100. The estimated respective indexes for 1927 were 84, 99, 92, 99, 73, and 93, and averaged 91, as compared with 113, 99, 109, 107, 102, and 95, and an average of 108 for 1926.

Corn-hog ratio in Ohio, C. R. Arnold (p. 79.)—A table is given showing the monthly corn-hog ratio from January, 1921, to December, 1927, and the average monthly and average annual ratios.

Index numbers of production, wages, and prices, J. I. Falconer (p. 80).—A table previously noted (E. S. R., 58, p. 684) is brought down through December, 1927.

Planning the farm for profits, P. E. McNall, R. S. Kifer, and D. R. Mitchell (*Wisconsin Sta. Bul. 395 (1927), pp. 24*).—This bulletin, prepared in cooperation with the U. S. D. A. Bureau of Agricultural Economics and the Wisconsin State Department of Markets, outlines suggested farming plans for 80-, 120-, and 160-acre farms and gives the estimated returns and receipts.

An economic analysis of farming in Overton County, Tennessee, C. E. Allred and S. W. Atkins (*Tennessee Sta. Agr. Econ. Survey No. 1 (1927), pp. XI+127, figs. 11*).—This is a mimeographed report of a study made to determine the factors affecting farm profits in the area, to determine the reasons for success or failure of individual farms, and to obtain facts upon which to base recommendations for changes in organization and management in areas having similar conditions. The report is based upon United States census and other statistical data and records obtained by personal visits to 50 farms.

Tables and charts are included giving agricultural statistics for the county, 1850–1925, the fundamental economic factors affecting the area, the crops and cropping systems, livestock and livestock products, and the place of tree crops in the agriculture of the area. The factors affecting farm profits in the county and the causes of success or failure on six farms are analyzed. Recommendations are made regarding the size of farms, different crops, soil improvement, crop rotations, livestock raising, tree crops, and other phases of farm organization and management.

Appendixes contain certain recommendations for improvements in the method of making farm management surveys, and descriptions of the methods used in the present study to get all farms on a comparable basis and to adjust the census data to the present area of the county.

A study of ranch organization in eastern Colorado, R. T. Burdick, M. Reinholt, and G. S. Klemmedson (*Colorado Sta. Bul. 327 (1928), pp. 61, figs. 19*).—This bulletin presents the results of a study of 22 ranches during the period 1922–1925. Records were kept on 6 ranches during all 4 years, for

3 years on 4 ranches, for 2 years on 10 ranches, and for 1 year on 2 ranches. Tables are given showing for the period for each ranch the acreage of land owned and leased, grazed and cropped or used for hay, and value per acre of land grazed and cost of leased land; number of cattle of different classes; distribution of capital, indebtedness, and expenses; source of ranch receipts; net available cash, ranch income, and return on total investment by years and for the period and on owner's equity; number of cattle sold by classes; percentage of growing cattle sold at different ages; percentage of death loss of cows and percentage of calf crop; ranch labor by years; number of cattle handled per man and effect of winter feed upon the calf crop; and comparison of the number of cows per bull and percentage of calf crop. Other tables show the averages of all ranches by years for ranch income, percentage of beef and pounds per head produced by different classes of cattle, sale weights and sale price per head by classes, sale price per 100 lbs. by classes, and comparison of net price per 100 lbs. and per head at ranches and central markets; ranch expense per head and per 100 lbs. of beef produced; breeding herd cost per cow and calf; and amounts and cost of winter feed per head by classes.

The factors affecting income are analyzed. Ranches selling less than 10 per cent of their calves made 3.71 per cent on investment, while those selling over 10 per cent made 1.04 per cent. The former had 0.92 per cent of the land in crops, handled 696 cattle per man and 42 head, except calves, per section of land, as compared with 1.36 per cent, 639 head, and 31 head for the latter. The average returns per acre were 14 cts., 3 cts., and 1 ct. for ranches of from 13,500 to 69,225 acres, 9,000 to 13,500 acres, and 4,360 to 9,000 acres, respectively. Ranches on which less than 400 cattle were handled per man returned 0.45 per cent on investment, those where 401 to 600 head were handled per man 1.32 per cent, and those where over 600 head were handled per man 2.54 per cent. On ranches where breeding herd costs, exclusive of interest, ranged from $3.75 to $5 per 100 lbs. of calf produced, the percentage of calf crop and return on investment were 62 and 4.54, respectively; where costs ranged from $5 to $7, 57 and 2.20; and where costs were from $7 to $14.44, 51 and —1.08.

Tables showing organization and returns by years for from 2 to 4 years are included for 5 of the more successful ranches of different sizes and types.

This work was carried on in cooperation with the U. S. D. A. Bureaus of Agricultural Economics and Animal Industry.

A study of ranch organization and methods of range-cattle production in the northern Great Plains region, M. L. Wilson, R. H. Wilcox, G. S. Klemmedson, and V. V. Parr (*U. S. Dept. Agr., Tech. Bul. 45 (1928), pp. [2]+92, figs. 16*):—This bulletin contains information concerning the adaptation of the northern Great Plains region for range-cattle production and methods of management and systems of ranch organization best suited to the region. It is based upon a study, made in cooperation with the respective agricultural experiment stations, of the records for the year beginning April 1, 1924, of 66 ranches in North Dakota, 97 in South Dakota, 57 in Wyoming, and 84 in Montana. The general conditions of the region are described, and different phases of ranch management are discussed.

Tables are given showing for ranches grouped according to the number of cows (50 and less, 51 to 100, 101 to 200, 201 to 450, and over 450) the acreage of farming and grazing land, by tenure; ranches using grazing land; size of ranch; opening and closing inventories; cattle of different classes purchased and sold; kind and quantity of feed fed to different classes of cattle; distribution of investment, indebtedness, expenses, and receipts; ranch income, unpaid labor, and return on investment; cash available for unpaid labor, depreciation, and

returns on operator's equity in capital; amounts and kinds of labor; and percentage of calf crops.

Tables are also given showing the hay and grain production of the 304 ranches by States and the death loss and the estimated normal weights and seasonal gains of different classes of cattle. Other tables show the average investment, receipts, expenses, and income on 295 ranches grouped by type of organization and size of herd; and the cash available to meet unpaid labor, depreciation, and return on operator's equity on 168 ranches having 100 cows or less.

Standard organizations are given for a 50-, 200-, and 500-cow ranch, and a 1,000-steer ranch, showing the organization, distribution of capital, operation, feed and labor requirements, and estimated production, receipts, expenses, and income.

An economic study of potato farming in the Hastings area for the crop year 1925, B. McKinley (*Florida Sta. Bul. 193 (1928), pp. 173+275, pl. 1, figs. 25*).—This bulletin presents the results of a study of 294 records of farm business for the year beginning November 1, 1924, obtained by the survey method in 4 sections of the Hastings potato area of Florida. Tables and text summarize by sections the data regarding farm business per farm, tenure, utilization of farm and crop land, capital invested, mortgages and borrowed working capital, livestock raised, farm receipts and expenses, crop yields, prices received for crops, previous occupations and education of farmers, and the distribution of costs, man labor, work stock, tractor and truck work, and other data regarding the potato crop.

An analysis is made of the relations of capital, acres in potatoes, receipts from potatoes, crop index, potato price index, and quality and production of potatoes to labor income.

The 50 farms with the largest capital (average $55,288) had an average labor income of $23, as compared with $82 for the 50 farms with the smallest capital (average $5,237) and with $537 for the other 194 farms (average $18,841). The average labor incomes were $47 for farms having less than 15 acres in potatoes, $157 for farms with 16 to 29 acres, $498 for farms with 30 to 39 acres, $207 for farms with 40 to 49 acres, $624 for farms with 50 to 69 acres, and $712 for farms with 70 acres and over in potatoes.

The labor income varied according to the percentage of receipts from potatoes as follows: 95 to 100 per cent, $877; 90 to 95 per cent, $652; 80 to 90 per cent, $74; 60 to 80 per cent, $368; and below 60 per cent, —$685. The labor income increased from —$916 with a crop index of 80 and under to $1,592 with a crop index of 121 and over, and from —$2,752 with a potato price index of 80 and under to $3,491 with a potato price index of 121 and over. The labor income was $654 for farms on which 80 per cent or more of the potatoes graded U. S. No. 1, $1,052 where 70 to 79 per cent graded No. 1, —$383 where 60 to 69 per cent graded No. 1, and —$683 where less than 60 per cent graded No. 1. There seemed to be no correlation between production and price of Florida potatoes, but the size of the late Northern crops was found to be a factor in determining the price of Florida potatoes the following spring.

The potato situation in Idaho for 1928, C. F. Wells (*Idaho Sta. Circ. 51 (1928), pp. 8, figs. 2*).—Tables and charts are included showing the March 1 intended United States plantings of potatoes compared with the acres harvested, 1923–1928; the estimated United States average yield per acre and total production, 1924–1928, compared with actual yields and production; and the total United States acreage and production and the average United States yield per acre and average United States farm price, December 1, 1900 to 1927.

A chart is also included showing the relation of the total United States production to the Idaho price of potatoes, 1921–1927.

Economic aspects of the watermelon industry, E. Rauchenstein (*California Sta. Bul. 449 (1928), pp. 26, figs. 7*).—Tables, maps, and graphs are presented showing by States and years the acreage and production of watermelons, 1922–1926; the yields and carlot shipments, 1919–1926; the unloads in 42 cities by States of origin, 1926; monthly carlot shipments by States, 1925–1927; and the carlot shipments from the Imperial and Coachella Valleys, Calif., 1911–1927; and the carlot shipments in the United States of watermelons, cantaloupes, and fresh fruits, 1925–1927.

The correlation index between carlots of Imperial Valley watermelons on track and Los Angeles prices, June 21, 1922, to August 2, 1927, was found to be —0.8456, and the equation for prices, log price per pound=0.4642—0.00307 carlots on track.

The Iowa agricultural outlook for 1928, C. L. Holmes (*Iowa Sta. Cur. Econ. Ser. Rpt. 7 (1928), pp. 16, figs. 4*).—This is the third annual report (E. S. R., 57, p. 190). Iowa farming in 1927 and the 1928 situation of different Iowa crops and livestock are discussed.

Studies of farm land prices and ownership, W. C. Jensen and B. A. Russell (*South Carolina Sta. Bul. 247 (1928), pp. 50, figs. 10*).—This bulletin presents the results of a study of farm real estate in Anderson County, S. C., based upon analyses of 10,051 deeds for the price series, deeds covering 185 farms and mortgages covering 167 farms for the period 1911–1925 to trace changes in land values, 694 farm management surveys, and interviews with merchants and real estate men.

Land prices were found to have had a gradual upward trend from 1893 to 1916, marked rise from 1916 to 1921, and a sharp decline from 1921 to 1925, and to have moved to some extent in cycles varying from 4 to 6 years and corresponding roughly with the movements in the price of cotton but lagging behind from 1 to 4 years.

Cost goods prices, general price level, rent, prices of industrial stocks, and other factors were considered. Their relations to land price were found to be indirect, being either affected by, or affecting, cotton prices, but no conclusion could be reached because of lack of data. How to profit rather than lose by land price changes, and the economic utilization of land and the economic size of holding under Anderson County conditions are discussed.

An appendix contains tables giving statistics for 1925 for Anderson County and for the State as to the number and size of farms, land classification, farm values, mortgage indebtedness, expenditures, crop acreages and production, and livestock and livestock production; and index numbers, averages, and other data regarding land values, prices, mortgages, land sales, etc.

Farm real estate assessment practices in Michigan, R. W. Newton and W. O. Hedrick (*Michigan Sta. Spec. Bul. 172 (1928), pp. 80*).—The statutory law of assessment and equalization and its interpretation by the Supreme Court of the State are set forth. Assessment and equalization in practice and the function of the State Tax Commission are discussed, and recommendations for tax reforms are made.

An appendix (pp. 71–80) includes a table summarizing farm real estate assessment procedure by States.

Freight rates and agriculture: A list of references, compiled by M. Gill (*U. S. Dept. Agr., Bur. Agr. Econ., 1927, pp. 36*).—A mimeographed list of books, reports, bulletins, and periodical articles discussing freight rates in their relation to agriculture.

Factors affecting the price of cotton, B. B. Smith (*U. S. Dept. Agr., Tech. Bul. 50 (1928), pp. 75, figs. 21*).—This bulletin reports the results of a study of the factors influencing the yearly and monthly price variations of cotton over

the period 1905–1925, made with a view "(1) to determine the factors which influence the price of cotton, (2) to reduce these factors to numerical measurement in so far as possible, and (3) to find and define the statistical relationship, if any, existing among these factors and the price."

It consists of two sections, a "preliminary analysis" dealing with price-supply relationships from year to year, and a "detailed analysis" made to explain month-to-month variations in price on the basis of systematic relationship to the several sets of factors. Linear multiple correlation applied to the logarithms of the variables was used in both analyses. Curvilinear multiple correlation methods were applied to the original variables in the detailed analysis.

Preliminary analysis.—Correlating P=December price per pound in cents, S=supply in millions of bales, I=Bureau of Labor Statistics Index of All Commodity Prices at Wholesale for December, the regression equation for the relation between annual supply, price level, and price was

$$\text{Log } P = 1.548 \text{ Log } I - 1.705 \text{ Log } S - 0.051$$

and the coefficient of multiple correlation 0.955.

The regression equation and coefficient of multiple correlation were

$$\text{Log } P = -0.9561 + 0.00825T - 1.0626 \text{ Log } S - 0.0361 \text{ Log } G + 1.4730 \text{ Log } I$$

and 0.965 for the relation between price in December and January and the indicated supply on December 31, index of grade of crop, price level, and trend, in which P=the price in cents per pound, T=the trend measurement, S=the supply in millions of bales, G=the grade index, and I=the index of price level.

Detailed analysis.—By multiple curvilinear correlation based on 240 random observations, the relation was determined between the monthly world price at New Orleans (P) and the following factors: t=crop year beginning June, the last two digits of the calendar year being used; m=the month within any given year; s=the indicated, or actual, supply at the beginning of the month; a=the "potential" supply, information on which was available nearest the first of the month, except that from January to May, inclusive, the figure for the preceding December was used; u=accumulated domestic consumption to the first of the month; e=accumulated exports to the first of the month; i=accumulated rates of general price changes, obtainable from data applicable to a period not later than the preceding month; and o=the average price of industrial stocks.

Numerous curves were obtained by methods of repeated simultaneous approximation, the functions being determined from the following equation

$$P = F_1(F_2(t) + F_3(m, t) + F_4(S, m, t) + F_5(a, m, t) + F_6(e) + F_7(u) + F_8(o) + F_9(i))$$

in which the values of F_1 to F_9 were found as follows: F_1 from graph showing the relation between the world relative price of cotton and the sum of the readings from graphs showing by months the relation of the actual supply and potential supply to cotton prices, the net seasonal change in world relative price of cotton, the relation of accumulated exports and domestic consumption to the world price of cotton, the relation between prices of 20 industrial stocks and world price of cotton during three periods, the relation between accumulated rates of general price change and relative price of cotton, and the effect of changes in demand on price; F_2 from graph showing the effect of changes in demand on price; F_3 from graph showing the net seasonal change in world relative price of cotton; F_4 and F_5 from graph showing by months the relation of the actual supply and potential supply to cotton prices; F_6 and F_7

from graph showing the relation of accumulated exports and domestic consumption to the world price of cotton; F_8 from graph showing the relation between prices of 20 industrial stocks and world price of cotton during three periods; and F_9 from graph showing the relation between accumulated rates of general price change and relative price of cotton. The coefficient of correlation was found to be 0.948.

Of the 90 per cent of price variability attributable to the factors considered, approximately 26.3 per cent is attributable to the net trend element, 38.7 per cent to the supply elements, and 25 per cent to the demand elements.

Twenty tables and a number of graphs are included giving data obtained in and for use in the analysis.

Marketing Georgia peaches, R. M. MIDDLETON (*Georgia Sta. Circ. 82 (1928), pp. 4*).—A table, with a few comments, is given showing carload shipments to different States by months for the years 1925 and 1926.

Vegetable statistics (*U. S. Dept. Agr., Statis. Bul. 22 (1928), pp. 268*).—Tables are included showing the acreage, yield per acre, production, price, and value of truck crops; number of farm gardens and value of products; production and value of canned vegetables; and carlot shipments, shipments and unloads, exports, imports, freight rates, and prices of vegetables for the year 1926, with comparable data for earlier years.

Publications issued by farmers' business organizations, compiled by C. GARDNER (*U. S. Dept. Agr., Bur. Agr. Econ., 1928, pp. [2]+15*).—A mimeographed list revised to February 1, 1928.

Community relations of rural young people, E. L. MORGAN and H. J. BURT (*Missouri Sta. Research Bul. 110 (1927), pp. 77*).—The results are presented of a study made in four trade-area rural communities of Missouri, in cooperation with the U. S. D. A. Bureau of Agricultural Economics, to ascertain what rural young people are thinking and their attitudes toward rural life and its institutions, education, religion, play, science, and urban life; to discover what young folks are doing, would do if they had a chance, and would like to learn to do, together with what means the community provides for satisfying these activity-wishes and apparently unsatisfied needs; and to ascertain the amount of migration of the young folks to and from communities and the reasons therefor. The data were collected by a graduate student of the University of Missouri in each community under the supervision of a representative of the department of rural sociology. Questionnaires and forms prepared by the department were used.

The attitudes of the major groups toward each other and of each group toward education, the church, play and recreation, and science and liberalism were obtained by interviewing 25 farmers, 25 townspeople, 25 village young people, 25 country young people, and all prominent business men, teachers, preachers, and town officials in each community. Of the attitudes of all groups toward all other groups 78 per cent was good, 20 per cent indifferent, and only 2 per cent showed ill will. Farmers appreciated the church most and play and recreation least, young people play and recreation most and the church least, and townspeople education most and play and recreation least.

The study of the activities and activity-wishes was based upon a list of 165 activity items checked by high-school students consisting of 121 village boys, 135 village girls, 88 country boys, and 83 country girls. Tables are given showing for each class of boys and girls the things they are doing, would do if they had a chance, and would like to learn to do, and classifying the activity-wishes. The percentages of the activity-wishes that were economic, religious, social, educational, and recreational were, respectively, for village boys 4, 2, 12, 14, and

67; village girls 8, 3, 13, 17, and 58; country boys 5, 1, 10, 14, and 70; country girls 7, 3, 15, 14, and 61; and all groups 8, 3, 16, 17, and 56.

The attitudes of the high-school students toward their community were obtained from essays prepared by 375 of them on the subject My Community. Their own community was considered a good place to live by 77 per cent and not a good place by 2 per cent. Two per cent of the answers were conditional and 18 per cent did not answer the question. The leading favorable points enumerated were schools, churches, railroads, location, and climate; and the chief unfavorable points were lack of college facilities, amusements, economic opportunities, social life, and good roads. The essays of 393 high-school students on The Advantages and Disadvantages of Farm Life showed 19 per cent preferred farm life and 66 per cent did not. The chief disadvantages enumerated were poor schools, distance, lack of entertainment and amusements, poor roads, and long hard work. Tables are given showing the data obtained from the essays by groups of young people.

The answers to 205 questionnaires regarding the migration of young people between the ages of 14 and 30 to and from the communities showed the leading causes for such migration were economic reasons, schooling, parents moving, and marriage.

There were 66 religious, 18 social, 5 educational, and 8 recreational organizations in the 4 communities, of which young people constituted 24, 83, 77, and 37 per cent, respectively, of the membership, being 42, 34, 36, and 7 per cent, respectively, of the young people in the communities. The hours of participation and cost per hour for young people in different organizations were—social 36 hours and 8 cts., religious 109 hours and 10 cts., educational 806 hours and 13 cts., and recreational 190 hours and 30 cts.

The needs of the communities for supplying the several classes of activity-wishes and the means of satisfying such wishes are discussed.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

Agricultural advancement, E. B. Ferris (*Mississippi Sta. Circ. 77 (1927), pp. 6*).—A description in popular style of how agriculture has been advanced by research, and especially of the experimental work in south Mississippi.

The place of 4-H clubs in the American system of public education, A. C. True (*U. S. Dept. Agr., Ext. Serv. Circ. 71 (1928), pp. 9*).—This is a mimeographed address presented before the department of rural education of the National Education Association in February, 1928. It covers the objects, needs, opportunities, management, and results of 4-H club work and its relation to vocational education.

State school funds and their apportionment, I, II, F. H. Swift (*Amer. School Bd. Jour., 76 (1928), Nos. 2, pp. 39–41, 145; 4, pp. 39–41, 140*).—These are the first and second of a series of articles presenting the plans of State school support in several States.

The first article considers the plan of Maryland, a plan providing for an equalization fund from which grants are made proportional to the need and economic ability of the local school unit. The second article considers the plan of Ohio, and deals especially with its past and present policies regarding the permanent public-school endowment fund.

Report of the Indiana Rural Education Survey Committee, March, 1926, G. W. Freeman et al. (*Indianapolis: State Supt. Schools, 1926, pp. 130, figs. 4*).—This is the report of the rural education survey committee appointed in 1925 "to make a study of existing inequalities in educational opportunities of rural children; of factors determining the rising cost of education; of

methods of expenditures of public school funds; of proposed changes in taxing unit for support of public schools; and of means of stabilizing the rural population."

The short-unit course in teaching home and farm mechanics, A. L. Moore (*Indus. Ed. Mag., 29 (1928), No. 10, pp. 362–365, figs. 5*).—The plan of the Chaffey (Calif.) Union High School district for rotating six units of work in home and farm mechanics among six rural schools is described.

Economic biology for students of social science.—Part I, Harmful and useful animals, P. C. Esdaile (*London: Univ. London Press, 1927, pp. XV+175, figs. 150*).—This book is "a collection of facts concerning certain animals and plants which are, or may be, closely associated with man and his household," and is intended especially for courses in household and social science.

The first courses in dairy husbandry, H. P. Davis (*Jour. Dairy Sci., 11 (1928), No. 1, pp. 35–45*).—A paper presented before the American Dairy Science Association, pointing out the necessity of carefully organizing the first course in dairy husbandry. Suggestions are made on subject matter and presentation, and an outline of class and laboratory studies is proposed.

Better farming, F. A. Welton (*New York: Rand McNally & Co., 1928, pp. X+486, figs. 288*).—This is a textbook for graded and high schools, including chapters on the various crops; kinds of livestock; farm equipment, implements, and improvements; farm living conditions; farm records; marketing; motive power; soils; plant nutrition; home projects and clubs; school exhibits; and other subjects. Each chapter is followed by questions, a project lesson, and references.

Economics of farm organization and management, C. L. Holmes (*Boston and London: D. C. Heath & Co., 1928, pp. XVI+422, figs. 25*).—"This text is designed to supply the basic subject matter for the introductory agricultural college course in Farm Organization and Management, with or without supplementary laboratory or demonstrational material."

Bar charts versus circle diagrams, F. E. Croxton and R. E. Stryker (*Jour. Amer. Statis. Assoc., 22 (1927), No. 160, pp. 473–482, figs. 27*).—This study, which supplements that previously noted (E. S. R., 56, p. 791), was made solely to determine "accuracy of judgment." Twenty-seven diagrams having 13 different combinations were presented to 807 observers. For 50–50 and 25–75 percentages circles were found superior, and for other 2-part diagrams bars were superior. For 3- and 4-part diagrams circles were found preferable, while for the single 5-part diagrams the mean error was in favor of the bar but was not significant. Of the 21,789 estimates made, 466 failed to total 100 per cent.

FOODS—HUMAN NUTRITION

Nutrition and diet in health and disease, J. S. McLester (*Philadelphia and London: W. B. Saunders Co., 1927, pp. 783, figs. 14*).—This is a reference volume for "physicians who must advise the sick and the near sick; teachers who must instruct the young; nutrition workers, the majority of whom work with school children and their parents; social service workers, who must offer advice to mothers and expectant mothers and who must concern themselves with economic considerations as related to the food of the family; officials whose duty it is to feed large numbers of persons, as in boarding schools, hospitals, hotels, prisons, armies, etc."

A little over one-third of the volume is devoted to nutrition in health and the remainder to nutrition in disease. An interesting feature is the grouping of nutritional factors into those of fundamental importance, such as fuel, protein, vitamin, mineral, and water requirements; and those of lesser importance, in-

cluding satiety values, roughage, digestibility, and the cost of food. Similarly, in the second part there is a classification of diseases in which diet is of paramount importance and those in which diet is of varying importance. The former includes deficiency diseases, diabetes mellitus, gout, obesity, leanness, anaphylaxis and food poisoning, and diseases of the kidney and urinary tract and of the digestive organs; and the latter febrile diseases, diseases of the heart and arteries, blood, joints, nervous system, skin, and endocrine organs, and the feeding of surgical patients.

Abundant references to the literature assembled as bibliographies at the end of each chapter, sample menus for special diets, and tables and charts of general value add to the usefulness of the volume.

The foundations of nutrition, M. S. Rose (*New York: Macmillan Co., 1927, pp. XI+501, figs. 87*).—The essential factors of an adequate diet are discussed in this volume in terms understandable to those who have had no specialized training in the fundamental sciences upon which the science of nutrition is based, and with illustrations from the animal experiments which have contributed so large a share of present knowledge concerning these essentials. The contributions to the diet of various types of food materials are indicated by a new method in which nutritive values are expressed graphically as shares of the day's requirements, a share being defined as one-thirtieth of the day's requirement of the average man. According to present standards, one share of each of the principal food requirements is energy 100 calories, protein 2.5 gm., calcium 0.023, phosphorus 0.044, and iron 0.0005 gm. Pegs of different lengths corresponding to the number of shares of each of these groups present in a given unit of any food, such as a single apple, an orange, a glass of milk, or an individual portion of a cereal can be used to show at a glance the real value of the food in terms of different constituents.

The final chapter on the construction of an adequate diet deals with well-balanced diets for healthy adults, growing children, and family groups, and with special food needs of mothers and babies. Attention is given in these chapters to the selections which must be made to safeguard the nutritive essentials in low-priced diets.

An appendix contains, in addition to height-weight tables, a table of commonly used foods in terms of shares of protein, calcium, phosphorus, and iron carried by one energy share of edible food material and relative amounts of vitamins A, B, and C.

Logarithmic tables for computing the surface area of the body according to Dubois' formula, C. H. McCloy (*Arch. Int. Med., 41 (1928), No. 1, pp. 97–101*).—For convenience in computing the surface area of the body according to the formula of Dubois and Dubois (E. S. R., 35, p. 370), the author has calculated tables of logarithms of height in centimeters and in inches, and weight in kilograms and in pounds, and of the antilogarithms for all resultant logarithms needed for the computation of surface area.

A basal diet for nitrogen balance experiments, L. M. Pickens and R. M. Arnold (*Jour. Home Econ., 20 (1928), No. 4, pp. 250–253*).—A simple basal diet for nitrogen balance determinations has been developed in the home economics department of Iowa State College. The diet consists of soda crackers, American cheese, apple butter prepared in the laboratory, unblanched almonds, and approximately 2 qt. of water daily. Data are given on the distribution of nutrients and energy in this diet, which furnishes daily 1,237 gm. of fat, 211.4 of carbohydrate, 65.7 of protein, 1.297 of calcium, 1.48 of phosphorus, and 0.0093 of iron, with 2,249 calories. The average daily nitrogen intake, outgo, and balance of five subjects on the basal diet alone are also given.

"The advantages of this diet are that it can be prepared at home or school with a minimum of labor; that one analysis of a food is sufficient in each experiment; that uniformity of diet throughout the experiment is secured; that the diet has been found not to give rise to digestive disturbances; and that it is palatable and satisfying."

Intestinal absorption.—A search for a low residue diet, K. Hosoi, W. C. Alvarez, and F. C. Mann (*Arch. Int. Med., 41 (1928), No. 1, pp. 112–126, figs. 4*).—To determine the best selection of foods for low-residue diets to be used when it is desired to keep the production of feces at a minimum, dogs with ileum fistulas were fed various types of foods, and the feces were collected, weighed, examined for color, odor, consistency, reaction, and microscopic appearance, and dried to constant weight for the calculation of moisture content.

As judged by the rate of passage through the intestines and the amount of residue, lean meat is considered the best basis for a low-residue diet. To this may be added rice, hard boiled eggs, sugars (except lactose), and probably small amounts of fruit juices, tea, and coffee. It is thought that the highest degree of absorption can be obtained by keeping the diet fairly dry and administering it in small amounts at frequent intervals. Of particular interest is the evidence obtained of the relative indigestibility, as judged by the large volume of fecal residue, of milk, raw egg albumin, raw bananas, Swiss cheese, baked potato, and white bread.

Effect of diets high in protein but inadequate in calories on weights of obese patients, R. W. Keeton and H. Mackenzie (*Soc. Expt. Biol. and Med. Proc., 25 (1928), No. 4, pp. 309, 310*).—Dietary measures employed by the authors in the treatment of obesity consist in the use of diets decreasing in calories to nearly 50 per cent of the basal requirement but containing from 90 to 120 gm. of protein daily. In the two cases discussed in this preliminary report, there was a gradual loss in weight, followed by a long period of stationary weight, but with the maintenance of nitrogen equilibrium and even storage of nitrogen. One of the subjects maintained practically constant weight for 50 days on a basal —30 per cent diet. It is also noted that maintenance of nitrogen equilibrium and tendency to store nitrogen have been found present in three other obese patients on diets containing 90 gm. of protein and furnishing approximately 1,000 calories.

Cultivating the child's appetite, C. A. Aldrich (*New York: Macmillan Co., 1927, pp. XII+127*).—Psychological factors influencing the appetites of children are given special attention in this small volume, which contains useful advice on the prevention and treatment of anorexia in children. A paper summarizing the essential features of the author's plan of treatment of this condition has been noted previously (E. S. R., 57, p. 898).

A study of food habits of people in two contrasting areas of Mississippi, D. Dickins (*Mississippi Sta. Bul. 245 (1927), pp. 52, figs. 17*).—The two soil areas selected for this study were the so-called brown loam and short-leaf pine areas. In both of these cotton and corn are grown extensively, but the brown-loam area, which is more fertile, is especially noted for trucking crops. A total of 38 complete records (records for 2 weeks during each of the four seasons) was obtained from the brown loam and 37 from the short-leaf pine area. Incomplete records were obtained from 25 other families. The food consumption data were obtained in all cases by trained supervisors, using the inventory method, and in addition information was obtained on food likes and dislikes. Physical examinations were made by one physician of the State board of health in about 80 of the original families enrolled, and data were also obtained on

illnesses during the year and on the weight and height of the children at each season. In analyzing the food consumption records, the Hawley short-cut method (E. S. R., 58, p. 84) was used for the most part after a comparison of this with the usual method based on average analyses had shown that the differences between the two methods did not exceed 5 per cent. The double scale of food requirements as recommended by Hawley was also used.

The standards of comparison adopted were calories 3,000, protein 75 gm., phosphorus 1.3, calcium 0.69, and iron 0.15 gm. per man per day. The average results for the brown loam and short-leaf pine areas, respectively, were calories 3,307 and 3,139, protein 82.14 and 77.2 gm., calcium 1.18 and 1.06, phosphorus 1.43 and 1.28, and iron 0.0126 and 0.0122 gm. The number of families in the two groups which fell 10 per cent or more below the standards set were for calories 4 in the brown loam and 6 in the short-leaf pine area, protein 4 and 8, calcium 1 and 2, phosphorus 6 and 12, and iron 24 and 28, respectively. It will thus be seen that in general the dietaries were slightly less satisfactory from the standpoint of everything but iron in the short-leaf pine area than in the more fertile and consequently more prosperous brown-loam area. This is accounted for chiefly by the fact that the housewives in the brown-loam area spent more in cash for food and that this money was fairly wisely spent.

Compared with the established standards, the diets furnished slightly more than actually necessary of calories, protein, calcium, and phosphorus, but were markedly deficient in iron. The milk supply was generous, but the meat supply very low, some families having salt pork as their only supply of meat. The consumption of whole-grain cereals and of fruits and vegetables was very low. There was very little difference in the percentage distribution of nutrients in the dietaries in the two groups, although the fruits and vegetables were slightly lower in the short-leaf pine area. From a general standpoint the diets were thought to supply a sufficiency of vitamins A and B, but to be deficient in vitamin C during the fall, winter, and early spring. Aside from this there appeared to be little seasonal variation in the nutritive value of the diets in the two areas.

No definite conclusions could be drawn from comparisons of the physical condition and the dietary habits of the subjects, although certain points of interest were brought out. One of these was the definitely higher percentage of children with pale mucous membranes, indicating an anemic condition, in the families whose iron consumption was low than among those receiving sufficient iron. Increases in weight and in height and the extent of freedom from infectious diseases were greater in the brown loam than the short-leaf pine area.

The estimated money values of the food consumed varied from 19 to 56 cts. per man per day and averaged 38.13 cts. for the brown-loam area and 33.78 cts. for the short-leaf pine area. The amounts of foods furnished by the farm and purchased averaged 69.78 and 30.22 per cent, respectively, for the brown-loam area and 77.66 and 22.34 per cent for the short-leaf pine area. In the two groups the average percentages of the different food groups furnished by the farm were meat and fish 64 per cent, fruit 73, vegetables 84, milk and milk products 96, and poultry and poultry products 98 per cent.

The author's comments on this study are that a general increase in the use of fruits and vegetables in the case of the majority and the introduction of some form of meat once a day in the case of a few would have resulted in better dietaries, and that the average Mississippi farmer can more easily afford, from the standpoint of health and finances, to put labor into raising food than cash into purchasing food.

A list of 33 references to the literature is appended.

Chemical composition of West Indian seedling avocados, J. Tilt and M. Winfield (*Jour. Home Econ., 20 (1928), No. 1, pp. 43–46*).—The average proximate analyses are reported for 51 avocados of the Trapp variety, grade 2, in the earliest stages of maturity and 49 seedlings, grade 2, and separate analyses for 6 samples each of Trapps and seedlings, grade 1, in the latest stages of maturity.

Omitting the averages of Trapps, grade 2, which were underripe and showed a higher moisture and lower fat and protein content than the other samples, the minimum, maximum, and average values reported were as follows: Moisture 81.65, 83.92, and 83.02 per cent, protein 1.12, 1.16, and 1.14 per cent, fat 6.43, 8.09, and 7.33 per cent, carbohydrate 6.72, 6.92, and 6.82 per cent, and crude fiber 1.16, 1.19, and 1.17 per cent. The average content of the ash was 1.02 per cent. Data are also given on the phosphorus, iron, calcium, and magnesium content of the Trapp and seedling avocados, grade 1, in terms of percentage of total ash and of the fresh material, the latter values being phosphorus 0.0477, 0.0507, and 0.0492 per cent, iron 0.0054, 0.0072, and 0.0063 per cent, calcium 0.0368, 0.0381, and 0.0370 per cent, and magnesium 0.0323, 0.0407, and 0.0365 per cent.

A comparison of these results with data on California avocados, as reported in the literature, shows that the Florida avocado is somewhat higher than the California in moisture and lower in fat and protein. The values of calcium, magnesium, and phosphorus agree closely, while the iron content of the Florida avocado is approximately one-half that of the California varieties.

The manganese content of raw and cooked vegetables, S. Munger and W. H. Peterson (*Jour. Home Econ., 20 (1928), No. 3, pp. 194–200*).—In this contribution from the Wisconsin Experiment Station the literature on the significance of manganese in the nutrition of plants and animals is reviewed briefly, and data are reported on the manganese content of various vegetables, uncooked and cooked, as in a previous study (E. S. R., 55, p. 87), by boiling in small and large amounts of water, by steaming, and by the use of the pressure cooker. The determinations were made by the Official method, with certain modifications, as described in a previous paper (E. S. R., 58, p. 290).

The materials tested consisted of five vegetables representative of stalks and leaves and five of roots, tubers, and bulbs. In the first group spinach was highest in its manganese content, 0.00079 per cent of the raw vegetable, followed in decreasing order by string beans 0.00037, cauliflower and celery 0.00019 each, and cabbage 0.00012 per cent of the raw vegetable. In the second group beets had the highest content of manganese, 0.00049 per cent, followed by carrots and potatoes 0.00015 each, onions 0.00012, and rutabagas 0.000074 per cent.

As in the earlier study, steaming proved to be the most efficient method of cooking to conserve the manganese of the vegetables, and boiling in an excess of water the least efficient. The losses were slightly greater for the leaves than for the roots, tubers, and bulbs. The average losses in the various methods were steaming 12, boiling in a moderate amount of water 20, pressure cooking 22, and boiling in an excess of water 40 per cent.

A list of 31 references to the literature is appended.

Quantitative determination of vitamins A, B, and C in collards and turnip greens, G. W. Burton (*Jour. Home Econ., 20 (1928), No. 1, pp. 35–42*).—In this study freshly cut turnip tops and collards were tested for their content of vitamin A by the Sherman-Munsell method (E. S. R., 54, p. 89), vitamin B by the Sherman-Spohn method (E. S. R., 51, p. 368), and vitamin C by the method of Sherman, LaMer, and Campbell (E. S. R., 46, p. 865). The materials

were fed fresh and after having been carefully cooked in just enough distilled water to leave no appreciable amount of liquid at the end of the cooking period, which was 30 minutes for the turnip greens and 2 hours for the collards. In the vitamin A tests the animals were irradiated for 5 minutes daily.

From 0.02 to 0.04 gm. of raw collards as the sole source of vitamin A proved sufficient to give the standard growth of 25 gm. in 8 weeks, and 0.02 gm. of raw turnip greens brought about a considerably greater gain in the same period. No appreciable destruction of vitamin A took place in cooking.

In the B experiments 0.8 gm. of raw turnip greens and 0.9 gm. of collards sufficed for maintenance over the 8-week period. The cooked turnip greens showed a 10 per cent destruction and the cooked collards from 40 to 45 per cent destruction of vitamin B.

Incomplete vitamin C studies indicated that 1 gm. of raw collards and slightly more than 1 gm. of raw turnip greens were required to supply sufficient vitamin C to afford complete protection against scurvy. Of the cooked material, an equivalent of 10 gm. of raw collards gave the same protection. The guinea pigs refused to eat a larger amount of the cooked turnip greens than the equivalent of 8 gm. of the raw greens, and this did not protect them.

In units per gram of fresh material raw collards are estimated to contain 1.11 units of vitamin B and from 25 to 50 units of vitamin A, and turnip greens 1.25 units of vitamin B and more than 50 units of vitamin A. Collards are thus slightly lower than turnip greens in their content of vitamins A and B, but they are higher in their content of C. Cooking for the time required for the two materials further decreases the content of vitamin B in the collards as compared with that of turnip greens.

The vitamin content of mung bean sprouts, C. D. Miller and D. B. Haie (*Jour. Home Econ., 20 (1928), No. 4, pp. 263–271*).—Mung bean sprouts, as purchased in the market at Hawaii, were tested for their content of vitamins A, B, and C in the raw state and after steaming for 5 minutes, with results which are summarized by the authors as follows:

"Compared with some other common vegetables, the sprouts have been shown to be a fair source of vitamin A in both the raw and cooked state; a very good source of vitamin B, both raw and cooked; and an excellent source of vitamin C in the raw state and a good source in the cooked. Using Sherman's unit basis for a more exact evaluation, mung bean sprouts have a vitamin A value of one-sixth to one-twenty-fifth that of lettuce and one-twenty-fifth that of green peas; a vitamin B value equal to lettuce, a little greater than carrots, and one-tenth that of raw green peas. In the raw state mung bean sprouts have a vitamin C content equal to that of lemon, orange, and tomato juice and when cooked 5 minutes a slightly lower value."

The anti-berberi vitamin content of sweet potato leaves and shoots, F. O. Santos and E. G. Collado (*Philippine Agr., 16 (1928), No. 9, pp. 513–520, pls. 2*).—Sweet potato leaves and shoots, previously reported to be a good source of vitamin B as tested on rats (E. S. R., 47, p. 465), have also been found effective in the cure of polyneuritis in cockerels, the amounts administered daily in the experiments reported being about 5 gm.

Factor H in the nutrition of trout, C. M. McCay, F. C. Bing, and W. E. Dilley (*Science, 67 (1928), No. 1731, pp. 249, 250*).—A study of the dietary factors influencing the growth of fishes has been undertaken at the Burlington fish hatchery in Connecticut. Each experimental group contained 50 fingerlings confined in separate troughs with individual water supplies and outlets. The growth and mortality rates were used to measure the efficiency of the rations.

In a series of 10 experiments 9 purified rations made up of casein, boiled starch, salt mixture, cod-liver oil, and yeast were fed. In 4 of these experiments the protein content was varied from 10 to 75 per cent, in 2 lard was included at 22 and 57 per cent levels, varying the other ingredients to obtain an adequate salt and protein intake, and in 1 each cod-liver oil, yeast, and salt mixture were omitted. Another lot was fed dried skim milk as a sole diet.

For 7 weeks all except the fingerlings on the low protein diet grew normally. Those on the low protein did not grow, but remained active and ate readily. After 7 weeks all lots began to die except the low protein and dried skim milk lots, the latter growing until they averaged 5 times their initial weight at 16 weeks and then began to die. All were dead at the end of the twentieth week.

The low protein lot began to die at the end of the fourteenth week, and at the end of the twentieth week only 17 remained. These were divided into two lots, one receiving raw liver and the other remaining on the original ration, on which they continued to die. Those on raw liver immediately began to grow and in 9 weeks tripled their weight.

From these results the authors concluded that neither vitamin A, B, or D was the limiting factor in the growth of trout, and that dried skim milk contained small amounts of the factor necessary but not enough to sustain long periods of growth. Other tests in which orange juice supplied vitamin C proved that it was not the limiting factor. The unknown factor found in raw meat has been designated by the authors as factor H.

A comparison of raw liver with that which had been cooked and dried showed the latter to be lacking in this growth-stimulating factor. It has been found that the factor is not related to vitamin E. "Synthetic milk" is also lacking in this factor.

The effect of sunshine on the acidity of the intestinal tract of rachitic rats, F. F. Tisdall and H. W. Price (*Bul. Johns Hopkins Hosp., 41 (1927), No. 6, pp. 432–436*).—Determinations by the method of Tisdall and Brown (E. S. R., 51, p. 664) of the H-ion concentration of the feces and the contents of different parts of the intestinal tract of the rats used in the investigation of the antirachitic effect of sunshine (E. S. R., 58, p. 495) have confirmed the observations of Zucker and Matzner (E. S. R., 51, p. 464) that the exposure of rachitic rats to sunshine increases the acidity of the feces. The acidity of the upper part of the small intestines of normal rats was slightly greater than of rats on a rickets-producing diet whether exposed to sunshine or not, but while the intestines of normal rats and of rats on the rachitic diet exposed to sunshine became progressively more acid, those of the rachitic rat became more alkaline throughout its entire course.

Short daily exposures to sunshine produced as marked changes in the acidity of the intestines as long exposures, the changes not paralleling the antirachitic effect.

Minot-Murphy liver diet in Addisonian anaemia: Report of two cases, J. H. Anderson and E. I. Spriggs (*Lancet [London], 1927, II, No. 19, pp. 958, 959, figs. 3*).—This report includes two sample diets in which the required amount of liver is given chiefly fried and raw-scraped, the latter being served in vegetable soup. Lightly roasted liver, raw liver in sandwiches, and a liver cream are also used.

Suggestions for the administration of the Minot and Murphy special diet for pernicious anaemia, E. A. Nicholls (*Boston Med. and Surg. Jour., 196 (1927), No. 8, pp. 302–305*).—The requirements for the Minot and Murphy special diet for pernicious anemia are given in a classified list of foods under the headings encourage, permit, and avoid. As a further help in the preparation of

diets, four 24-hour menus are given, the first a liquid diet and the others for weak, increasing, and established appetites. General directions are given for the preparation of liver in hot and cold dishes.

Effect of kidney on blood regeneration in pernicious anemia, W. S. McCann (*Soc. Expt. Biol. and Med. Proc., 25 (1928), No. 4, pp. 255–258, figs. 2*).—Data are reported showing a favorable response to the use of kidney (250 gm. daily) in place of liver in the dietary treatment of two cases of pernicious anemia. It is noted, however, that the relative values of kidney and liver feeding can be determined only on comparison of a long series of cases.

TEXTILES AND CLOTHING

Papers on textile subjects read at the meeting of the British Association for the Advancement of Science, Leeds, August 31 to September 7, 1927 (*Jour. Textile Inst., 18 (1927), Spec. No., Sept., pp. IV+T311–T525, pls. 2, figs. 84*).—This number presents in detail the papers noted from another source (E. S. R., 58, p. 94), and also includes the following papers: Moisture Relations of Colloidal Fibres, by J. J. Hedges (pp. T350–T360); Some Chemical Aspects of Wool Research, by A. T. King (pp. T361–T368); Ultra-Violet Radiation as an Aid to Textile Analysis, by H. R. Hirst (pp. T369–T375); On the Occurrence of Dark Fibres in the Suffolk Fleece, with Particular Reference to the Birth Coat of the Lamb, by J. E. Nichols (pp. T395–T413); Mendelian Breeding with Wensleydale Sheep, by F. W. Dry (pp. T415–T420); Race and Environment as Affecting the Type of Sheep and the Wool Supplies of the World, by A. F. Barker (pp. T421–T430); Some Problems of Textile Testing, by F. T. Peirce (pp. T475–T489); Quantitative Determination of the Physical Properties of Artificial Silk and Their Relationship to Textile Manufacture, by A. L. Wykes (pp. T494–T505); Air Conditioning Experiments and Some Special Forms of Hygrometers, by E. Griffiths (pp. T515, T516); Rancidification and Oxidation of Olive Oil, by L. L. Lloyd (pp. T517–T519); and The Isoelectric Point of Silk-Fibroin, by W. S. Denham and W. Brash (pp. T520–T524).

Studies on the fleece fibres of British breeds of sheep, J. S. S. Blyth (*Ztschr. Tierzüchtung u. Züchtungsbiol., 7 (1926), No. 3, pp. 383–417, figs. 16; Ger. abs., p. 407*).—Microscopic studies were made at the University of Edinburgh on fine and coarse samples from the British pedigree sheep. The breeds were grouped into mountain longwool—Herdwick, Blackface, Swaledale, and Lonk; luster wool—Lincoln, Leicester, Cotswold, South Devon, Border Leicester, and Romney Marsh; down wool—Southdown, Shropshire, Hampshire, Suffolk, and Oxford; and mountain short-wool—Exmoor, Cheviot, and Kerry Hill.

Of the two main types of fiber found in British sheep breeds, type 1 is proportionally the longer and coarser and exhibits characteristic reticulate scale markings and seems to occur only in the luster and the mountain longwool groups of breeds. Type 2, which is shorter and finer and possesses a coronal type of scale marking, occurs in all breed groups, constitutes the main type in the short-wools, and is present in varying proportion in the mountain longwools and the lusters. Kemp, the coarser of the two small subsidiary classes of fibers, is present in all breeds, is shorter than the main types, and is shed periodically, being usually found lying loosely in the fleece with a complete tip and root. The other small group consists of very fine short fibers similar in structure to the finest members of type 2. Type 1 and kemp are considered to be homologous with the hair of the primitive breeds of sheep, while the primitive wool is represented in modern breeds by type 2 and the small group of fine fibers.

Medulla varies greatly even within individual breeds, has a greater tendency to appear in the homologues of primitive hair than those of wool, and occurs

more frequently in the mountain than in the nonmountain wools. It is suggested that this variability is due in part to heredity and in some measure to environment.

The limits of variation in diameters and in lengths of fibers in the samples from the several breeds are tabulated, and microphotographs of fibers of each breed are appended.

A method of determining the clean weights of individual fleeces of wool, J. F. Wilson (*California Sta. Bul. 447 (1928), pp. 21, figs. 8*).—The method devised for the experimental scouring of wool is outlined, and the equipment involved is described and illustrated. Details are given of the essential parts of a fleece breaker, a device for mixing the wool thoroughly and opening the tip or weather end. The method is said to be accurate, simple, and economical.

To test the efficiency of the method, scouring tests were made by the author and L. Clarke on California middle counties fine wool, practically free, about 6 months' growth, and from purebred Rambouillet wethers. With moderately hard water a solution of 60 gm. of soda ash in 7 gal. of water proved best for all ordinary wools. While a temperature of 125° F. gave good results with most wools, exceptionally heavy wools and tags may be more thoroughly cleansed at from 135 to 140°. Gentle agitation of the wool was found preferable to more vigorous manipulation. A wringer or squeeze rolls seemed essential to proper scouring. The test data showed that for all scouring work not involving extreme accuracy of results the scouring solutions need not be changed often, thus effecting a considerable saving of labor and material. Tests over a range of from 100 to 1,000 gm. showed that with the indicated equipment 100-gm. samples, or at most 200-gm. samples, are more satisfactory than heavier samples.

Pulping flax straw, III, IV (*Paper Trade Jour., 86 (1928), No. 3, pp. 48–54, figs. 5*).—Two additional contributions are made to the series previously noted (E. S. R., 57, p. 796).

III. *Hydrolysis and delignification with sodium hydroxide and with a mixture of sodium hydroxide and sodium sulphide,* M. W. Bray and C. E. Peterson (pp. 48–50).—Comparison of the pulping actions of sodium sulfite, of sodium hydroxide, and of a mixture of sodium hydroxide and sodium sulfide on seed flax straw under the same cooking conditions showed that the relative vigor and reaction speed of the three processes, measured in terms of yield, increase in the order in which the chemicals are named. When small amounts of lignin were removed for a given degree of delignification less cellulose was destroyed with sodium sulfite than with either of the more alkaline chemicals. The hydroxide-sulfide mixture removed more lignin while destroying only a little more cellulose than did a straight sodium hydroxide digestion under the same conditions of pulping.

IV. *Further studies on hydrolysis and delignification with alkaline reagents,* E. R. Schafer and C. E. Peterson (pp. 51–54).—A study of the progress of the reactions during a digestion of flax straw with mixtures of sodium hydroxide and sodium sulfide showed the solution of lignin to be much slower than the solution of other portions of the material. The chlorine needed to render soluble the lignin in the crude pulp was nearly equal in weight to that of the lignin for six different types of digestions. The yield of chlorinated residue obtained by the modified Roe method bore a definite relation to the yield of the crude pulp from which it was isolated. Between limits of 70 and 40 per cent in the crude pulp yield the average loss in cellulose was 1 per cent for each 3 per cent loss in pulp. The solubility of lignin in a solution of sodium sulfite was found to be lowered by a preliminary mild hydrolysis with a solution of sodium hydroxide.

Kapok and substitutes, F. MICHOTTE (*Les Kapotiers et Succédanés. Paris: Soc. Propagande Colon., 1927, pp. 83, figs. 19*).—Information is given on the botanical relationships, production, and commercial movement of the fiber and composition and use of the seed of plants producing the fibers termed "kapok," which pertain to species of Eriodendron, Bombax, Cochlospermum, Chorisia, Ochroma, Kleinhovia, and Ipomoea. Plants producing the so-called vegetable silk and vegetable hair are also described briefly.

The "mildew" effect on silk, F. GROVE-PALMER (*Amer. Dyestuff Rptr., 17 (1928), No. 5, pp. 171–174*).—The cause and nature of chafe marks (misnamed mildew or lousiness) in silks is described, and ways are indicated for the treatment of warps to prevent chafe marks and to improve damaged goods.

Deterioration of five wide cotton sheetings due to laundering, M. GRIFFITH and R. EDGAR (*Jour. Home Econ., 20 (1928), No. 2, pp. 111–120, figs. 7*).—Five different cotton sheetings designated as A, high grade bleached; B, same brand as A, unbleached; C, mercerized; D, twill weave; and E, low grade were analyzed for weave, thickness, thread count, yarn count and diameter, number and direction of twists per inch of yarn, weight per square yard, length and diameter of fiber, percentage gloss of fabric, percentage of ash, wet and dry breaking and bursting strengths, and elasticity. Analyses for shrinkage, thickness, percentage of gloss, wet and dry breaking and bursting strengths, and elasticity were repeated after the sheetings had been washed and mangled in a laundry for 3, 50, 75, 100, and 200 times. The resistance to abrasion was also determined in the sheetings laundered 100 times.

The original prices of the sheets decreased in the order C, D, A, B, and E; the abrasion resistance after 100 launderings in the order B, A, D, C, and E; appearance after 200 launderings C, A, D, E, and B; and the cost of the sheets in terms of service rendered per period for a total of 200 launderings C, 5.99 cts.; D, 5.73; B, 5.33; A, 5.27; and E, 4.68 cts.

MISCELLANEOUS

Thirty-fifth Annual Report [of Minnesota Station], 1927, W. C. COFFEY (*Minnesota Sta. Rpt. 1927, pp. 50*).—This contains the organization list, a report of the director on the work and publications of the station, including brief abstracts of articles contributed to outside publications, and a financial statement for the fiscal year ended June 30, 1927.

Bimonthly Bulletin of the Ohio Agricultural Experiment Station [March–April, 1928] (*Ohio Sta. Bimo. Bul., 13 (1928), No. 2, pp. 33–80, figs. 17*).—In addition to articles abstracted elsewhere in this issue, this number contains one entitled Honoring Dr. Charles Embree Thorne.

NOTES

Florida Station.—Experiments conducted by the department of entomology have shown the feasibility of diluting calcium arsenate dust with an equal weight of hydrated lime for poisoning the boll weevil, thereby requiring only half as much calcium arsenate. Field tests over three seasons have shown the 50:50 mixture to equal the pure calcium arsenate in effectiveness of weevil control.

Arthur H. Eddins has been appointed assistant plant pathologist in corn disease investigations, effective May 15.

Idaho University and Station.—Expansion of certification services given by the extension division and the growing demand for this service have led this year to revision of certification rules and to increases in the field personnel. Under the revised system sufficient workers are to be maintained to take care thoroughly of all demands, and the machinery of certification is somewhat simplified.

The extension service, in some instances with the cooperation of the State department of agriculture, now supervises certification of poultry, potatoes, small seeds, cereals, and beans. In the case of poultry and potato certification the principal change made is to employ more field help. One or more experienced men will devote time in the field for several months this year entirely to flock mating and agglutination testing. At least three field inspectors will be kept busy visiting potato fields. Grain certification probably will require part-time services of a half dozen or more men.

More extensive changes were made in the provisions for certification of Grimm and Cossack alfalfa seed. This service, as well as poultry accreditation, is self-supporting. The scheme of fees has been revised to improve the system, and readjustments have been made to simplify collection methods. During the last few years, the certified acreage has advanced from 5,231 acres in 1920 to 38,777 acres in 1927.

Poultry accreditation work has also increased by leaps and bounds. Flock mating grew out of the poultry improvement program of culling, housing, and feeding, through the need felt for standard flocks. In 1926 agglutination testing was initiated. The first year 32,019 tests were given, last year 51,000 birds were tested, and next year it is expected that tests will be made on at least 60,000 birds. Turkey accreditation has also been introduced, and is becoming an important factor in the field work.

M. R. Lewis has resigned as head of the agricultural engineering department to accept a position with the United States Department of Agriculture Bureau of Public Roads, and will carry on irrigation investigations in Oregon. He will be succeeded by Hobart Beresford, formerly assistant professor of agricultural engineering and later in charge of the rural service department of the Idaho Power Co. Edgar H. Neal, assistant in irrigation research, will have charge of instruction in irrigation and drainage, and Alfred D. Edgar, assistant professor, will have charge of farm power subjects.

Kansas College and Station.—Frederick C. Fenton, associate professor of agricultural engineering in the Iowa College, has been appointed head of the

department of agricultural engineering vice H. B. Walker, whose resignation has been previously noted.

Dr. Roger C. Smith, professor of entomology, has been granted leave of absence, beginning October 1, to accept a temporary appointment as entomologist in the Technical Service of the Department of Agriculture and Professional Education of Haiti. Leave of absence of L. E. Melchers, head of the department of botany and now serving as chief mycologist to the Minister of Agriculture at Giza, Egypt, has been extended to January 1, 1929. J. A. Hodges, assistant professor of agricultural economics and assistant in farm organization, has been awarded one of the fellowships in agricultural economics sponsored by the Social Science Research Council and has been granted leave of absence during the coming academic year for graduate study at Harvard University.

Harold M. Scott, instructor and research assistant in poultry husbandry in the North Dakota College and Station, has been appointed assistant professor of poultry husbandry vice H. H. Steup, resigned to accept a position on the editorial staff of the *Poultry Tribune*.

Louisiana University and Stations.—W. R. Dodson, dean of the College of Agriculture and director of the stations; W. R. Perkins, director of the extension service; and E. L. Jordan, professor of animal husbandry, have resigned, effective June 12. W. G. Taggart, assistant director of the stations, has been appointed acting director of the stations and acting dean of the College of Agriculture.

Massachusetts College and Station.—Dr. L. A. Bradley has been transferred from the station to full-time instruction work in bacteriology, while James E. Fuller, now an instructor, has been appointed assistant research professor of bacteriology in the station. Ralph G. France has been appointed junior bacteriologist in the station to have charge of the service recently inaugurated to determine the bacterial content of water, milk, and other commodities or supplies offered for sale or use in the State. Dr. Glen L. Dunlap has been appointed junior veterinary pathologist to have charge of the diagnostic laboratory in poultry disease elimination work recently provided for by a special State appropriation.

Kenneth E. Wright, assistant in dairy bacteriology in the Illinois University and Station, has been appointed assistant research professor of dairy manufacturing vice A. W. Phillips, resigned.

New Mexico College.—A brick library building is being erected at a cost of about $37,000. The building is to be used as a general college library and in addition will contain several classrooms and offices.

New York State Station.—Funds have been appropriated by the legislature for cooperative studies of the serious damage inflicted on sweet corn by the European corn borer. Special stress will be laid on developing economical methods for combating the corn borer in sweet corn, particularly in the western part of the State where the corn is an important marketing and canning crop. G. E. R. Hervey has been appointed to carry on the field work and has begun operations in Chautauqua and Erie Counties. A recent statement from the station outlines the proposed work as follows:

"The work to be carried on this summer is planned to throw light on several important points in relation to the habits of the borer. Among other things, a study will be made of the mortality of the borers in soils of different types when buried by plowing at different depths. Then, a study will be made of the borers which escape the plowing operations to see how far they will travel over plowed land and their ability to survive in weeds, corn refuse, and other débris in the cornfield or nearby. The number of borers in various weeds will be de-

termined and the probable menace of weeds to neighboring cornfields ascertained. Influence of time of planting on borer attack will be studied, as late planting is thought to give some degree of protection. The susceptibility of different varieties of sweet corn to corn borer will also be observed. And, finally, the possibilities of using insecticides against the corn borer in sweet corn will be given careful attention."

North Carolina College and Station.—C. D. Matthews, head of the department of horticulture, resigned May 1 to engage in business in Raleigh.

North Dakota College and Station.—Leave of absence for further study has been granted to Rex. E. Willard, field agent in farm management and rural economics; E. A. Willson, in charge of rural life studies; and L. L. Nesbit. assistant agricultural chemist, their work to be done at Harvard University, the University of Wisconsin, and the University of Washington, respectively. Harold Seielstad has been appointed assistant in farm management vice Guy G. Gardner, resigned.

Rhode Island Station.—Dr. F. T. McLean has resigned as plant physiologist to become director of public education at the New York Botanic Gardens. Acting Director B. E. Gilbert has been appointed to fill the vacancy, beginning July 1, while F. R. Pember has been appointed associate plant physiologist. J. B. Smith has been appointed chemist to fill the vacancy left by Dr. Gilbert, and Donald E. Frear has been appointed assistant chemist. Louis H. Schwarte has been appointed assistant in animal breeding and pathology.

Texas Station.—The station is cooperating with the U. S. Department of Agriculture Bureau of Entomology in a study of the flight and dispersion of pink bollworm moths, the possible occurrence of the insect on native host plants, and its reaction under control conditions of temperature and humidity.

Dr. E. A. Tunnicliff, associate in animal pathology in the Illinois University and Station, was appointed veterinarian March 1 and is engaged in a study of diseases affecting range sheep and goats, principally at the Sheep and Goat Substation near Sonora.

Virginia Truck Station.—Dr. P. J. Chapman, extension instructor in entomology in Cornell University, has been appointed entomologist, effective May 15.

Wisconsin University and Station.—Through its committee on research, the American Medical Association has tendered the university an industrial fellowship for the fiscal year 1928–29 for the purpose of studying the copper content of common foodstuffs and the relationship of this copper to hemoglobin building in the animal body. The fellowship has been assigned to the department of agricultural chemistry. The study comes as a result of the recent discovery by the department of the necessity of copper in the diet of growing mammals and of its specific ability to promote hemoglobin building in cases of diet-produced anemias.

A recent résumé of the industrial fellowships in effect in the College of Agriculture showed that 14 such fellowship funds total $45,950 and are now supporting 19 research workers in the college. The research projects are greatly varied and have to do with such matters as the presence of hemolytic bacteria in certified milk, the use of citric acid and its salts in dairy manufactures, the quantitative determination of the amount of butyric acid produced by the fermentation process, the irradiation of foods with ultra-violet light, the advertising of farm products, the adaptation of electricity to the farm, the control of bovine contagious abortion, and the improvement of permanent bluegrass pastures.

The regents of the university have formally adopted a program of forestry research to be carried out in cooperation with the Federal Lake States Forest

Experiment Station and the Wisconsin Conservation Commission. Dr. Raphael Zon, director of the Lake States Station, has accepted an appointment as nonresident professor of forestry and has assumed general supervision of all forestry research projects.

The purchase of a 68-acre addition to the Hancock Substation in Waushara County was recently authorized. A 10-acre tract adjoining this substation has also been leased for 25 years and will be used for reforestation and other forestry demonstrations.

According to *The Wisconsin Country Magazine*, R. H. Larson has been appointed assistant in plant pathology for studies of bean diseases and aster wilt.

University of Alberta.—A new laboratory and greenhouses have been erected for plant pathology and plant breeding. Dr. O. S. Aamodt, associate pathologist in cereal breeding investigations, U. S. Department of Agriculture, has been appointed to take charge of the work in cereal breeding, beginning this fall after a summer in Europe, mainly at Cambridge and Svalöf.

Division of Agricultural Cooperation in Pan American Union.—Carrying out resolutions adopted by the Sixth International Conference of American States, held in Havana January 16 to February 20, 1928, a new division of agricultural cooperation has been established in the Pan American Union. The function of this division will be to advance cooperation and research in agriculture, animal husbandry, and forestry in the member countries of the Union. A study will be made of the organizations for agricultural advancement which are maintained by the various countries, including the projects of departments of agriculture, agricultural experiment stations, educational institutions, scientific and agricultural publications, and leaders in agricultural industry. Steps will also be taken to promote the exchange of seeds and plants and the organization of surveys of soils, forests, vegetable crops, and related problems and to conduct an information service or clearing house.

Technical cooperating committees are to be organized in the several countries to formulate programs for conferences on inter-American agricultural cooperation and problems of plant and animal sanitary control.

Alberto Adriani of Venezuela will be in immediate charge of the new division, with Dr. W. A. Orton, scientific director and general manager of the Tropical Plant Research Foundation, as technical adviser.

Coyocutena Agricultural College of Honduras.—This college was established in 1926 near La Libertad in the Department of Comayagua, Honduras. A tract of about 6,000 acres 2,000 feet above sea level, owned by Pompilio Ortega, founder of the school, has been made available for the institution. Two main buildings have been erected by the students themselves, one an administration building of adobe brick housing the office, library, and living quarters of the staff, and the second a students' dormitory of logs. A science building and a manual training building are projected.

At present 16 students are enrolled, ranging in age from 12 to 20 years, and the curriculum has been restricted to Spanish, English, arithmetic, geography and history of Honduras, free-hand drawing, and elementary agriculture. An abandoned coffee plantation near by has been acquired, and about 20,000 young coffee trees have been planted by the students. A beginning has been made in purebred livestock, a rain gage has been installed, and data on rainfall have been collected.

EXPERIMENT STATION RECORD

VOL. 59 AUGUST ABSTRACT NUMBER No. 3

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

Outlines of theoretical chemistry, F. H. GETMAN (*New York: John Wiley & Sons; London: Chapman & Hall, 1928, 4. ed., rev., pp. XIII+728, figs. 179*).—The present edition of this well-known textbook differs from the third edition principally as follows: "A fuller treatment of limiting densities and vapor pressures; a brief description of the latest and most accurate method of measuring heats of vaporization; a more comprehensive treatment of crystal structure and the methods of X-ray analysis; an enlargement of the section treating of the absorption of light and its bearing on chemical constitution; a thorough revision of the chapter on the elementary principles of thermodynamics; a more discriminating treatment of the phenomena of osmosis; the inclusion of the concepts of fugacity and activity in connection with the subject of vapor pressures of dilute solutions; a fuller discussion of the theories of emulsification and gel formation; an enlargement of the sections devoted to adsorption and the methods of preparation of colloids; a more detailed account of the theories of catalysis; the treatment of the more important practical applications of conductance and electrometric methods in separate sections in the respective chapters devoted to electrical conductance and electromotive force; the simplification of the treatment of hydrolysis; the adoption of a uniform and consistent system for the representation of galvanic cells, thereby connecting their polarity with the direction of current flow; a fuller treatment of both the hydrogen electrode and oxidation and reduction cells; the rearrangement and enlargement of the chapter on electrolysis and polarization; a brief presentation of the quantum theory together with its application to the principle of photochemical equivalence; an outline of Baly's . . . researches in the field of photosynthesis; and . . . the complete revision of the chapter on atomic structure."

Organic chemistry, W. A. NOYES (*New York: Henry Holt & Co., 1926, pp. XIX+677, figs. 22*).—Following three chapters devoted to the usual generalities, the organic compounds most commonly encountered are discussed by classes "to give the student a clear outline of the most important relations among organic compounds. . . . Many exercises are given to test the student's ability to grasp relationships rather than isolated facts. . . . The material in the later portions of the book is grouped pretty sharply into three divisions—[a] methods of preparation, demonstrations of structure, and general properties for a given class of compounds . . ., [b] a description of important compounds belonging to the class . . ., [and c] tables with references to the literature."

A comprehensive survey of starch chemistry, compiled and edited by R. P. Walton (*New York: Chem. Catalog Co., 1928, vol. 1, pp. 240+IV+360, figs. 45*).—Part 1 of this volume is a symposium, comprising the following contributions by selected authors in the scientific and technical chemistry of starch: Thermal Depolymerization of Starch in Relation to Molecular Constitution, by A. Pictet (pp. 9–15); Methylation of Starches in Relation to Molecular Constitution, by J. Irvine (pp. 16–23); Enzymic Hydrolysis of Starches in Relation to Constitution, by A. R. Ling (pp. 24–34); Bacterial Degradation and Constitution of Starch, by H. Pringsheim (pp. 35–50); The Colloid-Chemical Properties of Starch in Relation to Chemical Constitution, by M. Samec (pp. 51–61); Non-carbohydrate Constituents as a Factor in the Characterization of Starch Components, by T. C. Taylor (pp. 62–67); The X-Ray Spectrography of Starch, by J. R. Katz (pp. 68–76); Chemical Nature of Certain Amylases, by H. C. Sherman (pp. 77–86); The Rôle of Starch in Bread Making, by C. L. Alsberg (pp. 87–99); Gelatinization and Retrogradation of Starch in Relation to the Problem of Bread Staling, by J. R. Katz (pp. 100–117); Conversion of Starch in the Fermentation Industries, by A. Fernbach (pp. 118–129); The Manufacture of Corn Starch, by G. M. Moffett (pp. 130–138); Manufacture of Potato Starch, by E. Preuss (pp. 139–157); Manufacture of Dextrin, Envelope Gums, British Gum, and Modified Starches, by V. G. Bloede (pp. 158–174); Starch and Flour Adhesives, by J. Alexander (pp. 175–187); Significance of Starch Viscosity in the Manufacture of Paper and Textiles, by W. A. Nivling (pp. 188–214); The Use of Starch in the Textile Industry, Particularly for the Sizing of Cotton Warps, by F. D. Farrow (pp. 215–222); Starch-Converting Enzymes Used in the Textile Industries, by H. C. Gore, H. G. Turley, L. Wallerstein, and J. Takamine, jr. (pp. 223–234); and Early Development of Starch Chemistry and Manufacture, by R. P. Walton (pp. 235–240.)

Part 2 is a comprehensive classified bibliography, occupying 330 pages, under the two main headings of (1) starch and gums, and (2) amylases. Under the first head are included chemical, physical, analytical, and technological sections, each subclassified into more specific groups of references both to the general and patent literature. The enzyme literature is analyzed with similar thoroughness.

The microbiology of cellulose, hemicellulose, pectin, and gums, A. C. Thaysen and H. J. Bunker (*London: Humphrey Milford, Oxford Univ. Press, 1927, pp. VIII+363, [pls. 9], figs. [7]*).—"The treatise has been compiled from the point of view of the research worker who desires to know in what direction his efforts may most profitably be directed within this important subject of the natural and artificial decomposition of vegetable tissues." The activities of "all microscopic organisms, whether they belong to the animal or the vegetable kingdom," are considered, and it is stated that an attempt has been made to provide "a comprehensive account of the information available on this [cellulose microbiology] and allied subjects of the microbiological changes occurring in hemicelluloses, pectin, and gums." Part 1 of this book, on cellulose, hemicelluloses, pectin, and gums, contains chapters on the occurrence and properties and importance of microbiological aspect; part 2, on the types of microorganisms associated with the decomposition of cellulose, hemicelluloses, pectin, and gums, contains chapters on the Schizomycetes, Actinomycetes, and the Eumycetes, groups A and B; part 3, on the microbiological decomposition processes of gums, pectin, hemicelluloses, and cellulose, contains chapters on gums and pectin, hemicelluloses and cellulose, silage, etc., peat and coal, cellulose fibers and fabrics, and wood and wood pulp; and part 4, on industrial applications, contains a chapter on the application of microbiological reactions to the manufacture of industrial compounds from hemicelluloses and cellulose.

Milk sugar: Its manufacture, analysis, and applications, O. UNGNADE (*Milchzucker: Seine Fabrikation, Untersuchung und Verwendung. Hildesheim: Molkerei-Zeitung, [1926], pp. 71, pls. 3, figs. 14*).—Including a preface, the contents of this book are as follows: Manufacture of crude milk sugar, refining of crude sugars, works control, properties of milk sugars, patent literature, and economic considerations.

The chemical composition of ergot oil, W. F. BAUGHMAN and G. S. JAMIESON (*Oil and Fat Indus., 5 (1928), No. 3, pp. 85–89*).—This is a brief account of a detailed examination of the general, physical, and chemical properties and fatty acid content of an oil extracted by petroleum ether from a composite sample of Russian, Spanish, and Austrian ergot, 2 liters of the mixed oil having been available for the investigation. The following physical and chemical general characteristics were noted: Specific gravity, 25°/25°, 0.9222, refractive index, 25°, 1.4691, acid value 3.02, iodine number (Hanus) 73.8, saponification value 196.9, unsaponifiable matter (per cent) 1.18, acetyl value 7.3, Reichert-Meissl number 0.3, Polenske number 0.4, saturated acids as determined, 27.2 per cent (iodine number 2.6), unsaturated acids plus unsaponifiable matter as determined 68.6 per cent, iodine number of unsaturated acids 101.2, saturated acids, corrected, 26.5 per cent, and unsaturated acids, corrected, 68.1 per cent. The oil was found to contain glycerides of the following fatty acids in the percentages indicated: Oleic acid 62.5, linolic acid 8.7, myristic acid 0.3, palmitic acid 21.5, stearic acid 5.3, and arachidic acid 0.7, together with unsaponifiable matter 1.2 per cent.

Standard liquids for the viscosimeter [trans. title], D. KRÜGER (*Ztschr. Angew. Chem., 41 (1928) No. 15, p. 375*).—The values of various investigators for the absolute viscosity of castor oil at 20° and at 30° C. and of cane sugar solutions at 15, 20, and 25° in concentrations of 10, 20, 30, 40, and 60 per cent are tabulated. The usefulness of these standards is discussed in comparison with that of glycerin at high concentrations and of other standard solutions.

A modified moisture determination apparatus [trans. title], A. VAN DER WERTH (*Chem. Ztg., 52 (1928), No. 2, pp. 23, 24, fig. 1*).—Tetrachlorethane is considered preferable to xylol in the immiscible liquid distillation method for the determination of moisture. Its boiling point, like that of xylol, is about 140° C., and its freedom from fire risk is noted as a particular advantage. Since in this case the immiscible liquid is specifically heavier than water, the usual form of collecting and measuring tube is modified by the addition of a narrow return tube for the tetrachlorethane. This return tube is sealed to the lower end of the collecting-measuring tube and passes downward and then in a U bend immediately upward to about the height of the middle of the graduated part of the collecting-measuring tube. At this point it turns toward the wide tube, or distilling column proper, which it enters at an upward angle.

Notes on practical water analysis, W. D. COLLINS (*U. S. Geol. Survey, Water-Supply Paper 596-H (1928), pp. II+235–266, pl. 1*).—Information is given on the technique found most practicable by the U. S. Geological Survey for the analysis of waters of moderate mineral content to determine their suitability for industrial use.

[Alkalinity of water in New Mexico] (*New Mexico Sta. Rpt. 1927, p. 18*).—The pH values of 15 samples of water from various parts of the State are listed.

[Iodine content of natural waters in New Mexico] (*New Mexico Sta. Rpt. 1927, p. 18*).—An iodine content survey is noted as having indicated a lower iodine content than was expected.

Spray residue (*New Mexico Sta. Rpt. 1927, pp. 17, 18*).—The following amounts of arsenic trioxide in parts per million were found in six soils: Gila clay 0.8, Gila clay loam 0.5, soils Nos. 1, 2, and 3 from Tucumcari 0.6, 1.4, and

0.9, respectively, and caliche rock 2.0. As none of these samples, with the possible exception of the Gila clay loam, could have received arsenic from spray residue, it is considered that these soils normally contain very small amounts of arsenic. These amounts, however, are insufficient to injure plant growth, since both the Gila clay and clay loam are quite productive. The examination of a few samples of fruit is reported, early apples which had received from two to four sprayings having been found to contain from 0.016 to 0.02 grain of arsenic trioxide per pound before cleaning or wiping and from 0.003 to 0.005 grain per pound after wiping.

Rancidity determinations, W. C. Powick (*Oil and Fat Indus., 5 (1928), No. 4, pp. 107, 108*).—Evidently incorrect results in the use of the Kreis rancidity test were traced to the use of hydrochloric acid containing nitrosyl chloride. Such acid gives a blank test with phloroglucin. Under these conditions rancid fats will generally appear to be sweet, while sweet fats may occasionally appear to be rancid unless the positive color reaction is checked spectroscopically. In the absence of nitrosyl chloride, the author finds the test a reliable one for the detection of rancidity or incipient rancidity in fats and oils, though he notes that it must be used with care.

The method of determining the degree of rancidity in butter [trans. title], G. S. Inikhov (Inichoff) and A. F. Shoshin (A. T. Schoschin) (*Trudy Vologodsk. Moloch. Khoz. Inst. (Arb. Milchw. Inst. Wologda) Bul. 64 (1926), pp. 159–174*).—A new method of determining the rancidity of butter as worked out at the Vologda Dairy Institute, Russia, is suggested by the authors. This method is much more rapid than the steam distillation method, and consists of placing 1 gm. of butter in a 50 cc. Erlenmeyer flask and adding 10 cc. of petroleum ether and 1 cc. of Schiff reagent. After 10 minutes the intensity of color is compared with standards made from formalin as in the present method.

METEOROLOGY

Monthly Weather Review, [January-February, 1928], [*U. S. Mo. Weather Rev., 56 (1928), Nos. 1, pp. 34, pls. 13, figs. 15; 2, pp. 35–78, pls. 12, figs. 17*).—In addition to detailed summaries of meteorological and climatological data and weather conditions for January and February, 1928, and bibliographical information, notes, and abstracts, these numbers contain the following contributions:

No. 1.—The Climate of China (illus.), by C. E. Koeppe and N. H. Bangs (pp. 1–7) (see p. 205); M. A. Giblett on Line-Squalls (illus.) (pp. 7–11) and Horton and Grunsky on the Hydrology of the Great Lakes (pp. 11–14), both by A. J. Henry; Tornado at Cincinnati, Ohio, January 19, 1928, by W. B. Schlomer (p. 15); Tornadoes at Louisville, Ky., January 19, 1928, by J. L. Kendall (p. 15); A Midwinter Shower in North Dakota, by W. J. Berry (pp. 15, 16); Meteorological Summary for Southern South America, December, 1927, by J. B. Navarrete, trans. by W. W. Reed (p. 16); and Meteorological Summary for Brazil, December, 1927, by F. de Souza, trans. by W. W. Reed (p. 16).

No. 2.—The Cilmate of Southeastern Pennsylvania (illus.), by H. F. James (pp. 35–40 (see p. 205); Severe Cold Waves on the Texas Coast (illus.), by I. R. Tannehill (pp. 41–46); An Analysis of the Madison, Wis., Aerological Data, with an Application of the Bjerknes Theory (illus.), by A. F. Piippo (pp. 47–53); Statistical Correlations of Weather Influence on Crop Yields (illus), by J. B. Kincer and W. A. Mattice (pp. 53–57); Hourly Precipitation at Memphis, Tenn. (illus.), by A. R. Long (pp. 58, 59); and Meteorological Summary for Brazil, January, 1928, by F. Souza (p. 60).

Meteorological observations at the Massachusetts Agricultural Experiment Station, C. I. Gunness and H. Baumgartner (*Massachusetts Sta. Met.*

Buls. 471–472 (1928), pp. 4 each).—The usual summaries and notes are given of observations at Amherst, Mass., during March and April, 1928.

Ohio weather for the year 1926 (*Ohio Sta. Bul. 417 (1928), pp. 107–117, figs. 3*).—Data for temperature and precipitation are summarized for the experiment station at Wooster and for the State as a whole. Data for evaporation and length of the frost-free period at the station are also given.

It is stated that the weather of the year was characterized by a persistently cold spring and a very wet fall, but, as a whole, was practically free from extremes. "The temperature averaged below the normal every month in the year except February, August, and September, the deficiency being quite pronounced in March, April, and June. The precipitation was deficient during seven months of the year, but the excess during the other five months was sufficient to overcome the total deficiency and leave a margin of excess at the end of the year of 5.51 in. The rainfall was very excessive in August, September, and October, making it a very unfavorable year for the harvesting or saving of crops. The total snowfall was slightly more than the normal, more than half of it falling in January and February." The mean temperature for the year at the station was 48.5° F., as compared with the normal of 49.4°. The total precipitation was 39.42 in., as compared with the normal of 39.13 in. The frost-free period extended from May 4 to October 23, or 172 days, as compared with an average of 150 days.

The climate of southeastern Pennsylvania, H. F. James (*U. S. Mo. Weather Rev., 56 (1928), No. 2, pp. 35–40, pl. 1*).—The characteristics of the climate of southeastern Pennsylvania are briefly reviewed. From a climatic standpoint, this region is considered "the most favored part of the State for the development of a diversified agriculture. Its rainfall of over 45 in., well distributed throughout the year, is well above the average for the State. The growing season is the longest, the winters are the mildest, and the danger of droughts less than any other part of Pennsylvania. The summer heat and humidity is excellent for the rapid development of plant life. Few storms of tornadic violence prevail and the crop damage is very small. Oppressive heat due to the high humidity makes many days disagreeable to man and beast in summer, and the presence of many raw days in winter on account of the same high humidity modifies the mildness of the winter period. All things considered, however, the area possesses an exceptionally advantageous climate for the development of man, on the farm, in the factory, and at home."

Meteorological report for 1926, F. E. Hepner (*Wyoming Sta. Rpt. 1927, pp. 156–159*).—Observations at the University of Wyoming, Laramie, on pressure, temperature, precipitation, wind, and cloudiness are summarized as in previous years. The mean pressure for the year was 23.07 in. The maximum temperature was 87° F. July 18, the minimum —30° December 13. The mean monthly temperature was 41.2°. The last killing frost in spring occurred May 14, the first in autumn September 20. The annual precipitation was 12.94 in.

Climatological data for the United States by sections [November-December, 1927] (*U. S. Dept. Agr., Weather Bur. Climat. Data, 14 (1927), Nos. 11, pp. [191], pls. 5; 12, pp. [204], pls. 5*).—These numbers contain brief summaries and detailed tabular statements of climatological data for each State for November and December, 1927, respectively.

Climatological data for the United States by sections, [1927] (*U. S. Dept. Agr., Weather Bur. Climat. Data, 14 (1927), No. 13, pp. [241], pls. 2, figs. 24*).—This number summarizes the climatological data for each month of 1927 and for the year as a whole for each State.

The climate of China, C. E. Koeppe and N. H. Bangs (*U. S. Mo. Weather Rev., 56 (1928), No. 1, pp. 1–7, figs. 9*).—It is pointed out that monsoonal winds,

which blow prevailingly from the sea to the land in summer (from the southeast) and from the opposite direction (northwest) in winter, "determine to a large extent both the ranges in temperature from summer to winter and the distribution of precipitation throughout the year. Cold winters and hot summers, especially in northern China, and the frequent droughts and floods, which occur chiefly in spring and summer, are closely tied up with these reversals of wind direction."

Other controlling factors which are discussed are the rather weak cyclonic storms which pass across or very near the country, especially in spring, and the severe cyclonic storms (typhoons), which are most pronounced in September and are most severe in central and southern China. The relation of these factors to distribution of temperature and rainfall and to droughts and floods are briefly discussed. It is pointed out that "droughts are most common in north China, less frequent in central China, and rarely occur in southern China. In the north the amount of rainfall under normal conditions is none too heavy; hence, even a slight diminution in the amount received during any period of the growing season causes hardship." While droughts of varying degrees of intensity occur at frequent intervals, especially in the northern part of the country, devastating floods are of frequent occurrence in this region. The three fundamental causes of these floods are erratic rainfall, deforestation, and flat topography. "In many places in this region the surfaces of the rivers are well above the general level of the plain and held in their courses only by natural or artificial dikes or levees."

Typhoons frequently ravage the southern coast, especially in late summer, but lose much of their intensity as they pass inland. Assuming the characteristics of an extratropical cyclone, they pass northeastward over the interior and bring heavy rains to central and even to northern China.

SOILS—FERTILIZERS

Soil survey of Perry County, Mississippi, E. M. Jones et al. (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1922, pp. III+1771–1800, fig. 1, map 1*).—This report, prepared in cooperation with the Mississippi Geological Survey, is concerned with the soils of an area of 412,160 acres in southeastern Mississippi, the region being in general a highly dissected upland provided with so widely branching a series of drainage ways that no extensive areas of smooth upland remain, while the valleys of the larger streams produce a total range in elevation of about 200 ft. Terracing to prevent erosion is necessary, mainly on the sloping lands.

The soils of this area, in general well drained, are mapped and classified in 14 series subdivided into 31 types, besides swamp. Of these Ruston fine sandy loam, which occupies 24.7 per cent of the total area, Susquehanna fine sandy loam covering 10.3 per cent, and Kalmia fine sandy loam covering 10.9 per cent, are the most important in extent.

The soils of Cuba, H. H. Bennett and R. V. Allison (*Washington, D. C.: Trop. Plant Research Found., 1928, pp. XXIV+410, pls. 2, figs. 103*).—The survey upon which this book is based was carried out as a cooperative project by the U. S. D. A. Bureau of Soils and the Tropical Plant Research Foundation. The book is described as "including a generalized soil map and detailed descriptions of the physical and chemical qualities of the more important types, together with notes upon their general cultural requirements in relation to their agricultural adaptability and usefulness, with a chapter on soil classification, by C. F. Marbut." Its contents are general soil characteristics, soil series descriptions for middle, eastern, and western Cuba and the Isle of Pines, salt in

Cuban soils, soil moisture studies, climate, the relation of soils to agriculture in Cuba, and soil classification. An appendix is included on soil classes, classification of soils based on mechanical composition, conversion table for sugar cane yields, perdigón in various textural grades of Truffin clay and of several Cuban soils, a glossary of soil terms, and a list of plant names.

The marked difference between the most extensive and productive of the Cuban soils and the types found in the continental United States is noted as particularly striking. "Very rarely is a soil found in the United States with a clay content exceeding 65 per cent, while in Cuba vast areas contain more than 75 per cent, and some exceed 90 per cent of clay particles. Nor is there anything in the United States like the productive and very extensive Matanzas red soil, either physically or chemically, save pockets of red soil found in southern Florida, and some limited high-iron soils in east Texas (the Nacogdoches soils), and in parts of northern California and western Oregon and Washington."

Soil erosion a national menace, H. H. Bennett and W. R. Chapline (*U. S. Dept. Agr. Circ. 33 (1928), pp. 36, pls. 16*).—This circular is in two parts, the first dealing, under the heading of "some aspects of the wastage caused by soil erosion," with the problem as a whole, while the second part is devoted specifically to soil erosion on western grazing lands.

[Moisture conservation experiments], V. A. Tamhane and G. M. Bapat (*Bombay Dept. Agr. Ann. Rpt. 1925–26, pp. 184–187*).—Investigation of rainfall records in certain parts of the Bombay Presidency indicated that, despite the frequent failure of crops, the annual precipitation should theoretically provide for full crops of the local crop plants. Experiments were accordingly made to compare the effectiveness of several methods for increasing the moisture retaining capacity of the soil, four of these procedures being summarized as follows: (1) Deep plowing (9 to 12 in.), with two or three subsequent harrowings, completed a good time before the beginning of the rains, (2) leveling the plats and surrounding them with small "bunds" to prevent run-off, (3) repeated stirring of the surface soil to produce a soil mulch, and (4) green manuring.

In a year of good rainfall (1924) the green manuring treatment was found the most effective. In a year of scanty rainfall (1925) a treatment consisting in digging trenches in rows, filling these with loose soil, and sowing directly in the filled-up trenches gave the best results.

Trials of sub-soiling in 1925 (*Jour. Min. Agr.* [*Gt. Brit.*], *33 (1926), No. 6, pp. 513–517*).—The results obtained in the third year of an experiment previously noted (E. S. R., 53, p. 214) are briefly reported. The results show that each subsoiled plat again produced a greater yield than those in the same field which were not subsoiled. While the increase was not always as marked as in previous years, it was substantial and afforded sufficient evidence that the beneficial effect of subsoiling lasts for at least three years.

Soil color darkened by liming and cropping (*Ohio Sta. Bul. 417 (1928), pp. 26, 27*).—Changes occurring in the course of 31 years of various treatments are briefly noted. Despite losses of organic matter amounting to from 8 to 27 per cent since 1894, soil samples from the unlimed ends of 5-year rotation plats showed in 1925 a color consistently darker than that of the samples taken from the same plats in 1894. Possible causes of this change are suggested. Determinations of organic matter in 1925 showed no significant differences between the limed and unlimed ends of the plats, but the limed ends were observed to be uniformly darker in color. A color analysis in percentages of black, white, red, and yellow for one of the plats unlimed in 1894, unlimed in 1925, and limed in 1925 is tabulated.

Soil colloid studies (*Ohio Sta. Bul. 417 (1928), pp. 27, 28*).—Light absorption by clay suspensions too fine for practicable separation by the centrifuge is briefly noted as a possible means for the measurement of colloid particle size, the intensity of the transmitted light being determined by the change in resistance of a photoelectric cell. Clay particles of different sizes absorbed in the same mass concentration different proportions of the incident light.

Permeability of soils (*New Mexico Sta. Rpt. 1927, pp. 15, 16*).—Work on this project up to February, 1927, has been noted (E. S. R., 57, p. 315).

Experiments on the influence of flocculation on the breaking strength of Gila clay loam are reported complete, with results in part as follows: The compression strength varied with the percentage of moisture and the degree of flocculation between 60 and 107 lbs. per gram for cylindrical briquets 25 by 25 mm. made under a pressure of 2,000 lbs. per square inch, and between 7.8 and 10.6 lbs. per gram for 2-in. cubical briquets made under the lowest pressure possible. The factors in the variation were found to be briquetting pressure, percentage of moisture at the time of making the briquet, the presence of alkali, and the degree of flocculation. The greatest compression strength was found when the soil contained sufficient moisture to give maximum density. This critical moisture content was found higher for loams containing sodium compounds and appeared to be less in loams deflocculated by leaching. It was not, however, increased by flocculation with aluminum sulfate.

Experiments on the influence of the head of water on the rate of water movement in Gila clay and in Gila clay loam are also briefly noted. Increasing the depth of water on these soils did not greatly influence the rate of moisture movement, this factor being apparently of little consequence as compared with the effect of compacting or of flocculation. Higher heads caused small increases both in penetration and in percolation in the flocculated soils. In the deflocculated soils, however, the higher heads caused, for a time, small decreases in the rate of water movement. These phenomena were considered to be associated with the swelling of the colloids, this effect being greater for the deflocculated soils and more effective in retarding water movement in tightly packed soils. Increasing the head of water was found of very little practical value in overcoming the resistance of heavy, fine-textured soils.

Exchange bases in soils in relation to soil reaction and lime requirement (*Ohio Sta. Bul. 417 (1928), p. 31*).—"Laboratory studies indicate that to a considerable extent the reaction of a soil is dependent upon the ratio between hydrogen and bases in the exchange complex. With hydrogen as the sole exchangeable cation, all soils worked with have been near pH 4, which, therefore, appears to be the approximate limit of acidity in soils under normal conditions. In soils direct from the field 85 or 90 per cent of the total exchangeable cations may be hydrogen ions, and the reaction below pH 5. At about 75 per cent saturation with calcium or equivalent bases the Wooster soil is at pH 7. Addition of lime sufficient to neutralize practically all exchangeable hydrogen takes the reaction above pH 8."

Chemical studies of soil alkali (*Wyoming Sta. Rpt. 1927, pp. 140, 141*).—It is concluded that the principal alkalies of Wyoming do not occur naturally in any other than simple forms, thereby concluding the project (E. S. R., 56, p. 509).

Mechanical dispersion as an aid in the chemical study of soils (*Ohio Sta. Bul. 417 (1928), pp. 29, 30*).—In base exchange work, lime requirement determinations, and electrometric titrations the dispersion of the soil samples with a malted milk stirrer, as recommended by Bouyoucos (E. S. R., 57, p. 710), has been found valuable. The extremely slow extraction of exchangeable bases,

especially tedious in the case of clay soils, can be reduced to complete replacement in 10 minutes by the stirring dispersion method. For this purpose 25 gm. of soil were dispersed into 100 cc. of the solution, filtered with suction, and then washed with a further 100 cc. of the solution. The second to fifth dispersion, inclusive, showed a further extraction of calcium so slight as to be considered attributable to solution alone. A similar procedure, with a comparable saving of time, was used in the preparation of material for electrometric titrations and for the lime requirement determinations.

The effect of growing plants on solubility of soil nutrients, W. H. Metzger (*Soil Sci., 25 (1928), No. 4, pp. 273–280, figs. 3*).—This is a contribution from the Kansas Experiment Station, the work having consisted essentially in the determination of the relative concentration of bicarbonates in the water extracts of soil samples taken (1) close to the roots and (2) at a distance of from 2 to 4 in. from the roots of apple and pine trees, kafir, wheat, corn, buckwheat, lettuce, and cowpeas. Bicarbonate concentrations proved the most satisfactory index of the effect of the plant roots on the solubility of soil minerals.

Consistent differences in bicarbonate concentrations between the samples taken in close proximity to the roots and those taken from a greater distance were observed both in the field and in the greenhouse soils. In the cases of corn, wheat, and kafir the maximum effect of the plant on the bicarbonate concentration was found at the fruiting period of the plant. Out of 66 experiments with various plants, 53 showed an increase in the bicarbonate solution immediately about the roots, 4 showed no difference in concentration as between the nearer and the farther samples, and 9 showed a decreased concentration in immediate proximity to the roots. These results are considered additional evidence of a measurable solvent action of excretions of carbon dioxide from the plant roots upon the soil minerals.

A new apparatus for the Neubauer method [trans. title], R. Dietz (*Fortschr. Landw., 3 (1928), No. 1, pp. 9–11, figs. 4*).—Both from his own and other work with the Neubauer method (E. S. R., 53, p. 319), the author draws the inference that the rye seedlings used should be grown under accurately controlled light, temperature, and moisture conditions, and presents a full account of the construction and operation of a glazed, ventilated, revolving incubator. This incubator, or cabinet, is described as square, 2.2 meters high, and 1.2 meters wide and deep. It accommodates 256 Neubauer dishes at one time. A cooling coil, circulating fan, thermostat, and heating unit provide for the holding of the temperature between 18 and 20° C. It is stated that without some means of accurate control for the conditions noted correct comparative values can not be expected, but with the use of the present apparatus very promising results appear to have been obtained.

[Phosphorus and potassium estimations by the Neubauer method] (*Ohio Sta. Bul. 417 (1928), pp. 25, 26*).—Rye and buckwheat seedlings were used according to the Neubauer method (E. S. R., 53, p. 319) for testing the availability of the potassium and phosphorus supplies in seven plats of the 5-year rotation fertility experiment. The potassium results, with a summary of the fertilizer treatment of the soils examined, are tabulated. It is stated that the Neubauer method did not appear to offer, as a whole, any advantages over strictly chemical methods for estimating the supply of available soil potassium. For the estimation of available phosphorus the method is considered to have failed completely, the seedlings having obtained no more phosphorus from soils liberally supplied with that nutrient than from the corresponding untreated soils.

Determination of liming requirement [trans. title], K. MANTEUFFEL (*Fortschr. Landw., 3 (1928), No. 2, pp. 68, 69, figs. 2*).—The scientific and common (German) names of two groups of weed species, the presence of which are considered to indicate, respectively, highly developed and incipient calcium poverty, are listed, and it is noted that "a knowledge of weed plants, together with an accurate observation of the field, gives every farmer the possibility of determining the condition of his soil with respect to lime."

A bacteriological study of a soil type by new methods, H. J. CONN (*Soil Sci., 25 (1928), No. 4, pp. 263–272*).—Hoosick coarse sandy loam, an acid soil from which added organic matter rapidly disappears, so that productivity can be maintained only by frequent additions of humus-forming materials, was subjected, in comparison with two neutral to alkaline soils, to bacteriological study by methods developed by the author at the New York State Experiment Station (E. S. R., 58, p. 119) and by Winogradsky (E. S. R., 54, p. 119). Bacteria in soil suspensions were stained in gelatin-fixed films on a slide with rose bengal and other fluoresceins according to a method recently described by the author (E. S. R., 58, p. 813). Platings were also made, and cultures were isolated from these.

"The results so far obtained are preliminary only, and it is planned to pursue the investigation further. They merely indicate that bacteriological differences between this soil and the others studied do exist, and that the methods employed may serve to establish their nature. The methods are now published, together with the results so far obtained, with the hope that this line of attack may be suggestive to others."

The numbers of microorganisms in Carrington loam as influenced by different soil treatments, L. W. ERDMAN (*Iowa Sta. Research Bul. 109 (1928), pp. 229–258, figs. 4*).—In studies over a period of 12 years, the largest numbers of bacteria were found in March, 1926. In 1925 the largest numbers were found in July and November. Large fluctuations in numbers of bacteria occurred from one sampling to another. The largest number of fungi found was that in the samples taken in November, 1924, the number gradually decreasing during the winter months to a minimum in June, 1925. Another maximum was reached in January, 1926, this increase being followed by a decrease to a minimum in April, whereafter great fluctuations occurred, for which it is stated no explanation can be obtained from the data secured.

The numbers of Actinomycetes varied with those of the bacteria, an increase in bacteria being followed by an increase in Actinomycetes. Relative proportions of these organisms were from 1 to 10 to 1 to 20. Microorganism numbers and nitrate accumulation were not found correlated. Variations in the moisture content of the soils at the times of the various samplings appeared to have no appreciable influence on the numbers of microorganisms found.

Manure alone or manure and lime did not affect the numbers of fungi in the soil examined. Superphosphate (acid phosphate) and rock phosphate, when added with lime and manure, caused a slight increase in the numbers of fungi. All of the soil treatments studied increased the bacterial numbers, manure and lime increasing the number more than did manure alone, while manure, lime, and rock phosphate increased the number more than did the manure and lime, and the greatest increase was brought about by manure, lime, and superphosphate. The various soil treatments appeared not to affect the number of Actinomycetes.

Crop yields were increased by all of the soil treatments, there being a direct correlation between the bacterial numbers and the crop yields in the various plats. When superphosphate or rock phosphate was used the numbers of the fungi and of the Actinomycetes were correlated with the crop yields.

The data are stated not to have been sufficiently complete to permit of definite conclusions with respect to the effect of crop rotations on the number of microorganisms in this soil.

Studies on nitrification and its relation to crop production on Carrington loam under different treatments, L. W. Erdman and H. Humfeld (*Iowa Sta. Research Bul. 110 (1928), pp. 261–291, figs. 3*).—In securing the results here reported three lines of investigation were carried out, (1) a study of nitrification of the natural nitrogen of the soil, (2) a study of ammonium sulfate nitrification, and (3) an investigation of the nitrification of ammonium sulfate in the presence of calcium carbonate. The reaction of the soils was also determined after 30 days of incubation.

It was concluded, in part, that the variations in moisture content which occurred in these soils had no appreciable effect on their nitrifying power, nor was this apparently affected appreciably by the crop rotations in plats which had been left untreated for 12 years or in those which had been manured, manured and limed, or treated with crop residues and lime. The application of manure alone did not increase the nitrifying power of Carrington loam. The largest quantities of nitrates at the various times of sampling and the highest nitrifying power when this was measured by the nitrification of the natural nitrogen of the soil were found in soils from the 3-year rotation corn plats.

Definite correlations between the crop yields, the nitrifying power, and the reactions of the soils after incubation were observed when the nitrifying power of the soil was tested by the measurement of the nitrification of ammonium sulfate. The reaction of the soils at the time of sampling was also found to be correlated with the nitrifying power of the soil as determined by this method. Measurement of the ammonium sulfate nitrification in the presence of calcium carbonate did not yield perfect correlations between the nitrifying power and the crop yields, though the soils all showed a high nitrifying power when the crop yield was high.

The nitrifying power of all the soils with respect to ammonium sulfate was greater in the presence of calcium carbonate. Since soils from plats which had been limed in the field showed the highest nitrifying power, it is inferred that there is a definite correlation between the reaction of the soils and their nitrifying capacity.

Azotobacter studies, W. G. Sackett (*Colorado Sta. Rpt. 1927, p. 30*).—In a study of the part played by phosphates, soil toxins, and insoluble carbonaceous crop residues in the growth of Azotobacter, phosphates appeared to stimulate growth and nitrogen fixation.

The influence of heavy applications of dry organic matter on crop yields and on the nitrate content of the soil, A. W. Blair and A. L. Prince (*Soil Sci., 25 (1928), No. 4, pp. 281–287, figs. 3*).—The experiments described in the present contribution from the New Jersey Experiment Stations extend previous work with nonleguminous crops (E. S. R., 30, p. 324), these crops having been shown to be liable to a serious handicap in germination and growth as a result of heavy applications of such dry organic matter as starch, cellulose, dry leaves, and straw. Both legumes and nonlegumes were grown in the present series of experiments, in which a total of 40 cylinders was employed. The cylinders were arranged in 4 series of 10 each, the individual series receiving each the following series of treatments: Two cylinders without organic matter, 2 with 1 ton of dry rye straw (cut fine) per acre, 2 with 2 tons of the straw per acre, 2 with 4 tons, and 2 with 8 tons per acre. Sassafras loam soil was used. The experiments covered 3 years. Lime sufficient to hold the soil to a pH value of 6.4 and a little above 7.0 was applied.

As in the previous work above cited, the germination and yield of nonleguminous plants were greatly depressed by heavy applications of organic matter the first year. The yields of the legume crops, whether with or without nitrogenous fertilizer, were not, however, appreciably less with the heavy applications of straw than in the check cylinders. The straw did not greatly influence the nitrate content of first summer soil samples. Nonlegume crops in the cylinders given the heaviest applications of rye straw the first year gave larger yields than the check cylinders in the second year, the nitrate content of the soil being again little influenced. In the third year two sections of corn which received an unusually heavy application of nitrogenous fertilizer gave practically the same yields as the corn in the check cylinders. With barley which received a moderate application of sodium nitrate the heavy application of straw caused a decrease in yield.

"The work furnishes convincing evidence that the depressing effect which is sometimes produced by the application of dry organic matter is due to the locking up of available nitrogen, by organisms which use the organic matter as a source of energy."

[**The effect of added organic matter on nitrate production**] A. KEZER (*Colorado Sta. Rpt. 1927, pp. 11, 12*).—Brief report is made of the results of three years' tests of straw, cornstalks, cut alfalfa, dried blood, and sawdust supplying equivalent amounts of nitrogen as sources of organic matter and nitrogen. Large quantities of organic matter low in nitrogen appeared to decrease nitrate production, but this effect was observed to persist for the year of application only.

Synthetic manure, water requirements, and attendant losses of fertilizing constituent (*Ohio Sta. Bul. 417 (1928), pp. 31–33*).—"Although there has been considerable loss of both potash and nitrogen from the composts, the composition of the artificial manure produced compares favorably with that of average open-yard manure from horses and cows. It would appear that the economy of the artificial manure process might be greatly increased by placing the compost piles upon a tight floor so arranged that the leachings could be recovered and returned to the top of the piles."

Trumbull County fertility tests (*Ohio Sta. Bul. 417 (1928), pp. 87, 88*).—Fertility tests on the Trumbull County Experiment Farm have shown certain investments to be necessary for satisfactory crop yields, as without these expenditures the productivity of the land remained below a profitable level. A table showing cost of treatment, acre value per 4-year rotation, and balance over cost for treatments over a 10-year period, ranging from none to manure at 8 tons per acre (charged at the rate of $1 per ton to cover cost of spreading) with 500 lbs. of superphosphate (acid phosphate) and 2 tons of limestone, gives the net profit as $42.62 with no treatment and $99.96 for the full treatment mentioned.

The availability of potassium to plants as affected by barnyard manure, R. P. BARTHOLOMEW (*Jour. Amer. Soc. Agron., 20 (1928), No. 1, pp. 55–81*).—Finding the few recorded experiments on the value of barnyard manure contradictory in apparent results and suggestive of "a lack of understanding with regard, first, to the availability of the potassium in manure, and, second, to the effect of the manure in converting the insoluble potassium minerals in the soil into salts which can be used by the plants," the author of this communication from the Wisconsin Experiment Station conducted pot experiments on the growth of alfalfa, a heavy potash feeder, and of oats and Sudan grass, which require less protassium for normal growth, in quartz sand, in soils with manure and with various combinations of mineral fertilizers, and with manure plus

fertilizers. All crops were grown at the rate of 12 plants per 2-gal. jars, lime having been applied at rates sufficient to correct the acidity as indicated by the Truog test. With the results of these experiments are recorded analyses of a number of samples of barnyard manure for potassium soluble in various reagents and in water. Determinations of potassium in the plant tissue harvested were made "on plants from jars from which one would expect the largest amount of potassium to be taken from the soil alone or from the soil plus manure." The conclusions presented are in part as follows:

(1) The postassium content of manure may vary from 3 to 20 lbs. per ton. (2) All of this potassium content is available for plant growth before much of the organic matter is decomposed. (3) Alfalfa, oats, and Sudan grass recover practically all of the potassium contained in manure applied to quartz cultures and to soils deficient in available potassium. (4) From soils well supplied with available potassium, alfalfa recovers practically all of the potassium applied in manure, while oats and Sudan grass recover from one-half to nearly all. (5) The percentage of potassium found in the harvested plant tissue was always higher in plants grown on soils to which manure had been applied. (6) Most of the soils fertilized with manure had more potassium soluble in N/5 nitric acid and less total potassium than had adjoining soils which had not received fertilizer treatment. (7) Crops removed considerably more potassium in addition to that added in the manure over a period of years from plats fertilized with manure than they did from unfertilized plats. (8) The decomposition of the organic matter in manure may convert some of the insoluble minerals of the soils into forms which can be used by the plant.

The influence of mineral fertilizers in the Moscow Province [trans. title], L. L. Balashev (*Trudy Nauch. Inst. Udobr. (Trans. Sci. Inst. Fert. [Moscow])*, *No. 35 (1926)*, *pp. 85–157*, *figs. 11*).—The experiments reported cover a period of from 6 to 11 years with rye, oats, potatoes, flax, and clover on soils consisting mostly of loams and clays. The results showed that oats responded best to fertilizers and potatoes and flax the least. Nitrogenous fertilizers were the most effective, especially for grain crops, followed closely by the phosphate fertilizers. On clover, gypsum increased the yield 50 per cent. Both clover and flax responded best to potassium fertilizers.

Summary of fertilizer experiments at the agricultural experiment stations of the Tver Province [trans. title], A. V. Kazakov (*Trudy Nauch. Inst. Udobr. (Trans. Sci. Inst. Fert. [Moscow])*, *No. 35 (1926)*, *pp. 43–83*, *figs. 7*).—This report includes experiments conducted at the Shatilov Experiment Station on weathered chernozem, at the Tula experimental field on gray forest soils, at the Odoev experimental field on podsolized loam, and at the Mishen experimental field on podsolized loam.

On weathered chernozem the limiting factor is phosphorus. Thomas slag gave as good results as superphosphate (acid phosphate). Finely ground rock phosphate also compared favorably with superphosphate on the weathered chernozem. There was no response to either mineral or organic nitrogenous fertilizers nor to potash, nor was the nitrogen and potassium combination effective.

Oats was less responsive to fertilizers than either the winter grains or the other spring grains. Potatoes responded to phosphate applications, but in a smaller degree than the grains. Barnyard manure increased the yield of potatoes more than mineral fertilizers. The yield of sugar beets was increased 50 per cent by the addition of phosphatic fertilizers, and the same was true for the legumes and grasses.

On the gray podsolized soil the results were conflicting and paradoxical. The phosphorus fertilization exceeded barnyard manure in its effect. The soil did not respond to nitrogen.

AGRICULTURAL BOTANY

The cytological bases of the mycoplasm theory [trans. title], J. Beauverie (*Compt. Rend. Acad. Sci. [Paris], 182 (1926), No. 22, p. 1347*).—The author describes four orders of cell phenomena supposedly related to degeneration resulting from direct or indirect action under parasitic influence, and he considers the bodies said to have been described by J. Eriksson as results of degeneration due to the activity of such parasite or parasites.

Degeneration of chloroplasts [trans. title], J. Beauverie (*Compt. Rend. Acad. Sci. [Paris], 183 (1926), No. 2, pp. 141–143*).—The author claims to have shown that degeneration of chloroplasts occurs under experimentation or parasitism in either of two ways which are indicated, as are also the conditions.

Water content of plants and chlorophyll assimilation [trans. title], A. Mayer and L. Plantefol (*Ann. Physiol. et Physicochim. Biol., 2 (1926), No. 5, pp. 564–605, figs. 8*).—Preliminary experimentation has shown that respiration in *Hypnum triquetrum* is not influenced by increasing the carbon dioxide content of the atmosphere even to 5 per cent. Assimilation is not greater at 5 per cent than at 1 per cent carbon dioxide. On the other hand, assimilation is influenced by the physiological state of the plant, notably by the fact that the plant has previously been in a state of assimilative activity, for which there exists an optimum as regards temperature and another as regards illumination. Assimilation is decreased by lowering the water content. Apparently, chlorophyll assimilation is more closely dependent upon imbibition than upon respiration.

Radiations and chlorophyll [trans. title], J. Amar (*Compt. Rend. Acad. Sci. [Paris], 182 (1926), No. 22, pp. 1353, 1354*).—These studies favor the view that all cellular pigmentation is a product of vital reaction and that such pigmentation reacts to the chemical or biological action of a certain group of radiations. As regards the law of vital reaction in general, the author claims to have shown that this relates to the promotion of cellular activities, operations that are essentially oxidational. Every biological pigment promotes organic combustion.

In the light of these tenets, examination is briefly made of certain facts recently observed regarding absorption of radiation and chlorophyll diffusion. By means of its green coloration, the leaf pigment stops the red radiation, which not only preserves the physical constitution of the pigment and maintains the greenness proper to its own normal condition but also aids in its diffusion. This pigment distributes itself throughout the protoplasm in the form of distinct elements without being dissolved or massed. Thus chlorophyll, preeminently among the plant pigments, carries on regular work in all parts of the pigmented cell, and this work is conditioned on the absorption of the less refrangible rays of the visible solar spectrum.

Cellular pigment and physicochemical action [trans. title], J. Amar (*Compt. Rend. Acad. Sci. [Paris], 182 (1926), No. 25, pp. 1566–1563*).—Following up the above report, the author states that the life of a grain of chlorophyll is conditioned (since it is a pigmented cytoplasmic particle) by its osmotic and capillary equilibrium. The pigment is a product of cellular metabolism, a product of defense or protection, inseparable from the living matter. It escapes from acid vacuoles and from centers of intense oxidation. Chlorophyll assimilation is exclusively a cytoplasmic operation of the nucleus.

Influence of light and temperature on seed germination in absence of calcium [trans. title], R. Cerighelli (*Compt. Rend. Acad. Sci. [Paris], 182 (1926), No. 7, pp. 483–485*).—It is concluded that during the germination of pea seeds in the absence of lime, light exercises no influence on the growth of root or trunk, but that temperature shows a special effect upon growth in each of these regions.

Influence of light on the absorption of phosphoric acid and of potassium by plants [trans. title], A. Nemec and M. Gracanin (*Compt. Rend. Acad. Sci. [Paris], 182 (1926), No. 12, pp. 806–808*).—The authors report that, in studies utilizing the technique of Neubauer (E. S. R., 50, p. 118), young pea and barley plants which developed under full daylight were richer in mineral matter than were those developed under colored light. It appears that violet and red rays give a favorable difference as regards utilization of potassium but not of phosphoric acid. In plants cultivated under red and violet rays, the accumulation of potassium appears to be connected with the synthesis of carbohydrate and albuminoids.

Relation of temperature to the physiological values of salt solutions as indicated by growth of wheat roots, S. F. and H. M. Trelease (*Bul. Torrey Bot. Club, 53 (1926), No. 8, pp. 605–609*).—Comparisons of a number of culture solutions by tests at 14°, 19°, and 30° C. showed that for different temperatures certain of the solutions had nearly the same relative physiological values (for root growth in very young wheat seedlings), while for different temperatures other solutions showed markedly different relative physiological values.

Influence of temperature on respiration in submerged plants [trans. title], A. Hée (*Compt. Rend. Acad. Sci. [Paris], 182 (1926), No. 2, pp. 152–154*).—Studies using the technique employed by Hée and Bonnet (E. S. R., 58, p. 524) on the phanerogams *Elodea canadensis* and *Myriophyllum spicatum* and on a green filamentous alga, *Cladophora* sp., appeared to confirm the views that respiration in submerged plants tends to augment continuously with rise of temperature in the medium (though it does not appear to follow the Van't Hoff law), and that there appears to be no optimal point.

The effect of freezing on the respiration of the apple, D. B. Carrick (*New York Cornell Sta. Mem. 110 (1928), pp. 28, figs. 5*).—In a previous publication (E. S. R., 53, p. 727) the author showed that incipient ice formation in an apple fruit did not result in any visible change of color in the cells, but that even slight freezing increased the granular texture and insipidity of the fruit, as well as its susceptibility to fungus invasion. Such apples appeared to break down rapidly in storage. As a further contribution to knowledge relating to the effect of freezing on apples, studies were made of the respiration of the fruit to determine the nature and extent of injury in variously frozen apples.

Winesap apples frozen for 3 and for 6 hours after ice formation at air temperatures of from —7.5° to —8.5° C., when measured at 0° increased their respiration as much as 85 per cent above the previously determined normal performance. This acceleration lasted for several days, gradually declining, but it was still evident one month after treatment. Winesap apples frozen sufficiently to kill four-fifths of the cells, at 0° excreted only about one-third of the amount of carbon dioxide which they had formerly produced as normal, unfrozen fruit. The same variety of apples frozen for 3 and for 6 hours after ice formation, when measured at 20° increased in respiration in a manner similar to that at 0°, although generally with a smaller percentage gain. Apples frozen for 6 hours and then held at 20° soon became invaded by Penicillium.

Baldwin apples frozen for 3½ hours gave the characteristic increase in carbon dioxide when measured at 0°. McIntosh apples, when frozen for 3, 6, and 9 hours showed almost an equal respiratory response at 0°. When measured at 20°, the frozen McIntosh fruits gave a significant rise in respiration at 3-, 6-, 9-, and 12-hour exposures. With one exception, the gain following a freezing treatment was somewhat less than in the other measurements. McIntosh apples frozen for 21 hours, at which time all the cells were killed, gave off 87 per cent less carbon dioxide at 20° than they had previously given off as normal, unfrozen fruits.

A critical statistical study of experimental data on the effect of minute electric currents on the growth rate of the coleoptile of barley, F. G. Gregory and L. Batten (*Roy. Soc. [London] Proc., Ser. B, 99 (1926), No. B 695, pp. 122–130, figs. 3*).—A critical statistical analysis has been made of the data on which the results described by Blackman, Legg, and Gregory (E. S. R., 51, p. 424) for the effect of electrification on the growth of the coleoptiles of barley are based, and it has been shown that the growth rates even in these comparatively large samples of a pure line barley do not show a normal distribution. The length of the coleoptile at the beginning was correlated with the growth rate, and a negative correlation was established between the initial growth rate and the natural acceleration of the rate which occurs apart from electrification. When the data are corrected as here shown, it is found that the increase in the rate of growth during five hours as a result of one hour's electrification is highly significant, the probability being over 200:1. The effect of a three hours' electrification is regarded as suggestive but not significant, giving a probability of 13:1. Apparently the material used was quite variable.

Benzidine as reactive in living plants [trans. title], C. Rouppert (*Compt. Rend. Acad. Sci. [Paris], 182 (1926), No. 8, pp. 533–535*).—The author, working with lignified tissues and with microscopic preparations of young plants of bean and of chestnut in weak solutions of benzidine, was able to demonstrate the Mangin-Raciborski (benzidine) reaction for lignified membranes, also the presence of an oxidase.

Action of iron sulfate on the vegetation of grapevines [trans. title], G. Thomas (*Prog. Agr. et Vitic. (Éd. l'Est-Centre), 48, (1927), No. 33, pp. 153, 154*).—Remarkable growth and other favorable results are credited to the action of iron sulfate on grapevines, particularly old stocks of the variety Aramon.

The physiological rôle of starch stored in green leaf parenchyma [trans. title], V. Lubimenko (*Compt. Rend. Acad. Sci. [Paris], 182 (1926), No. 10, pp. 651–653*).—This work was carried on in collaboration with S. S. Fichtenholz, E. R. Gubbenet, L. G. Gavriloff, and A. J. Kokine in order to ascertain the physiological conditions for the accumulation or dissolution of starch during the course of the day in the foliar parenchyma of plants of various species developed under natural conditions in different latitudes.

It was found that both accumulation and dissolution were influenced by the intensity of both temperature and illumination. The behaviors of certain plants in these respects are detailed. The facts show clearly that both accumulation and dissolution are intimately connected with the mechanism of the current which transports soluble carbohydrates from leaf to stem. Concentration is a factor. It is shown that in the palisade region the concentration of carbohydrate may vary even in different parts of the same cell.

Quantitative variations during daylight of carbohydrates in leaves of green plants [trans. title], P. P. Stanescu (*Compt. Rend. Acad. Sci. [Paris], 182 (1926), No. 2, pp. 154–156, figs. 2*).—From examinations of leaves from green

trees over a wide systematic range, it appears that the phenomenon of photosynthesis is rhythmic, that characteristic being marked during the daytime and particularly in summer.

Variations of inulin in grafted Jerusalem artichoke [trans. title], L. DANIEL (*Compt. Rend. Acad. Sci. [Paris], 182 (1926), No. 4, pp. 282–284*).—Details, with discussion, are given of studies carried on during 1923 and 1924 on the distribution of inulin in the various parts of Jerusalem artichokes.

The rôle of glucosides in plants [trans. title], M. BRIDEL (*Rev. Gén. Sci., 37 (1926), No. 5, pp. 134–139*).—It is considered probable that perennial plants under normal vegetative conditions offer much less information as to the physiological rôle of glucosides than do annual plants, which to some extent give comparatively clear responses to tests.

It is thought probable that there exist in plants two sorts of glucosides of unequal mobility, the reserves of the more available including hydrolyzable sugars, invertin, and starch, and those of the less mobile the glucosides. The plant thus supposedly utilizes the glucoside reserves in two stages, the second stage being that of utilization in cases of absolute necessity or emergency as complementary to the utilization in the first stage. Germination may furnish an instance of second-stage utilization. The exact rôle of glucosides is not yet accurately known.

Variations of the threshold of amylogenic condensation in different cells of the plant [trans. title], A. MAIGE (*Compt. Rend. Acad. Sci. [Paris], 182 (1926), No. 9, pp. 588–590*).—Applications of the four methods previously noted (E. S. R., 58, p. 524) are indicated. It is claimed that in the cases studied the special amyliferous character of the cells is in relation to a low level of the threshold of condensation. It appears that physiology plays an important rôle as regards the general distribution of starch in the plant and in its localization in certain of the cells and tissues.

The presence in certain fungi of an oxidase not previously indicated [trans. title], J. WOLFF (*Compt. Rend. Acad. Sci. [Paris], 182 (1926), No. 5, pp. 343, 344*).—In *Russula foetens* and *R. emetica*, it is claimed, the author has demonstrated and partly studied an enzyme not previously known which accompanies laccase and tyrosinase (both previously known), which he has named ferrase, and which, he thinks (from analogy with laccase and tyrosinase) may be widely distributed within the plant kingdom.

The migration of nitrogenous substances in oak [trans. title], R. COMBES (*Compt. Rend. Acad. Sci. [Paris], 182 (1926), No. 16, pp. 984–987*).—Studies, some of which have been noted (E. S. R., 58, p. 523; 59, p. 25), involving analysis of the principal parts of the whole plant (oak), are reviewed in outline with results in tabular form. They tend to show that in general the augmentation of nitrogen in the stem and in roots exhibits a tendency toward equalization or uniformity of nitrogen in the different parts of the plant.

The migration of nitrogenous substances in beech in the course of autumnal yellowing [trans. title], R. COMBES (*Compt. Rend. Acad. Sci. [Paris], 182 (1926), No. 19, pp. 1169–1171*).—The results obtained during 1925, following the studies noted above which are presented in tabular detail, in general confirm for the beech the phenomena established for the oak, namely, the disappearance in great part of the leaf nitrogen and the corresponding increase of nitrogen in the stem and root. Brief details and discussion are given.

Variation of organic and mineral materials, particularly calcium, in tree leaves during autumnal yellowing [trans. title], R. COMBES and R. ECHEVIN (*Compt. Rend. Acad. Sci. [Paris], 182 (1926), No. 25, pp. 1557–1559*).—Following up the above and previous work (E. S. R., 58, p. 523), the author used species

of Acer, Aesculus, Castanea, Corylus, and Fagus for determinations. As a result of this work, it is stated that the leaf dry matter in all species used shows a diminution varying in different trees. It is claimed that the total of organic material in leaves during autumn undergoes a variation (25 to 45 per cent) which is always present in the same general aspect.

Corn stalk tests found unreliable as guides to fertilizer needs (*Ohio Sta. Bul. 417 (1928), pp. 28, 29*).—As a result of two years' study of the method of Hoffer (E. S. R., 56, p. 220) for recognizing by chemical tests of split cornstalks the requirements of corn for nitrogen and potash, the general conclusion has been reached that the stalk tests can not be expected to give reliable indications of fertilizer needs under Ohio conditions.

The life-cycle of the nodule organism, Bacillus radicicola (Beij.), in soil and its relation to the infection of the host plant, H. G. Thornton and N. Ganguilee (*Roy. Soc. [London] Proc., Ser. B, 99 (1926), No. B 699, pp. 427–451, figs. 21*).—By means of a modification of the Winogradsky staining technique the changes in morphology of *B. radicicola* in soil were followed, and a regular cycle of changes was found, unbanded rods, cocci, and banded rods successively predominating in the soil. Percentage increase of cocci was associated with increased bacterial numbers and with the appearance of motile forms. By modifying the liquid used to suspend the inoculum added to the soil, the time of predominance of cocci could be altered. Certain effects, which are particularized, suggest that the additional nodule formation which is here instanced is due to the known effect of the phosphate in increasing the distribution of the bacteria.

Study of roots of Alpine plants and their mycorrhizas [trans. title], J. Costantin and J. Magrou (*Compt. Rend. Acad. Sci. [Paris], 182 (1926), No. 1, pp. 26–29*).—Particulars and views presented show the very important influence of arctic as contrasting or paralleling Alpine climates, and the important part played by mycorrhizas in Alpine as in arctic floras. Various plants and groups are discussed in connection with their mycorrhizas as to life duration and distribution (arctic or montanic).

Some fungi parasitic on roots of phanerogams [trans. title], A. L. Guyot (*Compt. Rend. Acad. Sci. [Paris], 183 (1926), No. 2, pp. 145–147, fig. 1*).—This brief discussion relates to the systematic position, also the biologic significance of certain complicated effects, in case of several fungi named as found on roots of certain plants.

GENETICS

Studies in North American violets.—I, General considerations, A. Gershoy (*Vermont Sta. Bul. 279 (1928), pp. 18, fig. 1*).—A report is given of cytological, genetical, and taxonomic studies of 46 North American and 5 foreign species representing 3 of the taxonomic sections of violets.

Chromosome counts were made also of the 4 main groups, and they are said to indicate the occurrence of polyploidy of other than hybrid origin. Species with the lowest chromosome number are regarded as the oldest phylogenetically, while those with the highest count are considered as the most modern. In most cases a positive correlation was found between a close morphological relationship between species and the occurrence of an identical chromosome number.

Genetic studies of 161 species hybrids, some of which extended to the F_5 generation, showed a positive correlation between the morphological and chromosome number relationship of the species crossed and the degree of sterility of the hybrids between them. The F_1 hybrids are said to exhibit varying degrees of intermediate inheritance. This intermediate condition tends to persist in the

subsequent generations with occasional partial reversions to the type of the parent species. Inbreeding after hybridization was found to tend to establish permanent recombinations.

Pure line studies with ten generations of Hubbard squash, M. B. Cummings and E. W. Jenkins (*Vermont Sta. Bul. 280 (1928), pp. 29, pls. 2, figs. 7*).—Comparisons over a 10-year period of three lines of Hubbard squash (1) an open-pollinated control, (2) a high-quality self, and (3) a low-quality self led to the general conclusion that in this variety, at least, continuous self-pollination is entirely feasible, having produced over the 10-year period practically no ill effects. Apparently a pure Hubbard squash can be kept pure without intercrossing as a means of maintaining vigor and reproductive capacity.

Using the number of leaves per plant as an index to vegetative vigor, it was found that the average number of leaves in the open-pollinated line increased, while in the other two lines the number of leaves decreased slightly during the 10 years. The open-pollinated line gained also in the average length of vine, while the selfed lines lost. All three lines showed a gain in the average number of squashes per vine, in the average weight of squashes, and in the average number of good seed per vine during the 10 years, indicating no loss of vigor or reproductive capacity. A general decrease was observed in the average weight per single good seed in the case of open-pollinated squashes on all three lines. No significant reduction in the viability followed long continued self-pollination.

Colour inheritance in rice, S. K. Mitra, S. N. Gupta, and P. M. Ganguli (*India Dept. Agr. Mem., Bot. Ser., 15 (1928), No. 4, pp. 85–102*).—Studies on the color of leaf sheath, pulvinus, ligule, auricle, internode, outer glume, inner glume, tip, stigma, and kernel in several varieties of rice showed the inheritance of color to be quite complex. Factors for purple, pink, brown, yellow, red, black, white, and green were mutually independent, and similarly the actual shading of each, as light or deep color. Color factors were generally dominant over noncolored, e. g., purple is dominant over green or white, red over white, green or yellow over brown, and black over green or yellow. While in most cases where colored and noncolored factors were crossed simple 3:1 ratios prevailed, ratios of 9:7, 12:3:1, 9:3:4, 9:6:1, and 1:2:1 were also noted. In a few crosses between noncolored plants ratios of 9 colored:7 noncolored and 15:1 and 1:3, respectively, were observed.

The chromosome numbers of some flowering plants, K. Tjebbes (*Hereditas, 10 (1928), No. 3, pp. 328–332, figs. 2*).—Counts in cytological studies revealed the following haploid chromosome numbers: *Phacelia tanacetifolia* and *Portulaca grandiflora* 9, *Delphinium cardiopetalum* 8, *Atriplex hortensis* 9, *Geranium pratense* and *G. sylvaticum* 12, *Plantago lanceolata* 6, *Viscaria oculata* 12, and *Sidalcea neomexicana* 13. The author also found 6 in pollen mother cells of *Linaria vulgaris*, *L. genistifolia*, *L. hendersonii*, *L. repens*, *L. marocana*, and *L. dalmatica*.

The chromosomes of some Scirpoids [trans. title]. A. Håkansson (*Hereditas, 10 (1928), No. 3, pp. 277–292, figs. 3*).—Haploid chromosome numbers recorded were *Eriophorum vaginatum* and *E. polystachion* 29, *Scirpus sylvaticus* 31, *S. radicans* 28, *S. maritimus* 52, *S. lacustris* and *S. tabernaemontani* 21, *S. compressus* 22, *S. setaceus* 13, *S. palustris* 19, *S. uniglumis* 23, and *S. multicaulis* 10. The size of chromosomes and the origin of the different numbers are discussed briefly.

Increase of chromosome number in the hybrid Nicotiana tabacum × N. rusbyi [trans. title], F. Brieger (*Ztschr. Induktive Abstam. u. Vererbungslehre, 47 (1928), No. 1, pp. 1–53, figs. 14*).—Cytological observations made in connection with genetic studies revealed 36 chromosomes in the F_1 of *N. tabacum* (24 hap-

loid) ×*N. rusbyi* (12). Among back crosses on *N. tabacum* was a plant possessing 60 chromosomes, evidently arising from the combination of an F_1 gamete possessing all 36 F_1 chromosomes and an *N. tabacum* gamete with 24. Another plant with approximately 55 chromosomes probably arose through the uniting of an F_1 gamete having about 30 chromosomes with an *N. tabacum* gamete with 24. The genetic and cytological behavior of the material is discussed in detail.

Inheritance of size and conformation in cross-bred sheep (*New Hampshire Sta. Bul. 232 (1928), pp. 15, 16, fig. 1*).—The mean body measurements of the F_1 and F_2 offspring were intermediate between the mean size of their parents, though there was a greater range of variation among F_2s than in F_1s. It appeared in the size crosses that different characters were not inherited equally, and this served as an explanation of the discredit into which continued inbreeding has fallen in the popular development of livestock, notwithstanding the established principles that the development of new breeds or combinations of traits depends largely upon the culling of undesirable elements and the intensive inbreeding of the selected stock.

In studies upon the inheritance of wool characters it was found that fineness of wool was evidently controlled by multiple factors and together with length of fiber tended to diminish in successive generations in the Southdown and Rambouillet cross, though these conditions showed no physiological dependence. Crimpiness, though intermediate in its mode of inheritance, showed an inclination of the F_1 offspring toward the more crimpy parent, with a positive correlation between crimp and diameter of the fiber. The analysis of the inheritance of fleece weight was considerably complicated by the effect on it of age, feeding, and general environmental conditions.

The functional interrelation of the ovaries as indicated by the distribution of foetuses in mouse uteri, C. H. Danforth and S. B. de Aberle (*Amer. Jour. Anat., 41 (1928), No. 1, pp. 65–74*).—An analysis of the distribution of the fetuses in the uteri of 500 pregnant mice at Stanford University indicated a random distribution between the two horns. There were at least three factors or groups of factors regulating the production of ova, (1) the physiological status of the animal as regards age, race, and reaction to environmental conditions tending to influence both ovaries in the same direction and producing a positive correlation between the number of ova developing on each side, (2) an influence acting in opposition to the preceding tending to lessen this correlation, and (3) a reciprocal relation between the output of the two ovaries, which is interpreted as due to the presence of a limited amount of material necessary for the maturation of ovarian follicles, thus limiting the total number of ova produced by the animal.

On ovarian regeneration in the albino rat, F. B. Hanson and F. Heys (*Soc. Expt. Biol. and Med. Proc., 25 (1927), No. 3, pp. 183, 184*).—In studies of possible ovarian regeneration at Washington University both ovaries were removed from 105 albino rats, and it was found that in a period ranging from 90 to 180 days there were 8 cases of ovarian regeneration. Microscopic examination revealed, however, that the ovaries were incompletely removed from 2 of these animals, while in 6 cases extirpation was apparently complete. There appeared to be less likelihood of regeneration in younger animals than when spaying occurred at more advanced ages.

Seventh annual report [of the animal breeding research department, Edinburgh University, 1926–27], F. A. E. Crew et al. (*Edinb. Univ., Anim. Breeding Research Dept. Rpt. Dir., 7 (1926–27), pp. 35, figs. 15*).—This publication gives a brief account of the various phases of work in progress at the animal breeding research department of the University of Edinburgh.

Investigations are under way dealing with the inheritance of colors and patterns, quality of wool, and fertility and fecundity in sheep; analysis of the Clydesdale breed from stud book records and inheritance of defects and studies of the sex ratios in horses; color, sex transformation, age of keeping purebred cows, and the effect of age of breeding on the offspring in cattle; inheritance of color and other characteristics and physiological studies of reproduction and sterility in goats; changes in the pigmentation, sex modifications, and sex identification at time of hatching in poultry; and the study of the physiology of reproduction in rabbits, rats, mice, and Drosophila.

FIELD CROPS

Crops and plant breeding, F. L. Engledow (In *Agricultural Research in 1925 [and in 1926]. London: Roy. Agr. Soc. England, 1926, pp. 1–24; 1927, pp. 1–35*).—Recent research activities are reviewed in the 1925 book under the topics of recent studies of fungus diseases; daylight and plant growth; and the physical basis of heredity. A similar review in the 1926 volume deals with seeds and seed testing; grafting problems and the question of stock and sterility in fruit trees; slugs, wireworms, and leatherjackets; and the winter hardiness of crops.

[Field crops work in Georgia, 1927] (*Georgia Sta. Rpt. 1927, pp. 7–20*).—Varietal leaders (E. S. R., 57, p. 225) over periods of several years have included strains of Purplestraw wheat and Red Rustproof oats and Greece and Tennessee Winter Beardless barley. Hastings, Whatley, and Weekley Prolific corn made the highest yields of shelled grain in 1927. Selections of Delfos and other Delta cottons were high in acre value, and D. & P. L. No. 8 and No. 4, Piedmont Cleveland, and College No. 1 led in lint yields. Breeding work with wheat, soy beans, cowpeas, and corn is noted briefly. Although oats cost slightly more per pound than corn to produce, it gave more grain per acre and is better in rotation with cotton and protects the land better in winter.

Cotton plants grown in a solution including ammonia and nitrate nitrogen absorbed nitrogen at the rate of 35 parts ammonia nitrogen to 100 nitrate nitrogen for the first 2 weeks. This ratio gradually changed to about 55:100 when the plants were 6 weeks old. Cotton did better in solutions with only nitrate nitrogen than in one containing only urea nitrogen and did not grow in a solution containing ammonium acetate or potassium nitrite.

Seed cotton yields rose from 669 lbs. per acre with no nitrate to 814 lbs., with 233 lbs. of sodium nitrate, and top-dressing with sodium nitrate returned the best yields when applied at chopping and of ammonium sulfate half at planting and half at chopping. A comparison of mixtures of sodium nitrate with cottonseed meal for cotton showed it profitable to mix a small quantity of meal with the nitrate. Cotton yields from nitrogen derived from a number of sources are tabulated. Two hundred lbs. of Nitrophoska (32–16–16) gave better results than when made up with dry sand to 800 lbs. of 8–4–4. Sulfur seemed to preserve the quantity of nitrogen in the organic matter of compost and to delay manure from becoming water-logged or soggy. Cotton spaced 12 and 13 in. apart outyielded that at wider and closer distances, and weed removal without cultivation surpassed ordinary cultivation. The 1927 survey of the length of staple in Georgia cotton showed 2.4 per cent of the State crop to be $\frac{13}{16}$ in. and less, 77.9 per cent $\frac{7}{8}$ in., 15.6 per cent $\frac{15}{16}$ in. and 4.1 per cent 1 in. and longer.

Crop rotation studies in cooperation with the U. S. D. A. Office of Soil Fertility Investigations suggested that corn grown on heavy Piedmont soils of average fertility needs no fertilizer except nitrogen. When legumes are grown with the corn, phosphates should be applied unless used on some other crop in

the rotation. On fertile corn land a small amount of potassium will probably pay. Potassium chloride applied in the row resulted in better corn yields than when broadcasted.

Top-dressing with 480 lbs. of lime apparently increased the yield of sound peanuts from 450 to 609 lbs. per acre, although the lime did not seem to decrease the percentage of pops noticeably. Good hand-picked seed made 157 lbs. more per acre than poor field run seed, and a spacing of from 5.5 to 6 in. in 2.5-ft. rows yielded the most Spanish peanuts. Increasing applications of sodium nitrate or potassium chloride for Spanish peanuts tended to decrease yield, and application of 100 lbs. of superphosphate (acid phosphate) only increased yield slightly. The small Improved Spanish led the varieties with 584 lbs. of sound nuts per acre, and had the highest percentages of sound nuts and of meats.

[Crop experiments in New Hampshire] (*New Hampshire Sta. Bul. 232 (1928), pp. 17–20, fig. 1*).—A progress report of rejuvenation experiments with worn-out hay lands being carried on by F. S. Prince and T. G. Phillips indicates the current response of grass, alfalfa, and sweet clover to manure, lime, and fertilizers. Pasture improvement work and a dairy farm rotation experiment are described briefly, and the relative hardiness of varieties of alfalfa and sweet clover and red clover strains are noted. Tests by O. Butler showed that dusting sets with sulfur resulted in better stands when potato seed was cut before planting and bagged.

[Agronomic work in New Mexico] (*New Mexico Sta. Rpt. 1927, pp. 16, 17, 44, 45, 47–54, 72–74, figs. 2*).—Variety tests with winter and spring wheat, oats, and barley, corn, cotton, grain sorghums for grain and forage, sorgo, broomcorn, alfalfa, beans, tobacco, and potatoes, control work with Johnson grass, and studies on the germination and growth of chamiza are reported on as heretofore (E. S. R., 57, p. 224).

Immature seed from cotton picked after frost was low in protein but not in oil or nitrogen-free extract. No pronounced variations in composition seemed due to variety, locality, or quantity of irrigation water. Delinted seed samples contained 0.36 and 0.38 per cent of gossypol, and hulls contained 0.023 per cent, confirming the view that the gossypol content is low in cottonseed produced in certain regions, especially in the Southwest.

The heaviest potato crop with best quality of tubers has been produced by plentiful irrigation. It appears that in southern New Mexico at least a uniform and constant percentage of soil moisture during the tuber formation period is an important factor.

In range improvement studies seed of nearly all of the range plants tested were low in germination, although in a few plants germination seemed to improve with age. The behavior of *Prosopis glandulosa, Pentzia incana, Phytolacca dioica,* and Bermuda grass is commented on. An analysis of air-dry *Sophia* sp. gathered in a green, immature stage is tabulated.

[Field crops experiments in Ohio] (*Ohio Sta. Bul. 417 (1928), pp. 16–24, 52, 53, 85, 86, 87, figs. 2*).—Further investigations (E. S. R., 57, p. 125) dealt with the productivity of strains and varieties of alfalfa and of red clover from different sources, the composition of sweet clover at different growth stages, dry weight and nitrogen yields in various parts of the soy bean, corn breeding and crop substitutes for corn under corn borer conditions, and pasture studies. The lawn and golf course problems being studied are outlined.

Nabob, a pure line selection from Nigger wheat, resembles the parent in appearance, growth habit, and maturity, showed 50 per cent less susceptibility to stinking smut, slightly excelled it in milling and baking quality, was very winter hardy, and outyielded Nigger, Trumbull, and Fulhio.

During 10 years winter wheat receiving no mulch has averaged 36.2 bu. per acre, with 1 ton of straw mulch 35.9, and with 2 tons 33 bu. Apparently not more than 1 ton per acre should be applied and this not until late in winter. The depressing effect of the straw mulch seemed partly due to the reduction of available nitrogen or nitrates in the soil. Some benefit was derived from the application of 100 lbs. of sodium nitrate. Slightly more clover hay was harvested from the plats mulched with 1 ton of straw. Little benefit from mulching was also noted on several of the county experiment farms.

Wheat ready for cutting with the binder and containing 45 per cent of moisture required 7 days before the moisture had fallen to 14 per cent, low enough for harvest with the combine. Oats and barley dried out faster than wheat and were ready for the combine in 2 or 3 days after the binder stage. Shattering caused very little loss of grain up to the time when the combine could be used.

Hill applications of fertilizer were more effective than broadcast fertilizer in stimulating the growth of corn during a backward season, and a complete fertilizer gave better results than superphosphate (acid phosphate) or a phosphate-potassium mixture. The development rate increased with increasing hill applications of a 3–12–4 (N–P–K) fertilizer up to 400 lbs. per acre, both with and without supplemental broadcast applications of manure and superphosphate.

Where potato planting covers several weeks as in Ohio, each seed piece in the late plantings has given rise to more sprouts than in early plantings. Greenhouse studies disclosed that after the resting stage, which extends until December or January in late varieties, seed potatoes send up only one sprout from each seed piece until April or May when a 2-sprout stage appears. This in turn is followed about a month later by a 3-sprout stage and a continued increase in the number as planting is delayed. The resting stage is longer in unripe seed, and consequently the cycle is later than in mature seed. Storage near 32° F. retarded the cycle, the single sprouting stage continuing for 2 weeks or longer after that of tubers stored at 38°.

[Agronomic work in Wyoming] (*Wyoming Sta. Rpt. 1927, pp. 131, 132*).—Current leaders among the crop varieties included Baart, Hard Federation, Federation, and Red Bobs wheat; Kherson, Iowar, Banner, and Markton oats; California Feed, Horn, and Odessa barley; and Pearl, Late Ohio, and Downing potatoes. Slender wheat grass with 4.71 tons per acre, brome grass 4.27 tons, a mixture of crested wheat grass, timothy, and red clover 3.84 tons, and a mixture of western wheat grass, timothy, and alsike clover 3.66 tons were noteworthy among combinations for irrigated pastures and meadows. An 8-year rotation continued to surpass a 4-year rotation.

[Agronomic investigations of the Agricultural Research Institute, Pusa, 1926–27], A. R. Khan, W. H. Harrison, G. S. Henderson, T. S. Venkatraman, and W. Sayer (*Agr. Research Inst., Pusa, Sci. Rpts. 1926–27, pp. 10–23, 28–30, 70–77, 128–142, pl. 1*).—Continued experiments and breeding work with field crops (E. S. R., 57, p. 227) are reported on.

The progress of inheritance studies with wheat, oats, barley, corn, tobacco, flax, sesamum, *Cajanus indicus*, grain, peas, lentils, hemp, and *Hibiscus cannabinus* is noted briefly. In hemp raised from single plant cultures the final ratio was 1 male : 2.34 females : 0.93 monoecious individuals and in plants from a mixed seeding 1 : 3.51 : 1.24, respectively. Contrary to conclusions of Ceiselsky, the proportion of staminate and carpellate plants did not differ much whether the parents had received fresh or stale pollen. Observations suggested that there is a regular tendency in hemp toward monoeciousness which may

include about from 21 to 22 per cent of the population, that those plants which have been said to reverse their sex under mutilation or other stimuli may be monoecious, and that such stimuli are not after all responsible for the reversal of sex.

In a study of the effect of fertilizers on the quality of sugar cane juice and crude sugar, superphosphate (acid phosphate) closely followed by potassium sulfate produced canes the juice of which had the highest sucrose and lowest glucose contents, while ammonium sulfate and cyanamide depressed the sucrose content and increased the glucose, the sulfate giving the most extreme values. Mustard cake in effect resembled cyanamide in the early stages but later resulted in a marked improvement in sucrose content and purity. The crude sugar produced varied in quality according to the quality of the juice from the several fertilizer plats.

A solution containing 26 per cent of sucrose and 0.7 per cent of agar was found to be a suitable culture medium for sugar cane pollen. Pollen germinated after 2 hours' exposure to free air in the laboratory at from 23 to 25° C., and it even germinated after exposure to direct sunlight at from 23 to 30°.

Effect of fertilizers on maintaining stands of alfalfa, B. A. Brown (*Jour. Amer. Soc. Agron., 20 (1928), No. 2, pp. 109–117*).—The stands and yields of alfalfa on a series of limed and variously fertilized plats on Gloucester fine sandy loam soil at the Connecticut Storrs Experiment Station were studied during 1923, 1924, and 1925.

Nitrogenous fertilizers, particularly manure, seemed to increase the total yields and grasses and weeds and to reduce the percentages of alfalfa in the stands. Phosphoric acid carriers gave slightly better stands of alfalfa than did no treatment, although no advantages were observed when superphosphate (acid phosphate) supplemented manure or potassium. Potassium either from manure or the chloride was very beneficial in maintaining stands of alfalfa on the field. Although the reasons for the marked effects of potassium on the stands of alfalfa have not been determined, it is suggested that the relatively large potassium percentage in alfalfa and the assistance which potassium may render in synthesis and translocation of starch in plants may have been responsible.

[Barley production in Czechoslovakia] (*Věst. Československ. Akad. Zeměděl. (Bul. Czechoslovak Acad. Agr.), 2 (1926), No. 10, pp. 1069–1137, fig. 1; Ger. abs., pp. 1182–1187; Fr. abs., pp. 1188–1193; Eng. abs., pp. 1194–1199*).—A symposium on brewing barley held at Brno in November, 1926, included papers on the status of the crop in Czechoslovakia; its improvement, types, and varieties, seed certification, market qualities, soil fertilizer, and climatic needs; and control of stripe disease and the relation of weather to crop quality.

Micrometric analysis of barley grain in the spike [trans. title], O. Kopecky (*Věst. Československ. Akad. Zeměděl. (Bul. Czechoslovak Acad. Agr.), 2 (1926), No. 10, pp. 1128, 1129; Ger. abs., p. 1187; Fr. abs., p. 1193; Eng. abs., p. 1199*).—Measurements on barley spikes showed the heaviest kernels on the left side and in the bottom third of the spike, the weight decreasing toward the tips. These relations varied in different spikes. The curved side of the spike has been the heavier. The moisture content decreased with lapse of storage period. The moisture was highest and varied most in analyses made just after harvest. The nitrogen content in the spikes examined was rather constant.

Edible canna in the Waimea District of Hawaii, J. C. Ripperton and R. A. Goff (*Hawaii Sta. Bul. 57 (1928), pp. 41, figs. 19*).—Experiments with edible canna, including seed selection, planting, fertilizers, and harvesting trials, are reported, with data on the climate, soils, and agricultural conditions in the

Waimea District and notes on the feed and fertilizer value of the crop and on the manufacture of starch. See also previous notes (E. S. R., 51, p. 834; 57, p. 329).

Immature rootstocks with one or two buds, followed by subsurface and attached spike types of the various kinds of rootstocks, returned the highest yields. It is advised that mature rootstocks with no visible bud, detached spikes, and secondary immature rootstocks be rejected in selecting planting stock.

Chemical treatment of seed did not prevent rotting, although rotting does not affect the growth of the hill unless bud development is delayed. Under Waimea conditions seed should be planted at least 4 in. deep and at 4 by 4 ft. distances to permit cross cultivation. While planting 2 seed pieces per hill insures better germination and somewhat higher yields, it increases the costs of seed selection and planting. Mulching with canna tops retarded germination and did not prevent weed growth. Fertilizers failed to increase yields of rootstocks appreciably, possibly due to the high fertility of the test soils.

Monthly harvests from the ninth to nineteenth months, inclusive, from 1- and 2-seed plantings showed an irregular although nearly continuous growth and unusually high yields of rootstocks. At the end of the nineteenth month the 1- and 2-seed plantings yielded 42.93 and 43.93 tons per acre, respectively. The crop should grow until the new growth produces rootstocks of undesirable size for starch making or until the older rootstocks show signs of deteriorating. For starch manufacture the crop should be harvested at from 17 to 18 months.

The plant's growth seemed to be of a cyclic nature rather than uniform. Periods of comparative dormancy were followed by periods of rapid growth, probably partly due to inherent causes and partly to climate.

According to analyses of the different parts of the plant, the tops are valuable both as feed and as fertilizer. The stalks from an acre contain the equivalent of over 1 ton of high-grade fertilizers, and an acre of rootstocks removes from the soil the equivalent of 1,200 lbs. of fertilizer. During manufacture the pulp loses most of the total fertilizer elements contained in the rootstocks.

Relative adaptability of red-clover seed of different origins, R. C. Wiggans (*New York Cornell Sta. Bul. 463 (1928), pp. 38, figs. 9*).—Extensive comparative trials with red-clover seed from many sources (E. S. R., 50, p. 435) during the period 1920–1926 demonstrated that practically all nationalities of red-clover seed have characteristic properties, and that the source should be noted carefully in choosing red-clover seed. The chances are greater for a successful crop when the conditions where the seed is grown resemble those where it is to be used. Seed produced under milder conditions should be used only when better adapted seed is not to be had. The data did not recommend Italian red clover for New York farmers, and the indications were that French seed would not average more than 80 per cent as much as Michigan or New York seed under conditions as severe as those at the station. If imported seed must be used, its exact source should be known and care taken to get seed grown as far north as possible under continental conditions. Certain domestic strains seemed as poorly or worse adapted to New York conditions as many of the imported lots.

Seedling vigor and diastatic activity of dent corn as related to composition of endosperm and stage of maturity, W. R. Tascher and G. H. Dungan (*Jour. Amer. Soc. Agron., 20 (1928), No. 2, pp. 133–141, fig. 1*).—The influence of the composition of the endosperm and stage of maturity of seed corn on the diastatic activity and vigor of seedlings during germination was studied at the Illinois Experiment Station. See also earlier notes (E. S. R., 52, p. 335; 56, p. 546.)

During germination the radicles emerged more rapidly and the plumules less rapidly in corn harvested early than in mature seed. Seed which had been harvested when mature produced heavier sprouts than that harvested in the milk, glaze, or dent stages. Horny corn produced sprouts that averaged 0.148 gm. heavier than those from floury corn, and tests made during germination showed a relative diastatic activity of 4.23 for horny corn and 4.05 for floury corn.

Iowa corn yield test; Results of 1927 tests, J. L. ROBINSON and A. A. BRYAN (*Ames: Iowa Corn and Small Grain Growers' Assoc., [1927], pp. 24, figs. 5*).—This publication reports the yields of open-pollinated and hybrid strains of corn tested in 12 districts in the State in 1927 under the auspices of the Iowa Corn and Small Grain Growers' Association, cooperating with the Iowa Experiment Station and the U. S. Department of Agriculture. The leading strains of the several sections in previous years are also noted.

The perennial cultivation of cotton, with special reference to the cultivation of ratoons in Egypt, J. TEMPLETON (*Egypt Min. Agr., Tech. and Sci. Serv. Bul. 75 (1928), pp. [2]+81, pls. 12*).—The relative behavior of ratoon (E. S. R., 54, p. 132) and first-year plants of Egyptian cotton plants was studied in several localities in Egypt during the period 1922–1926. The literature relating to perennial culture of cotton in different parts of the world is reviewed.

Ratoons differ little from first-year plants in first-flower date, but their blooming curve rises more rapidly, reaches a maximum much sooner, the maximum blooming rate is much faster, their useful blooming period is considerably shorter, and the crop is much earlier (up to 6 weeks) than from first-year plants, and in most of the districts the ratoons outyielded first-year plants. Varietal differences were noted in regard to yields. Ratooning did not appear to have a detrimental effect on staple and quality of lint.

Ratoon plants evidently can not carry over winter the insect pests of cotton in Egypt and in general suffer less from insects than first-year plants. Pink bollworms attack ratoons earlier, but less severely, than first-year plants, although the latter when near ratoons suffer more than when ratoons are absent. Resting larvae of pink bollworm are much fewer in seeds of ratoon cotton, except in the third pickings, than in first-year plants.

Other advantages of ratoon cotton are the lower cultivation cost and the fact that pure seed will remain pure longer. The only result of these studies applicable to all cotton countries seemed to be the earliness of the ratoons, due to the fact that the plants start off in the second year with an established root system.

Paspalum renovation experiments, J. N. WHITTET, D. V. DUNLOP, and R. N. MEDLEY (*Agr. Gaz. N. S. Wales, 39 (1928), No. 2, pp. 119–132, figs. 7*).—Experiments at Wollongbar Experiment Farm, Lismore, New South Wales, in the period 1924–1927 demonstrated that plowing alone caused substantial increases in the production of paspalum, which were further amplified by the application of 2 cwt. of superphosphate (acid phosphate) per acre. Residual effects of both treatments were quite marked. Superphosphate had the greater current effect, while basic superphosphate gave somewhat the higher yields in the second year. Stock showed a marked preference for the plowed and top-dressed areas.

Size of plat and number of replications in field experiments with soybeans, T. E. ODLAND and R. J. GARBER (*Jour. Amer. Soc. Agron., 20 (1928), No. 2, pp. 93–108, figs. 2*).—Soy beans grown in cultivated rows at the West Virginia Experiment Station were harvested in units of 8 ft. of row, which permitted the composition of plats of different sizes. The crop was harvested

for forage in 1925 and for seed in 1926. Study of the data suggested that under conditions obtaining in the experiments a plat 16 ft. long and replicated three times would be most satisfactory considering accuracy and economy of land and labor.

The optimum soil reaction of the sugar beet, O. ARRHENIUS (*Indus. and Engin. Chem., 20 (1928), No. 2, p. 219, fig. 1*).—Pot experiments supplemented by field studies in southern Sweden showed sugar beets to yield best on a neutral or slightly alkaline soil (pH 7 to 7.5).

The nitrogen problem in sugar cane culture in Java [trans. title], O. ARRHENIUS (*Arch. Suikerindus. Nederland. Indië, Meded. Proefsta. Java-Suikerindus., 1928, No. 3, pp. 91–152, pl. 1, figs. 9; Eng. abs., pp. 111–113*).—Investigations were concerned with the uptake, requirement, and optimum concentration of nitrogen for sugar cane and the nitrate and ammonia equilibrium in the soil.

Cane varieties differed in their nitrogen content, E. K. 28 taking up 5 pikols per bouw (381.5 lbs. per acre); P. O. J. 2878, 7 pikols; and D. I. 52, 9 pikols. Nitrogen assimilation increased with the nitrogen concentration of the nutrient solution. The nitrogen requirement of cane was estimated to be from 8 to 10 pikols of ammonium sulfate per bouw under normal conditions. It seemed probable that cane could use ammonium nitrogen and that it suffers much if grown in a medium low in nitrogen during early growth, whereas it may endure quite low concentrations when older without much loss in tonnage or sugar.

Normal cane soil in Java seemed to contain little or no nitrites. Nitrification of ammonium salts proceeds very rapidly, being completed in less than a month. The soil was observed to be low in nitrates during the wet season, due to leaching, and also when the field is cropped. Soils differed in their nitrate contents, although the pH evidently did not influence nitrate production. The poorer soils responded well to the heaviest applications of ammonium sulfate. There was an inverse relation between nitrate production and the quantity of fertilizer applied.

Economic aspects of cane sugar production, F. MAXWELL (*London: Norman Rodger, 1927, pp. VII+199, pls. 17, figs. 4*).—This book treats of the characteristics of leading sugar cane countries, varieties, quality of cane produced, and cane and sugar yields per acre. Economic phases discussed include methods of payment for cane, labor, production costs, factories, and white sugar manufacture, and organization. The work of sugar experiment stations in Java, Hawaii, Mauritius, Queensland, and Natal is outlined briefly, and specimen contracts and agreements are appended.

Potentialities of sweet clover as plant breeding material, L. E. KIRK and J. G. DAVIDSON (*Sci. Agr., 8 (1928), No. 7, pp. 446–455, figs. 3*).—This paper discusses varietal adaptation and differentiation and variability in sweet clover species and aberrants in sweet clover, and describes the mode of pollination in sweet clover and its relation to the technique of breeding improved varieties.

A wheat variety survey in Washington, E. G. SCHAFER and E. F. GAINES (*Jour. Amer. Soc. Agron., 20 (1928), No. 2, pp. 171–181, figs. 5*).—A survey made by the Washington Experiment Station in 1926 showed that of 97.2 per cent of the wheat crop in bushels, spring wheat varieties made up 56.2 per cent and winter wheat 41 per cent. Of the spring wheat Baart produced 20.7 per cent, Bluestem 9, Jenkin 5.9, Marquis 5.4, Federation 4.8, and Hybrid 123 3.4 per cent, and the leading winter sorts included Triplet with 10.5 per cent, Turkey 8.4, Hybrid 128 7.9, Fortyfold 5.7, and Ridit 2.2 per cent. Data from surveys in 1922 and 1923 are also recorded.

Almanack and year book of the breadstuffs industries (*Northwest. Miller, 154 (1928), No. 1, Sect. 2, pp. 104, figs. 22*).—This compilation of statistical and general information on the milling industry and the grain trade is similar in scope to the volume noted earlier (E. S. R., 54, p. 136).

High pressure and seed germination [in alfalfa and sweet clover], P. A. DAVIES (*Amer. Jour. Bot., 15 (1928), No. 2, pp. 149–156, figs. 4*).—Application of a pressure of 2,000 atmospheres at 18°±2° C. to seeds of *Medicago sativa* at Harvard University increased the total germination more than 50 per cent when the seeds were allowed to dry and were germinated after 30 days and after 6 months. Similar treatment of seeds of *Melilotus alba* for from 5 to 20 minutes increased the total germination over 200 per cent when the seeds were dried and stored for 30 days before germination. An increase of over 150 per cent in germination was obtained from similarly treated seeds dried for 6 months and for 10 months before germination.

Two-hour and 8-hour exposures to 500 atmospheres at 18°±2° failed to produce the increase in germination noted above, indicating that short exposures at high pressures are more advantageous than long exposures at low pressures. Seeds of *Medicago sativa* exposed to 2,000 atmospheres pressure at 0° for 5 minutes and germinated immediately afterward gave a lower total germination than seeds exposed for 1 minute at 18°±2°, and seeds of *Melilotus alba* exposed for 30 minutes under the same conditions approximated the 5-minute exposure at 18°±2°, suggesting that short exposures at room temperature are as advantageous for germination as long exposures at 0°.

Results of seed and legume inoculant inspection, 1927, J. G. FISKE (*New Jersey Stas. Bul. 466 (1928), pp. 99, figs. 2*).—The purity and germination percentage and other data are tabulated for 1,520 official samples of field crops and garden seed and lawn mixtures obtained during 1927, and the crops, inoculation, number of organisms, and viability guaranties are shown for 60 official samples of legume inoculants.

[Bindweed control in Colorado], A. KEZER (*Colorado Sta. Rpt. 1927, p. 12*).—Control studies showed that with proper cultivation bindweed could be controlled in 2 years. Such cultivation consists of deep plowing, stopping all irrigation, and then clean and frequent cultivation with knives or such implements as the duckfoot which will cut the roots of the young plants 2 or 3 in. below the soil surface. To prevent top growth may require cultivation at least every 4 days.

Control of dodder in lespedeza, S. H. ESSARY (*Tennessee Sta. Circ. 22, (1928), pp. 2*).—Control methods recommended include removal of most of the dodder seed from lespedeza by proper threshing and recleaning and spraying field infestations early in the season with a 3 per cent solution of sulfuric acid.

HORTICULTURE

Report of the horticulturist, E. P. SANDSTEN (*Colorado Sta. Rpt. 1927, pp. 40, 41, 42*).—Tomato investigations conducted at Manzanola led to the conclusion that selection is more effective and certain than any other method of improving the tomato. In celery storage studies at Littleton it was found that cement pits were the most satisfactory. In the belief that vegetable growing in the mountain areas must be broadened to include livestock as a source of fertility, a rotation was planned which included alfalfa, potatoes, peas, and grain as well as special vegetable crops. In work at Avon with lettuce and at Fort Collins with tomatoes no general benefit was secured from the use of commercial fertilizers.

[Horticultural investigations at the Georgia Station] (*Georgia Sta. Rpt. 1927, pp. 23, 24–27, fig. 1*).—The usual annual report (E. S. R., 57, p. 235).

The results of experiments with peaches in both the Coastal and Piedmont regions again showed the value of a complete fertilizer for this fruit. High nitrogen in the fertilizer ratio for Elberta peach trees tended markedly to delay ripening. Of 1,114 Rubus crosses made in 1927, 745 were successful, but considerable difficulty was met in obtaining satisfactory germination of the resulting seeds. Onion seedlings set out in the field in late autumn were badly winter injured.

A variety planting of pecans near Cornelia indicated that this nut may be grown successfully in this region. However, injury to the crowns of young trees suggested the need of a winter protective wrapping from the ground to the crotch until the trees are 5 or 6 years old. Anatomical studies of pecan flowers showed that the pollen tube reaches the ovarian cavity soon after pollination, but that about two weeks elapse before the tubes enter the embryo sac, which does not mature until nearly 2 weeks after pollination. Actual fusion of the female and the male nuclei does not occur until the end of the fifth or sixth week. In records taken upon the number, time, and cause of pecan drops it was found that uninjured nuts such as remain small and finally drop have shrunken seed coats and no embryos, a condition entirely different from that produced by insect punctures. A condition identical with that known as blackheart was produced artificially. Studies on the development, shedding, and dissemination of pecan pollen showed that the rate of pollen shedding varies at different times of the day, and that rain or heavy dew prevents or retards shedding. Apparatus was devised which enabled the collection of pollen from the air at any height up to 30 ft. and at varying distances from the tree. Observations on two lots of pecans held at from 28 to 30° and at from 36 to 38° F. revealed no perceptible rancidity after 13 months. Some very slight changes were found in the chemical constituents of the oil of the nuts. Another lot of pecans held at from 105 to 110° for a similar period did not become rancid but lost a large part of its moisture.

[Horticultural investigations at the New Hampshire Station] (*New Hampshire Sta. Bul. 232 (1928), pp. 6–10, 23–25, 28, fig. 1*).—Continued studies upon soil management in the Woodman apple orchard (E. S. R., 57, p. 334) showed an increasing influence of fertilizers on yield. Graded in descending order in respect to their effect on yield are (1) cultivation and complete fertilizer plus 4 lbs. of nitrate of soda per tree, (2) cultivation plus complete fertilizer alone or with extra phosphorus and potash, (3) cultivation without fertilizer, and (4) sod without fertilizer. Yields in 1927 were small, that of the high nitrogen plat being about 60 per cent of the usual harvest. The failure of twig measurements to show the significant variations of earlier years is attributed to the lack of light in the lower branches of trees which grew most rapidly. The plats retained about the same relation in respect to trunk girth as in earlier years.

Tests upon the effect of the time of applying nitrogen fertilizers on the size of fruit, set of blossoms, and fruit bud formation suggested that applications during the period of active growth of the fruit do not influence the ultimate size of the apples but do have a marked influence upon the set of blooms the subsequent spring. Applications about 2 weeks prior to blooming of nitrate of soda, ammonium sulfate, and a mixture of nitrate of soda, superphosphate (acid phosphate), and muriate of potash to bearing McIntosh trees at Hollis showed all three treatments to have increased the length but not the diameter of twig growth. In the case of nitrate of soda and ammonium sulfate the

increase was approximately 25 per cent. The unexpected absence of effect on flower formation is believed due to the heavy crop of fruit, which likely reduced bud formation. Comparable results were secured at the station with nitrate of soda applied 2 weeks before and 2 weeks after blooming. No material influence was noted either on average annual twig growth or flower bud formation. Studies by G. F. Potter and T. G. Phillips indicated that both soluble and insoluble nitrogen have a very definite influence on fruit bud formation. A definite positive correlation was recorded on July 1 between the percentage of starch and the size of the spurs. This condition was not found on August 1, and the starch content in spurs of the same size did not seem to affect in any way the proportion of fruit buds formed.

In the case of peach trees the plats receiving nitrogen alone or combined with other materials made greater trunk girth gain and yielded about 7.5 lbs. more of fruit per tree. Trees receiving muriate of potash in addition to nitrate of soda yielded nearly 8 lbs. more than those receiving nitrogen alone. However, in the dry year of 1926 no increased growth resulted from potash.

Variety tests conducted by Potter, L. P. Latimer, and L. R. Tucker showed that the Delicious apple bears well colored and well flavored fruits, but the size is rather small, and a tendency to water core was observed. The Cortland is deemed of value to follow but not necessarily to supersede the McIntosh. Among pears, Flemish Beauty was promising on account of vigor and productivity, and Bartlett, Clapp Favorite, and Kieffer also fruited well.

The McIntosh apple was found by Latimer to be practically self-sterile, with Wagener and Delicious as the most effective pollinizers. The Baldwin gave poor results as a pollinizer. Of three pollens, Delicious, Wealthy, and Gravenstein, used on Baldwin, the Delicious was most effective.

Following up earlier studies by himself and Bakke at the Iowa Station (E. S. R., 56, p. 43), S. Dunn applied the adsorption of dye test to 22 apple varieties and found a general agreement with the earlier results. The readings varied from 0.018 in the case of a hardy variety to 0.105 for a tender one, the figures representing the fraction of dye left in the solution.

Fertilizer studies with sweet corn conducted by F. S. Prince and J. R. Hepler showed stable manure to be most effective, the maximum yield, 6,590 lbs. of ears per acre, for the two years 1926 and 1927 being obtained on the 30 loads of manure plat. Superphosphate was the only commercial material to pay for its original cost.

Observations on Howard 17 strawberries planted in the spring of 1926 on plats which had been fertilized in the same way for 8 years showed the greatest differences in the mortality of plants and in the number of runners per plant. Chemical fertilizers apparently increased mortality. Fertilizers had no effect on the time of ripening nor to any considerable extent on yields. Little or no influence was recorded from lime applied to half of each plat. Studies by Hepler upon the effect of superphosphate in hastening the growth of strawberry plants failed to show any significant influences. Heavy applications of manure increased and potash decreased the number of new plants. As recorded by Hepler in cabbage fertilizer studies, supplementing stable manure with inorganic forms of nitrogen or with commercial fertilizer almost invariably increased the yields beyond those obtained from added applications of manure. However, where no basic application of manure was applied the supplementary manure was more effective than chemicals. Nitrate of soda plats were consistently high yielders and tankage plats low.

Hepler found that cabbage piled in pyramidal heaps and covered with straw and soil kept best when the soil layer was not too thick, 4 in. being sufficient. With heavier coverings the temperature rose too high, with much resultant

decay. Tile chimneys had no material effect on temperatures in the pits. Spinach following strawberries on the fertility plats benefited significantly (56 per cent yield increase) from lime applications. Manure and commercial fertilizer gave better results than manure or fertilizer alone.

Preliminary studies by Phillips and T. O. Smith indicated that tomatoes have a very low potassium requirement. Plants grown with one-tenth the usual amount of potash thrived better than those on normal quantities. However, where potash was removed as closely as possible abnormal development occurred.

[Horticultural investigations at the New Mexico Station] (*New Mexico Sta. Rpt. 1927, pp. 32–44, 46, 47, fig. 1*).—Freezing weather during blossoming time in March and April was again (E. S. R., 57, p. 235) a limiting factor in fruit production, causing serious damage to most species of fruits. The Bartlett pear, although not usually considered any hardier than the apple, produced a satisfactory crop.

Observations on the resistance of several varieties of tomatoes to yellow western blight showed significant variations. Marvelosa and U. S. D. A. No. 1099 were the most resistant varieties, showing losses of 25 per cent each.

Continuation of the cabbage fertilizer project showed a general decline in yields from those of 1926. The injurious effect of shade trees on cabbage yields was shown in 10,810 lbs. per acre for the shaded part of the field as compared with 18,000 lbs. for the unshaded area. The most productive plat, 25,896 lbs. per acre, was on a soil in which an alfalfa crop was plowed under in the fall of 1925 and to which an application of 12 tons of goat manure and 200 lbs. of superphosphate (acid phosphate) per acre was applied in 1927. The lowest yield, 3,096 lbs. per acre, was on a control plat in the same area. Trenching to cut off the invading roots of the shade trees materially increased yields above those of comparable untrenched plats.

Sweet cherries, domestica, and other plums yielded very good crops in 1927. Pecans and Persian walnuts made satisfactory growth and yielded fair crops in most varieties. In the duty of water project with grapes, 2.45 acre-ft. of water in seven irrigations was required to produce a crop. Of four grape varieties, the Mission was the most productive.

An attempt to grow a fall crop of peas by sowing on July 22 resulted in only 1 per cent of germination. Lettuce sown at 15-day intervals from November 4 to the end of January germinated well in all cases but was not commercially successful due to the formation of unsatisfactory heads. The best heads developed from the November 15 and December 1 sowings. Sweet peas proved to be a satisfactory winter cover crop, both from the viewpoint of fertility and from that of an abundant yield of beautiful flowers in early spring. In variety tests of sweet corn the Evergreen varieties again proved superior.

[Horticultural investigations at the Ohio Station] (*Ohio Sta. Bul. 417 (1928), pp. 51, 54–57, 85, 89, fig. 1*).—The customary report (E. S. R., 57, p. 135).

Attempts to develop an early, round, solid, dark red canning beet progressed favorably. Tests of the Marvana, Marvelosa, and Marglobe wilt resistant tomatoes indicated that all three possess sufficient resistance to produce crops on badly diseased soils. The results of a test of pepper varieties are given.

Comparisons of the relative cost and merits of tillage and grass mulch in a Stayman Winesap-Delicious orchard which fruited commercially for the first time in 1921 showed grass mulch to be less costly and in the case of the Stayman Winesap slightly more effective in respect to yields than tillage. At the Hamilton and Clermont County Farms grass mulch with fertilizers was practically equal to tillage. In a test at Danbury fertilizers greatly increased the yields of 11-year-old Elberta peach trees.

Fruit setting studies with apples suggested a division of varieties into two groups, those which normally pass through the first drop with an average of from 2 to 4 fruits per cluster and those which reach the same stage with 2 or less fruits per cluster. In the first group were such varieties as Jonathan, Baldwin, Grimes, Ben Davis, Oldenburg, Wealthy, and Yellow Transparent. These may be nitrated over an extended period with assurance of sufficient set. However, with varieties in the second group, Winesap types and Delicious, application of nitrates should be made not later than 2 or 3 weeks prior to blossoming. Rather heavy dormant thinning of the branches of the group 2 varieties should assist in the maintenance of vigor.

The Windsor was found to be an effective pollinizer for sweet cherries. Sour cherries were not satisfactory pollinizers for sweet cherry varieties because of differences in the time of blooming. The pollinizing capacity of the Duke cherries was found to be impaired by abnormalities in the pollen. More abnormalities were observed in Montmorency than in Early Richmond pollen; in fact, Montmorency selfed gave from 26 to 28 per cent set as compared with from 36 to 42 per cent for Montmorency pollinated with Early Richmond.

Stating that peach varieties may be distinguished by leaf characters, the better known varieties are classified into groups. In studies with raspberries it was found that the thicker the cane the greater the shoot growth and the yield. Studies of the effect of pruning on the Cumberland black raspberry showed practically equal shoot growth on pruned and unpruned canes, but the shoots of the unpruned plants were inferior in size, quality, and appearance. Pruned laterals bore larger and better quality fruit than did unpruned laterals, and of 8, 12, 18, and 24 buds left per lateral the first two were most successful as respects quality, size, and appearance of the fruit. Furthermore, plants with short canes were less subject to injury during culture. In the case of the King red raspberry unpruned canes produced a larger number of berries and more average shoot growth than pruned canes. Comparing canes of different heights, it was found that yield, number of shoots, and total shoot growth increased in accordance with increased length of cane.

Records taken in an apple orchard established in 1913 on fertile, level soil at the Miami County Farm indicated that regular crops of excellent apples may be produced on this type of soil, and that in spite of the natural fertility nitrate fertilizers are beneficial in the case of sod-grown trees.

In studies in Mahoning County on soils treated with limestone and producing clover in rotation the largest increase in yield of tomatoes was obtained on plats receiving 600 lbs. of 5–12–4 (N–P–K) fertilizer. Staked tomatoes set 2 ft. apart in the row greatly outyielded unstaked plants 4 ft. apart in the row. Mulching tomatoes decreased yields and tended to delay maturity but gave nice, clean fruit in a wet season. Staking favored early ripening and lessened decay.

Dusting peaches with a mixture of 80 lbs. of sulfur, 10 lbs. of lime, and 10 lbs. of arsenate of lead proved as effective as the New Jersey dry mix spray for controlling scab, curculio, and brown rot. The pubescent surface of the peach aided greatly in the retention of the dust. On Rome apple trees (controls 98.8 per cent scabby), dusting with the above mixture gave 90 per cent of scab-free fruit. On Jonathan a 25–65–10 sulfur-lime-arsenate of lead mixture gave 90 per cent of marketable apples as compared with 13.5 per cent for the control trees. Eight dustings were compared with five sprayings, and although dusting materials cost more than sprays the work was done six times as rapidly.

Better methods of canning crops production, C. B. Sayre (*New York State Sta. Bul. 553 (1928), pp. 30, fig. 1*).—This is a preliminary report on canning crops investigations.

The application of superphosphate (acid phosphate) alone or in combination uniformly increased the yield of tomatoes, indicating that phosphorus was an important limiting factor. Of 150-, 300-, 600-, and 1,200-lb. per acre applications of a 4–16–4 (N–P–K) fertilizer, the largest yields and the largest net profits were obtained from the 1,200-lb. application. Of four materials, nitrate of soda, sulfate of ammonia, calcium nitrate, and urea, used as side dressings for tomatoes which had received 600 lbs. per acre of a 4–16–4 fertilizer before transplanting, the first two resulted in satisfactory gains, the calcium nitrate barely paid the cost of application, and urea failed to return a profit. John Baer tomatoes spaced 3 ft. by 3 ft. outyielded wider plantings both in 1926 and 1927. However, 3.5 ft. by 4 ft. is considered a more practical spacing. In comparative tests of methods of growing tomato plants and of dates of sowing seed the largest net returns were obtained from seed sown March 25 with seedlings transplanted at the rate of 108 per flat. Attempts to grow plants in the open in unheated coldframes were not successful. The John Baer proved best among 21 canning varieties tested. Marglobe proved too late in ripening.

Early and late sowings of Alaska, Surprise, Green Admiral, and Horsford peas at the rates of 3, 4, 5, and 6 bu. per acre showed 5 bu. to be most satisfactory. In both early and late sowings of Alaska, Surprise, and Green Admiral and in a late planting of Horsford, in general, the early plantings of each variety and of each rate of seeding produced approximately twice the yields of the corresponding late plantings. Weekly sowings beginning April 9 and ending May 28 showed consistently in favor of early planting. With these four varieties, a difference of 49 days between first and last sowings made only 20, 21, 16, and 10 days differences in ripening, respectively. It is suggested that varieties differing in maturity should be depended upon to extend the season rather than repeated planting.

In general the treatment of pea seeds with organic mercury compounds increased yields above costs. It is pointed out that freshly inoculated peas should not come into contact with fertilizers or with mercuric disinfectants. The grading of pea seeds before planting gave entirely negative results. Grading of seed corn, on the other hand, gave excellent results as previously noted (E. S. R., 58, p. 839). In check row plantings Golden Bantam corn 4 plants per hill, hills spaced 30 in. by 30 in., and Evergreen corn 4 plants per hill, hills spaced 36 in. by 36 in., gave the best results. Treating of corn seed with mercury compounds gave contradictory and dubious results. In rotation experiments peas following peas yielded considerably less than when succeeding other crops. Tomatoes, on the other hand, produced just as well following tomatoes.

New or noteworthy fruits, IX, U. P. Hedrick (*New York State Sta. Bul. 551 (1928), pp. 13, pls. 4*).—Briefly summarizing the present status of fruit testing and fruit breeding at the station, the author in this, the ninth of a series (E. S. R., 54, p. 643) relating to meritorious fruits tested at the station, describes 13 new or noteworthy fruits as follows: The Beauty, Formosa, and Stanley plums, the Early Elberta and Mikado peaches, the Sure Crop nectarine, the Fredonia and Golden Muscat grapes, the Latham and Lloyd George raspberries, the Fredonia gooseberry, the Mastodon strawberry, and the Adams elderberry. Four of these, the Stanley plum, the Golden Muscat grape, Lloyd George raspberry, and Fredonia gooseberry, are illustrated in color. The Stanley plum, Fredonia grape, Golden Muscat grape, and Fredonia gooseberry were originated at the station.

Chemical composition of apple juices as affected by climatic conditions, J. S. Caldwell (*Jour. Agr. Research [U. S.], 36 (1928), No. 4, pp. 289–365, figs. 12*).—Analyses for 6 successive years of the expressed juice of 216 varieties

of apples grown at Arlington Experiment Farm, Rosslyn, Va., and representing the widest possible diversity in type and character showed a definite relationship between chemical composition for any given year when the varieties were considered collectively and the amount and distribution of the climatic factors during the growing season of that year. Of the three climatic factors, sunshine, temperature, and precipitation, variations in the first were most potent, variations in temperature less effective, and precipitation only rarely of any significant influence. Under the conditions of the experiments decreases in the amount of sunshine and heat below the 50-year average resulted in a general depression of sugar content below that of normal seasons. The extent of the departure of sunshine and temperature from normal was a direct measure of the departure of the composition of the fruit from normal. There was found a definite and consistent positive correlation between sugar content, both total sugar and sucrose, and acid content and a negative correlation of sugar with content of astringent substances. The acid-astringency-sugar ratio in a single variety varied sharply from year to year.

Having previously shown that climatic conditions during the growing season exert a determining influence on chemical composition of the grape (E. S. R., 54, p. 40), the author infers that the annual crop upon a perennial plant is an integrated expression of the climatic factors for the season in which it is produced, and in the same degree to which the growth of an annual plant integrates these factors.

Mean summer or "optimum" temperatures in relation to chemical composition in the apple, J. S. Caldwell (*Jour. Agr. Research [U. S.], 36 (1928), No. 4, pp. 367–389*).—Analytical studies upon 98 varieties of apples grown at Arlington Experiment Farm, Rosslyn, Va., and representing 16 groups having supposed temperature optima ranging from 52 to 67° F. failed to support the optimum temperature theory proposed by Shaw (E. S. R., 26, p. 45), namely, that mean summer temperature is the dominant climatic factor determining quality. All of the varieties, high and low temperature groups alike, produced their best fruit under seasonal conditions which afforded the greatest opportunity for photosynthetic activity, and conversely the poorest fruit in the less favorable seasons. There was a very considerable range in the composition of the fruit of the same trees from year to year, but the tendency was for mass variation rather than individual variation. Climatic conditions favoring the attainment of high or low quality, as measured by total sugar, sucrose, acid, and astringency contents, exerted a uniform influence irrespective of the temperature groups, leading the author to conclude that varieties of apples possess a much greater capacity of adaptation to varied summer conditions than is assumed by the optimum temperature theory. Sunshine with its opportunity for photosynthetic activity rather than mean summer temperature is deemed the controlling climatic factor. During the 6 years of the study the mean summer temperature range was from 3.7° above to 1.6° below the 50-year average.

FORESTRY

[Forestry investigations at the Ohio Station] (*Ohio Sta. Bul. 417 (1928), pp. 86, 90–106, figs. 5*).—Measurements taken in plats of Corsican, white, red, and Ponderosa pines, Norway spruce, and native oaks established in 1914 showed average annual increases in diameter ranging from 0.12 to 0.26 in. and in height from 0.85 to 1.5 ft. Stating that abandoned farm lands ultimately revert to valuable forest but that the process is too slow, landowners are advised to plant desirable species, stock of which may be secured from the State nurseries which distributed over 2,500,000 trees in 1927. Tabulated data

are presented on the average annual diameter and height growth in young plantations of conifers and deciduous trees. Some of the introduced species give promise for Ohio conditions. Activities in the purchase and development of State forest lands are cited, and information is given on forest fires—their nature, control, extent, and number during the years 1922–23 to 1926–27. Forest taxation, legislation, and various educational activities relating to the care, protection, and perpetuation of the forests are reviewed.

Twenty years growth of a sprout hardwood forest in New York: A study of the effects of intermediate and reproduction cuttings, J. N. Spaeth (*New York Cornell Sta. Bul. 465 (1928), pp. 49, pls. 6, figs. 11*).—Studies in 1925 of sample plats laid out at the time of improvement cuttings (1905) in a private forest located near Poughkeepsie showed marked differences in the general trend of diameter growth curves of sprouts and of seedlings. Sprouts grew more rapidly in their youth, while seedlings made their rapid development later. For red, white, and chestnut oaks these growth differences disappeared after the trees had reached 10 in. in diameter. Improvement cuttings tended to reduce by from 30 to 50 years the time required by these oaks to attain merchantable diameter of 12 in. or more.

Volume determinations showed that in fully stocked, even aged stands of the white oak type the average mean annual increment for stands of merchantable age was 55 cu. ft., or from 190 to 200 bd. ft. per acre per year. Increments were less in the chestnut oak type than in the white oak type. In fully stocked, even aged stands of white oak type periodic annual increment in cubic feet was found to culminate between the thirtieth to thirty-fifth years, at which time it was about 85 cu. ft. per acre per year. Periodic increment in board feet culminated at about the seventy-fifth year, at which time it was about 267 bd. ft. per acre per year.

Improvement cuttings in middle age stands of white oak stimulated the rate of growth of the remaining trees and in nearly mature stands frequently resulted in abundant natural reproduction. In the absence of much undergrowth white pine reproduced abundantly under open stands of the white oak type. White, chestnut, red, and black oaks, hard maple, white ash, hickory, and white pine were found to successfully reproduce from seed. White ash was the most abundant element in reproduction on the hardwood swamp type, suggesting that the better-drained areas may be converted into a high forest with white ash predominating, while the poorly drained areas are best adapted to red maple coppice for cordwood.

Rates of growth of immature Douglas fir as shown by periodic remeasurements on permanent sample plots, W. H. Meyer (*Jour. Agr. Research [U. S.], 36 (1928), No. 3, pp. 193–215, figs. 5*).—Computation of data obtained from periodic measurements on permanent sample plats laid out on different quality sites in young stands of Douglas fir lying in the region west of the Cascade Range in Washington and Oregon showed a rapid increment in volume; for example, three Site II plats 69 years of age in the Cascade National Forest averaged a volume per acre of approximately 53,000 bd. ft., Scribner rule, and two Site I plats 53 years old in the Siuslaw National Forest averaged 47,000 bd. ft., Scribner rule. The mean annual increments for cubic feet have all neared or passed their maximum, but for Scribner volume are still gaining in all cases.

In respect to diameter growth on Site I average diameters increased at the rate of 1 in. in 3 years, on Site II 1 in. in 5 years, Site III 1 in. in 6 years, and on Site IV about 1 in. in 7 years. The character of the curve of stem distribution in diameter classes was observed to follow definite trends as the stand

grew older. From a skewness toward small diameters to a more normal or symmetrical distribution and beyond that to more and more positive skewness double frequencies with two peaks apparently merged into one with advancing age.

Mortality records showed losses of about 2 per cent of the basal area every 5 years, but since the losses were chiefly confined to smaller diameter classes the actual volume loss was small. Utilizing recently prepared yield tables for second-growth Douglas fir, tentative conclusions are presented as to the approach of abnormally stocked stands to a normal condition.

Effect of pruning Douglas fir planting stock, J. F. KÜMMEL (*U. S. Dept. Agr., Forest Serv., Forest Worker, 4 (1928), No. 2, pp. 8, 9*).—Pruning 2-year-old Douglas fir seedlings at the time of transplanting to the field exerted a beneficial influence, as measured in vigor of subsequent growth, but had no significant effect on survival. Comparing leader pruning with branch pruning, the latter was found superior, causing less interference with leader development, and hence is considered the better practice. However, when the leader was cut directly above a large lateral bud or a single vigorous lateral twig a new leader was quickly formed.

DISEASES OF PLANTS

[Plant disease investigations in Colorado], W. G. SACKETT (*Colorado Sta. Rpt. 1927, pp. 22, 23*).—In connection with a study of cucumber and tomato failures in greenhouses near Denver a successful method of soil sterilization by steam was developed (E. S. R., 58, p. 208).

Planting 3-year-old bean seed is said to have reduced the amount of bacteriosis in the Arkansas Valley. With some varieties 2-year-old seed gave satisfactory results.

In cooperative experiments on the cause of failures of cucumbers to produce a crop, seed obtained from 19 different firms gave equally healthy plants when protected from insects and partially shaded, while vines exposed to the bright sun and not protected from insects died prematurely.

A disease of onions characterized by premature blanching, falling over of tops, and a soft rot in the neck of the bulbs was found to be caused by *Bacillus carotovorus*.

Plant diseases (*Georgia Sta. Rpt. 1927, pp. 20–23, fig. 1*).—Line selection and breeding work with tomatoes for resistance to *Fusarium lycopersici* is said to have shown that when F_1 plants were set in heavily infected soils the plants in general were more susceptible than the parent varieties. One plant out of 75 seedlings showed no signs of infection, and cuttings were made of this for further experiments.

Experiments on peach rosette are said to indicate that this disease is not seed borne.

In studies for the control of *Sclerotium rolfsii* a number of chemicals are reported to have given promising results when tested in the laboratory, but applications of mercuric chloride, calcium arsenate, lead arsenate, and sodium borate applied as dusts about pepper plants in the field were not completely effective in controlling the disease. Heavy applications of lime are said to have controlled seed-bed rot of sweet potatoes due to *S. rolfsii*.

An investigation of an internal rot of pimento pepper fruits showed that the disease was due to species of Macrosporium, Penicillium, and other mold fungi which entered the fruit through the remnants of the style.

Two dust fungicides are reported to have been effective in controlling seed-borne diseases of cotton, but further experiments are desired before definite recommendations are made for their use.

Inconclusive results were obtained in experiments for the control of downy mildew of cucurbits, in which copper fungicides were applied as sprays and dusts.

[Plant disease investigations at the New Hampshire Station] (*New Hampshire Sta. Bul. 232 (1928), pp. 10, 22, 29*).—Investigations by O. Butler are said to have shown that foliage injury caused by Bordeaux mixture is dependent on dew or rain. When these were absent no injury followed spraying. Increasing the proportion of lime in the fungicide reduced foliage injury in the presence of dew or rain. When the Bordeaux mixture contained four times as much lime as copper there was no injury to apple foliage, but to prevent injury to peach foliage six times as much lime as copper is recommended.

Studies conducted by Butler are said to indicate that there is a more serious attack of bitter pit of apples during years of light bearing of Baldwin trees than when there is a heavy crop.

Comparisons made of Maine grown potato seed stock with southern New Hampshire stock are said to have shown a higher percentage of leaf roll in the local supplies. Studies having shown essentially the same temperatures during the 90-day period from May to August as for June to September, the effect of early planting was investigated, and while stock from early planting showed between 3.2 and 4.6 per cent net-necrosis late planting gave 42.9 per cent. Seed from northern New Hampshire stock planted on June 23 and harvested September 21 showed 0.78 per cent mosaic infection and 1.17 per cent leaf roll.

The removal of tubers affected by net-necrosis prior to planting reduced disease but was not a sufficient means to control it. Studies of the vigor and method of sprouting of the potato are said to indicate that a large percentage of leaf roll tubers may be recognized by the manner in which a tuber sprouts.

Comparisons of spraying v. dusting potatoes conducted by Butler are said to have shown conspicuously greater resistance to tipburn on the sprayed plats. Bordeaux mixture, 8–4–50, was applied every 14 days, while dust was applied every 7 days. Tipburn developed severely during the summer, and the nontreated and dusted plats were nearly dead on September 1, whereas the plants in the sprayed plat were still green.

Studies by S. Dunn are said to show that bean anthracnose can be controlled by heating the seed, and that preheating at a moderate temperature increased resistance to injury when seed were subjected to the higher temperatures required for the destruction of the fungus. Seed held at a temperature of 45° C. for from 8 to 20 days and then transferred to an oven maintained at from 95 to 100°, for from 1 to 8 hours, gave germinations of 92 per cent for the short period of heating as compared with 52 per cent for the longer treatment.

[Plant disease investigations of the New Mexico Station] (*New Mexico Sta. Rpt. 1927, pp. 19, 20, 21–23, fig. 1*).—In continuation of a study of the diseases of chili pepper (E. S. R., 57, p. 244), the effect of soil moisture and level and ridge planting on wilt was investigated. Practically no difference was noted in the soil moisture of the different plats, although they were irrigated differently. The level rows had the higher moisture content and the largest number of wilted plants.

All attempts to isolate a causal organism of apple measles are said to have given negative results. Grafting experiments begun in 1924 failed to show the transmission of the disease in this manner. Indications of measles were observed in 1-year-old wood. Unthrifty trees appear to be more susceptible to the disease than healthy ones, and the trouble seems most prevalent in orchards on poor soil with a high soluble salt content and poor drainage, or in low spots in orchards.

Iron sulfate was found to give only temporary relief when applied to chlorotic trees.

Further experiments on the control of powdery mildew of peas confirmed those previously reported (E. S. R., 58, p. 243).

Botany and plant pathology (*Ohio Sta. Bul. 417 (1928), pp. 34–41, figs. 2*).—A reduction of oat smut from 47 per cent in check plats to less than 1 per cent is reported for the use of dusts composed of formaldehyde in charcoal or infusorial earth and iodine in infusorial earth. No difference in the percentage of corn root rot was found to follow the treatment of the seed with organic mercury compounds. Large applications of potash and phosphorus fertilizers in the hill showed no reduction of corn-root rot.

In tests for the control of seed-borne diseases of vegetables, considerable variation was noted for different treatments, but no stimulating effect was observed following the use of any of the organic mercury compounds. Tomato seed were injured somewhat when treated according to manufacturers' recommendations for the use of their products.

In experiments on the control of scab and black scurf of potatoes, the standard treatments with corrosive sublimate or formaldehyde gave better results than any of the newer compounds tested. Three years' results in spraying and dusting potatoes indicated that freshly mixed copper-lime dust gave as good control as most of the sprays. Copper-lime dust was more effective for the control of celery blight than commercial dusts or Bordeaux mixture applied as a spray.

In connection with steam sterilizing soil in greenhouses, it was found that in ordinary greenhouse loam soil all stages of nematodes were killed by raising the temperature of the soil to 120° F. for 10 minutes. The thermal death point of the organisms appeared to lie between 116 and 118°.

Considerable attention was given to studies of tomato diseases. The bacterial wilt known as the Grand Rapids disease, which often causes serious losses in greenhouses, was found to be carried from plant to plant by the hands of workmen and by the knives used in pruning the plants. Satisfactory control of this disease was secured by the prompt eradication of diseased plants and the adoption of sanitation. Studies of the temperature, humidity, and fungicidal relations of spores of Cladosporium showed a wide range of temperature and moisture, and indicated that the spores withstand many of the standard copper and sulfur fungicides. Controlling the humidity and providing good air circulation are suggested for the control of leaf mold of the tomato. A form of injury to tomatoes is described as associated with the use of jute strings used in training the plants. Further investigations on streak of tomato (E. S. R., 57, p. 144) are said to show that this virus disease may remain in the soil for several months if the soil does not become too dry or warm. The disease was communicated to tomato plants by inoculating them with juice from potatoes affected with mild mosaic, rugose mosaic, leaf roll, spindle tuber, and even from healthy potatoes. It was also produced by the transfer of sap from nightshade previously inoculated with potato mosaic and with tomato inoculated with potato mosaic.

On account of the frequent failure of sulfur dusts and sprays to control apple scab, comparisons were made of the adhesiveness and fungicidal properties of a number of sulfur combinations in comparison with lime sulfur. The fungicidal value of the different compounds were determined as shown by the germination of spores of the fungi which cause, scab, brown rot, and bitter rot of the apple. While the lime-sulfur combinations adhered better than the others, they did not prevent the germination of the fungus spores. Field tests under comparable conditions are said to have given similar results. Chemical

tests of the fungicidal property of sulfur showed that the toxic factor is pentathionic acid (E. S. R., 58, p. 745). One year's results under conditions favorable for apple scab are said to indicate that sulfur dust will control scab if properly applied in sufficient quantity.

From a study of the accumulation of iron in connection with corn root rot, it is concluded that iron accumulation is neither a cause nor a result of root rot of corn, but is due to some other factor or factors, either genetical or physiological, which have not been fully investigated.

As a result of three years' efforts to control raspberry diseases, it is stated that there are in nurseries about 200,000 disease-free plants available to growers.

Economic mycology, R. M. Nattrass (*Univ. Bristol, Agr. and Hort. Research Sta. Ann. Rpt. 1926, pp. 134–144*).—In this portion of the report on advisory work, 1925–26, observations are outlined on the more important diseases, special investigations carried out, and investigations to be continued. Diseases mentioned cover a wide range of hosts and causal organisms indicated.

Breeding plants for disease resistance, C. E. Leighty (*Jour. Amer. Soc. Agron., 19 (1927), No. 3, pp. 219–225*).—It appears from the literature listed that disease resistance in plants is due to different causes, most of which are imperfectly understood and many of which are hardly guessed at. Some are apparently morphological, and some are physiological or chemical in nature. In the absence of a more complete understanding, however, the breeder can proceed with his work by methods already in use.

The control of plant disease through seed certification—aided by test gardens and field crop inspections, H. L. Bolley (*Phytopathology, 17 (1927), No. 1, p. 40*).—The author outlines the methods pursued by him in experiments to produce strains of wheat and flax that are resistant to certain diseases.

Increasing stands from vegetable seeds by seed treatment, E. E. Clayton (*New York State Sta. Bul. 554 (1928), pp. 16, pls. 2*).—A report is given of an investigation on the relative value of dust and liquid methods of seed treatment with organic mercury compounds in preventing decay of supposedly healthy seed after sowing, and of comparing results from such seed treatment with early sowings favorable to seed decay and late sowings not favorable to decay. A number of organic mercury compounds were used with supposedly healthy seed of cabbage, lettuce, radishes, spinach, peas, corn, cucumbers, tomatoes, and string beans, and with plantings made at intervals from early spring to midsummer.

With early sowings, treatment with the organic mercury preparations is said to have given striking increases in stand over untreated seed of all crops except spinach and lettuce. Little or no increase was observed from treated seed planted late in the season. Increased stands from treated seed planted early are attributed to protection afforded by the mercurial preparations against decay organisms in the soil. Increased yields obtained from treated seed are said to have been somewhat greater than would be expected from the gains in stand.

Seed treatment was found to increase stands in the greenhouse in midwinter greatly, but comparative sowings of the same treated and untreated seed in the greenhouse in late spring showed little or no benefit from seed treatment.

Acetic acid as a soil disinfectant, W. L. Doran (*Jour. Agr. Research [U. S.], 36 (1928), No. 3, pp. 269–280, figs. 2*).—A preliminary account is given of experiments at the Massachusetts Experiment Station which indicate that acetic acid applied to the soil protected plants against diseases caused by fungi in the soil and at a cost about half that of formaldehyde.

The application to soil of from 1 to 1.2 per cent acetic acid (equivalent to from 7.44 to 8.93 lbs. of 56 per cent acetic acid in 50 gal. of water) at the rate of about 0.5 gal. per square foot was found to protect tobacco against black root rot, brown root rot, and bed rot or damping-off, and to protect cucumber, tomato, lettuce, and white spruce against injury by damping-off during and after seed germination.

Acetic acid is said to be toxic to seeds and plants with which it comes in contact. The exact time interval which must elapse between the application of the chemical to soil and the planting of seed will depend upon the species of plant and upon the soil, from 7 to 14 days having been long enough in most cases. Acetic acid is said to have no lasting effect on the soil reaction.

Morphological notes together with some ultrafiltration experiments on the crown-gall pathogene, Bacterium tumefaciens, H. R. Rosen (*Mycologia, 18 (1926), No. 5, pp. 193–205, pls. 2*).—Developing and employing a special method of staining, the author observed in *B. tumefaciens* a marked variation in size in young cultures; the presence of many club-shaped rods in young cultures; the presence of heavily staining, bipolar bodies in ordinary rods; a central body in rods possessing one polar body; and other evidence indicating a nuclear phenomenon prior to cell division.

Using a Berkefeld V filter in preliminary experiments, the filtrate is found to contain small rods, which when transferred give rise to characteristic growths of *B. tumefaciens*. Checked with a culture of *Bacillus amylovorus*, the filtrate remained sterile. Attention is called to the budlike processes said to occur in the virus of various tumors, and a comparison is made with this and the budlike extensions on rods of *Bacterium tumefaciens*.

Notes on Testicularia cyperi, C. W. Edgerton and E. C. Tims (*Mycologia, 18 (1926), No. 4, pp. 169–171, pl. 1, fig. 1*).—Descriptive notes are given of *T. cyperi*, a smut of somewhat rare occurrence except perhaps in Louisiana, the sori of which take the place of the developing ovules of the sedge *Rynchospora corniculata*.

Effects of soil moisture and temperature and of dehulling on the infection of oats by loose and covered smuts, C. O. Johnston (*Phytopathology, 17 (1927), No. 1, pp. 31–36*).—Experiments at the Kansas Experiment Station prior to 1924 are said to have never given 100 per cent infection no matter how heavily the seed grain was smutted.

Studies were made in 1924 and 1925 to determine the effect of temperature, moisture, and presence or absence of glumes on smut infection. Seeds of susceptible and resistant varieties of oats were heavily inoculated with smut spores before planting, and the data accumulated are said to indicate that low smut infection takes place in very early and very late plantings. High smut infection apparently depends on high temperature and low moisture content of the soil. The removal of glumes increased the amount of smut infection, the increase being greatest for the susceptible and moderately susceptible varieties and least for the resistant ones. Some varieties are believed to secure their resistance through the protection afforded by the glumes, while others have protoplasmic resistance. In no case was complete infection secured, even with dehulled seed.

Formaldehyde seed treatment for oat smuts, V. F. Tapke (*U. S. Dept. Agr., Misc. Pub. 21 (1928), pp. 4, fig. 1*).—Directions are given for the spray, sprinkle, and dip methods for the use of formaldehyde in controlling oat smut.

Varietal resistance and susceptibility to wheat scab, I. T. Scott (*Missouri Sta. Research Bul. 111 (1927), pp. 14*).—A report is given of four years' tests of resistance and susceptibility of winter wheats to scab (*Gibberella*

saubinetii). Artificial inoculations were made of 189 varieties and strains of winter wheat, and the percentage of infection is shown in tabular form. Relatively low percentages of infection were obtained in most cases, the failure to produce a greater degree of infection being attributed to weather conditions during May and June of the years in which the trials were conducted.

Certain varieties and selections are said to have shown promising results in the trials, the outstanding ones with low scab infection being Fulcaster W18; Michigan Wonder No. 207; Red May W203, W210, and W214; and Red Cross W206. However, no recommendation is made of varieties or strains as resistant to scab.

Yellowing of alfalfa caused by leafhoppers, F. R. Jones and A. A. Granovsky (*Phytopathology, 17 (1927), No. 1, p. 39*).—The authors claim to have demonstrated that yellowing as observed on the second crop of alfalfa in Wisconsin is caused by *Empoasca fabae*.

Control of beet seedling diseases under greenhouse conditions, F. P. McWhorter (*Virginia Truck Sta. Bul. 58 (1927), pp. 525–544, fig. 1*).—Accord ng to the author, *Phoma betae* and *Corticium vagum solani* are responsible for most of the seed bed losses to beets grown under forcing conditions, such as prevail in eastern Virginia. These organisms are both soil and seed borne, and control measures were undertaken against the seed-borne fungi. The data recorded are held to apply only to the Extra Early Egyptian variety of beets when grown under forcing conditions and not in field practice.

The author recommends for the control of diseases the use of soil in the seed bed which has never been used for beet propagation, and it is advised that the soil should not be heavily manured as it might then contain an abundance of fungus material. After the bed has been nearly filled with the soil, a layer of clean sand about 0.5 in. in depth is recommended. The seed treatment recommended consists of treating the seeds for 3½ hours in a 0.25 per cent aqueous solution of chlorophenol mercury. Attention should be paid to the regulation of the watering of the beds, and the soil temperature should be kept from about 55 to 60° F. during the first 2 weeks.

The inheritance of reaction to Ustilago zeae in maize, F. R. Immer (*Minnesota Sta. Tech. Bul. 51 (1927), pp. 62, figs. 13*).—As a part of a general study of disease resistance and in continuation of an investigation by Hayes et al. of the inheritance of reaction to *U. zeae* (E. S. R., 56, p. 244), the author gives an account of studies of the mode of inheritance of resistance or susceptibility of corn to smut.

Studies were made of selfed lines of corn and crosses between them, selfed lines apparently homozygous for a particular type of smut reaction having been isolated after only a few years of selfing. Factors determining smut reaction were found to be transmitted alike in both male and female gametes. Crosses between selfed lines differing in smut reaction were, in general, intermediate in reaction. A slight tendency to approach the more susceptible parent was found in the F_3 and back crosses. Reaction to ear smut infection was inherited in the same manner as reaction to total smut infection. F_1 combinations of eight smut-resistant strains proved as resistant as the average of the parent strains.

The relationship between the percentage of smut-infected plants is said to have been quite constant for the same strains grown both in Minnesota and in West Virginia the same two years. The location of smut boils on the plants differed somewhat when grown in the two States, and this is thought to have been due to different physiologic forms of smut or to the conditions for infection at different stages of growth of the plants. The location of smut boils

on the plants was found to be a strain characteristic. A seedling infection study in the greenhouse showed no appreciable correlation between the amount of seedling infection with a single physiologic form of smut and plant infection under field conditions.

Linkage relations were studied between the factors determining smut reaction and one or more known genetic factors in seven of the chromosome linkage groups.

Chemical-dust seed treatments for dent corn, J. R. Holbert, C. S. Reddy, and B. Koehler (*U. S. Dept. Agr. Circ. 34 (1928), pp. 6*).—The results are given of two years' experiments with commercial mercury compounds used as seed disinfectants of dent corn before planting. Corn from well-selected, nearly disease-free seed was benefited by treatment when early planting was followed by a period of cold, wet weather. Under more favorable weather conditions following planting there was little or no increase in yields.

Varieties of corn were found to differ in the degree to which they were benefited by the seed treatments.

Further experiments with seed treatments for sweet-corn diseases, C. S. Reddy and J. R. Holbert (*Jour. Agr. Research [U. S.], 36 (1928), No. 3, pp. 237–247, figs. 5*).—In continuation of experiments for the control of seed-borne diseases of sweet corn (E. S. R., 58, p. 549), the results are given of experiments carried on in a season when conditions were favorable for the development of Diplodia seedling blight. Greenhouse and field tests were made at the Arlington Experiment Farm, near Washington, D. C., and in the field near Bloomington, Ill., in which the efficiency of a considerable number of the newer fungicides was compared.

The results are said to show that Diplodia seedling blight can be largely prevented by dust or liquid treatment with any one of several compounds and without injury to the seed. Conditions unfavorable for growth at planting time appeared to increase the relative benefits from seed treatments, and there are said to have been indications that dust-treated sweet-corn seed can remain longer in cold soils without injury than untreated seed. Dust seed treatments for the control of Diplodia seedling blight of seed corn were as satisfactory as liquid treatments, and they are said to possess certain advantages. With sweet corn, as with dent corn, it is considered advisable to separate out the nearly disease-free seed, as such seed is not benefited by seed treatments while second-grade seed is usually greatly benefited by proper treatments.

Onion immunity trials, 1926, R. M. Nattrass (*Univ. Bristol, Agr. and Hort. Research Sta. Ann. Rpt. 1926, p. 65*).—A further trial, using varieties previously (E. S. R., 57, p. 644) showing marked resistance, was made on land contaminated with *Sclerotium cepivorum*. The results as tabulated for Wroxham Globe, Rowsham Park Hero, and Up to Date stand out, with diseased root percentages as low as 9.6, 7.5, and 5.1 per cent, respectively.

Potato eelworm, J. Strachan and T. H. Taylor (*Jour. Min. Agr. [Gt. Brit.], 32 (1926), No. 10, pp. 941–947*).—Information detailed suggests, as control measures, a suitable rotation of crops with at least two years between potato crops, avoidance of soil transportation from infected fields, clearing the infected land thoroughly from potatoes, and boiling the potatoes to be used as food for pigs.

Factors of spread and repression in potato wart, F. Weiss and P. Brierley (*U. S. Dept. Agr., Tech. Bul. 56 (1928), pp. 14, pl. 1*).—The authors describe means of dissemination of potato wart and give an account of investigations on the viability of the pathogene in the dormant state, susceptibility of resting spores to heat and disinfectants, etc.

Viable sporangia of the potato-wart fungus (*Synchytrium endobioticum*) are said to be possible of dissemination on soil adhering to tubers as ordinarily handled in commerce, as well as by actually infected tubers. The simultaneous transfer of the host and parasite is said to be more effective in distributing the disease than the dissemination of sporangia alone.

Inoculation experiments are said to show that the infection of the tomato is favored by the same conditions that make for copious infection of potatoes, that is, a temperature near from 15 to 18° C., frequent wetting, and hilling soil about the stalks. Of 65 varieties of tomatoes tested none were found resistant to the fungus.

Resting sporangia adherent to tubers were not destroyed by ordinary seed disinfection as applied to potatoes.

The control of sorghum kernel smut and the effect of seed treatments on vitality of sorghum seed, C. O. Johnston and L. E. Melchers (*Kansas Sta. Tech. Bul. 22 (1928), pp. 37*).—On account of the disadvantage of treatment and occasional injury to sorghum seed by the formaldehyde soaking method used for the control of kernel smut (*Sphacelotheca sorghi*), experiments were carried on to determine whether modifications of the standard method or the employment of other chemicals would give satisfactory control without seed injury.

In formaldehyde soaking treatments satisfactory smut control was obtained when the strength of the solution was increased and the length of treatments decreased. Seed injury, however, was somewhat increased. Soaking the seed in a 1–240 solution for 30 minutes was said to have given practically as good smut control as soaking for 1 hour. Storage of seed treated with strong formaldehyde is considered to be unsafe. Dry heat treatments did not control kernel smut except when the temperature was so high as to injure the germinability of the seed or when the treatment was supplemented by the standard formaldehyde treatment. Treatment with copper-sulfate solutions gave nearly as good smut control as treatment with formaldehyde, and there was slightly less seed injury.

A number of commercial chemical compounds used as solutions gave reasonably good smut control and little seed injury. Dust treatments are considered the most promising for the control of covered kernel smut of sorghums. Copper-carbonate dust applied at the rate of from 2 to 4 oz. per bushel of seed, depending upon the copper content, is said to have given excellent smut control in experimental and demonstration plantings, with no appreciable seed injury. Dehydrated copper sulfate, Dosch copper lime, flowers of sulfur, and Corona dusts gave excellent control. Sulfur dusts of various kinds appear to be nearly as promising as copper carbonate for sorghum seed treatment and can be applied at considerably less cost.

The authors state that the amount of seed injury due to treatment depended in a large measure on the physical condition of the seed. Scarred, cracked, dull or dirty, and immature seed were often injured by relatively mild treatments, while good, sound, clean, well-matured sorghum seed were seldom injured by more severe treatments.

The growth of tobacco and brown root rot of tobacco as affected by timothy infusions of different ages, W. L. Doran (*Jour. Agr. Research [U. S.], 36 (1928), No. 3, pp. 281–287*).—Experiments of Anderson, Osmun, and Doran (E. S. R., 55, p. 450), and others are said to have shown a transitory effect of timothy on tobacco as a following crop.

The author gives an account of experiments to determine whether there is a relation between brown root rot of tobacco and the stage of decomposition of

timothy. Infusions of entire timothy plants and clippings made during the growth of timothy were added to the soil in the pots in which tobacco plants were grown. The effect on the tobacco plant was found to be sometimes harmless and sometimes injurious, depending on the age of the infusions; that is, on the stage of the decomposition of the timothy. The response of the plants to an infusion of a given age was found to be influenced by the proportion of tops to roots of timothy used and by the temperature at which the decomposition process went on. The infusions of timothy which retarded the growth of tobacco plants produced on their roots brown discolorations and lesions apparently of the same type as those which, in the field, have given rise to the name brown root rot.

The results of the investigations are considered to lend support to the hypothesis that brown root rot of tobacco is the expression of the injurious effect on tobacco roots of one or more toxic substances which are formed from, and at certain stages in, the decmposition of vegetable organic matter, especially the residues of certain slowly decomposing crops such as timothy.

The early-blight diseases of tomato, F. P. McWhorter (*Virginia Truck Sta. Bul. 59 (1927), pp. 547–566, figs. 5*).—The author describes the various manifestations of early blight of the tomato caused by *Macrosporium solani.*

Two distinct cycles of the disease are recognized, a long or complete cycle and a short cycle. The first is characterized by attacks on the seedlings in the plant bed followed by damping-off, foot rot, stem blight, leaf blight, blossom blight, and black rot. The short cycle is said to be initiated by primary leaf lesions that result from contact of lower leaves with contaminated field soil. This is followed by stem infection, blossom infection, fruit infection, and fruit drop.

The horse nettle (*Solanum carolinense*) is believed to be a possible carrier of the fungus, but the author has so far been unable to infect Jimson weed with *M. solani* from tomato.

Ecological aspects of a pathological problem (western yellow blight of tomatoes), M. Shapovalov (*Ecology, 6 (1925), No. 3, pp. 241–259, figs. 5*).—The data here recorded are thought to show that the regional as well as the seasonal prevalence of the pathological condition of a tomato plant known as western yellow blight is most influentially determined by certain combinations of weather conditions. High temperature in conjunction with low humidity favors blight development. Increase in air humidity, with temperature unchanged or even higher, reduces evaporation rate and, if of sufficient duration, is followed by a check in the development of this disease.

The exact manner in which high evaporation rates facilitate blight development is not yet clear, nor has it yet been determined whether the usual root decay in blighted plants is essential to bring about the typical disease symptoms. The rôle played by fungi requires further investigation.

Sugar beet curly-top virus, the cause of western yellow tomato blight, M. B. McKay and T. P. Dykstra (*Phytopathology, 17 (1927), No. 1, p. 39*).—Circumstantial evidence is said to indicate a relation between curly top of sugar beets and the western yellow blight of tomatoes. By transferring viruliferous leafhoppers (*Eutettix tenella*) from curly top beets to healthy tomato plants, symptoms of yellow blight resulted after an incubation period of two or three weeks under greenhouse conditions. Some of the same lot of leafhoppers transmitted curly top to sound sugar beets. All untreated control lots remained healthy.

Principles and practices of spraying deciduous fruit trees for control of plant diseases, D. G. Milbrath (*Calif. Dept. Agr. Mo. Bul., 16 (1927), No. 1,*

pp. 20–24, figs. 2).—After a summary as regards the periods of activity of the hosts and of the parasites and the conditions of susceptibility or tolerance of the hosts, a spray schedule is offered for the control of some of the more important plant diseases, including the apricot brown rot fungus (*Sclerotinia cinerea*), an apricot shot hole fungus (*Coryneum beijerinckii*), the peach blight fungus (*C. beijerinckii*), the peach leaf curl fungus (*Exoascus deformans*), and the pear scab fungus (*Venturia pyrina*). This schedule is said to be not out of harmony with the control of insect pests occurring on the same hosts.

The white root rot of fruit trees caused by Roselinia necatrix (Hart.) Berl., R. M. Nattrass (*Univ. Bristol, Agr. and Hort. Research Sta. Ann. Rpt. 1926, pp. 66–72, pls. 2*).—Attack symptoms, inoculation experiments, and fungus life history are outlined for the fruit tree white root rot fungus, *R. necatrix*, which is distinguished symptomatically from the honey fungus, *Armillaria mellea*, with which it is occasonally confused.

It appears doubtful whether *R. necatrix* can attack any other part of the plant than the fine roots, the destruction of which causes the death of the host. No fructifications of the fungus have been known to occur under natural conditions, and it remains doubtful if the conidia aid in the dissemination of the disease. It is not doubted that the sclerotia represent the resting form of the fungus in England, and that under favoring conditions they can produce mycelium capable of passing through the soil to attack healthy host plants.

Control measures are limited largely to removal and prevention. Young trees when affected can be saved by uprooting in autumn or winter, sanitation, and replanting in clean soil.

The number and arrangement of flagella of the fire blight pathogen, Bacillus amylovorus, H. R. Rosen (*Mycologia, 18 (1926), No. 1, pp. 23–26, pls. 2*).—In 1924 and 1925, cultures of bacteria from apples showing typical symptoms of fire blight at first apparently conformed with written descriptions of *B. amylovorus*. After transfers and use of a flagella stain, flagella and other differences were noted. Studies and impressions of these are briefly recorded.

The control of apple scab, N. B. Bagenal, W. Goodwin, E. S. Salmon, and W. M. Ware (*Jour. Min. Agr. [Gt. Brit.], 33 (1926), No. 1, pp. 38–49, pls. 2*).—Experimentation is described as carried out with the trees which had been used in the work previously noted (E. S. R., 56, p. 849), though the spraying in 1925 was so arranged that groups of trees received, respectively, either 2 or 3 applications of Bordeaux mixture or of lime sulfur, while 1 group was sprayed with lime surfur plus lead arsenate, applied 3 times, and in such manner that the 25 control (unsprayed) trees were so distributed that some were present in each of the 3 rows of trees that were sprayed.

The variety Bismarck, like several other commercial varieties, becomes infected in leaves produced before blossoming time and on the successively later foliage. This makes it necessary to apply the spray 3 times, the earliest of these, at the pink-bud stage of growth, being essential.

In the spraying experiments in 1925, the unsprayed trees produced only 15 per cent of healthy apples, 25 per cent of the fruit being unmarketable. The crop from thrice sprayed trees in the same rows gave for Bordeaux mixture 76 per cent scab free, 1 per cent unmarketable; for lime sulfur plus lead arsenate 71 per cent scab free, 2 per cent unmarketable; and for lime sulfur alone 65 per cent scab free, 4 per cent unmarketable.

The beneficial effects of the additional early spraying at the pink-bud stage over those in which only the 2 later sprayings were made were for Bordeaux mixture 25 and for lime sulfur 14 per cent. Serious leaf fall late in the season resulted from the use of Bordeaux mixture (both when applied twice and when

applied 3 times), though no harmful effect on the crop was observable. No evidence was obtained in 1925 that any of the spray fluids used caused a dropping of the young fruit.

Some observations on "red plant" of strawberries, E. Ball (*Univ. Bristol, Agr. and Hort. Research Sta. Ann. Rpt. 1926, pp. 73–77, pl. 1*).—The author has made some observations previously suggested by Ballard and Peren (E. S. R., 52, p. 748) regarding the symptoms, propagation, distribution, and control of the strawberry red plant disease.

It is stated that red plant is most easily recognized in the spring at blossoming time, but that it can also be recognized later in the year. The disease is already widespread. Some strains appear to be entirely unaffected. Circumstantial evidence indicates that the disease can be controlled by roguing at blossoming time.

Banana freckle and leaf spot, O. A. Reinking (*Mycologia, 18 (1926), No. 4, pp. 185, 186*).—Recent investigation is said to indicate that in the Philippines leaf spot and banana freckle are the same and similar to the banana freckle described by Carpenter (E. S. R., 41, p. 153) as occurring in Hawaii, and to be caused by the fungus here designated as *Macrophoma musae*. After a brief review of the literautre the present author suggests that Carpenter's *Phoma musae* should be reduced to a synonym of *M. musae*. Banana freckle or black spot will then have to be designated as caused by *M. musae*.

No infection of the banana Gros Michel was observed in the course of the investigation here referred to, even when it was growing adjacent to heavily infested bananas of the Chinese Dwarf variety.

Two species of Physalospora on Citrus and other hosts, N. E. Stevens (*Mycologia, 18 (1926), No. 5, pp. 206–217, figs. 2*).—A Physalospora found on Citrus and other hosts in Cuba is described as *P. fusca*. This fungus is distinguished from other known species of the genus in having brown ascospores. The perfect stage of the fungus, which has usually been called *Diplodia natalensis* in this country, appears to be identical with *P. rhodina*, and *P. gossypina* is thought to be a synonym of this fungus. What is thought to be the pycnidial stage of *P. rhodina* has been received from various localities outside of the United States.

Chrysanthemum eelworm, K. M. Smith (*Jour. Min. Agr. [Gt. Brit.], 33 (1926), No. 1, pp. 57–60, pl. 1*).—In the fall of 1924 and the spring of 1925 there appeared in Lancashire and Cheshire a serious disease of chrysanthemums known then locally as rust due to the symptoms, which differed somewhat with varieties as did also the susceptibility to attack by the nematode, *Aphelenchus ritzemabosi*. Among the less susceptible varieties, as listed, are September Glory, Goldfinch, Crawford Yellow, Golden Glory, Baldock Crimson, Western King, Phyllis Cooper, and Bronze Beauty.

A rot of gladiolus corms caused by Penicillium gladioli, L. McC. and Thom, L. McCulloch and C. Thom (*Jour. Agr. Research [U. S.], 36 (1928), No. 3, pp. 217–224, pl. 1*).—A detailed account is given of investigations on a disease of gladiolus corms and Tigridia bulbs caused by *P. gladioli* (E. S. R., 58, p. 853).

Experiments with corrosive sublimate and commercial fungicides for the control of the disease are said to have shown that the sclerotia of the fungus are rather resistant.

Brief notes are given of other sclerotial diseases of gladiolus.

Notes on Hibiscus diseases in West Java, C. Hartley (*Phytopathology, 17 (1927), No. 1, pp. 25–27*).—The author reports *Bacterium solanacearum*, *Sclerotium rolfsii*, or a nearly related species, *Colletotrichum hibisci*, and *Heterodera radicicola* attacking *Hibiscus cannabinus*, and a form of injury

of *H. sabdariffa altissima* unlike that described by B. T. Palm and S. C. J. Jochems and differing from that reported by Reinking as due to *Phoma sabdariffae* (E. S. R., 41, p. 841).

A witches' broom of introduced Japanese cherry trees, A. Rathbun-Gravatt (*Phytopathology, 17 (1927), No. 1, pp. 19–24, fig. 1*).—A description is given of witches'-broom of Japanese cherries caused by *Exoascus cerasi*, which is believed to have been introduced in and near the District of Columbia on trees imported from Japan in 1906 and 1912.

All infections were cut out and burned, and the disease is believed to have been eradicated.

Lilac blight in the United States, M. K. Bryan (*Jour. Agr. Research [U. S.], 36 (1928), No. 3, pp. 225–235, pls. 2, figs. 3*).—A study is reported of a lilac blight occurring in Illinois that was found to be identical with a disease described by van Hall in Europe (E. S. R., 13, p. 1019). The blight is caused by *Bacterium syringae*, and the disease is characterized by the blackening and killing of the young stems and leaves in the spring. It is said to be most destructive in rainy seasons, and the appearance of the affected plants suggests fire blight.

Comparative studies of *B. syringae* and *B. citriputeale*, reported as a probable cause of a lilac blight in California (E. S. R., 58, p. 658), are said to have failed to show any distinguishable characters in cultures, and the two organisms are believed to be identical.

Rose diseases: Their causes and control, A. M. Waterman (*U. S. Dept. Agr., Farmers' Bul. 1547 (1928), pp. II+20, figs. 10*).—Popular descriptions are given of the more common diseases to which roses in the home garden, nursery, or greenhouse are subject, and the best methods of control are indicated.

Sweet pea fasciation, a form of crowngall, N. A. Brown (*Phytopathology, 17 (1927), No. 1, pp. 29, 30, pls. 2*).—A form of fasciation of sweet peas occurring in the greenhouse in New Jersey and elsewhere is described. Inoculation experiments are said to have shown that the disease is caused by the crown gall organism, *Bacterium tumefaciens*.

Observations on forest pathology in Great Britain and Denmark, J. S. Boyce (*Phytopathology, 17 (1927), No. 1, pp. 1–18*).—Notes are given of observations made in 1925 on the diseases of forest trees in Great Britain and Denmark, especial attention having been given to the pathological condition of various species of conifers introduced from the western part of the United States.

ECONOMIC ZOOLOGY—ENTOMOLOGY

The beaver in the Adirondacks: Its economics and natural history, C. E. Johnson (*Roosevelt Wild Life Bul. [Syracuse Univ.], 4 (1927), No. 4, pp. 499–641, pls. 3, figs. 41*).—A discussion of the economic status, distribution, and natural history of the beaver in the Adirondacks in connection with a list of 49 references to the literature.

Protection of marine piling against borer attack: Chemical aspects, W. D. Ramage and J. S. Burd (*Indus. and Engin. Chem., 19 (1927), No. 11, pp. 1234–1240, fig. 1*).—Straight-run or whole creosotes have been found to penetrate wood in an unaltered condition, there being no tendency toward filtration of the heavier constituents in the outer layers of the wood. "There is no fixation of creosote constituents in the wood, and low-boiling substances do not polymerize to any appreciable extent to form high-boiling substances. The loss of creosote from treated wood is due to the combined volatility and solubility of the constituents in the low-boiling fractions, and the loss falls almost

entirely on these low-boiling constituents. Creosote constituents boiling below 235° C. are largely lost from treated wood within two or three years; therefore the percentage of these low-boiling constituents in the oil should be limited to the amount necessary for good penetration. Also, the tar-acid specification should refer to the fractions above 235°.

"Certain oil-tar distillates have a greater protective value against marine borers than that with which they have ordinarily been credited. Inorganic substances, by themselves, have little prospect of value in the preservation of marine piling against borer attack. Chlorine treatment has no practical value in the protection of piling against marine borers."

Report of the entomologist, C. P. GILLETTE (*Colorado Sta. Rpt. 1927, pp. 29–31*).—The more important of two pests discovered in the State for the first time was the Hessian fly, found at harvest time in some of the wheat fields in Phillips County. The other was the strawberry Harpalus, a black ground beetle rather common in portions of the eastern part of the country, which was found near Fort Collins in strawberry fields, in some of which the loss of fruit was practically complete. The asparagus beetle, a comparatively recent importation from the eastern part of the country, became a rather serious pest in some of the truck gardens in the vicinity of Denver.

[Work with economic insects at the New Hampshire Station] (*New Hampshire Sta. Bul. 232 (1928), pp. 23, 25, 32, 33*).—A brief reference is made to the European corn borer, which has not yet become a menace in the State. Studies of this pest were conducted by W. C. O'Kane in more than 20 localities in continuation of those noted in Technical Bulletin 33 (E. S. R., 57, p. 262). There was no visible increase in numbers over those of the preceding three years. Individuals representing the two-generation phase seemed unable to reach sufficient development to hibernate successfully. A majority of the individuals attempted a second generation, however, in spite of an unfavorable length of summer season.

Brief reference is also made to a study of the life history of the stalk borer by P. R. Lowry, a more detailed account of which, given in Technical Bulletin 34, has been noted (E. S. R., 58, p. 259). It is pointed out that infestation may be prevented by plowing or closely mowing grassland or weed areas around cultivated fields and gardens from about the middle of August to the first week in September, thus preventing egg laying in these areas. Mowing infested weeds or grasses while the larvae are still in the active feeding stage is more likely to increase the infestation in cultivated crops. Burning weeds and grasslands from November to April will destroy the eggs, and especially prized plants may be protected by collars with a band of tanglefoot around the outside.

The increase of the codling moth during the preceding two or three seasons in the apple orchards of the State and the more drastic restrictions as to permissible residues of spray materials on fruit, especially compounds of arsenic and lead, led to work with a view to possible modification of the sprays. The restrictions brought about new developments in spray materials, which point to the possible use of white oils impregnated with organic poisons such as those derived from pyrethrum. Among the insects under observation were the brown-tail moth, Colorado potato beetle, the imported cabbage worm, the squash bug, the tarnished plant bug, and the fall webworm. The percentage of kill secured in each case is said to have been relatively high. It is pointed out that the creep of the impregnated oils, as influenced by additions of small amounts of soap, for example, has an important bearing on its toxicity.

Studies of the life history of the white-pine weevil were continued, and several gaps in the known life history were filled. Some parasitic enemies were discovered that had not previously been found to attack this pest in the State.

[Work with economic insects at the New Mexico Station] (*New Mexico Sta. Rpt. 1927, pp. 20, 21, 23, 44*).—Brief references are made to the progress of projects dealing with the San Jose scale, insects of field and garden crops, including the cabbage aphid, red spider, Harlequin cabbage bug, Mexican bean beetle, cucumber beetle, and imported cabbage worm, and of the giant apple root borer, cottony maple scale, and codling moth.

Experiments with 2 to 4 per cent red engine oil, using Kayso as an emulsifier, gave good results against the San Jose scale, it being easly applied and costing less than lime sulfur.

Dusting with nicodust was satisfactory for controlling the cabbage aphid, but frequent applications were necessary. A thorough dusting with finely divided sulfur dust gave good control of the red spider. Dusting the plants with sodium fluosilicate or cyano-dust proved satisfactory against the Harlequin cabbage bug. The Mexican bean beetle was controlled by the use of magnesium arsenate when applied at the rate of 2 lbs. to 100 gal. of water, or as a dust. The application of sodium fluosilicate at the rate of 1 lb. of the insecticide to 2 lbs. of hydrated lime is recommended for use against the cucumber beetle. The use of 1 lb. of lead or calcium arsenate to 4 lbs. of the nicodust against the imported cabbage worm gave satisfactory control.

Paradichlorobenzene was found to offer possibilities as a control for the giant apple root borer. In work with the cottony maple scale at Las Vegas it was found that a 4 to 6 coal oil emulsion spray gave a fairly satisfactory control.

In control work with the codling moth it was found that Ben Davis trees sprayed 6 times had 71 per cent sound fruit and the check trees had 47 per cent sound fruit, while Winesaps sprayed 6 times had 96 per cent sound and check trees 88 per cent sound. Arkansas Blacks sprayed 6 times had 76 per cent of sound fruit and the unsprayed trees 62 per cent sound.

[Work in entomology at the Ohio Station] (*Ohio Sta. Bul. 417 (1928), pp. 42–50*).—A brief account is given of studies of the European corn borer in Ohio, and brief mention is made of other corn insects, the oriental fruit moth (*Laspeyresia molesta* Busck), the European red mite, apple aphid experiments, the codling moth, apple leafhopper, subterranean potato insects, the beet, or spinach, leaf miner (*Pegomyia hyoscyami* Panz.), the garden centipede (*Scutigerella immaculata* Newport), thrips in greenhouses, and the greenhouse leaf tyer.

[Reports on economic insects] (*Ceylon Dept. Agr. Buls. 45 (1919), pp. 4, pl. 1; 46 (1919), pp. 23, pls. 4, figs. 2; 54 (1922), pp. 38, pls. 11; 56 (1922), pp. 30, fig. 1*).—Bulletins on economic insects from the Ceylon Department of Agriculture not previously noted include the following: Tortrix Flight Breaks and Field Experiments with Anti-tortrix Fluids, both by N. K. Jardine; The Treatment of Buried Prunings on Shot-hole Borer Infested Estates, by F. P. Jepson; and The Effect of Manures on the Shot-hole Borer of Tea (*Xyleborus fornicatus* Eich.), by C. H. Gadd and F. P. Jepson.

[Pink bollworm and the Thurberia weevil] (*Assoc. South. Agr. Workers Proc., 28 (1927), pp. 142–149*).—Two papers dealing with these pests are given, namely, Present Status of the Pink Bollworm and the Thurberia Weevil from a Quarantine Standpoint, by R. E. McDonald (pp. 142–145), and Status of Pink Bollworm and Thurberia Weevil Infestations in the United States in View of the Recently Discovered Arizona and New Mexico Infestations, by G. G. Becker (pp. 146–149).

[Cranberry insects], C. S. Beckwith (*Amer. Cranberry Growers' Assoc. Proc. Ann. Meeting, 58 (1928), pp. 14, 15*).—While there are many species of leafhoppers that occur on cranberry bogs, the three most important in order of

the number of individuals are the blunt-nosed leafhopper (*Euscelis striatulus* Fall.), the sharp-nosed leafhopper (*Platymetopius frontalis* Van D.), and the yellow leafhopper (*Thamnotettix smithi* Van D.). The first two of these are said to be present in Massachusetts and Wisconsin but not in the Washington-Oregon section. Since false blossom is present in all sections but does not spread in Washington and Oregon, the possibility of one or both of these leafhoppers being carriers is suggested.

Insect studies in relation to cranberry false-blossom disease, I. B. Dobrosky (*Amer. Cranberry Growers' Assoc. Proc. Ann. Meeting, 58 (1928), pp. 6, 7, 10, 11, figs. 3*).—"In a limited number of experiments carried on during 1924 and 1925, the toad bug, *Phylloscelis atra* Germ., the large green leafhopper, *Gypona octolineata* (Say), and the sharp-nose leafhopper, *Platymetopius magdalensis* Prov., did not transmit the false blossom disease of cranberries. . . . Because of its presence in regions where this disease occurs, and because of its abundance and activity in the bogs in New Jersey during the season of 1926 when this disease was spreading rapidly, the blunt-nose leafhopper, *Euscelis striatulus* Fall., is suspected of being the agent for the spread of cranberry false blossom."

Cockroaches, silver-fish, and book-lice, E. I. McDaniel (*Michigan Sta. Circ. 101 (1928), pp. 12, figs. 3*).—A brief account of these pests, with means for their control.

Contributions to the physiology of digestion in the Australian roach, Periplaneta australasiae Fab., R. L. Abbott (*Jour. Expt. Zool., 44 (1926), No. 1, pp. 219–253, figs. 8*).—This is a report of studies of the rôle of the crop in absorption and in the digestion of fat, the number and nature of the enzymes of the midintestine, and the possible function of the rectal glands.

Records of Australian Thysanoptera (thrips), [I], II, A. A. Girault (*Queensland Agr. Jour., 27 (1927), No. 5, pp. 403–406; 28 (1927), No. 4, pp. 348–352*).—Part 1 records the occurrence of 37 forms, and part 2 gives additional records of 58 forms.

Notes on cotton-stainers (Dysdercus) in the Sudan, J. W. Cowland and W. Ruttledge (*Bul. Ent. Research, 18 (1927), No. 2, pp. 159–163, fig. 1*).—This is a brief report of a year's observations by the assistant Government entomologists in the Sudan.

Midsummer sprays for the peach cottony scale, S. W. Harman (*New York State Sta. Bul. 552 (1928), pp. 22, pls. 2*).—A further account of work with the peach cottony scale (*Pulvinaria amygdali*), a popular discussion of which has been noted (E. S. R., 56, p. 257), as has a report of tests with oil sprays against the hibernating scales (E. S. R., 57, p. 760).

In this bulletin the author considers the seasonal history, relative importance of summer applications, selection of spray materials, and insecticidal efficiency of various spray mixtures, much of the data relating to which are presented in tabular form. The experiments were conducted to determine the tolerance of peach foliage to spray applications of the more promising insecticides as well as to determine the efficiency of these materials when used during the summer months in combating the pest. The insecticides used in these tests included lubricating oil emulsions containing either Junior Red Engine oil or Diamond Paraffin oil, Volck, Medina Summer Emulsion, white mineral oil No. 11 emulsion, nicotine sulfate, Ivory soap, potash fish-oil soap, lime sulfur, Bordeaux mixture, and bichloride of mercury.

Under conditions governing the tests, white oil emulsions, namely, Volck, Medina Summer Emulsion, and white mineral oil No. 11 emulsion, caused little or no appreciable injury. However, when used in combination with Bordeaux

mixture or when applied on foliage retaining sulfur residues, they caused shot-hole injury and premature dropping of the peach leaves. Undiluted white mineral oil No. 11 was the only material tested that killed eggs within the ovisac. Exposed or naked eggs were destroyed by the 2 per cent white oil emulsions, but in general only a small percentage of the eggs even in ruptured ovisacs succumbed to treatment.

The white mineral oil emulsions at 2 per cent strengths proved the most effective sprays for midsummer treatment of the peach cottony scale. One thorough application at the end of the egg-hatching period and before smutting of the fruits was evident gave commercial control. The nicotine soap spray killed the active larvae at the time of application, but the degree of protection afforded the trees was inferior to that secured with white oil emulsions. Apparently it is ineffective against the few scales that have established themselves before the treatment, and there is little or no residual influence on the crawlers that emerge subsequent to treatment. Two applications, one during and the second at the end of the hatching period, were necessary to give satisfactory control. Heavy soap applications were not as efficient as the nicotine-soap combinations.

The most satisfactory method of controlling the pest consists of an application of an oil spray when the buds begin to swell during early spring.

The cotton bollworm in South Australia, A. M. Lea (*Jour. Dept. Agr. So. Aust., 31 (1928), No. 6, pp. 608–615, figs. 17*).—A summary of information on this pest contributed by the South Australian Museum.

The potato tuber worm, F. W. Poos and H. S. Peters (*Virginia Truck Sta. Bul. 61 (1927), pp. 595–630, figs. 3*).—This is a report of studies on the life history and control of this pest conducted in 1926 and 1927 in continuation of those by Spencer and Strong previously noted (E. S. R., 55, p. 356).

Data on larval development of males and of females in 1927 are presented in tabular form. The eggplant leaf miner, *Phthorimaea glochinella* Zell., is considered as an associated species, drawings being given which illustrate the differences in the genitalia of the two species. The account also includes notes furnished by C. Heinrich on the differentiation of the larvae of the two species. No characters could be found to differentiate the pupae except size, those of the potato tuber worm varying from 7 to 7.5 mm. in length and those of *P. glochinella* from 5.5 to 6 mm.

The host plants of the pest, listed in the order of their importance during the 2 years, are potato, tobacco, jimson weed, eggplant, and horse nettle.

A list is given of 13 species of parasites that were reared from the potato tuber worm in Virginia during the course of the 2 years, 11 of which were considered primary. Eight of these parasites were also reared from the closely related eggplant leaf miner. *Microbracon gelechiae* (Ashm.) was the most abundant species in the early part of the season, while *Campoplex ferrugineipes* Ashm. was the most abundant in the latter part, especially in the potato sections of the State.

The results obtained from the use of insecticides applied as dusts to control the pest are reported in tabular form. Four applications as dusts reduced the number of larval mines 50 per cent as compared with the check plats. Similar tests with sprays gave no appreciable reduction in the number of larval mines. Experiments indicated that large numbers of moths could be attracted to sweetened baits and that molasses was preferred to brown sugar, Karo sirup, or honey; also that the dilution was not of special importance. Many moths were attracted to trap lights. None of these measures, however, gave promise of being practical control measures.

When the potato tuber worm is abundant, special care should be taken to keep the tubers covered with at least 2 in. of soil before harvest in order to prevent entrance by the larvae. Early harvesting is recommended. Potatoes should be barreled immediately upon being plowed out and then removed from the field to a sheltered place until they can be disposed of, in order to protect them from the insect and the weather.

It is pointed out that the only certain way of controlling the pest in tidewater Virginia, where there is a large concentrated potato acreage, is to destroy the cull potatoes of the spring crop and eliminate the fall crop.

Three shade tree insects, W. J. Baerg (*Arkansas Sta. Bul. 224 (1928), pp. 25, figs. 13*).—The insects here considered are the bagworm, the walnut caterpillar, and the fall webworm.

The bagworm is thought to occur in every county of the State. Studies of its life history have extended over the period of 4 years from 1924 to 1927. Observations of its instars and measurements of larvae in 7 male and 8 female instars are recorded, as are observations of its oviposition on various host plants. Parasites reared by the author during the course of the studies include *Spilocalcis mariae* Riley, *Eupelmus amicus* Gir., and *Allocota thyridopterigis* Riley.

The walnut caterpillar, which prefers black walnut, frequently occurs on pecan, butternut, English walnut, Japanese walnut, and hickory. Its life history and habits, including dates of oviposition, hatching and growth of larvae, duration of pupal stage, and instars and measurements of larvae of the second generation of 1927, are reported upon. In the course of the life history studies the author reared several parasites of the eggs and larvae.

The fall webworm in northwest Arkansas prefers to feed on persimmon and hickory, but commonly occurs on walnut, elm, maple, oak, and other shade trees, as well as on various fruit trees. A brief account is given of its life history and habits, including dates of oviposition, hatching of the eggs, larval instars, and pupation. It is stated that under extremely favorable conditions in the northwestern part of the State there may be a partial second generation, although proof is wanting. Under conditions prevailing in the extreme southern part of the State there is thought to be at least a partial second generation as a rule. In the course of the study the author reared the parasites *Apanteles hyphantriae* Riley and *Hyposoter pilosulus* Prov., the latter appearing to be quite effective.

The bulletin concludes with a brief discussion of control measures.

Soil type influences corn borer infestation (*Ohio Sta. Bul. 417 (1928), pp. 24, 25*).—With a view to determining the influence of the soil factor, observations of the type of soil were made on 350 fields for which infestation counts had been made. In field corn, infestation of which is highest and is fairly uniform on Toledo silty clay, a survey of 28 fields showed an average infestation of 62 per cent. Field corn on sandy soils within the Lake Plain showed in three cases an average infestation of 44 per cent. Corn on the upland soils to the south, consisting of Mahoning silty clay loam and Volusia silty clay loam, showed a very low infestation.

Bacterial diseases of the European corn borer larvae (Pyrausta nubilalis Hübn.) [trans. title], S. Metalnicov and V. Chorine (*Compt. Rend. Acad. Sci. [Paris], 186 (1928), No. 8, pp. 546–549*).—An account is given of studies made of several bacterial forms found attacking the European corn borer in France in 1927. Two of the forms were extremely pathogenic when ingested by the borers, one related to *Bacillus sphingidis* and *B. noctuarum* described by

White in 1923 (E. S. R., 50, pp. 845, 846) and the other related to *Coccobacillus acridiorum* d'Herelle (E. S. R., 27, p. 357).

These organisms were responsible for a high mortality among the borers in Artemisia stalks in September and October, 1927. From 60 to 70 per cent of the borer larvae placed in a jar containing pieces of Artemisia stalks wet with a culture of the organism succumbed in 24 to 48 hours, it having penetrated their tunnels to the interior of the stalks, and their blood was found to contain large numbers of the bacteria. Since similar results were obtained with both forms, this is considered to have demonstrated the possibility of their practical use in combating the pest. Through use of special culture media and by passage the authors have succeeded in increasing the virulence of the organisms until a mortality of 95 to 100 per cent has been obtained in worms infected by ingestion.

Influence of the hydrogen-ion concentration in culture media on the virulence of the Coccobacillus of the European corn borer [trans. title], V. Chorine (*Compt. Rend. Acad. Sci. [Paris], 186 (1928), No. 10, pp. 657–659*).—This is a brief account of work conducted with a view to increasing the virulence of the small Coccobacillus pathogenic for the European corn borer, above referred to.

Latoia bicolor Walk., a new pest of dry rice [trans. title], S. Leefmans (*Landbouw [Buitenzorg], 3 (1927), No. 6, pp. 387–389, fig. 1; Eng. abs., p. 389*).—This is a brief account of a slug caterpillar which attacks rice grown on dry fields in Java.

On a lycaenid butterfly attacking pineapples in Trinidad, B. W. I., W. V. Harris (*Bul. Ent. Research, 18 (1927), No. 2, pp. 183–188, pls. 2*).—This is an account of observations of *Thecla basilides* Geyer.

Some notes on tea tortrix (Homona coffearia Nietn.), J. C. Hutson (*Ceylon Dept. Agr. Yearbook, 1927, pp. 11–18, pl. 1*).—These notes on the life history, habits, and control measures supplement the data given in Bulletins 40 (E. S. R., 41, p. 357) and 45 and 46, above noted.

Notes on the "diamond back-moth" (Plutella maculipennis Curtis), F. Q. Otanes and P. Sison (*Philippine Agr. Rev., 20 (1927), No. 2, pp. 251–254, pl. 1*).—An account of a lepidopteran that is a destructive enemy of cabbage and other cruciferous vegetables such as radishes, pechay, etc., in the Philippines.

Mothproofing fabrics and furs: A consideration of the procedures that have been proposed by others and a description of a new process, L. E. Jackson and H. E. Wassell (*Indus. and Engin. Chem., 19 (1927), No. 10, pp. 1175–1180, figs. 3*).—This contribution from the Mellon Institute of Industrial Research reports upon an investigation of possible moth-repelling chemicals, a list of 118 of which is given. The work, which was conducted largely with the webbing clothes moth although the black carpet beetle was also used, led to the discovery that the cinchona alkaloids and their derivatives are particularly effective moth repellents.

In order to make the food of the clothes moth unattractive, bitter substances such as aloes and ethyl phthalate were tried on wool, which was then exposed to the insects. Certain alkaloids were chosen for study on account of their bitterness and also because they form salts with such acids as hydrofluoric acid. Although bitterness and the property of forming a hydrofluoride did not prove to be the essentials needed to produce a mothproofing compound, the choice of substances for trial based on this hypothesis finally led to the discovery of a series of compounds that have strong moth-repelling properties. Most of them proved to be ineffective mothproofing agents.

A process in which one of the cinchona alkaloids is employed is said to have been in commercial use for more than a year in the dry-cleaning industry in eight large cities in the eastern, southern, and mid-western parts of the United States. Processes utilizing the cinchona alkaloids are said to be adaptable to many other industries in which the clothes moth is a destructive nuisance.

It is pointed out that the cinchona alkaloids are inodorous; they adhere to the materials to which they are applied; they can be put on evenly like a dyestuff; they are not apparent on the materials treated; they do not dust off; they do not affect undesirably the physical properties of textile fibers; they can be made soluble in inexpensive organic solvents, such as petroleum naphtha, as well as in water; they are nontoxic to human beings; they are valuable clothes moth repellents; and they are economical to use industrially. They are commercially suitable for treating materials by immersion in or by spraying with the solution.

The bulb flies of narcissus with special reference to the bulb industry in Virginia, F. W. Poos and C. A. Weigel (*Virginia Truck Sta. Bul. 60 (1927), pp. 569–594, figs. 3*).—This is a summary of information on the narcissus bulb fly and the lesser bulb fly in connection with a list of 52 references to the literature.

The rôle of flies in the transmission of the germs of some diseases important in Tunis [trans. title], E. Wollman (*Arch. Inst. Pasteur Tunis, 16 (1927), No. 4, pp. 347–364, figs. 4*).—Included in this discussion is an account of studies of the rôle of flies in the transmission of undulant fever. Experiments conducted by the author have shown that the house fly may transmit *Bacterium abortum* at least as long as 24 hours after becoming infected. Autosterilization does not appear to take place within 48 hours, and in one case *Lucilia caesar* carried this organism an even longer period.

Observations on the oviposition of Aëdes aegypti Linn. in relation to distance from habitations, L. H. Dunn (*Bul. Ent. Research, 18 (1927), No. 2, pp. 145–148*).—The author has found the yellow-fever mosquito to manifest a preference for ovipositing in water containers located outside of houses, with bushes and trees near by to provide places of rest and concealment, as compared with containers of similar type inside of houses. It may oviposit in water containers 500 yds. from human habitations with no known nearer source of blood supply.

Biology and control of the blackberry leaf-miner, D. M. Daniel (*New York State Sta. Tech. Bul. 133 (1928), pp. 38, pl. 1, figs. 5*).—This is a report of studies conducted during 1926 and 1927 with the blackberry leaf miner (*Metallus rubi* Forbes), including descriptions of its life stages, studies of its life history and habits, seasonal history, natural enemies, and methods of control. This pest is said to be a limiting factor in the culture of blackberries in western New York. The injury results from the feeding of the larvae, which mine between the two surfaces of the leaf. In certain years from 60 to 70 per cent of the total leaf surface in a field may be destroyed. Heavy infestations for successive years weaken the plants, causing poorly developed fruits of inferior flavor.

In control work the larvae were found the most susceptible to insecticides, 4 per cent oil sprays of the highly refined white oil emulsion type giving from 18 to 86 per cent kill. Of the two oils tested, Volck averaged 54 per cent control and Medina Summer Emulsion 39 per cent. The organic insecticide Derrisol, at a dilution of 1 to 200, averaged 69 per cent control. The results obtained are considered insufficient to warrant recommendations until the experiments have been completed. It is pointed out that while the blackberry is the preferred host the dewberry also suffers injury.

Natural enemies of the pear leaf-curling midge, Perrisia pyri Bouché (Dipt., Cecidom.), J. G. Myers (*Bul. Ent. Research, 18 (1927), No. 2, pp. 129–138, figs. 5*).—This is a report of investigations conducted by the author largely in France in 1925, while under a commission from the New Zealand Government Department of Agriculture.

There were found to be three main parasites and one very efficient predator associated with *P. pyri* in France. Of these, at least during July and August, the predacious capsid *Pilophorus perplexus* achieves the greatest destruction of midge larvae. The two species of platygasterids differ in several points of ethology from the species of the same or closely related genera attacking the pear midge (*Contarinia pyrivora*). They are both egg parasites, developing very slowly in the midge larvae during the growth of the host. Their action appears to be largely complementary, corresponding to morphological differences in the organs of oviposition. Their life history is very imperfectly known. *Torymus abbreviatus* is extremely efficient. Its eggs are laid within the curled leaf among well grown midge maggots, on which the larva lives as an ectoparasite. The duration and location of the pupa stadium is not yet known. Some half dozen other enemies were found to play a less important part.

Ceratopogon shimai, a new midge affecting the domestic fowl, C. Sasaki (*Imp. Acad. [Japan] Proc., 3 (1927), No. 10, pp. 687–689, figs. 7*).—The author here describes a new species of Ceratopogon which seriously affects the domestic fowl in Japan. This midge makes its appearance from June to October. Remaining secure in shelter in the day time, it comes out at night and sucks blood from the comb of the fowl. The point attacked becomes inflamed and is found to remain as a dark spot. This midge also frequently attacks man.

The copra bug (Necrobia rufipes DeGeer), C. H. Corbett and C. Dover (*Trop. Agr. [Ceylon], 69 (1927), No. 6, pp. 351–354*).—This is an account of the red-legged ham beetle, which is widely distributed in the warmer parts of the world as a pest of copra and other stored products, often doing considerable damage. Both larvae and adults are actively predacious.

Life history of the apple curculio, B. B. Fulton (*Iowa State Hort. Soc. Rpt., 60 (1925), pp. 36–39, pls. 2*).—In this brief account the author summarizes the life history and habits of the apple curculio in Iowa. This beetle is an important pest in certain localities, mainly in the southern half of the State. It is quite partial to a few varieties, particularly Ben Davis. The hawthorn and wild crab are its original and native host plants, and it can be found infesting these plants in places where it is not a pest on apples.

In many respects the life histories of the plum curculio and the apple curculio are quite similar although different in a few important details. The apple curculio commences oviposition when the apples are very small, during the latter part of May, and continues until July. Only a few eggs are laid each day or night, the average being 60 or 70 for an individual during a season. The larva hatches out in about a week and continues to grow for a period of about three weeks before pupating, the pupal stage lasting for about one week. The average period from oviposition until emergence of the adult is a little over one month. The earliest adults of the new generation are said to come out in July before the last of the overwintering beetles have died off.

Report of progress on the control of the apple curculio, R. M. Clark (*Iowa State Hort. Soc. Rpt. 60 (1925), pp. 39–42*).—This is a report of control work conducted in two orchards in Polk County, Iowa. The life history studies of Fulton, noted above, having shown that the egg, larva, and pupa of the new generation must spend a period in the June drop apple on the ground, the complete destruction of the June drop apples appears to be the logical means

of controlling the pest. In attempting such control, fall pigs weighing from 70 to 90 lbs. were placed in the worst infested areas, which had been fenced off, all the grass in the orchards having been destroyed by disking in April and May. The clean-up was accomplished on the worst areas in about three weeks, and before the beetles were mature enough to emerge from the drop apples.

The sections of orchard thus treated showed none of the characteristic work of the new brood of beetles during the late summer and fall. The pigs used in the June drop clean-up made a profit of $10 each when fed out afterwards with corn and tankage.

Further report on the control of the apple curculio, R. M. Clark (*Iowa State Hort. Soc. Rpt., 61 (1926), pp. 33–38*).—This is a report of control work with the apple curculio in continuation of the studies of 1925 on the life history of the pest by B. B. Fulton, and control work by the author, above noted.

Counts made in the fall of 1925 on plats pastured by pigs in June and early July showed 70 per cent of the apples to have been injured by the apple curculio. However, the fruit showed none of the characteristic work of the new brood beetles of the late summer and fall, all the injury having been caused by the spring attacks. The benefit resulted in 1926 when the injury to the crop of that year was reduced from the 70 per cent of 1925 to only 1.77 per cent. The check plats showed a normal increase of the curculio injury.

The results show that it is necessary to run at least 5 pigs of at least 100 lbs. weight per acre for 4 or 5 weeks following the beginning of the June drop in order to reduce the pest to the noncommercial damage point in 1 year; more pigs per acre might do the work in 2 or 3 weeks. It is pointed out that the June drop control of apple curculio depends upon the fact that few if any of the beetles can mature if the egg-carrying apples stay on the tree. The egg laying begins late in May in the newly formed apples, many of which go to the ground with the June drop.

The author emphasizes the fact that the orchard should not be turned into a regular hog pasture. In a mixed orchard the pigs should be ready to be turned in about June 15 and continued for 1 month. If the June drops be cleaned up in a shorter time the hogs should be taken from the orchard. No benefits were obtained from running the pigs in the orchard during the hibernating period of the curculio.

The apple curculio and its control by hogs, B. B. Fulton (*Jour. Agr. Research [U. S.], 36 (1928), No. 3, pp. 249–261, figs. 5*).—Following a review of the literature, the author deals with the nature of the injury, seasonal history, habits of the adults, hibernation, resistance of larvae and pupae to heat, parasitism, and control experiments.

It is pointed out that both early and late injuries to apples caused by the apple curculio show certain characteristics which distinguish them from similar injuries by the plum curculio. It is concluded that probably 80 per cent or more of the total new brood of curculios likely to survive will be found on the ground in the egg, larval, or pupal stage by July 15. Curculios in immature stages in the apples are killed by exposure to sunlight on bare ground. The adults of the new generation begin to emerge about the 1st of July. The adults are able to emerge when apples are buried under a few inches of soil.

Experiments conducted with insecticides, supplemented by observations in the orchard by Clark, noted above, show that there is little hope of controlling the apple curculio with arsenical poisons. It is pointed out that Crandall (E. S. R., 16, p. 1098) reached the same conclusion after feeding apple curculios on fruit treated with Paris green.

The experiment with the use of hogs has shown that "pigs weighing about 100 lbs. are the best size for this purpose, since they do not tramp down the

low branches. They do not feed from the trees to any great extent if the apples are more than a foot above the ground. The pigs prefer green apples to grass, and they can find the apples more readily if the orchard is cultivated before the middle of June. No cultivating should be done after the apples begin to drop. Pigs should be encouraged to frequent parts of the orchard containing the varieties most subject to injury by the apple curculio. This can be done by throwing there whatever extra feed is necessary. The best results will be obtained if the pigs are kept on slightly short rations.

"The greatest drawback to keeping pigs in the orchard is that they injure the trees by rooting or by rubbing against the trunks. When small pigs are used for only a month such injury is negligible. Pigs should not be oiled while they are in the orchard, on account of possible injury to the trees from oil rubbed into the bark."

Notes on the mango twig borer (Euclea capito Pasc.), F. Q. Otanes and A. G. Toquero (*Philippine Agr. Rev., 20 (1927), No. 2, pp. 249, 250, pls. 4*).—Brief notes are given on this common cerambycid enemy of mango, which also attacks avocado, *Acalypha tricolor*, papua, Citrus, tiesa or canistel, bauno, camphor, and kapok. It is said to be controlled by cutting off badly infested twigs and smudging the trees, which tends to drive away the beetles and other injurious insects such as mango hoppers (*Idiocerus niveosparsus* and *I. clypealis*), the most serious pests of the mango.

On some chalcidoid scale parasites from Java, A. B. Gahan (*Bul. Ent. Research, 18 (1927), No. 2, pp. 149–153, figs. 2*).—In this contribution from the U. S. D. A. Bureau of Entomology, the genus Spaniopterus is erected, and two species and a variety representing as many genera are described as new.

On the wasps (Polistes gallicus) infested by Stylops [trans. title], E. Rabaud and J. Millot (*Compt. Rend. Soc. Biol. [Paris], 96 (1927), No. 13, pp. 944–946*).—This is a brief note on the effect of Stylops upon infested wasps.

Time factors in relation to the acquisition of food by the honeybee, O. W. Park (*Iowa Sta. Research Bul. 108 (1928), pp. 181–225, figs. 13*).—In the studies conducted the author found that the most satisfactory method of marking honeybees consisted of applying pigment combined with white shellac in alcohol. A contrivance of simple construction was devised which, when placed in the entrance of a hive, caused practically every incoming and outgoing bee to pass through the entrance dorsal side up, thereby enabling the observer to detect the marked bees. A suitable method was discovered for distinguishing between nectar carriers and water carriers without injury to the bee.

"The average speed determined for the flight of worker bees during a calm was a little less than 15 miles per hour. The time required for gathering a load of nectar varies greatly, but under favorable conditions 1 hour has been shown to be ample time for a nectar carrier to make a round trip. Ten trips per day, under favorable conditions, probably is as reliable an average as can be deducted from the data at hand for nectar carriers. The time required for a pollen carrier to make a round trip varies greatly, but when gathering from corn under favorable conditions trips are completed in a quarter of an hour or less, on the average. The number of trips made by one pollen carrier in a day was not great, as a rule, because corn pollen usually is not available after about noon; consequently, an unqualified statement for the average number of trips made in a day would scarcely be justified. A water carrier can make a round trip in about 5 minutes, on the average, when the supply is near at hand. A water carrier sometimes makes 100 or more trips in a day, but the average is probably less than half that number. Field bees normally spend less than 5 minutes in the hive between field trips, regardless of whether they carry nectar, pollen, or water."

[Report of entomology and apiculture department of Wyoming Station] (*Wyoming Sta. Rpt. 1927, p. 143*).—This brief statement relates particularly to work with bees. Colonies that were kept too dry did not winter as well as those that had a great deal of moisture.

ANIMAL PRODUCTION

[Experiments by the Ohio Station in animal nutrition] (*Ohio Sta. Bul. 417 (1928), pp. 64, 65, 66, 67*).—Four experiments not previously noted are briefly reported.

The comparative nutritive value of linseed meal and cottonseed meal for different animals.—The proteins of cottonseed meal and linseed meal were equally well digested and were equally efficient for supplementing corn when fed on the same protein basis to rats. Cottonseed meal proved toxic when fed to pigs. Cottonseed meal alone or in combination with meat scrap as a supplement for growing chicks proved more efficient than linseed meal. For calves the two meals were practically equal.

Vitamin B in wheat as influenced by fertilizers.—Superphosphate was found to produce wheat with a high vitamin B content (E. S. R., 57, p. 168), while nitrate of soda and muriate of potash produced wheat of a low vitamin B content. Climatic conditions caused these results to vary. This study brought out the fact that the original vitamin B is made up of at least two vitamins, the antiberiberi vitamin and another which associated with this vitamin produces growth. Wheat is rich in the antiberiberi vitamin and low in the growth-promoting or pellagra-preventing vitamin.

Reproduction as affected by different salts.—Rats fed 10 cc. of milk per head per day, supplemented with 2 cc. each of normal $CaCl_2$ and Na_2HPO_4 in addition to starch, casein, cod-liver oil, agar, lard, and yeast became sterile after approximately 100 days. Adding 2.5 mg. of manganese sulfate to the milk for 4 rats improved the fertility of females. Copper sulfate and ferric chloride produced no beneficial effects.

The assimilation of calcium as affected by its physical state.—Rats assimilated and retained more calcium from dicalium phosphate if it was suspended in a starch paste than if fed as a dry salt. A metabolism study with a goat showed that more calcium is retained from fresh green clover hay than from the same hay cured in subdued light or in sunlight.

A note on the effects on pigeons of an exclusive diet of rice meal, bran, and polish, R. R. Williams (*Biochem. Jour., 21 (1927), No. 6, pp. 1349–1351*).—A group of six experiments were conducted by the author, using rice meal by-products in the diet of pigeons.

In the first test polished rice was used as the basal ration for four groups of 4 pigeons each. To this was added 3 gm. of rice polish, rice meal, rice bran, or a mixture of the three in the respective lots. All birds remained healthy and maintained their weight during a 60-day period.

When rice bran was fed as the exclusive diet 3 of 4 birds died within 32 days, after having lost an average of 44 per cent in weight. The remaining bird lost 26 per cent in weight in 40 days and remained stationary for an additional 80 days. Post-mortem examination of the sciatic nerve of all birds showed a distinct fatty degeneration.

Four birds fed an exclusive diet of rice meal lived 120 days and maintained their initial weight. The sciatic nerves of these birds appeared normal.

A diet of rice polish caused a slight loss in weight during the second and third weeks, but this loss was in all but one case recovered by the end of 120 days.

The sciatic nerves of 2 birds showed no lesions, while the other 2 were found to be moderately degenerated.

On a mixture of 14 parts of bran, 10 parts of meal, and 3 parts of polish, 1 bird lost 36 per cent of its initial weight, and on the sixty-fifth day was completely paralyzed and died. The sciatic nerve of this bird was slightly degenerated. Another bird declined to 76 per cent of its initial weight, while the remaining birds maintained their weight for 120 days and no abnormal lesions were found in the sciatic nerves.

Six birds fed a commercial rice polish lost from 30 to 40 per cent in weight and all died in an average of 19.4 days. Fatty degeneration of the sciatic nerve was pronounced in the case of 1 bird, but only slightly in the remainder.

Some of the author's conclusions are set forth on page 294 of this issue.

The chemistry of forage plants (*Wyoming Sta. Rpt. 1927, pp. 141, 142*).—Chemical analyses to determine the nutritive value of forage plants in the Red Desert showed that Nuttall's saltbush leaves gathered on October 28 had 16 per cent protein and the leaf-bearing twigs 9 per cent protein. Common sagebrush leaves contained 15.9 per cent protein, 43 per cent nitrogen-free extract, mostly sugars and starches, and 14.8 per cent fat and oil. However, its bitter taste makes it unpalatable for sheep. There were indications that the naturally cured range grasses do not possess the high value that has been placed upon them, being especially deficient in the protein necessary for growing young animals.

Discovering the base-line of animal nutrition (*New Hampshire Sta. Bul. 232 (1928), pp. 13, 14, fig. 1*).—A study of the maintenance requirements of cattle has been conducted by Benedict and Ritzman (E. S. R., 57, p. 863). It was found that cutting off the food supply switches the demand for energy upon the organism itself, and that profound changes are brought about in adapting the vital activities to the new conditions. Steers may be carried for three or four months on extremely low rations without affecting their health or ability to reach market condition with subsequent liberal feeding. This shows that cattle have the ability to slow down or accelerate their vital activities in accordance with the available food supply.

The food residues in the intestinal tract may at times amount to as much as one-fifth of the body weight of the animal and have been assumed to be a source of energy. Respiration studies have shown, however, that the nitrogen losses are from the body proteins, and that body fat supplies most of the energy for the body processes during fast. During the first few days of fast the amount of fat falls off rapidly, but later the heat production regularly declines. The so-called "hunger feeling" has been found to be a temporary condition due to contraction of the alimentary tract, and after the second day no particular irritation or craving for food was manifested.

[Experiments with beef cattle at the Colorado Station], G. E. Morton (*Colorado Sta. Rpt. 1927, pp. 15, 16*).—Three years' averages show that heifer calves gained faster during the first 30 days of a feeding period, but that steer calves gained approximately 40 lbs. more than heifers during a 6.5 to 7 months' feed. Feeding trials have shown barley to be practically equal to corn, cut corn fodder slightly less economical than corn silage, cottonseed cake more economical and efficient than linseed cake, and the dry matter in wet beet pulp more efficient than dry matter in dried beet pulp or dried molasses beet pulp in rations for fattening calves.

Satisfactory gains were secured on both green alfalfa and a perennial pasture grass mixture when cattle were full fed grain during the summer. No harmful effects due to the green alfalfa were observed.

Early protection and rotation of pastures allowed plants to reach seed maturity and increased the number of desirable plants and the grazing capacity of ranges.

[Experiments with sheep at the Colorado Station], G. E. MORTON (*Colorado Sta. Rpt. 1927, pp. 16, 17*).—Death losses of lambs fattening in the cornfield were decreased when the lambs were pastured on stock beets each day before going into the cornfield. This method of feeding was more economical than feeding cut corn fodder in conjunction with the stock beets.

Feeding cull potatoes and alfalfa hay to lambs pastured on pea fields decreased death losses materially. The succulence of the potatoes and the bulk furnished are thought to be responsible for the favorable results. A simple mineral mixture fed in conjunction with the pea pasture had no effect in preventing losses. Adequate shelter from wind was found to reduce by one-third the cost of fattening lambs in pea fields.

Sheep have been found effective for keeping down weed growth on summer fallow in a dry land rotation. Feeder lambs averaging 61.6 lbs. were produced over a five-year period by following this system.

[Investigations with sheep at the New Mexico Station] (*New Mexico Sta. Rpt. 1927, pp. 67–70*).—Feeding tests with lambs have shown no detrimental effects from feeding cottonseed meal at as high a rate as 1.25 lbs. per head daily.

Added minerals in the winter ration of ewes (*Ohio Sta. Bul. 417 (1928), p. 69*).—The addition of a mineral mixture composed of 2 parts of ground limestone, 2 parts of special bone meal, 1 part of salt plus 1 oz. of potassium iodide per 100 lbs. of mixture at the rate of ⅓ oz. per day per ewe had no apparent effect upon the vigor, condition, mortality, birth weight, and rate of gain of lambs nor the milking qualities, mother instinct, and fleece weight of ewes when compared to ewes receiving no mineral supplement but otherwise well fed.

Relation of milk yield to growth of lambs (*New Hampshire Sta. Bul. 232 (1928), p. 15*).—Continuing this study (E. S. R., 57, p. 367), E. G. Ritzman in cooperation with C. B. Davenport has found that the difference in weight increase between lambs from high-milking ewes and good-milking ewes was 16 per cent, between high- and fair-milking ewes 38 per cent, and between high- and poor-milking ewes 79 per cent. The greatest increase in growth was found in the second four-week period of the lamb's life, followed by a slight decline in the third period, except those lambs from low-milking ewes, and a further decline in the fourth period.

The fat content of the milk was secondary in importance to quantity. Lambs made similar gains on milk varying in fat content from 2 to 10 per cent.

Grain sorghums versus corn for fattening lambs.—Fourth and fifth experiments, J. M. JONES and R. E. DICKSON (*Texas Sta. Bul. 379 (1928), pp. 52, figs. 12*).—The results of five tests (E. S. R., 55, p. 360) comparing the value of grain sorghums and corn for fattening lambs are reported in this publication. In addition to the grain, cottonseed meal and alfalfa hay were fed in most cases.

On the basis of average daily gains the grains ranked in the following order: Corn 0.371 lb., ground threshed milo and ground threshed kafir 0.368 lb. each, and ground threshed feterita 0.365 lb. Ground milo heads ranked highest among the ground head grains, with an average daily gain of 0.353 lb., followed by ground feterita heads with 0.32 lb. and ground kafir heads with 0.309 lb. Whole threshed milo produced an average daily gain of 0.364 lb.

In general the lambs fed ground threshed or shelled grain made larger average daily gains than those fed ground heads. The lambs fed ground heads

required more feed per 100 lbs. of gain than did the lambs receiving ground threshed or shelled grain, although when the head roughage had been deducted the actual grain requirement was less. In some cases the lambs receiving ground heads actually consumed 25 per cent less grain and did not attain as high finish as those fed ground threshed or shelled grain. However, they made more economical gains.

Ground threshed darso, sorgo, and schrock produced satisfactory gains, and lambs so fed attained a good average finish. Whole cottonseed and cottonseed hulls as an exclusive ration proved very unpalatable, but the addition of 0.25 lb. of cottonseed meal increased the palatability of the ration and also the gains. Cottonseed hulls as the roughage portion of a ration of ground milo heads and cottonseed meal produced fairly satisfactory gains, but the gains were not as consistent as when alfalfa hay was fed. Whole cottonseed proved quite satisfactory as a protein supplement to ground threshed milo.

In comparison with yearling wethers, lambs receiving a similar ration made practically equal gains on 14 per cent less grain, 15 per cent less cottonseed meal, and 38 per cent less alfalfa hay. In these tests lambs consumed from 79 to 100 lbs. of grain, 10.5 to 15 lbs. of cottonseed meal, and 90 to 170 lbs. of hay to produce from 28 to 35 lbs. of gain in feeding periods ranging between 70 and 105 days.

[Experiments with swine at the Georgia Station] (*Georgia Sta. Rpt. 1927, pp. 28–30, fig. 1*).—The results of two experiments are noted.

Quality tests of soft and firm pork samples.—Quality tests of soft pork indicated that while in appearance this pork is unattractive in the uncooked condition, it is not inferior to firm pork when cooked. A hardening period of eight weeks following a softening ration gave a more desirable finished product than a longer hardening period. Lard from peanut-fed pigs and from corn-fed pigs was tested by about 60 judges as raw lard and when used for cooking in biscuits and pastry. The average scores for the hard lard were 80.5, 80.5, and 80.4 and for the soft lard 30.5, 83.7, and 79.1 points, respectively.

[*Soft pork investigations*].—Continuing this study (E. S. R., 57, p. 270), pigs that had been feeding on peanuts were divided into two lots of 33 pigs each. Lot 1 was fed a hardening ration of corn, tankage, and a mineral mixture and lot 2 sweet potatoes, tankage, and mineral mixture. Lot 1 gained 1,302.5 lbs. and lot 2 584.5 lbs. The pigs in lot 2 consumed 12,446 lbs. of sweet potatoes, 672 lbs. of tankage, and 24.5 lbs. of mineral mixture as compared with 5,270 lbs. of corn, 496 lbs. of tankage, and 8 lbs. of mineral mixture in lot 1. Sweet potatoes were not suited to be fed as the sole concentrate, but should be fed with corn or some similar feed for hardening hogs.

The softness produced by chufas feeding can be hardened by a prolonged feeding on corn.

[Experiments with swine at the Ohio Station] (*Ohio Sta. Bul. 417 (1928), pp. 67–69*).—Results of experiments are briefly noted.

Varieties of soy beans for fattening swine.—Tests in hogging down with corn, self-feeding in dry lot with corn, and palatability tests have shown that soy bean varieties ranked in the following order: (1) Midwest, (2) Hamilton, (3) Manchu, (4) Ebony, and (5) Wilson. No differences in the chemical or physical properties of the varieties were discovered. Cooked whole Manchu beans were much more valuable than when fed raw and ground, also the oil meal was 82 per cent more efficient than the ground beans.

Minerals for swine.—Adding copperas (iron sulfate), to a mineral mixture of salt, limestone, and spent bone black resulted in more rapid and economical gains, while adding Glauber's salts (sodium sulfate), gave slightly greater

gains per unit of feed but did not materially influence the rate of growth. Ground limestone fed at the rate of 1 to 1.5 per cent with a ration of corn, tankage, and salt increased the rate and economy of gain. Ground limestone containing 12.8 per cent magnesium, while not as efficient as limestone containing 1.5 and 3.7 per cent magnesium, gave quite satisfactory results. The breaking strength of bones of pigs fed the high magnesium limestone was lower than that of pigs fed the purer limestone.

Improving corn and tankage for pigs in dry lot.—Adding 0.5 per cent of untreated or aerated cod-liver oil to a ration of yellow corn, tankage, salt, and limestone improved its efficiency (E. S. R., 57, p. 867). Similar and more economical results were obtained by feeding alfalfa or other legume hays. The addition of 10 per cent of rice polish to the above ration gave highly satisfactory results.

Oats for pigs.—Hulled oats fed in conjunction with corn, tankage, alfalfa meal, and minerals produced more rapid and greater gains per unit of feed than a ration of corn supplemented with 2 parts of tankage, 1 part of linseed meal, and 1 part of alfalfa meal, with minerals, indicating that oats are equal to corn, pound for pound.

Preliminary report on certain fattening feeds for hogs, E. Alcacid (*Philippine Agr. Rev., 20 (1927), No. 3, pp. 295–309, pls. 16*).—Experiments were undertaken at the Alabang Stock Farm, Philippine Islands, to test the comparative value of some local feeds for fattening hogs. These feeds were fed with a basal ration of 10 parts of tiqui-tiqui, or rice bran, and 3 parts of copra meal. Three tests, 2 of 90 days' and 1 of 121 days' duration, were conducted using 3 lots of 1 pig each in trials 1 and 3 and 2 pigs each in trial 2. In lot 1 enough molasses was added to make the slop taste sweet, in lot 2 cassava roots were fed, and in lot 3 corn meal. The average daily gains per pig for the 3 trials were 0.478 kg. (1.05 lbs.), 0.447, and 0.444 kg. in the respective lots. The feed required to produce 1 kg. of gain in the respective lots was 5.09, 5.24, and 5.62 kg. The dressing percentage was highest in the molasses-fed group and lowest in the cassava-fed group. The return over feed cost was greater in the cassava-fed group than in either the molasses- or corn-fed groups.

Poultry experiment, G. E. Morton (*Colorado Sta. Rpt. 1927, p. 18*).—Single Comb White Leghorns fed an all-mash ration grew more uniformly, had a lower mortality rate, were more economical to grow, and had a somewhat higher and more uniform production than similar birds fed by the mash-and-scratch method.

[Experiments with poultry at the New Mexico Station] (*New Mexico Sta. Rpt. 1927, pp. 60–65*).—The results of two experiments are noted.

Poultry management and cost of production.—Single Comb White Leghorn pullets that had been on alfalfa pasture were divided into 2 pens of 100 birds each. Pen 1 received a ration which used New Mexico grown feeds to the greatest extent and contained 17.36 per cent of cottonseed meal. Pen 2 received the regular experiment station laying ration containing no cottonseed meal. Pen 1 produced from December 1 to May 31 7,824 eggs at a cost per dozen of 11.5 cts., and pen 2 produced 8,356 eggs at a cost per dozen of 12.4 cts. For a few weeks in January and February the eggs laid by pen 1 showed cottonseed meal spots, indicating that the ration contained somewhat more meal than is safe to feed.

The same scratch and mash ration was fed to 3 pens of 18 White Leghorn hens each, except that to the basal ration was added in pen 2 3 lbs. of Eggzyme and in pen 3 5 lbs. of Eggzyme. The egg production for 6 months was 1,896, 1,898, and 1,902 eggs, respectively.

Cottonseed meal feeding experiments.—Continuing this study (E. S. R., 57, p. 271), 8 pens of 20 White Leghorn hens each were fed, 4 pens on alfalfa pasture and duplicate pens in bare yards. Two pens received mash containing 23 per cent of tankage and no cottonseed meal, 2 other pens 23 per cent of tankage and 5 per cent of cottonseed meal, 2 others 14.5 per cent of tankage and 14.5 per cent of cottonseed meal, and the last 2 no tankage and 38 per cent of cottonseed meal. The scratch feed was the same in all lots.

The pen receiving 38 per cent of cottonseed meal on alfalfa pasture produced eggs with dark spots on the yolks at the end of the second month. These spots gradually increased in size and intensity of color until late spring, when the effect of cottonseed meal began to decrease. The duplicate pen in the bare yard did not consume as much mash and therefore not as much cottonseed meal, and no black spots appeared on the yolks of the eggs laid in this pen. No ill effects were noted in the other pens receiving cottonseed meal. See also a previous note (E. S. R., 58, p. 900).

[Poultry experiments at the Ohio Station] (*Ohio Sta. Bul. 417 (1928), pp. 65, 66, 71–73, fig. 1*).—The results of experiments in continuation of those previously noted (E. S. R., 57, p. 173) are reported.

Calcium requirements of the growing chick.—When 0.5 per cent of cod-liver oil was added to a ration of yellow corn, middlings, casein, and salt, it was necessary to supplement the ration with 2 per cent of calcium carbonate to obtain normal ash content of the bones.

Calcium for bone formation in the chick.—Tests with day-old chicks showed that the calcium in calcium carbonate, calcium sulfate, calcium lactate, tricalcium phosphate, dicalcium phosphate, oyster shells, high calcium limestone, dolomitic limestone, bone meal, and certain rock phosphates was equally available as judged by the ash in the bones. The basal ration with which these supplements were fed contained 0.5 per cent of cod-liver oil, and each supplement was so fed that the calcium intake equaled the calcium in 2 per cent calcium carbonate.

Nutritional factors affecting hatchability of eggs.—As previously noted ultraviolet light produced more beneficial effects upon the hatchability of eggs than cod-liver oil, but a marked improvement in hatchability followed the addition of 5 per cent of high grade alfalfa leaf meal in conjunction with either oil or light.

Linseed oil meal v. meat scraps for layers.—Two groups of 50 White Leghorns each were fed and managed in the same way except that 1 group received linseed oil meal as a protein supplement and the other meat scrap. Linseed oil meal was practically as efficient as meat scrap both in egg production and hatchability of eggs.

Alfalfa hay chopped v. leaf alfalfa meal for layers.—Three lots of 40 White Leghorn pullets each were fed the same basal ration with the following supplements: High quality alfalfa hay chopped in 0.5 in. lengths, 5 per cent by weight of alfalfa leaf meal, and 10 per cent by weight of alfalfa leaf meal. The egg production was somewhat better in the lot receiving the chopped alfalfa hay than in either of the other lots. The hatchability of eggs was practically the same in all lots.

Methods of feeding poultry.—The all-mash system of feeding, due to its sanitary advantages, ease of feeding a definite ration, and the saving in labor, has proved to be the most satisfactory method of feeding poultry at the station.

[Experiments with poultry at the Wyoming Station] (*Wyoming Sta. Rpt. 1927, pp. 138–140*).—The results of three experiments are briefly noted.

Feeding for egg production.—Corn proved more efficient than barley for egg production, especially when milk and sprouted grain was added to the basal ration. Five months' feeding without exposure to sunlight on a ration of corn or barley, mill-run, meat scrap, and salt as a mash, and oats and barley or corn as scratch, caused pullets to develop leg weakness and nutritional roup and to lay soft-shelled eggs.

Hatching eggs in an incubator at high altitudes.—Of the fertile eggs produced by hens confined indoors during March, F. J. Kohn found that only 40 to 56 per cent hatched. No turkey eggs produced during this month hatched, but 73 per cent of the fertile eggs laid in April and 55 per cent of those laid in May hatched.

No measurable effect was found from adding oxygen to the air in the incubator during the last 4 days. Unlimited moisture in the incubator is advisable for the last 3 days of incubation if the evaporation during the first 18 days has been 15 per cent or more, but causes considerable damage if the evaporation has been less than 12 per cent.

Crooked breastbones in turkeys.—Turkeys on a basal ration of grain and meat scrap with what green feed could be picked up on a poor and restricted range had dented breastbones. On the other hand, those receiving finely chopped alfalfa leaves had perfect breastbones. In the first pen the turkeys averaged 11.6 lbs. at the end of five months' feeding, while those in the second averaged 12.8 lbs.

The relative utilization of different calcium compounds by hens in the production of eggs, G. D. Buckner, J. H. Martin, and A. M. Peter (*Jour. Agr. Research [U. S.], 36 (1928), No. 3, pp. 263–268*).—A ration of wheat and yellow corn with skim milk available at all times and green feed twice a week was fed to 40 yearling White Leghorn hens at the Kentucky Experiment Station from January 1 to March 11. At this time they were divided into four uniform lots and fed the following calcium supplements: Lot 1 calcium carbonate, lot 2 calcium sulfate, lot 3 calcium lactate, and lot 4 calcium chloride. On April 12 lots 1 and 2 were changed to calcium sulfate and calcium carbonate, respectively, and continued on these supplements to July 18. Lot 3 was changed on June 15 to calcium carbonate, on which it was continued to July 18. On April 6 lot 4 was changed to precipitated tricalcium phosphate and on June 15 to calcium carbonate and continued to July 18.

The hens were trapnested, and all eggs laid in a week by a hen were weighed together. The shells were removed, dried for 12 hours at 100° C., and after cooling weighed.

Of the supplements used calcium carbonate proved most effective when judged by the degree to which it is used in egg production, its influence on the weight of egg content and shell, and the quantity consumed. Calcium sulfate and precipitated tricalcium phosphate were not as effective as calcium carbonate, as shown by the number and weight of eggs produced. Calcium lactate was utilized readily as shown by the number of eggs produced, but the quantity consumed was variable and small when compared with calcium carbonate. Calcium chloride was not consumed in sufficient quantities to justify conclusions, but only a slight increase in egg production followed its addition to the ration.

Studies on egg quality.—II, Seasonal variations in yolk color, S. L. Parker (*Poultry Sci., 6 (1927), No. 6, pp. 259–273, figs. 7*).—Samples of eggs that had been shipped from the Pacific coast to New York, graded, and reshipped to the California Experiment Station were there graded by the yolk shadow and by the yolk color according to a chart previously explained (E. S. R., 55, p. 771).

Gradings were also made on eggs shipped direct to the station from the packing plant at Petaluma. These gradings were done over a period of a year.

The results showed no definite seasonal trend in yolk color, and this was true whether the color was graded by the yolk shadow or by the yolk color of the freshly opened raw egg. The laboratory grading agreed quite closely with the previous grading by the New York egg candlers. No significant differences were found in the yolk colors of eggs from two Pacific Coast States. These results also furnished additional evidence that yolk color was closely correlated with the amount of green feed the birds received, as reported in part 1.

"Black spot" of eggs, W. A. R. D. Weston and E. T. Halnan (*Poultry Sci., 6 (1927), No. 6, pp. 251–258, figs. 5*).—An egg showing black internal discoloration was examined by the poultry section of the animal nutrition department, School of Agriculture, Cambridge, England, and the spotting found to be due to the presence of a fungus belonging to the species Cladosporium. By using a spore emulsion of *C. herbarum*, it was possible to reproduce in practically all cases the "black spot" in newly laid eggs. Penetration of the shell membrane by the fungus seemed to be completed after nine days, but certain temperature and moisture conditions may hasten or retard this period. Microscopic examination suggested that several hyphae enter a pore on the surface cuticle of the shell and penetrate directly through the air spaces and thus gain access to the interior. Conditions favorable to black spot are direct contamination and proper moisture conditions which are often fulfilled in practice by using damp nest boxes filled with straw. *C. herbarum* is generally found on any cereal straw. Other fungi, such as *Penicillium* sp., are capable of producing similar spots in eggs.

The effect of adding moisture to the egg chamber on the percentage of eggs hatched under artificial incubation, E. Alcacid (*Philippine Agr. Rev., 20 (1927), No. 3, pp. 311–347*).—In order to determine the effects of adding moisture in the egg chamber of incubators upon the hatching percentage and of evaporation of moisture from the eggs, an experiment was begun May 5 and ended January 7 at the Alabang Stock Farm, Philippine Islands. The eggs in one incubator received no artificial moisture, in a second the eggs were sprinkled with lukewarm water every morning, and in a third the nursery tray was filled with sand kept moist at all times. Four trials in all were conducted in this manner and the results averaged.

The percentage of hatch of fertile eggs in the incubator supplied with wet sand was 73.07, in the one in which the eggs were sprinkled with water 69.23, and the check 58.82. The percentage of dead germs during the first week was 6.19 in the check, 2.82 in the sand set, and 2.29 in the sprinkled set. The percentage of chicks that died in the shell was 16.49 in the check and 13.3 and 11.72, respectively, in the sprinkled and sand sets. There was little difference in the weight of chicks hatched from any set.

The total average amount of water lost from an egg in the check set was 5.58 gm., from eggs in the sprinkled set 4.39 gm., and from eggs in the sand set 4.56 gm. The moisture loss of eggs during incubation was controlled by the incubator temperature and not by the room temperature. The moisture loss on the fourteenth day was greater than that on either the seventh or the nineteenth day. The loss of moisture by evaporation decreased as the eggs became older.

The growth of chicks as affected by sunlight through glass substitutes, R. M. Bethke and D. C. Kennard (*Poultry Sci., 6 (1927), No. 6, pp. 290–301, figs. 4*).—Continuing this study at the Ohio Experiment Station (E. S. R., 55, p. 671), 5 lots of 21 week-old White Leghorn chicks each were confined in similar

indoor pens. Lots 1 and 2 were used as the "no light" controls. Lots 3, 4, and 5 received 30 minutes' daily exposure between 10 a. m. and 12 m. to direct sunlight, sunlight through "screen glass," and sunlight through "fabric glass," respectively.

By the end of the fifth week, one-half of the birds in lots 1 and 2 showed signs of leg weakness, and by the end of the ninth week all birds were affected to a greater or less extent. The other 3 lots showed no abnormalities, nor were there any outstanding differences between the lots.

At the end of 9 weeks 24 chicks from lots 1 and 2 were divided into 4 pens of 6 chicks each. Lot 1a was exposed for 15 minutes daily to direct sunlight, lots 2a and 3a for 15 minutes daily to sunlight through screen glass and fabric glass, respectively, and lot 4a was irradiated for 5 minutes daily with a quartz mercury lamp at a distance of 36 in. During the 4 weeks of the test the gains in the respective lots were 281, 231, 219, and 298 gm., as compared with 138 gm. for the controls in lots 1 and 2. Only very mild cases of leg weakness were apparent after 4 weeks treatment.

At the end of 13 weeks the tibia and femur of 5 representative birds in lots 1, 2, 3, 4, and 5 and of all birds in lots 1a, 2a, 3a, and 4a were removed for ash determination of the tibia and calcification determination of the femur. The average percentage of ash of the bones in lots 1 and 2 was 37.35 per cent. Exposure to direct sunlight or sunlight through glass substitutes accounted for an approximate increase of 10 per cent in ash content and gave better calcification of the femur bones. Exposure to ultra-violet rays gave the highest ash content and a somewhat better calcification.

Shade and green feed for chickens, R. B. Thompson and R. Penquite (*Oklahoma Sta. Circ. 69 (1928), pp. 8, figs. 6*).—The value of shade and green feed for poultry under conditions as they exist in Oklahoma is pointed out by the authors, as are also the means of obtaining them. A poultry green feed calendar that has proved quite successful is included.

Brooding chicks on the farm, R. B. Thompson (*Oklahoma Sta. Circ. 70 (1928), pp. 14, figs. 3*).—The general practices of brooding chicks on the farm, together with a brief discussion of the good and bad features of the various kinds of brooders and hovers, are given. The Oklahoma method of feeding chicks and conveniences and appliances for the brooder house are also discussed.

Turkey investigations in dressing shrinkages, O. A. Barton (*North Dakota Sta. Circ. 36 (1928), pp. 12, fig. 1*).—The average dressing shrinkage percentage over a four-year period of turkeys weighing under 10 lbs. was 11.05, of those weighing 10 to 14 lbs. 9.82, and of those over 14 lbs. 9.64. The corresponding average drawing shrinkage percentages for the same classes were 16.37, 15.54, and 15.2, respectively. A range of 2 per cent or more was found between the high- and low-dressing shrinkage, and a range of from 5 to 7 per cent in the drawing shrinkage. There are several factors that may affect these shrinkages, but more study is deemed necessary before final conclusions may be drawn. No relationship existed between the dressing shrinkage and the drawing shrinkage.

Where there is a spread of 10 cts. per pound between live weight and dressed weight a gain of approximately $1 per head was realized by dressing turkeys weighing 12 lbs. or more dressed. Dressing poultry added approximately 7 cts. per pound to the cost of preparing turkeys for the roaster.

DAIRY FARMING—DAIRYING

Physiological studies of dairy cows (*New Hampshire Sta. Bul. 232 (1928), p. 16*).—Continuing this study (E. S. R., 57, p. 370), J. M. Fuller found that the different breeds of dairy cows varied slightly in the time spent in standing.

Ayrshires were found to stand 50.63 per cent of the time, Guernseys 52.97, Holsteins 53.8, and Jerseys 47.24 per cent.

[Experiments with dairy cattle at the Ohio Station] (*Ohio Sta. Bul. 417 (1928), pp. 59–62, 86, 87*).—The results of several experiments are noted.

Minerals for dairy cows.—Four years of feeding dicalcium phosphate at the rate of 2 lbs. per 100 lbs. of grain have shown no beneficial effect upon milk production nor upon the condition of cows or calves. These results led to the conclusion that unless production is heavy no mineral supplements are necessary for cows receiving legume hay and a variety of grains.

The food value of milk as affected by high and low protein rations.—Continuing this study (E. S. R., 59, p. 166), various iron compounds, yeast, cod-liver oil, casein, agar, starch, and a mineral mixture were added to exclusive milk diets of rats, and their effect upon anemia was determined by homoglobin measurements. Rats fed 0.4 gm. of yeast per day had, after one month's feeding, from 15 to 16.5 mg. of hemoglobin per 100 cc. of blood. After feeding the same length of time on a ration without yeast, the hemoglobin content was only 3.44 mg. per 100 cc. Allowing the hemoglobin content to drop to 1.3 mg. per 100 cc. and then adding yeast to the ration brought the content to 15 mg. per 100 cc. in 30 days.

Ground roughages.—Two lots of six cows each were fed by the double reversal method on a ration consisting of 2 parts of alfalfa hay, 1 part of corn stover, and 2 parts of grain. Each cow also received 1 lb. of molasses diluted with an equal amount of water per day. One lot received whole alfalfa hay and coarsely cut stover, and the other lot ground alfalfa and ground stover. While receiving the ground roughage the cows produced 2.1 per cent more milk and 3.7 per cent more butterfat than while on whole roughage. There was less waste of roughage when the cows received it in the ground state.

Hamilton County, improving a dairy herd.—By the use of purebred Jersey bulls from dams with high records the average fat production of the dairy herd in Hamilton County has been increased from 262 lbs. in 1920 to 366 lbs. in 1926.

[Experiments with dairy cattle at the Wyoming Station] (*Wyoming Sta. Rpt. 1927, pp. 137, 138*).—Two experiments are noted.

Feeding dairy calves.—Continuing this study with calves (E. S. R., 54, p. 768), it has been found that the cost of feed for a pound of gain was as follows: Skim milk with hay or pasture 4.5 cts., grain and whole milk 5 to 11 cts., whole milk to 3 months and grain to 5 months 7.3 to 8.3 cts., nurse cows 8 cts., whole milk to 3 months and whole milk and grain to 5 months 8 to 9 cts., and whole milk with grain to 5 months 12 cts. These costs are for milk and grain alone, but the cost of roughage and pasture was practically the same in all lots.

Feeding for milk production.—In a test in which 20 per cent of cottonseed meal in a ration of bran was compared with bran alone for dairy cows, the production was increased 15 per cent and the cost 18 per cent. In another test no increase in production followed the addition of cottonseed meal.

Cotton seed for dairy cows (*New Mexico Sta. Rpt. 1927, pp. 56–59*).—Two groups of 2 cows each were fed by the reversal method for experimental periods of 32 days each, separated by a 11-day transition period (E. S. R., 57, p. 273). During the first period lot 1 received a grain mixture of equal parts of cottonseed and bran and during the second period a mixture composed of corn 4 parts, bran 2 parts, and cottonseed meal 1 part. The feeding in lot 2 was the same except that the order was reversed. In addition to the grain the cows consumed on the average 11.4 lbs. of alfalfa hay and 27.4 lbs. of corn silage daily. The grain mixture was fed at the rate of 1 lb. to 3 lbs. of milk produced.

The total production while the cows were receiving cottonseed and bran was 3,065.7 lbs. of milk and 173.03 lbs. of butterfat, and while receiving corn, bran, and cottonseed meal 3,306.5 lbs. of milk and 169.36 lbs. of butterfat. Some difficulty was experienced in getting cows to eat their full grain ration when changed from corn, bran, and cottonseed meal to cottonseed and bran. The reverse change caused no such difficulties, and there was less variation in the weights of the cows when this change was made.

Feeding pimientos to milk cows (*Georgia Sta. Rpt. 1927, p. 33*).—Pimiento peppers were fed to dairy cows for a short period. No effect was noted on the color, flavor, or odor of the milk nor the flavor or odor of the butter made from the milk. The color of the butter, however, was of a pinkish hue.

The influence of the winter exercise of cows on their milk production [trans. title], N. N. Pelekhov (Pelechoff) (*Trudy Vologodsk. Moloch. Khoz. Inst. (Arb. Milchw. Inst. Wologda) Bŭl. 58 (1926), pp. 22*).—The Vologda Dairy Institute, Russia, has conducted 2 experiments with 2 groups of 3 cows each to determine to what extent winter exercise influences milk production, fat content of milk, and weight of animal. During the first test one group of cows was allowed in the open for 3 hours daily without any effort being made to make them exercise. In the second test the cows were driven at a walk for 1 hour after the morning milking and for 1 hour after the noon milking.

In neither test was any influence due to exercise noted on the milk and fat production of the animals. However, there was a slight decrease in weight. The author concludes that the greatest benefit derived from winter exercise is in the general health of the animal and its resistance to disease, especially of the younger animals.

The effect of the ages of sire and dam on the average butterfat production of offspring in dairy cattle, W. Gifford and E. C. Elting (*Jour. Dairy Sci., 11 (1928), No. 1, pp. 1–8, fig. 1*).—The butterfat records and dates of birth for the daughters of sires of the Guernsey breed having ten or more Advanced Registry daughters to January 1, 1924, were used as the basis for this study. The fat records of all animals studied were either mature or mature equivalent records. The fat records were grouped according to the age of the parents at the time the progeny were born. The fat records made by progeny of parents that were of the same age at the time they were mated were also secured.

The coefficient of correlation between the age of sires and butterfat records of progeny was 0.07±0.01, between age of dams and butterfat records of progeny 0.021±0.011, and between age of sire and dams (same age) and butterfat records of progeny 0.05±0.028. These correlations show a very slight relationship between the age of the sires and the progeny records. No other relationship existed, and arithmetical averages gave no significant indication that any particular age had any pronounced effect upon the records of progeny. The results led the authors to conclude that the age of the sire and dam does not affect the butterfat production of the progeny.

Several features of the physiology of the milk gland of interest in practical dairying [trans. title], N. N. Pelekhov (Pelechoff) (*Trudy Vologodsk. Moloch. Khoz. Inst. (Arb. Milchw. Inst. Wologda) Bŭl. 59 (1926), pp. 28*).—A study of the milk records of three herds of different breeding by the Vologda Dairy Institute, Russia, brought out the following points:

The breed of cattle originating in the vicinity of the institute reached maximum production at a later age than the other two breeds. North Russian cattle produced only 28 per cent of their mature milk record after first calving as compared with 70 per cent for European and American cattle. The longest lac-

tation period corresponds to the period of maximum production. Decrease in production during a single lactation period is more an individual trait than due to age or total production. Pasturage prolongs the lactation period. The length of the dry period is not influenced by the number of calves an animal has produced nor its age. Neither does production nor length of previous dry period exert any influence on the length of the succeeding dry period. A dry period of 100 days shortens the succeeding lactation period and decreases milk production, while the unusual shortening of the dry period has the opposite effect upon the lactation period. Abortion has an unfavorable effect upon the immediate lactation, but none upon succeeding periods. Tuberculosis exerts an unfavorable effect upon the immediate lactation period and is conducive to abortion. Three milkings per day are recommended as a method of determining the value of cows.

Micrococci present in the normal cow's udder, A. F. Breed (*New York State Sta. Tech. Bul. 132 (1928), pp. 28*).—In a study of the predominating flora in the normal cow's udder, 176 cultures of micrococci were isolated from the udders of cows in the station herd. These were separated into the following species: *Micrococcus aureus* 33 cultures, *M. aurantiacus* 24 cultures, *M. freudenreichii* 23 cultures, *M. albus* 21 cultures, *M. candidus* 20 cultures, *M. epidermidis* 13 cultures, *M. citreus* 10 cultures, *M. varians* 10 cultures, *M. flavus* 8 cultures, *M. conglomeratus* 4 cultures, *M. luteus* 3 cultures, and *M. casei* 2 cultures. The remaining cultures were reddish or pink chromogens which did not agree with the key devised by Hucker.

Chromogensis, of the yellow and orange types, was lessened more frequently than increased by the use of milk agar. Some white cultures, however, showed yellow pigmentation and some orange cultures a deeper orange on this medium.

The average germ content of the milk from the udders of the cows was found to be in excess of 500 per cubic centimeter.

Studies on the Coccaceae.—VIII, A study of the cocci resisting pasteurization temperatures, G. J. Hucker (*New York State Sta. Tech. Bul. 134 (1928), pp. 30, fig. 1*).—In this study on the Coccaceae (E. S. R., 55, p. 326) 301 samples of market milk from typical dairies in the environs of Copenhagen, Denmark, were used for collecting data. Each sample of milk was divided into 3 portions, and 1 was held at 10° C., another at 22°, and the third at 30° for 4 hours and then pasteurized. After pasteurization platings were made and incubated for 2 days at 37° and duplicate platings incubated at 22 and 45°.

It was found that 180 strains of cocci resisted pasteurization, and of these *Streptococcus thermophilus* predominated. *S. faecium* and *S. liquefaciens* were also able to resist the usual pasteurizing temperature. Of the strains studied 76 proved to be micrococci, of which *Micrococcus epidermidis, M. candidus, M. varians,* and *M. luteus* were the most frequently found.

Holding the milk at 10° before pasteurizing usually resulted in destroying *S. thermophilus,* and such milk yielded a miscellaneous flora when pasteurized. When held at 20 to 30° relatively large numbers of *S. thermophilus* were present in the pasteurized milk. The number of colonies appearing on plates incubated at 22 and 37° made from pasteurized milk was only slightly affected by the temperature at which the milk was held previous to pasteurizing.

The conclusions drawn from this study are that the temperature of holding milk between milking and pasteurizing had a slight effect upon the number of the cocci resisting pasteurizing temperature, but a greater effect upon the types of cocci found in the pasteurized milk.

A study of the yellow cocci which survive pasteurization, B. W. Hammer and G. M. Trout (*Jour. Dairy Sci., 11 (1928), No. 1, pp. 18–23*).—Preliminary investigations at the Iowa Experiment Station showed that practically

all the organisms producing yellow colonies on the plates were cocci. A total of 113 cultures of these yellow colonies, most of which came from dairy products, were plated on various media. The organisms were found to resist the usual pasteurization temperature in skim milk, whole milk, cream, bouillon, and ice cream mix. What differences were found in resistance to heat were not pronounced. When sufficient acid was present in the milk to cause coagulation, the resistance of the organisms to heat was reduced.

Differences in morphology, the liquefaction of gelatin, action on litmus milk, and growth on slopes suggested a division of the organisms into three groups, which may be considered, according to the classification previously noted (E. S. R., 52, p. 519), as *Sarcina lutea* type A, *Micrococcus varians* type B, and *M. luteus* type C. Since these organisms cause deteriorating changes in milk or cream very slowly, they are probably of little practical importance.

Studies on starters, B. W. Hammer and M. P. Baker (*Iowa Sta. Research Bul. 106 (1928), pp. 133–156*).—Continuing this series of studies (E. S. R., 53, p. 781), the data reported in this bulletin are divided into three parts.

In part 1 the effect of the rate of inoculation on the acidity produced by a starter on prolonged incubation was studied. A number of starters were run through series of transfers, and considerable variation was found in the acidity developed in any series when the cultures were allowed to stand until approximately the maximum acidity was reached. Heavy inoculations did not give higher acidities than light inoculations under these conditions. Heavy inoculations did not tend to increase the acid tolerance of the organisms.

The effect of overripening on the rate of coagulation of a starter is reported in part 2. Holding starters at a temperature satisfactory for the growth of the contained organisms did not injure their ability rapidly to coagulate milk into which they were inoculated. In general, holding for 30 hours at 70° F. did not appreciably decrease the rate at which starters coagulated milk, but there was evidence of a definite decrease in the number of organisms during this time. The acidity increased rapidly for a time after the coagulation, and then the increase became slower. Holding starters in ice water or freezing the starters did not appreciably change the rate of coagulation, but the acidity remained low, indicating that growth of the organisms had been checked, and there was a decrease in the number of bacteria.

The effect of the pasteurization exposure on the rate of coagulation of a starter was studied in part 3. The results showed that starters made from milk pasteurized at different temperatures developed acid and coagulated more slowly when made from milk heated to 145° for 30 minutes than when the milk was heated to higher temperatures. Heating at 160° for 30 minutes gave essentially the same rate of growth of starter organisms as when higher temperatures were used for this period. The cause of the variations found in the rate of coagulation following different pasteurizing temperatures undoubtedly lies in the effect of the heat on the germicidal properties of milk. In order to obtain uniform growth of starter organisms from day to day, pasteurizing temperatures must be watched closely.

The influence of temperatures and certain other factors upon the percentage of fat in milk, E. Weaver and C. A. Matthews (*Iowa Sta. Research Bul. 107 (1928), pp. 157–180, figs. 10*).—Studies of the factors influencing the percentage of fat in milk have been continued (E. S. R., 59, p. 72), using an average of 43 cows in the station herd for the collection of data. In obtaining the environmental temperatures a recording thermometer was placed in the milking barn and another in a shaded place on the north side of the barn. Readings of the thermometers were made at 6-hour intervals starting at 6 a. m.

All data were obtained on a weekly basis starting November 2, 1925, and included temperatures inside and outside the barn, average daily milk production, and average butterfat tests. Computations were also made to give weekly data on the cow's age, stage of lactation and gestation, and condition. For convenience, the year was divided into eight seasons of approximately 6.5 weeks each.

A definite variation was found in the fat percentage of the milk with the seasonal changes, being highest during the first half of the winter (January), gradually declining to the last half of summer (August and early September), and rising rapidly in the fall. The higher the inside and outside temperatures of the barn the lower was the butterfat test. Ayrshire and Holstein tests were approximately 0.6 per cent lower and the Guernsey and Jersey tests 1.1 per cent lower in the second half of summer than in the first half of winter. There were indications that outside temperatures were more closely correlated with fat test than inside temperatures. The fat test tended to be high immediately following freshening, declined for 2 or 3 months, and then rose during the rest of the lactation period. Advance in the stage of gestation caused an increase in the fat test. Regression coefficients indicated that of the factors studied environmental temperatures exerted the most influence on the butterfat test. However, there were considerable variations which could not be attributed to the factors studied.

The microflora of the ripening process of Camembert cheese [trans. title], A. M. Skorodumova (*Trudy Vologodsk. Moloch. Khoz. Inst.* (*Arb. Milchw. Inst. Vologda*) *Bŭl. 65 (1926), pp. 175–206*).—Bacteriological studies of Camembert cheese during the process of ripening at the Vologda Dairy Institute, Russia, showed that the lactic acid group predominated and that few peptonizing bacteria were present.

The chemical composition, including dry weight, moisture, fat, total protein, ash, sodium chloride, lactose, and acidity content, of the cheese during the process of ripening is presented by M. P. Babkin (pp. 204–206). Changes in protein are given in the form of total, soluble, and ammonia nitrogen.

The preparation and processing of ice cream mix, A. C. Baer (*Milwaukee: Olsen Pub. Co., 1927, pp. 136, fig. 1*).—In this treatise the author has combined facts with personal experiences and suggestions that will assist the manufacturer of ice cream and will introduce various factors and problems to the student and others interested in the manufacture of ice cream.

The viscosity of ice cream (*New Hampshire Sta. Bul. 232 (1928), p. 17*).—Experiments by H. F. DePew (E. S. R., 57, p. 375) showed that both the apparent and real viscosity of the ice cream mix was increased by a greater concentration of solids, an increase in percentages of gelatin, a decrease in the temperature of aging, and homogenization. Homogenizing at 145° F. gave a greater viscosity than 110°, and rapid cooling of the mix did not seem to affect the viscosity. Excessive viscosity increased the time required to obtain overrun and decreased the overrun obtainable. A very viscous mix produced a finished product of smoother texture than a very thin mix. Differences of 500 lbs. or less in homogenizing pressure produced no detectable differences in the texture of ice creams.

VETERINARY MEDICINE

Report of the veterinary pathologist, I. E. Newsom (*Colorado Sta. Rpt. 1927, pp. 46–48*).—In referring briefly to sheep losses in feed lots, it is stated that coccidiosis is seemingly on the increase, while necrobacillosis, showing

complications in the lungs and in the omasum, was much more severe than usual and was responsible for considerable loss.

The large tapeworm, *Taenia expansa*, was seen for the first time in feeder lambs and promises to be a considerable factor in future losses.

In control work with infectious abortion in the college herd, previously noted (E. S. R., 57, p. 279), another large dairy herd is being handled in the same manner. Four tests have been run, the first test showing 35 reactors and the fourth only 1. A total of 2,014 blood tests was made, of which 455 were found to be reactors.

The testing of birds for bacillary white diarrhea was continued with a total of 2,462 such tests, 10.07 per cent being reactors. It is pointed out that while the test is not 100 per cent accurate, like the abortion test it affords the greatest hope of eradication of the disease of any plan yet devised.

Report of the veterinarian, G. H. Glover (*Colorado Sta. Rpt. 1927, pp. 48, 49*).—It is reported that the death of many cattle in the eastern part of the State late in the summer was caused by eating pigweeds (*Amaranthus* spp.). The marsh elder (*Iva xanthifolia*) was found to be an occasional cause of bitter milk.

[Report of zoology department of Wyoming Station] (*Wyoming Sta. Rpt. 1927, pp. 147, 148*).—This brief statement deals particularly with the broad tapeworm, *Moniezia expansa*, and the muscle parasite of sheep *Sarcocystis tenella*.

Annual report of the Civil Veterinary Department, Bengal, and Bengal Veterinary College for the year 1926–27, R. T. Davis and A. D. MacGregor (*Civ. Vet. Dept., Bengal, and Bengal Vet. Col. Ann. Rpt. 1926–27, pp. 48+4*).—This is the usual annual report (E. S. R., 57, p. 872).

Veterinary research report No. 3 (*N. S. Wales Dept. Agr., Sci. Bul. 29 (1927), pp. 53*).—The papers presented in this report are as follows:

Annual Report of the Director of Veterinary Research for the Year 1925–26, by H. R. Seddon (pp. 3–19); A Specific Arthritis in Lambs (pp. 20, 21) and The Occurrence of *B. botulinus*, Type B, in Rabbit Carrion (pp. 22–25), both by H. R. Seddon and H. R. Carne; Bacterial Infection Associated with Grass Seed Infestation in Sheep, by H. R. Seddon and H. G. Belschner (pp. 26–30); *Corynebacterium equi* Infection in a Mare, By H. R. Carne (pp. 31, 32); Incidence of Coccidiosis in Australian Rabbits as Determined by Faecal Examinations, by H. R. Seddon and H. R. Carne (pp. 33–42); On the Preservation of Rabbit Faeces for Transmission for Examination as to the Presence of Oocysts of *Eimeria perforans* and *Eimeria stiedae*, by H. R. Carne (pp. 43–45); Feeding Tests with Stinkwort (*Inula graveolens*) (pp. 46, 47) and Feeding Tests with Mexican Poppy (*Argemone mexicana*) (pp. 48–50), both by H. R. Seddon and H. R. Carne; and The Use of Poison Baits for Control of Grasshoppers, by H. R. Seddon (pp. 51–53).

Recent developments on the use of carbon tetrachlorid, M. C. Hall (*North Amer. Vet., 8 (1927), No. 11, pp. 49–53*).—This is a review of recent work on the subject in which it is pointed out that animals to be treated with carbon tetrachloride should be put on a diet rich in assimilable calcium for at least a week before treatment. Failing this, intravenous calcium should be administered in cases of intoxication, but the indicated measures are primarily prophylactic.

Precautions for feeding spoiled sweet clover hay: Rabbits can be used to determine its safety for cattle feed, L. M. Roderick and A. F. Schalk (*North Dakota Sta. Circ. 35 (1928), pp. 4*).—It is first pointed out that sweet clover poisoning can not be detected from external appearances of the animal

until considerable damage has been done. If, however, the blood is examined from time to time it will be found that it gradually loses its power to clot when drawn from the animal, and when it reaches a certain lowered clotting power it passes through the vessel walls and hemorrhages result. If such cattle continue feeding on the diseased clover they will invariably die, chiefly from loss of blood. Animals subjected to surgical operations, such as dehorning and castrating, while their blood is in this condition, bleed to death in a large number of cases. With a view to determining a method of handling such sweet clover so that losses can be avoided or reduced to a minimum, some feeding trials were conducted, and these trials are briefly reported upon.

These experiments and field experiences have shown quite conclusively that it is primarily a disease of young cattle, particularly animals from a few months up to 2 or 3 years of age. It is, however, not at all uncommon in older cattle. The disease was produced in 1 of 4 young wethers, but only after a long period of feeding, and the disease has never been associated with sheep in the field under ordinary farm conditions. In young cattle the bleeding stage appears after 3 to 4 weeks or more of feeding of the moldy hay, depending largely upon the condition of the sweet clover.

It was found that rabbits are affected more readily and much earlier by the poisoning than cattle under the same conditions of feeding, and that they can be used in testing the hay. A large majority of the rabbits arrive at the bleeding stage and die within 6 to 20 days, with an average of about 10 or 11 days, or invariably from 7 to 10 or 12 days earlier than cattle fed the same material. The plan of testing consists in the feeding of a hutch of 4 or more tame rabbits on the hay in question at the same time it is being fed to cattle. Hay should be selected each day from the same spot, place, or layer of the stack or mow so that both classes of animals will be eating the same kind of hay. If any of the rabbits die they should at once be sent to the station pathologist and the cattle removed from the damaged sweet clover. If the death of the rabbits is caused in 6 or 7 days after feeding from a specimen of hay, it is considered doubtful if such hay should be used for livestock, but if, on the other hand, the rabbits continue to eat the hay for 2 weeks or more before they die, the feeding trials indicate that it can be fed with comparative safety to horses, sheep, and older cattle as part rations or by alternating it with reliable feeds.

It is pointed out that it is not advisable to attempt any dehorning, castration, or other major or minor surgical operations upon cattle within 3 weeks after they have been removed from the molded or spoiled sweet clover hay or silage. However, there appears to be no danger from sweet clover pasture.

The account supplements Circular 27 (E. S. R., 54, p. 775).

Bacteriology, particularly bacteriological diagnosis, I, K. B. Lehmann and R. O. Neumann (*Bakteriologie, Insbesondere Bakteriologische Diagnostik. I. Band. Munich: J. F. Lehmann, 7. ed., rev. and enl., pt. 1, 1926, pp. XX+172, pls. 65, figs. 3*).—The first part of this work which deals with bacteriological technique (pp. 1–83), is followed by a discussion of general diagnosis (pp. 85–103). The main part (pp. 105–172) is devoted to an atlas consisting of colored plates showing the morphology, nature, and growth of cultures of the pathogenic bacteria and some protozoa.

Some general aspects of pathological conditions caused by filterable viruses, T. M. Rivers (*Amer. Jour. Path., 4 (1928), No. 2, pp. 91–124, pls. 7*).—This address, delivered before the Philadelphia Pathological Society, November 10, 1927, is based upon work a reference to which has been noted (E. S. R., 58, p. 274). The account includes a tabulated list of the majority of diseases in which intracellular inclusions have been described, a list of the filtrable

virus diseases in which intracellular changes are sufficiently characteristic to be of significance, and a list indicating hypotheses concerning the nature and origin of inclusions observed in cells affected by viruses. A classified bibliography of 13 pages is included.

The Twort-D'Herelle phenomenon, P. HADLEY (*Jour. Infect. Diseases, 42 (1928), No. 4, pp. 263–434*).—This is a critical review and presentation of a new conception (homogamic theory) of bacteriophage action. The several parts of the work deal with the origin or "source" of the lytic agent, the bacteriophage "unit" and some of its physical characteristics, the range of activity of the bacteriophage and some of its characteristic modes of action, the influence of specific substances and of conditions of environment on bacteriophage, the influence of the bacteriophage on its substratum, the serologic aspects of the bacteriophagic reaction, the rôle of the bacteriophage in disease and in immunity, views on the nature of the bacteriophage and of the mechanism of lytic action, the relation of transmissible autolysis to the phenomenon of microbic dissociation, a theory of transmissible autolysis based on the dissociative reaction (homogamic theory), and the biologic significance of transmissible autolysis. The work includes an 11-page list of references.

Bacterium abortus as the cause of disease in man [trans. title], J. VAN DER HOEDEN (*Tijdschr. Diergeneesk., 55 (1928), No. 5, pp. 209–226, pls. 2; Ger., Fr., Eng. abs., pp. 224–226*).—This discussion of the subject includes a report of a case of undulant fever (Bang) of man in a small village in the Netherlands, from which country it had not previously been reported. It is thought to have been contracted by wound infection from the patient's herd of six cows, four of which had aborted.

The distribution of rinderpest virus in infected blood, H. E. HORNBY (*Jour. Compar. Path. and Ther., 41 (1928), No. 1, pp. 17–24*).—The author concludes from studies conducted in Tanganyika Territory that in whatever way the problem is attacked the result is the same, namely, that more than 98 per cent, and probably more than 99 per cent, of the virus of rinderpest blood is attached to the leucocytes. The small quantity that is free in the plasma is able to pass a Berkefeld V filter.

Zoological contributions to the surra problem.—XVI, XVII, Further surra transmission experiments with Tabanus rubidus Wied. [trans. title], O. NIESCHULZ (*Centbl. Bakt. [etc.], 1. Abt., Orig., 105 (1927), No. 1–3, pp. 133–136; Arch. Protistenk., 61 (1928), No. 1, pp. 92–118, figs. 2*).—The details of further transmission work are presented (E. S. R., 58, p. 262).

A precipitin test in experimental trichiniasis, G. W. BACHMAN (*Jour. Prev. Med., 2 (1928), No. 1, pp. 35–48*).—"Satisfactory antigen solutions of *Trichinella spiralis* were prepared by freeing the larvae from infected meat by artificial digestion, and by hydrolyzing the dried trichinella powder in 0.1 per cent hydrochloric acid. This acid solution can be used unmodified for artificial immunization of rabbits, but as test antigen in vitro precipitin tests it must be neutralized with 1 per cent sodium hydroxide and used at a pH of 7.2 to 7.4.

"In artificially immunized rabbits precipitins were detectable in high concentration five days after the last injection of the antigen, remaining in a high concentration (demonstrable with antigen dilutions of 1:2,000 in terms of dry weight of the trichinella powder) until about the fortieth day; then they gradually disappeared and were not demonstrable after about the seventieth day.

"In rabbits infected with *T. spiralis* by feeding on trichinous meat, precipitins were not demonstrable until the thirtieth day; then the titer increased rapidly (demonstrable with antigen dilution of 1:3,500 in terms of dry weight of the

trichinella powder) until the ninetieth day, and were still detectable in two cases after 227 days and in one case after 367 days (end of observation period).

"Precipitins were demonstrable in the serum of a man infected with *T. spiralis* in an antigen dilution of 1:3,500."

Tularaemia among meadow mice (Microtus californicus aestuarinus) in California, J. C. PERRY (*Pub. Health Rpts. [U. S.], 43 (1928), No. 5, pp. 260–263; abs. in Jour. Amer. Med. Assoc., 90 (1928), No. 12, p. 986*).—Two mice (*M. californicus aestuarinus*), collected in nature in Contra Costa County, Calif., where there were large numbers of sick and dead mice, were found by the author to be infected with *Bacterium tularense*. This is the first record of *B. tularense* having been isolated from naturally infected wild mice.

Infectious abortion in cattle (*Georgia Sta. Rpt. 1927, pp. 31, 32*).—Referring to eradication of the disease from the main station herd of dairy cattle, it is again pointed out that a badly infected herd was apparently freed from the disease in about two years' time through the application of suitable methods of sanitation and quarantine and periodic application of the agglutination test. It is pointed out that these cattle have been kept for most of the time in lots adjacent to those in which badly infected cattle were kept for other experimental studies.

Further work with acriflavine (E. S. R., 57, p. 279) has shown that a single injection of 1 gm. of neutral acriflavine in a 1 to 300 solution can not be depended on to effect a cure. There was some indication that this treatment may have been responsible for the curing of a small percentage of cases treated in a herd of about 50 cattle.

Formol-vaccine against contagious bovine abortion [trans. title], R. VAN SACEGHEM (*Bul. Méd. Katanga, 3 (1926), No. 6, pp. 164–166; abs. in Trop. Vet. Bul., 16 (1928), No. 1, pp. 19, 20*).—The author finds that large doses of formol-vaccine have to be repeated at short intervals. This vaccine is superior to vaccine killed by heat. The strength of formalin used is 2 per 1,000, the death of the organism taking place in 48 hours. The vaccine is prepared by washing off the growth from glycerin agar, and the formalin is added while the rather thick emulsion is repeatedly shaken. It is incubated for 5 days at 37° C. and is then diluted until the density corresponds to 10,000,000 organisms per cubic centimeter, when 0.5 per cent carbolic acid is added. The dose is 20 cc., and 6 injections at intervals of 10 days are recommended.

On the culture of the acid-resistant bacillus of Johne [trans. title], A. BOQUET (*Compt. Rend. Soc. Biol. [Paris], 97 (1927), No. 19, pp. 43–45*).—This is a brief account of cultural studies of the causative organism of Johne's disease of bovines.

Glucose therapy in parturient paresis [trans. title], W. F. VAN BEEK (*Tijdschr. Diergeneesk., 55 (1928), No. 6, pp. 273, 274; Ger., Eng., Fr. abs., p. 274*).—An account is given of a cow suffering from parturient paresis which was treated without result by insufflation of the udder, but which recovered after a subcutaneous injection of 100 gm. of glucose.

Bacillus oedematiens and braxy of sheep in Victoria, Australia [trans. title], A. W. TURNER and J. DAVESNE (*Compt. Rend. Soc. Biol. [Paris], 96 (1927), No. 13, pp. 921–923*).—This note deals with the cultural characteristics of the organism found to be a strain of *B. oedematiens*.

The poisoning of sheep on mountain grazing ranges in Nevada by the western chokecherry (Prunus demissa), C. E. FLEMING and R. DILL (*Nevada Sta. Bul. 110 (1928), pp. 14, figs. 7*).—This bulletin supplements Bulletin 109, previously noted (E. S. R., 55, p. 371).

Studies of poisoned animals and post-mortem examinations showed that death was due to a form of poisoning by this plant that had not previously been observed. Since the symptoms of poisoning followed promptly after drinking from mountain streams, the herders in charge of the animals were led to believe that the sheep had been poisoned by the water. It was found, however, that several hours before drinking the poisoned animals had eaten fatal quantities of chokecherry along with other half-dry leaves and browse, and there was not enough moisture in the stomach to set the poison free from the leaves. As soon as the animals drank, the added moisture caused the liberation of the poison and the immediate poisoning of the sheep. In some such cases the sheep died promptly, in other instances even after the animals drank water the poison was liberated rather slowly, and symptoms of poisoning were present for hours, even for a day or more.

It is pointed out that like many other forms of plant poisoning of both sheep and cattle this form of chokecherry poisoning is primarily due to the dried and overgrazed condition of the range. There is said to be no known remedy for chokecherry poisoning. It is pointed out that in late summer the chokecherry leaves lose their poisonous properties, and that in the autumn they may be eaten in quantity without harm to the sheep and are, in fact, considered valuable forage at that time of year.

Tick paralysis in sheep, S. VAN RENSBURG (*Farming in So. Africa, 2 (1928), No. 24, pp. 661, 662*).—An account of an affection of sheep, caused by *Ixodes pilosus*, which has increased rapidly from 1914 and since 1922 has been a veritable menace to sheep in many parts of South Africa.

The feeding of tobacco and nicotine sulfate as stomach worm preventives (*Ohio Sta. Bul. 417 (1928), p. 69*).—Feeding tests with finely cut tobacco and a nicotine sulfate and salt mixture showed that neither had merit as a preventive of stomach worms in sheep.

Impossibility of vaccinating the goat against M. melitensis even by enormous doses of vaccine [trans. title], E. BURNET (*Arch. Inst. Pasteur Tunis, 17 (1928), No. 1, pp. 73–78*).—The studies here reported show that the goat can not be successfully vaccinated against undulant fever.

A study of the histopathology of the so-called adenosarcoma of swine, W. H. FELDMAN (*Amer. Jour. Path., 4 (1928), No. 2, pp. 125–138, pls. 4*).—Eleven embryonal tumors of swine are described, nine of which had their origin in the kidney and two posterior to this organ in the sublumbar region. Available data indicate that this group of tumors constitute the most common neoplasm of swine, a species which seems to possess a relative lack of susceptibility to tumorous proliferations.

"Bighead" of horses a heritable disease, B. M. GONZALEZ and V. VILLEGAS (*Jour. Heredity, 19 (1928), No. 4, pp. 159–167, figs. 4*).—This is a contribution from the College of Agriculture, University of the Philippines, in which the data presented are considered to demonstrate beyond reasonable doubt that osteoporosis is a constitutional disease which is heritable. A provisional hypothesis is put forth that it is a simple dominant nonsex-linked mendelian character. The theory is advanced that the disease is caused by the failure of an organ or organ system to function properly. Control measures directed toward the prevention of breeding of affected individuals are recommended.

Genetic studies on resistance to disease, E. ROBERTS and L. E. CARD (*Anat. Rec., 37 (1927), No. 2, p. 175*).—This refers to studies conducted at the Illinois Experiment Station over a period of 3 years, reports of which have been previously noted (E. S. R., 56, pp. 276, 478). The work with more than 8,000

chicks is said to provide evidence that resistance and susceptibility are due at least in part to genetic factors. The work with inbred flocks is said to suggest that inbreeding without preventive measures against the disease tends to eliminate susceptible individuals, thus increasing resistance of the population. No relation between the results of the ordinary tests for detection of bacillary white diarrhea and the survival among the offspring was found.

On infection of the fowl with Bacterium gallinarum Klein [trans. title], M. KLIMMER and H. HAUPT (*Centbl. Bakt. [etc.], 1. Abt., Orig., 105 (1927), No. 1–3, pp. 99–113*).—This is a discussion and report of studies presented in connection with a list of 41 references to the literature. The authors are led to conclude that *B. pullorum* Rettger is a variety of *B. gallinarum*.

Diphtheria or pox in poultry and its prevention, L. DE BLIECK and T. VAN HEELSBERGEN (*Doetinchem, Netherlands: C. Misset, 1927, pp. 16, figs. 8*).—Following an introduction by E. Brown, a practical account is given of this disease, with methods of combating it, particularly the authors' method of vaccination, previously noted (E. S. R., 53, p. 785; 57, p. 878).

Control of poultry paralysis (*New Hampshire Sta. Bul. 232 (1928), p. 30*).—Work was conducted by E. M. Gildow during the year with a view to determining the relation between paralysis and coccidiosis. Evidence was found of immunity development against coccidiosis on the part of birds that had recovered from paralysis, the one out of four birds given a severe dose of embryonated coccidia which survived having previously recovered from paralysis. Birds given a half dose amounting to 2,800 embryonated coccidia survived the test, and only one lost weight.

Of 44 paralytic birds placed in batteries during the year without supplemental treatment, 14 recovered and started laying without having shown evidence of the disease in their external appearance and actions. Of the 30 pullets that died, 20 showed evidence of coccidial forms in the intestinal tract, 5 showed no evidence of such forms, and 5 were not autopsied. No evidence of long roundworms or tapeworms was detected; some few cecal worms were found in most of the specimens. Two of five birds which showed no evidence of coccidia were in batteries a long enough period to have eliminated the coccidia that they might have harbored. The use of a clean range in itself was not enough to prevent paralysis, 37 cases developing in approximately 1,200 pullets kept under such conditions, while only 13 cases developed in 400 pullets kept on ranges that had been used for 4 or 5 years.

The results of the year led to the conclusion that coccidiosis is in most instances in the State closely associated with paralysis. It is believed, however, that there is a form of paralysis which is not connected with any of the internal parasites of poultry. It is thought that a program to prevent or control coccidial infection is essential, including a range rotation that will insure a good heavy sod which will be without bare spots.

Tests made of iodine vermicide, which has been found helpful in the control of roundworms and tapeworms and the resistant forms of coccidia, indicate that it is without value for the treatment of typical paralysis.

Roup in chickens (*Wyoming Sta. Rpt. 1927, pp. 145, 146*).—Results obtained during the year indicate that vaccination with either commercial products or autogenus bacteria is of little benefit in the control or prevention of roup.

Further observations on an experimentally produced sarcoma of the chicken, E. STURM and J. B. MURPHY (*Jour. Expt. Med., 47 (1928), No. 4, pp. 493–502*).—The authors report upon numerous attempts made to separate a causative agent from the cells of a tar sarcoma of the chicken. The experiments with filtrates and desiccates injected as such or in combinations with

embryonic tissues all failed to give positive results, as did injections of filtrates and desiccates into developing chick embryos.

On the inheritance of resistance to fowl typhoid in chickens, W. V. LAMBERT and C. W. KNOX (*Anat. Rec., 37 (1927), No. 2, pp. 174, 175*).—In this abstract reference is made to preliminary work, the results of which indicate a marked difference in the mortality of chicks descended from parents that have survived an acute infection of fowl typhoid as contrasted with chicks from similarly bred parents not having had this disease. In determining the size of the dose it was found that the number of organisms injected had a decided influence on the mortality. All chicks were injected intraperitoneally with the same dose of fowl typhoid bacilli, the dosage finally adopted being 12,000,000 organisms.

Testing pullets for white diarrhea (*New Hampshire Sta. Bul. 232 (1928), p. 31*).—In an attempt to ascertain how early in a pullet's life it reacts to the agglutination test, a pen of 125 infected pullets was tested by E. M. Gildow at monthly intervals from the fourth month after they were hatched until they were 12 months old. The reactors were found and removed after each test, thus eliminating so far as possible the transmission of the disease from bird to bird. The pullets started laying at from 4.5 to 5 months of age. The reactors shown were as follows: 2 at 4 months, 4 at 5 months, 3 at 6 months, 2 at 7 months, 1 at 8 months, 0 at 9 months, 1 at 10 months, 0 at 11 months, and 1 at 12 months. It is pointed out that 11 out of a total of 14 positive reactors were eliminated by the time the birds had been laying as a flock for 3 months, but it is not considered advisable to test pullets before such time.

In the white diarrhea campaign 70,000 birds were given the agglutination test during the period from June 1, 1926, to March 10, 1927, practically 20,000 of which were hens and 50,000 pullets. The percentage of infection in both was 2.1 per cent. The fowls represented 133 flocks, 45 of which had not been tested the preceding year. It is pointed out that there are now 56 flocks on the accredited list, containing 45,000 birds.

In post-mortem examinations made of 1,875 specimens, 515 represented white diarrhea, 364 coccidiosis, 342 pneumonia and chilling, 145 paralysis, and 67 rickets. The specimens came from 402 different farms and showed 38 different types of ailments.

Additional observations on the development of the eye worm of poultry, J. W. FIELDING (*Aust. Jour. Expt. Biol. and Med. Sci., 5 (1928), No. 1, pp. 1–8, figs. 11*).—This is a further contribution on the eye worm of poultry (E. S. R., 56, p. 879), the development of which has been followed from egg to adult. Four larval stages and an adult stage are described.

Ineffectiveness of internal medication of poultry for the control of external parasites, D. C. PARMAN, W. S. ABBOTT, J. J. CULVER, and W. M. DAVIDSON (*U. S. Dept. Agr., Tech. Bul. 60 (1928), pp. 24, figs. 2*).—The first part of this account (pp. 1–20) deals with tests of 30 materials administered internally to fowls to determine their effect on external parasites, and the second part (pp. 20–24) with tests with proprietary preparations used in the food and drinking water for the control of external parasites of poultry.

The studies of proprietary remedies designed for internal administration against external parasites showed conclusively that those of the hen are not adequately controlled by internal treatment with the chemicals used. "In no case have any deleterious effects been observed on any of the parasites feeding upon the hens to which any of the materials were administered. In all cases the parasites fed upon the medicated hens normally, reproduced normally, and, as far as was determined, developed normally thereafter. Where internal

medication for external parasites has been used by poultry raisers and apparently beneficial results have been obtained, it is probable that those making such tests were misled by the lack of knowledge of the habits of the parasites or by extraneous factors not considered. There is grave danger in giving certain internal medicants to fowls, as their vitality may be decreased to such an extent that they may actually become more heavily infested with parasites as a result of the medication. The use of internal medications against external parasites is detrimental to the poultry industry in that it not only involves useless expenditures, but allows the parasites to continue their ravages when they might be destroyed by recognized methods."

None of the preparations tested, when given in the food or drinking water, showed any indications of value against the parasites used in the experiments. These tests, considered with the feeding experiments reported, showed conclusively that preparations of this type, given in the food or drinking water, can not be of any practical value for the control of the common external parasites of poultry.

The details of the work are reported largely in tabular form.

[Diseases of quail], H. L. STODDARD (In *Report on Cooperative Quail Investigation, 1925–1926. [Beachton, Ga.]: Com. Coop. Quail Invest., 1926, pp. 45–47*).—In the course of investigations of quail conducted in southern Georgia and northern Florida, visceral gout, a dietary trouble, was found to cause the death of a few of the breeders, and chicken pox, or sorehead, to cause the loss of others.

AGRICULTURAL ENGINEERING

[Irrigation experiments at the Colorado Station], A. KEZER (*Colorado Sta. Rpt. 1927, pp. 13, 14*).—It is reported that water colder than the normal when used for the irrigation of wheat in the first spring irrigation apparently had only a slight effect. Later the soil apparently became warm enough so that even the coldest water had no retarding effect on the growth.

[Irrigation studies at the New Mexico Station] (*New Mexico Sta. Rpt. 1927, pp. 23–32, fig. 1*).—The progress results of ground water studies in the middle Rio Grande Valley, N. Mex., of duty of water investigations, of studies of the rate and cause of rise of ground water in the Mesilla Valley, of studies of duty and effect of duty of water on alfalfa, of studies of the water requirements and economical use of water for cotton and other crops, and of studies of rainfall supplemented by underground water in the production of crops of low water requirements, all conducted in cooperation with the U. S. D. A. Bureau of Public Roads, are reported.

[Evaporation studies at the Colorado Station], R. L. PARSHALL (*Colorado Sta. Rpt. 1927, p. 44*).—In evaporation studies from free water surfaces a relation was established between a large evaporating surface and a standard buried pan, the large reservoir losing about 75 per cent as much as a standard pan. Studies of evaporation from moist soils showed that for various types of soils, except the very heavy alkali adobe, the evaporation loss with the water table at 1 in. below the surface approximates very closely the loss from a free water surface.

Hydrostatic uplift in pervious soils, H. DE B. PARSONS (*Amer. Soc. Civ. Engin. Proc., 54 (1928), No. 4, pt. 1, pp. 941–956, figs. 6*).—This paper describes a study to determine the hydrostatic uplift on the base of a structure founded on a pervious soil when there is no loss of head due to velocity of flow. A record is presented of 218 tests with sand, gravel, and clay under both low and high hydrostatic heads.

It was found that shallow depth of soil under the test base affects the results. The results also show that the effective area, or that portion of the base on which the uplift acts, is approximately from 90 to 100 per cent, according to the test conditions. The apparatus used and the methods of conducting the tests are fully described and illustrated.

Laboratory tests on physical properties of water-bearing materials, N. D. STEARNS (*U. S. Geol. Survey, Water-Supply Paper 596–F (1927), pp. IV+121–176, pls. 3, figs. 9*).—The apparatus and technique for such tests are described and illustrated, and typical results from experiments are tabulated and discussed.

Surface water supply of Snake River basin, 1923 (*U. S. Geol. Survey, Water-Supply Paper 573 (1928), pp. VI+259, fig. 1*).—This report, prepared in cooperation with the States of Idaho, Oregon, and Nevada, presents the results of measurements of flow made on streams in this basin during the year ended September 30, 1923.

Ground water in the Ordovician rocks near Woodstock, Virginia, G. M. HALL (*U. S. Geol. Survey Water-Supply Paper 596–C (1927), pp. II+45–66, pls. 2, figs. 4*).—A study of the ground waters in an agricultural country near Woodstock, Va., is reported.

The conclusion is drawn that drilled wells are preferable to dug wells in this vicinity, because they are more sanitary and less liable to go dry. In the shale area drilled wells less than 200 ft. deep will generally yield supplies of hard water sufficient in quantity for farm use, but large supplies can rarely be obtained. The yield of wells in the limestone area is variable and depends on the size and number of water-bearing crevices encountered. It is concluded that in general it is not advisable to drill deeper than about 300 ft. in either shale or limestone. If a drill hole is still dry at this depth it should be abandoned and a new location sought.

Chemical character of waters of Florida, W. D. COLLINS and C. S. HOWARD (*U. S. Geol. Survey, Water-Supply Paper 596–G (1928), pp. IV+177–233, figs. 8*).—The results of this study and analyses indicate that the surface waters of Florida differ widely in composition. In general, however, the rivers and smaller streams carry only small quantities of dissolved mineral matter. All the rivers become brackish toward their mouths. Nearly all the surface waters are noticeably colored, and the larger lakes and streams generally have more color than the smaller ones. Detailed data are also given on the quality of the ground waters in western, northern, central, and southern Florida.

Quality of water of Colorado River in 1925–1926, W. D. COLLINS and C. S. HOWARD (*U. S. Geol. Survey, Water-Supply Paper 596–B (1927), pp. II+33–43, pl. 1, figs. 2*).—Analyses of 139 samples of Colorado River water are presented and briefly discussed.

Quality of the surface waters of New Jersey, W. D. COLLINS and C. S. HOWARD (*U. S. Geol. Survey, Water-Supply Paper 596–E (1927), pp. IV+89–119, pl. 1, figs. 2*).—The results of an investigation of the quality of the surface waters of New Jersey are reported and discussed, including analyses. The results indicate that, where unpolluted, these waters are generally clear and contain only moderate quantities of dissolved mineral constituents. The waters in the southern part of the State are softer but more highly colored than those of the northern part.

Quality of water of Pecos River in Texas, W. D. COLLINS and H. B. RIFFENBURG (*U. S. Geol. Survey, Water-Supply Paper 596–D (1927), pp. II+67–88, pl. 1, figs. 4*).—The results of this study and analyses indicate that early in

the course of the Pecos River it receives large quantities of calcium and sulfate through the solution of gypsum from the soil. Sodium and chloride appear in increasing quantities to the Texas line, but the alkaline earth salts are appreciably in excess of the alkali salts. In Texas the river water carries about equal quantities of alkali salts and alkaline earth salts as far as Barstow. The alkali salts increase from this point on.

Methods of exploring and repairing leaky artesian wells (*U. S. Geol. Survey, Water-Supply Paper 596–A (1927), pp. II+32, pls. 5, figs. 5*).—This publication includes a preface by O. E. Meinzer and contributions on Methods of Exploring and Repairing Leaky Artesian Wells on the Island of Oahu, Hawaii, by J. McCombs (pp. 4–24); and on The Au Deep-Well Current Meter and its Use in the Roswell Artesian Basin, New Mexico, by A. G. Fiedler (pp. 24–32).

Public Roads, [April, 1928] (*U. S. Dept. Agr., Public Roads, 9 (1928), No. 2, pp. 25–48+[2], figs. 30*).—This number of this periodical contains the status of Federal aid highway construction as of March 31, 1928, and a list of the motor vehicle registrations, fees, etc., for 1927 of the different States and the District of Columbia, together with the following articles: How Massachusetts is Improving her Roadsides, by R. E. Tribou (pp. 25–36); and Power-Shovel Operation in Highway Grading.—Part 3, Hauling with Trucks and Large Tractor-Drawn Wagons, by T. W. Allen and A. P. Anderson (pp. 37–47).

Termite pole damage in California, T. E. Snyder (*Elect. West., 60 (1928), No. 3, pp. 135–138, figs. 5*).—The results of a study conducted by the U. S. D. A. Bureau of Entomology on the damage to rural electric line poles by termites are reported.

It was found that subterranean termites will not attack poles set in a constantly water saturated soil or in soil saturated with alkaline salts. Nonsubterranean termites were found to live more or less indefinitely in old poles stored in pole yards. The injury to poles by subterranean termites is fairly widespread and the most serious, but can be prevented by treating the butts of the poles with coal-tar creosote. Damage by nonsubterranean termites is serious but less widespread. Impregnation of the entire pole with coal-tar creosote by a pressure process will prevent such damage, but is more costly.

Formulating a definite program of farm electrification, J. C. Scott (*Elect. West, 60 (1928), No. 3, pp. 131–134, figs. 7*).—A brief statement is given of the points to be considered in the development of a farm electric load.

Nebraska tractor tests, 1920–1927, rules for official tractor testing, and the Nebraska tractor law (*Nebraska Sta. Bul. 224 (1928), pp. 39, figs. 6*).—This bulletin summarizes all reports of Nebraska official tractor tests conducted since the work began in 1920 under the provisions of the Nebraska tractor law (E. S. R., 57, p. 678). During the 8 years of that period tests have been conducted on 147 different models and types of tractors. During the first 4 seasons of testing there were several tractors the claims for which had to be revised before they could complete the test. During the last 4 years, however, every tractor tested has been able to go through the test and has met all original claims made for it. A summary of the data is presented in tabular form. A statement is also given of recent changes in tractor design.

[Combine-harvester studies at the Ohio Station] (*Ohio Sta. Bul. 417 (1928), pp. 82, 83, fig. 1*).—A comparative study of harvesting with the combine and the binder showed that the combine was satisfactory in oats even where the oats was flat on the ground. Several mechanical defects appeared when the combine was set to cut low. In the wheat it was necessary to raise the cutter bar to a 17-in. stubble and then to proceed rather slowly. No

trouble was experienced in oats when cutting a low stubble. It was found that the binder was able to cut a considerably larger number of acres of wheat and oats per 8-hour day than the combine, owing to the necessity of preceeding slowly to give the combine an opportunity to handle the straw. It was also impossible to take a full swath with the combine when harvesting wheat.

Wind-pressure tests made on large model building, E. R. Dawley (*Engin. News-Rec., 100 (1928), No. 13, pp. 508–510, figs. 4*).—Studies conducted at the Kansas State Agricultural College are reported in which a series of wind tunnel tests on a large model building were conducted. Tests were made as follows, placing the building in both crosswise and endwise positions in the wind tunnel: (1) Framework only, (2) building covered and with doors and windows closed, and (3) building covered but with doors and windows removed.

The wind pressure was found to vary with a power of the velocity slightly higher than the square. The exact formula for the maximum pressure from this experiment is $P=0.00176V^{2.05}$ at 125 miles per hour. Many of the other formulas, such as that of Rankine and Smeaton, were found to be two or more times too high.

Window shutters that can be securely fastened are recommended for localities subject to hurricanes or even tornadoes. For other light buildings, which are sometimes carried bodily away, anchor bolts are recommended for both the roof and the walls. It was also found that building frameworks in the preliminary stages of construction may be subjected to wind stresses at a given wind velocity in excess of those possible after the building is completed. Hence greater care is recommended in providing wind bracing during construction. It is suggested that structures may be designed to withstand lateral pressures of 35 lbs. per square foot without undue expense.

Straw lofts for poultry houses (*Wyoming Sta. Rpt. 1927, p. 140*).—A continuation of experiments on the insulation of poultry houses by the use of straw lofts showed that the house with the straw loft was from 5 to 10° warmer in the early morning and from 10 to 20° cooler in midday than the house without the straw loft. During a cold snap, when the temperature went down to −30° F., the lowest temperature in the house with the straw loft was +4°. None of the hens in the straw loft house had frozen combs. In the uninsulated house the temperature reached −4°, and all of the chickens were frostbitten. The eggs from the house with the straw loft also had the highest hatchability.

The losses to agriculture caused by the spontaneous combustion of haystacks [trans. title], G. Laupper (*Matér. Étude Calamités, 3 (1926), No. 10, pp. 112–140, pls. 4, figs. 3; Fr. abs., pp. 136–138; Eng. abs., pp. 138–140*).—It is pointed out that the losses from this cause in Switzerland are considerably greater than is generally supposed. It has been found that when hay is being stacked the individual straws become thoroughly mixed and form regular, compact layers. The stack is thus made up of a series of strata, which is a necessary condition for the formation of combustion chambers inside the stack. Even when apparently dry, hay always contains a certain amount of moisture, and after being thoroughly exposed to the sun its initial temperature is fairly high. The living vegetable cells develop heat and moisture, creating favorable conditions for bacterial development. The heat thus generated accumulates in the stack, and the moisture condenses in the upper strata, making them soft and disintegrating the cellular matter. The soluble carbohydrates combine with the albumens and vapor into a sticky cement which amalgamates the hay stratum into a nonconducting mass. Below this mass a combustion chamber

is formed in which dry distillation takes place, producing water vapor and carbon dioxide. The heat of the combustion chamber increases steadily as does also the pressure of the gases. The latter are liable to escape violently either through a newly formed chimney or as the result of the explosion of the haystack. The products of distillation mixed with air produce a kind of detonating gas which is the immediate cause of spontaneous combustion. The latter is due to the action of pyrophoric iron.

In one experiment hay was calcined in an air-tight receptacle at from 250 to 300° C. (482 to 572° F.). The charred mass was then poured out hot onto a plate and became incandescent after a few minutes. This phenomenon was found to be due to the presence of pyrophoric iron produced by cellulose. Charred hay from which all iron was extracted did not react in this manner. However, the same result could be secured by restoring the removed iron in the shape of protoxide of iron or in solution.

The fact that hay which has been thoroughly exposed to the sun's rays must be richer in hydrocarbons is advanced as the reason why more stacks are destroyed by fire during a good hay season. Annual statistics of haystack fires are presented to support this hypothesis, showing that the smallest number of fires have occurred in the wettest years. The monthly data show a maximum in July and August, and high figures also in October and November on the one hand and in January, February, and March on the other.

Studies of means of prevention lead to the conclusion that there is no sure cure. Ventilation proved worse than the trouble. Layers of straw or of salt were also equally useless. The only measure which is recommended is to spread the hay on the ground as soon as abnormal temperatures are noticed .

An apparatus is described for use in detecting threatened combustion.

Gases from sewage sludge digestion, W. D. Hatfield, G. E. Symons, and R. R. Mills (*Indus. and Engin. Chem., 20 (1928), No. 2, pp. 174–176, figs. 5*).—Studies are reported which showed that the rate and volume of gas production from sludge digestion in Imhoff tanks and the hydrogen sulfide content of the gas are directly proportional to the temperature of digestion. Laboratory data indicate that the maximum gas rate occurs at about 30° C. (86° F.), and that the rate decreases at higher temperatures. A large scale demonstration was given of the advantage of heating sludge digestion chambers to increase the rate of digestion and to increase the sludge capacity through rapid digestion. The chief components of the Imhoff gas are methane 70 per cent, carbon dioxide 20, and nitrogen 7 per cent.

RURAL ECONOMICS AND SOCIOLOGY

[Investigations in agricultural economics at the New Hampshire Station] (*New Hampshire Sta. Bul. 232 (1928), pp. 4, 5, 12, 21, 22, 26, 27, figs. 3*).—Results of investigations in agricultural economics are reported as follows:

[*Orchard labor requirements*] (pp. 4, 5).—A study of 10 farms with from 565 to 3,100 bearing trees in southern New Hampshire by H. C. Woodworth, G. F. Potter, and H. A. Rollins in cooperation with the U. S. D. A. Bureau of Agricultural Economics, showed that the average man labor requirements per tree in 1926 were for pruning 11 minutes, brush disposal 4, spraying 9, fertilizing 2, tillage 5, setting and resetting 1, mowing 4, mulching 1, protection 1.5, thinning 4, propping 1.5, harvesting 60, and miscellaneous 3 minutes, totaling 107 minutes. The average requirements per 1,000 trees by months were for January 5 hours, February 11, March 83, April 190, May 144, June 130, July 87, August 108, September 328, October 609, November 92, and December 3 hours. The con-

clusion is reached that 1,000 trees may be considered a minimum unit for specialized fruit farms.

[*Costs of handling grain*] (p. 12).—A survey of 197 retail feed and grain stores by E. H. Rinear showed that gross margins charged by dealers over wholesale prices ranged from $2 to $12 per ton, the majority charging from $4 to $6. Total costs to dealers in handling grain varied from $2 to $10 per ton, with the majority ranging from $4 to $6.

[*Potato production costs*] (pp. 21, 22).—Survey records obtained by M. F. Abell in the fall of 1926 for 191 farms raising 2 acres or more of potatoes showed that the costs for labor, materials, and miscellaneous items averaged $164.85 per acre. The man labor required in the southeastern, central, and northern sections averaged 125, 138, and 130 hours, respectively, where hand methods were employed, and 84, 89, and 100 hours, respectively, where machine methods were used.

[*Hotel markets for vegetables and poultry*] (pp. 26, 27).—The main objections of hotel stewards to buying vegetables locally were found by E. H. Rinear and J. R. Hepler to be lack of uniform grading, poor packing, and insufficient volume to supply needs regularly. The demand for dressed poultry was found by Rinear to be for high grade birds of uniform quality and weight, and for a dependable supply service. See also a previous note by Woodworth et al. (E. S. R., 55, p. 688).

[Agricultural economics investigations at the Ohio Station, 1926–27] (*Ohio Sta. Bul. 417 (1928), pp. 77–81*).—Results of investigations are reported as follows:

Cost of cultivating corn in different-sized fields.—Cost record reports on Putnam County farms for 1926 showed that with 1-row cultivators the average number of man hours per acre varied from 1.49 for fields of over 18 acres to 1.95 hours for fields of less than 7.99 acres, the acres cultivated per day varied from 6.7 to 5.1, and the total cost per acre from 91 cts. to $1.15; and that with 2-row cultivators the variations were from 0.74 to 1.02 man hours, from 13.5 to 9.8 acres, and from 59 to 77 cts., respectively.

Season of egg production as related to profits.—Results of 1920–1924 cost records on 22 Medina County farms showed that on farms selling less than one-twelfth, from one-twelfth to one-sixth, and over one-sixth of the annual production of eggs from October to January, inclusive, the annual production per hen was 59, 87, and 112 eggs, the cost of eggs per dozen 31.6, 31.8, and 28.8 cts., the average selling price per dozen 29.7, 33.6, and 39.2 cts., the return per hour of labor 25, 35, and 70 cts., and the cost per $1 returns from poultry $1.03, 94 cts., and 74 cts.

[*Livestock losses at stockyards*].—For the period October 1, 1926, to September 30, 1927, one hog out of every 483 received at the Cleveland yards arrived dead or died in the yards, and one hog out of every 258 was crippled. The total estimated loss amounted to $43,926.93, or about $3.21 per carlot received.

Farm real estate taxes.—Real estate taxes per acre in 1926 varied from 59 cts. to $1.75, averaging $1.27, in the different sections of the State. The percentage of the tax assessed on buildings varied from 18 to 30, averaging 24.

Movement of rural population.—A study of 465 farm families in Union and Van Wert Counties showed that 87 per cent of the owners and 76 per cent of the tenants had lived in the same county since marriage, and that 68 and 57 per cent, respectively, had lived in the same township. Of the 631 grown children, 50.1 per cent lived in the open country, 11.7 per cent in villages, and 38.2 per cent in cities.

Costs of family living.—The household accounts of 50 farm families for the calendar year 1926 showed the average budget to be $1,531.62, distributed as

follows: For food, 38 per cent, 10 for operating expenses, 13.7 for clothing, 6.8 for household furnishings and equipment, 3.4 for health, 1.6 for recreation, 5.2 for education, 0.7 for organization dues, 2.7 for church and benevolences, 1.7 for gifts, 7.5 for transportation, 8.3 for life insurance, savings, and investments, and 0.4 per cent unclassified.

The apple industry of Ohio, C. W. Hauck (*Ohio Sta. Bul. 418 (1928), pp. 70, figs. 21*).—This bulletin assembles statistics pertaining to the production and marketing of apples in Ohio and the United States. The data were gathered from reports of the U. S. Departments of Agriculture and Commerce, the Ohio Department of Agriculture, the station, and other sources.

The trends in production, total and per capita production, value of Ohio apples, relation between total and commercial production, number of trees bearing and nonbearing, varieties, international trade, storage of apples in Ohio, freight rates, shipments, local marketing, Ohio farm and seasonal prices of apples, effects of production and substitution of other foods on apple prices, and the purchasing power of apples are considered.

Agricultural economics in the Empire, J. P. Maxton ([*London*]: *Empire Marketing Bd., 1927, pp. 24*).—This is the report of a committee appointed by the Empire Marketing Board to prepare a report to serve as a basis for discussion at the Imperial Agricultural Research Conference. The field of agricultural economic research, the recent developments, and its present status, and the agencies engaged in such research in the British Empire are described briefly. The relation of agricultural economists to public statistics, the World Census in 1930, the importance of agricultural geography, farm management and the special methods of studying its problems, the opportunities for research in the economics of the marketing of farm products, cooperation, and the agricultural significance of certain general social and economic structures, such as transportation, land tenure, taxes, rural sociology, etc., are discussed. The application of the results of agricultural economic research to the improvement of farming conditions is also considered. A list of references is included.

Agricultural survey of Europe: France, L. G. Michael (*U. S. Dept. Agr., Tech. Bul. 37 (1928), pp. 184, figs. 12*).—This is the fourth of the series previously noted (E. S. R., 55, p. 484), and contains an analysis of the agricultural situation in France from the viewpoint of the potential demand for agricultural products and the nature and extent of the competition that farmers of America must meet in disposing of their surplus. Comparisons are made between the pre-war and postwar trends in the agriculture of the country.

The agricultural self-sufficiency of Germany, H. Metzner (*Die Landwirtschaftliche Selbstversorgung Deutschlands. Berlin: Paul Parey, 1926, pp. VI+150*).—The present status and possibilities of the production of foods, feeds, livestock, and raw materials are analyzed.

Danish agriculture and cooperation [trans. title], A. Gascon y Miramon (*Bol. Agr. Tec. y Econ.* [*Spain*] [*18 (1926)*], *No. 216, Sup., pp. 325, figs. 4*).—This is a study of the agriculture, cooperative and semicooperative agricultural organizations, land systems, agricultural education, and research in Denmark, and of the adaptation of Danish systems and methods to conditions in Spain.

[Mortgages of agricultural land in the Punjab, India], S. B. Singh (*Punjab Bd. Econ. Inq., Rural Sect. Pub. 5 (1925), pp. VIII+30*).—The results are reported of an inquiry regarding the history, types, conditions, redemption, economic effects, and other phases of mortgages on agricultural land in the Kot Kapura Utar Assessment Circle of the Ferozepore District in the Punjab.

Services, facilities, and costs of marketing vegetables in the lower Rio Grande Valley of Texas, G. L. Crawford (*Texas Sta. Bul. 378 (1928), pp. 39,*

figs. 11).—This bulletin presents the results of a study to ascertain the kinds of vegetables grown and the extent to which each kind is grown, the marketing channels, and what marketing services are rendered and their costs, and to point out possible improvements. The data, which are for the season 1925–26, were obtained by personal visits to 215 growers and 15 shippers operating at 35 points and from railroad officials, bankers, and others. The plants and equipment and the financing of the growers by shippers, transportation facilities, and the State-Federal inspection are described. The cost of harvesting, methods of marketing and prices received by growers, services rendered by shippers, distribution, competition of other sections, factors affecting prices received, etc., are discussed for each of the vegetables grown.

An economic study of certain phases of fruit marketing in western New York, R. B. Corbett (*New York Cornell Sta. Bul. 464 (1928), pp. 51, figs. 15*).—This is a study of the costs of packing fruit in 35 local fruit-packing associations of the Western New York Fruit Growers Cooperative Packing Association, Inc., in 1922, and in 24 of such associations and 4 independent associations in 1923, based upon records obtained by personal visits to the secretaries of the several local associations. The methods of computing depreciation, the items of cost considered, and the distribution of total costs to the various packs are described. Tables and texts give for each of the two years the value of the property of different kinds of the associations, the range of and average total costs of packing, and labor, management, office, building, and equipment costs, and scoring each association for efficiency on each of the above costs and also on the cost of power, light, and heat, other costs. volume of fruit packed, percentage of culls, number of varieties, and wage rate.

The costs of packing on a number of farms were also studied in 1922, and the average costs found to be lower than those in the cooperative packing houses.

The volume of fruit packed, percentage of culls, number of varieties, investment in real estate and equipment, and the arrangement of the packing house were studied in their relation to packing costs. The costs per barrel were 58.1, 40.7, and 34.7 cts., respectively, for associations packing less than 8,500 bbls., 8,500 to 18,000 bbls., and over 18,000 bbls. in 1922; and 54.8, 48.1, and 41.7 cts., respectively, for associations packing less than 7,050 bbls., 7.050 to 10,000 bbls., and over 10,000 bbls. in 1923. The costs per barrel in 1922 increased from 37.8 cts., when 9.6 to 16.6 per cent of culls were handled, to 56.1 cts., when 21.1 to 43.9 per cent of culls were handled; and in 1923 from 44.2 cts., when 11.4 to 17.3 per cent of culls were handled, to 51.4 cts., when 17.4 to 31.2 per cent of culls were handled.

Crops and Markets, [April, 1928] (*U. S. Dept. Agr., Crops and Markets, 5 (1928), No. 4, pp. 113–152, figs. 3*).—Tables, graphs, notes, reports, and summaries of the usual types are included. Tables are also included showing the farm population changes by geographic divisions during 1927; the prices of purebreed cattle, hogs, and sheep, 1926 and 1927; and the production of important crops in the five leading States, 1925, 1926, and 1927.

Social participation in a rural New England town, J. L. Hypes (*Columbia Univ., Teachers Col. Contrib. Ed. No. 258 (1927), pp. IX+102, figs. 15*).—The results are presented of a study made, "first, to describe the voluntary primary group structure, excluding family groupings, found in a typical rural New England town, noting historically their developmental and ecological setting; second, to measure objectively and quantitatively the participation normally taking place in and through these group structures, noting indications of nonparticipation; third, to correlate, as far as the limits of the study will reasonably allow, structures and participation with their conditioning factors."

A house-to-house survey of a 39 per cent chance sampling of the 373 households of the town of Lebanon, Conn., was made, covering 70 American households, 14 Pole, 10 German, 37 Jew, and 13 other households. Only the primary group activities taking place between July 1, 1923, and June 30, 1924, were included. Two measures of social participation are evolved and used by the author (1) *the individual-hour of attendance*, which is "simply the clock-hours of time an individual or group spends in a given social activity," and (2) *the family participation index*, which "is a sort of average secured by dividing the total individual hours of attendance of a household participating in a given social activity by the number of members of the household eligible to participate in that activity."

An analysis is made of the participation structures—population, organized groups, and service organizations and neighborhoods, and of the group membership and attendance; of the influences on participation of the social factors—nationality, participation reciprocity, age and sex, mortgages and tenure, and means of communication; of the geographical factors—geographical position, agricultural quality of land, and season of the year; and of the cultural and economic factors, i. e., the evolutionary trends in the social composition, in the occupational life, and in the institutions of the town. Tables and graphs are included showing by nationalities the formal education and labor-saving and sanitary equipment of the households, the service efficiency of the town, number of organizations in which households are enrolled, membership in formal voluntary organizations, participation in informal group activities, attendance participation in formal and informal groups, effects of means of communication and season of the year upon attendance, distribution and tenure on different soil types, origin of population, vocational division of household, manner of acquiring farms, the agricultural ladder, reading matter, and family attitude toward rural life. Other tables show the time correlations in primary group attendance, age and sex factors in participation, relation of mortgages and tenure to attendance, and by soil types the number of households represented in social, economic, and athletic and recreational organizations.

The major participation determinants were found to be geography and historical episodes, dominance of the city, nationality, participation reciprocity, time of year, age and sex, and means of communication and transportation. The chief effects of agricultural quality of the land were upon distribution and selection of the population. Of the 2,246 socio-economic services secured by the 144 families, only 685 were furnished by the town.

Native stock constituted half of the population and 74 per cent of the organizational membership. The average percentages of household adherence to voluntary primary groups were for Americans 42, Poles 29, Germans 29, Jews 25, and others 32, an average of 35. The attendance indexes for different types of groups were athletic and recreational 99, high school 88, fraternal 67, civic 65, socio-religious 64, religious worship 56, and economic 55. The average household spent 3.9 per cent of its time in voluntary primary group activities. The average number of hours per household spent in formal and informal activities by different nationalities were Americans 507 and 1,044, Poles 611 and 879, Germans 318 and 1,439, Jews 445 and 937, and others 674 and 1,306, averaging 526 and 1,052, respectively.

Participation in one type of social activity was found to bear a reciprocal relation to participation in other types, the correlations being from 0.501 to 0.938 in a number of cases. Participation in formal groups varied from 81 per cent in July to 107 per cent in April (January=100 per cent). Marked age and sex variants were found in the membership and attendance of the different

types of organizations. Improved means of communication seemed to reduce the time spent in the primary group activities of the town. Distance, tenure, and mortgages were found to have but minor importance as determinants.

Rural libraries, W. C. NASON (*U. S. Dept. Agr., Farmers' Bul. 1559 (1928), pp. II+50, figs. 19*).—This publication describes different types of rural library service and illustrates each with specific examples, and discusses methods of starting libraries and making them serviceable to the community.

Proceedings of the Second International Country Life Commission, edited by E. MUMFORD (*Internatl. Country Life Comn. Bul. 5 (1928), pp. 187*).—This is the English edition of the proceedings of the International Country Life Commission held at East Lansing, Mich., on August 3–6, 1927 (E. S. R., 57, p. 405). Included are the list of officers, committees, and persons attending; the program; papers and addresses delivered; the reports of the committees on the teaching of rural sociology and a policy for rural community development as a world interest, and of other committees; and the proposed statutes of the International Country Life Commission to be considered at the next session.

FOODS—HUMAN NUTRITION

Report of the Medical Research Council for the year 1925–1926, EARL OF BALFOUR ET AL. ([*Gt. Brit.*] *Med. Research Council Rpt. 1925–26, pp. 161*).—This annual report (E. S. R., 55, p. 590) includes progress reports on the various nutrition studies conducted under the auspices of the Medical Research Council, Great Britain, with literature references to completed work, most of which has been noted from the original sources.

[Dietary habits of Georgia rural people] (*Georgia Sta. Rpt. 1927, p. 28*).—This brief preliminary report on records of dietary habits of 100 families in 18 different counties of Georgia indicates that the diets are deficient in phosphorus, very deficient in iron, and less deficient in calcium. Analyses by the station chemist have shown that turnip and mustard greens and Georgia collards are higher in iron than spinach, thus implying that a greater consumption of these vegetables would be advisable.

Basal metabolism of young women (*Ohio Sta. Bul. 417 (1928), pp. 74, 75*).—Preliminary observations are reported on the basal metabolism of girls from 14 to 18 years of age, most of them in the 15-, 16-, and 17-year-old groups. Girl scouts, 4–H Club girls, and students of home economics and physical education served as subjects in this study, which thus far has included a total of 256 observations on 48 girls. The average values for the entire number were total calories 1,363, calories per kilogram of body weight 25.33, calories per centimeter of height 8.43, and calories per square meter of body surface 36.35. In the groups from 15 to 18 years, inclusive, the calories per square meter decreased steadily with age. The calories per kilogram also decreased with age with the exception of the 17-year group, which showed a slight increase over the 16-year group. No regularity of increase or decrease in total calories or in calories per centimeter of height was noted.

Calculations of the individual variations from the average for each age gave lower results with reference to calories per square meter of body surface and per centimeter of height than for total calories or calories per kilogram of body weight. It is concluded that the prediction of basal metabolism can be made more accurately on the basis of height and surface area than of age or weight.

Day by day variations in the basal metabolism of young women (*Ohio Sta. Bul. 417 (1928), p. 75*).—Five young women served as subjects for a series of basal metabolism determinations which were made 6 days a week for periods

of from 23 to 47 days. From the data obtained, the average heat production per square meter of body surface of each subject and the individual variations from each average have been tabulated.

The minimum and maximum deviations of individual values from the average for each subject were as follows: Average calories per square meter per hour 34.01 and 36.68, individual positive variations from the average 2.39 and 3.85 per cent, individual negative variations from the average 2.04 and 4.22 per cent, and the total variations from the average 2.23 and 3.66 per cent.

Growth standards of height and weight for girls in private schools, H. Gray and C. Gower (*Amer. Jour. Diseases Children, 35 (1928), No. 3, pp. 411–413*).—Standards of average height for age and average weight for height of girls in private schools corresponding to similar standards for private school boys (E. S. R., 56, p. 394) have been computed from data obtained on 1,030 girls from 5 to 19 years of age in five private schools in or near Chicago. As compared with previously reported standards, these girls were "definitely taller than the well-known Baldwin-Wood medians; the excess, averaging the differences for all ages, was 20 mm. (0.8 in.) and ranged from 6 (age 14) to 33 mm. (age 6). They were taller by a greater margin than the Francis W. Parker and University of Chicago School girls reported by Baldwin in 1914. This difference is interesting, because pupils from those same two schools composed 61 per cent of our series. They were slightly shorter than the 323 girls from eastern private schools whose measurements were plotted by Benedict and Talbot."

The basal metabolic rate of students in Sydney, N. S. W., with a discussion on methods of determining basal metabolism, E. M. Hindmarsh (*Aust. Jour. Expt. Biol. and Med. Sci., 4 (1927), No. 4, pp. 225–268, fig. 1*).—Extensive data are reported on the basal metabolic rates of men and women medical students at the University of Sydney, New South Wales.

The determinations, which were conducted by the open circuit or gasometer method of indirect calorimetry with a Douglas bag, gave results averaging 8.9 per cent lower for men and 10.5 per cent lower for women than the DuBois standards and 7.6 per cent lower for men and 8.6 per cent for women than the Harris-Benedict standards. The probable causes of the lowered metabolic rates obtained are discussed, with many references to the literature and with the conclusion that the lowered values may be due to the more muscular relaxation of the subjects in the warm climate of Sydney.

The question of the reliability of various methods of determining basal metabolism is discussed at considerable length, with a comparison of the results which would have been obtained in the present investigation had the oxygen consumption or the carbon dioxide excretion alone been determined. On the average, slightly lower results were obtained as calculated from the oxygen consumption and slightly higher from the carbon dioxide excretion values. It is concluded that the most consistent results are obtainable from the gasometric method, including determinations of the oxygen absorbed, the carbon dioxide excreted, and the respiratory quotient.

A few experiments on the effect of increasing the lung ventilation are reported, the results of which indicate that the metabolism figures may be markedly increased by forced lung ventilation. Determinations of the respiratory quotient and the volume output of expired air are considered to be useful checks on the normal breathing of a subject and, with determinations of alveolar carbon dioxide and oxygen immediately before and immediately after the test, to give the most accurate information concerning the normality of the sample collected. A list of 37 references to the literature is appended.

A nutrition study in an Indian reservation, J. A. Stene and L. J. Roberts (*Jour. Amer. Dietet. Assoc., 3 (1928), No. 4, pp. 215–222*).—This is a general report of a dietary survey conducted among the Sioux Indians of the Crow Creek Reservation, Fort Thompson, S. Dak. The survey covered 67 families, which included 323 individuals, of whom 192 were children.

Of specific foods, bread and cereals formed the bulk of the diet. The bread was always made of white flour, and the cereals, chiefly oatmeal, were served more often with black coffee than with milk. Potatoes and beans were quite commonly used, followed in popularity by squash and canned tomatoes. Fresh vegetables and fruits were seldom eaten. Butter, eggs, and milk were seldom used, and the meat supply was irregular and very poor. As compared with commonly accepted standards, only 5 families, including 10 children, were receiving diets at all adequate, and about 15 families, with 32 children, were subsisting almost entirely on bread and coffee. Although no medical examinations were given, the available statistics showed high mortality, particularly among the children. Of 107 deaths from known causes, almost 85 per cent were due to infectious respiratory diseases. This fact, together with the prevalence of sore eyes and blindness, is thought to suggest that the diet, which is particularly low in vitamin A, is the determining factor in the high mortality.

Diet and pregnancy, G. D. Royston (*Jour. Amer. Dietet. Assoc., 3 (1928), No. 4, pp. 223–233*).—A discussion, with 27 references to the literature, of the dietary measures to be followed during normal pregnancy and in the treatment of abnormal conditions during pregnancy, such as vomiting, nephritis, and overweight. Of particular interest is the statement that in 102 cases of sterility among private patients treated by the author, 17 instances were found in which a deficiency in vitamin E appeared to play a part and that following the correction of this dietary deficiency the sterility was cured in 8 of the patients.

The influence of diet upon the teeth (*Nature [London], 121 (1928), No. 3044, pp. 325–327*).—A review of recent literature on the subject.

Dehydrating peaches (*Georgia Sta. Rpt. 1927, p. 27*).—It is stated briefly that a satisfactory product can be obtained from pulped cull peaches by drying the material in thin layers at 140° F.

Egg recipes (*Oklahoma Sta. Circ. 71 (1928), pp. 10*).—This is a collection of 34 recipes for the use of eggs in a wide variety of ways. A note discusses briefly the nutritive value of eggs and the different purposes for which they are used in ordinary cooking, such as thickening agents, to add lightness, to add richness and color, and as a coating to prevent absorption of grease in frying.

The value of whole potato in human nutrition, S. K. Kon and A. Klein (*Biochem. Jour., 22 (1928), No. 1, pp. 258–260*).—The early experiments of Hindhede on the digestibility of potatoes (E. S. R., 28, p. 564) have been repeated in an experiment lasting 167 days, during which two subjects, a man aged 25 and a woman aged 28, subsisted on a diet of potatoes supplemented with butter or pork fat, with the addition of a little fruit (apples and pears) and occasionally tea or black coffee with sugar. The potatoes were cooked in various ways, but steam cooking seemed to give the most palatable product, and this method was generally used in the latter part of the period. The potatoes were weighed for each meal and an effort made to have the rest of the food intake constant. Accurate account was not kept of the amount of fat consumed, but it was estimated to be from about 120 to 150 gm. daily. The nitrogen metabolism determinations were made at frequent intervals.

In the four periods reported the average daily intake of potatoes and the corresponding nitrogen balances for the man were 1,560 gm. and +0.12, 1,758 gm. and +0.67, 1,661 gm. and +0.28, and 1,752 gm. and +1.25, respec-

tively, and for the woman 1,024 gm. and —1.89, 1,293 gm. and —0.14, 1,167 gm. and —0.91, and 1,039 gm. and +0.09. The daily nitrogen intake over the entire time averaged 5.7 gm. for the man and 3.8 gm. for the woman. Both subjects maintained excellent digestion, felt very well throughout the entire period, and did not tire of the uniform diet. The results are thought to confirm the opinion of Hindhede as to the high value of potato as a source of nitrogen for the human adult.

The nutritional value of tuberin, the globulin of potato, S. K. Kon (*Biochem. Jour., 22 (1928), No. 1, pp. 261–267*).—The protein tuberin, prepared from new potatoes by a heat coagulation method, was tested for its nutritive value by the Mitchell method (E. S. R., 51, p. 407) and the method of Osborne, Mendel, and Ferry (E. S. R., 40, p. 765).

At an 8 per cent level intake the biological value was found to be 71 by the Mitchell method. In the other method the maximal gain of 2 gm. body weight per gram of protein ingested was at a 7.8 per cent level, smaller amounts not being used.

These results, which are thought to indicate that tuberin is a satisfactory complete protein, are discussed with reference to the conflicting literature on the availability of potato nitrogen and also with reference to the relative values of the two methods employed. The author is of the opinion that in the Mitchell method there is a specific error which manifests itself in the tendency to higher biological values in the periods immediately following the standardizing nitrogen-free or low nitrogen periods. The other method is thought to have the advantage of greater simplicity, but the disadvantage of requiring roughly three times as much protein for the same number of rats as the method of Mitchell and of being more sensitive to variations in the food intake. "Obviously the two methods are not strictly comparable, as the one measures the efficiency of a given protein to make good, over short periods of time, the wear and tear of body tissues, while the other measures the ability of a protein to build new tissues. The question which of these methods is the more adequate for judging the relative values of various proteins in human nutrition by means of animal-feeding experiments remains to be answered."

The effect of pasteurisation on the nutritive value of milk, J. B. Orr, A. and J. A. Crichton, E. Haldane, and W. Middleton (*Scot. Jour. Agr., 9 (1926), No. 4, pp. 377–385, fig. 1*).—In continuation of the series of studies on the effect of heat on milk (E. S. R., 56, p. 291), three experiments are reported in which a comparison was made of the growth records of calves receiving fresh milk, pasteurized milk, and pasteurized milk plus 8 or 12 gm. of calcium lactate daily. Growth was slightly less on the pasteurized than on the fresh milk or the pasteurized milk plus the calcium lactate. Although the number of tests and the number of animals in the individual tests were too small to enable definite conclusions to be drawn, the results are thought to indicate that "the process of pasteurization affects the physiological properties of milk in such a way as to decrease its value for promoting growth and maintaining health in young animals."

Studies on the effect of heat on milk.—IV, The iodine content, H. E. Magee and A. E. Glennie (*Biochem. Jour., 22 (1928), No. 1, pp. 11–14*).—In continuation of the series of studies noted above, fresh, boiled, and pasteurized milk prepared as noted in the first paper of the series (E. S. R., 56, p. 291) and also samples prepared by bringing separated milk in an open beaker rapidly to the boiling point and allowing it to cool in the open were analyzed for their content of iodine by the Leitch-Henderson modification of the Fellenberg method (E. S. R., 56, p. 312), with results indicating a loss by volatilization on

heating of 20 per cent or more of the total iodine of the separated milk. The ratio of diffusible to nondiffusible iodine was the same in the milk after heating as before, approximately 83 per cent of the total iodine being in the diffusible form.

Food poisoning (*Jour. Amer. Med. Assoc., 90 (1928), No. 6, pp. 459–462, figs. 2*).—This epidemiologic analysis of 425 alleged outbreaks of food poisoning in the United States during 1923, 1924, and 1925, based upon data gained from field investigations, records of various health departments, daily files of newspapers, and records of the National Canners' Association, but hitherto unreported in medical literature, indicates very forcibly the extent of erroneous diagnoses of food poisoning and of the incorrect use of the term ptomaine poisoning. A suggested simple classification of poisoning by food is botulism and food poisoning, the latter being further subdivided into bacterial food poisoning by the paratyphoid enteritidis group of bacteria and perhaps others and mushroom poisoning.

Ergot poisoning among rye bread consumers, J. Robertson and H. T. Ashby (*Brit. Med. Jour., No. 3503 (1928), pp. 302, 303*).—Attention is called to several cases of ergot poisoning among Jewish patients accustomed to eat black rye bread and to the absence of this poisoning in members of the same families not eating the bread. Analyses of the rye used in making the bread showed the presence of 1 per cent of ergotized rye, an amount calculated to furnish 22.85 grains daily of ergot in the ordinary consumption of the bread, this amount being close to the maximum of therapeutic dosage. The patients recovered quickly on ceasing to eat the bread.

Dormancy or delayed germination of spores of Clostridium botulinum subjected to heat, E. C. Dickson (*Soc. Expt. Biol. and Med. Proc., 25 (1928), No. 6, pp. 426, 427*).—Previous observations on the dormancy of spores of *C. botulinum* which had been subjected to heat in broth covered with a thin layer of oil within sealed tubes (E. S. R., 55, p. 194) have been extended to a final time of 73 months after heating. Although no positive tests were obtained at this time, one positive test was obtained at 72 months, two at 71 months, and none at 70 months. It is concluded that these dormancy periods can not be assumed to be the maximum possible under the conditions of the experiment.

Studies on hemoglobin formation in the rat, G. F. Cartland and F. C. Koch (*Soc. Expt. Biol. and Med. Proc., 25 (1928), No. 6, pp. 447–449*).—In this brief summary, without experimental data, of a study of the relationship between the protein and vitamin composition of the diet and the hemoglobin-forming process in the rat, as determined by blood regeneration following severe anemia produced by bleeding, the following conclusions are given:

"Wheat gluten is an adequate dietary protein for promoting hemoglobin synthesis in the rat. Casein is not superior to wheat gluten for this purpose. Hemoglobin and tryptophane in the diet are no better utilized than gluten for hemoglobin production in the rat. The blood-forming process in the rat is not dependent upon the presence of vitamins A, B, or E in the diet."

A rat technique for demonstrating the interfering effect of cereals on bone calcification, H. N. Green and E. Mellanby (*Biochem. Jour., 22 (1928), No. 1, pp. 102–112*).—The experimental work on dogs leading to the theory that cereals have a definite interfering effect on bone calcification (E. S. R., 56, p. 92) has been repeated on rats, following a technique which is described in detail in the present paper.

The results obtained are thought to furnish further proof of the authors' theory, which is not held by most investigators, that cereals actually contain a

substance which has an anticalcifying action or an antagonizing action toward vitamin D. "What constituent of the cereal is responsible for this powerful property of interfering with bone calcification has not been discussed in this paper, but the simplified technique described ought to allow a more rapid accumulation of facts concerning this important side of dietetics."

[The vitamin content of Georgia grown foods] (*Georgia Sta. Rpt. 1927, p. 28*).—The statement made in the previous report (E. S. R., 57, p. 292) concerning the richness of turnip greens in vitamins A and B has been confirmed, and in addition collards have been found to be rich in these two vitamins. The Hearts of Gold variety of cantaloupe is said to be a very good source of vitamins A, B, and C.

The interrelationship of the carriers of vitamins A and B as affecting the growth and development of the tissues and organs of young animals, J. E. Richardson, L. S. Palmer, and C. Kennedy (*Amer. Jour. Physiol., 83 (1928), No. 2, pp. 712–728, figs. 7*).—This paper deals with attempts to determine the cause of the greasy condition of the fur occasionally observed in rats on a presumably balanced and adequate diet composed of highly purified food materials and including standard amounts of proteins, salts, and vitamins A and B. The experimental work reported is thought to indicate that the abnormalities are not caused by too low a level of vitamins A and B, but are due to faulty fat metabolism or utilization resulting from the removal from the food constituents of some compounds essential for the utilization of fat. The suggestion is made of important interrelationships between the carriers of vitamins A and B.

The quantitative estimation of vitamin D, H. Jephcott and A. L. Bacharach (*Biochem. Jour., 22 (1928), No. 1, pp. 60–62, figs. 2*).—Using as a source of vitamin D "Ostelin," an antirachitic extract of cod-liver oil prepared by a method based on that described by Zucker (E. S. R., 49, p. 608), the authors have determined the effect of increasing amounts of this preparation on the pH of the feces of rats on a rachitic diet, following the technique previously described (E. S. R., 56, p. 412).

On plotting the lowest values for the mean of two consecutive daily readings of fecal pH against the actual weight of the vitamin-containing substance, an S-shaped curve was obtained. The minimum amount of vitamin D which shows any appreciable effect is considered to be that which gives a lowering of the fecal pH to about 7.1, and the maximum effect is produced with an amount giving a lowering of pH to about 6.6. In the previous communication, the antirachitic unit was defined as the amount giving a mean value of pH 6.7 or less on two consecutive readings, neither of which is higher than 6.8. For convenience this unit has been subdivided into 10. It is stated that there are about 100 such units in a gram of the most active cod-liver oils.

The quantitative determination of vitamin D, E. Poulsson and H. Lövenskiold (*Biochem. Jour., 22 (1928), No. 1, pp. 135–141, pl. 1*).—Various methods which have been advocated and are in more or less general use for the quantitative determination of vitamin D are discussed, with the conclusion that a fault common to most of these methods is the use of different animals for the preparatory and final periods. In order to avoid this difficulty, the authors have returned to radiographic observations. Young rats are placed upon a rachitic diet such as that of Steenbock, Black, et al. (E. S. R., 54, p. 489), and after about 25 days an X-ray photograph is taken of the left knee joint and the rats are weighed. The antirachitic substance is then administered in varying amounts to different animals for 6 days, after which further X-ray photographs are taken and the rats are again weighed. The value of the material as a source of vitamin D is indicated in units per gram.

Antineuritic yeast concentrates.—III, The curative pigeon test: A critique, H. W. KINNERSLEY, R. A. PETERS, and V. READER (*Biochem. Jour., 22 (1928), No. 1, pp. 276–291, fig. 1*).—In this continuation of the investigation previously noted (E. S. R., 58, p. 89), the authors have subjected the curative pigeon test as described by Peters (E. S. R., 52, p. 462) to rigid examination as to its quantitative value.

The factors which have thus far been found to affect the pigeon test are gross errors, such as caused by failure to introduce all of the doses into the crop or by vomiting; errors of feeding due to failure to standardize the bird as regards diet; the heat cure (mentioned in the previous paper), which can be avoided by leaving the birds in a warm place for at least 2 hours before treatment; and the glucose cure which, with the water cure, can be eliminated by giving a small dose of glucose in water at the same time that the bird is being tested for the heat cure. As demonstrated by Kon (E. S. R., 58, p. 194), the spontaneous cures observed by Kon and Drummond in pigeons on a synthetic vitamin B-free diet do not occur in pigeons fed polished rice.

The modified technique recommended for testing materials for the antineuritic vitamin is described in detail.

The sterility of white rats maintained on certain synthetic diets, U. SUZUKI, W. NAKAHARA, and N. HASHIMOTO (*Imp. Acad. [Japan] Proc., 3 (1927), No. 9, pp. 619–621*).—The authors report absolute sterility in rats fed a diet of meat protein 15, cane sugar 10, starch 65, McCollum's salt mixture 5, and oryzanin 5 parts, supplemented by 0.5 mg. of biosterin (a concentrated fat-free preparation of vitamin A) and 1.5 mg. each of $AlK(SO_4)_3$, Na_2SiO_3, $MnSO_4$, and NaF per rat daily. The addition of from 0.2 to 0.5 per cent of cholesterol or 5 per cent of synthetic triolein or the irradiation of the diet did not prevent sterility. The most striking changes in the reproductive system of the male rats were marked degeneration of the testicles and almost complete absence of spermatozoa. In the females, the ovaries showed no special injury, and some intact ova were demonstrable in all the ovaries examined. In two cases of apparent abortive pregnancy, each animal showed unmistakable placenta formation and, on microscopic examination, rudimental embryos in various stages of dissolution and absorption. It is concluded that the failure of reproduction was due to the absence of vitamin E.

On the reproductive failure of white rats on synthetic diets, U. SUZUKI, W. NAKAHARA, and N. HASHIMOTO (*Inst. Phys. and Chem. Research [Tokyo] Sci. Papers, 7 (1927), No. 116, pp. 143–151, pls. [5]*).—Essentially noted above.

A note on the effects on pigeons of an exclusive diet of rice meal, bran, and polish, R. R. WILLIAMS (*Biochem. Jour., 21 (1927), No. 6, pp. 1349–1351*).—This paper, noted in detail on page 259, is of particular interest in connection with the paper of Marrian et al. (E. S. R., 58, p. 893) in that the question of toxemia in connection with deficiency diseases is again brought to the front. The demonstration that rice meal by-products are distinctly harmful to pigeons when fed as an exclusive diet, together with previous observations in the literature on the presence of toxic substances in wheat and cotton seed, has led the author to conclude that "in the 'deficiency diseases' there exist toxemias consequent or incident to dietary disturbances which may play no small rôle in determining the pathology and symptomatology of these diseases. This does not necessarily imply that the foods productive of these diseases are toxic in the ordinary sense. Nor is the opposing argument, that in the case of beriberi the hypothetical toxemia is corrected by addition to rather than by a subtraction from the diet, necessarily contrary to the view suggested. Hart et al. [E. S. R., 35, p. 577] have shown that effects of the toxic element

in wheat which are serious when the diet is otherwise poor disappear almost completely when other dietary defects are corrected."

The contribution of biology, chemistry, and physics to the newer knowledge of rickets, A. F. Hess (*Science, 67 (1928), No. 1735, pp. 333–335*).—In this paper, presented at the symposium on the contributions of other sciences to medicine at the annual meeting of the American Association for the Advancement of Science, held at Nashville, December 28, 1927, the author traces the investigations in chemistry on calcium and phosphorus metabolism, in physics on ultra-violet radiations, and in biology on the experimental production and cure of rickets, each of which has contributed a share to our present knowledge of rickets, and points out that a similar cooperation between the laboratory sciences and the clinic will be required to solve other problems of clinical medicine.

Experimental scurvy in the guinea pig, A. W. Meyer and L. M. McCormick (*Soc. Expt. Biol. and Med. Proc., 25 (1928), No. 6, pp. 494–496*).—A summary of the characteristic symptoms, necropsy findings, and blood changes noted in an investigation of experimental scurvy in guinea pigs.

Pellagra in the Mississippi flood area, J. Goldberger and E. Sydenstricker (*Pub. Health Rpts. [U. S.], 42 (1927), No. 44, pp. 2706–2725*).—Unfavorable economic conditions rather than food deprivation directly due to the Mississippi flood are considered to have been chiefly responsible for the noticeable increase in pellagra in some of the inundated States. Diversification of agriculture in this area, including the increased production of garden crops and of dairy and beef cattle, is recommended as the best means of solving the pellagra problem.

Blood regeneration in severe anemia—influence of inorganic ash of liver, kidney, and apricots, F. S. Robscheit-Robbins, C. A. Elden, W. M. Sperry, and G. H. Whipple (*Soc. Expt. Biol. and Med. Proc., 25 (1928), No. 6, pp. 416–418*).—In this preliminary report, it is noted that the ash of fresh beef liver, pig kidney, and dried apricots, materials which in previous studies had proved effective in blood regeneration in experimentally produced anemias in dogs (E. S. R., 57, p. 795), is likewise effective, although somewhat larger amounts are required than would correspond to the effective doses of the original materials. These results are in conformity with the success reported by Waddell et al. (E. S. R., 58, p. 897) in the use of the ash of various materials in the treatment of nutritional anemia in rats.

It is thought that iron can be ruled out as the essential factor responsible for the reaction, inasmuch as various fruits have been found to be inert although containing as much iron as apricots which are so active. In discussing the significance of these results, the suggestion is made that "it is possible that certain salts and inorganic elements have an influence upon internal protein metabolism and may in some measure determine the direction of the flow of these building stones—now for tissue growth or repair—now for body fluid protein maintenance—now for emergency new hemoglobin and red cell production."

TEXTILES AND CLOTHING

The physical properties of fabrics; The effects of yarn and weaving structure, Part I, J. M. Essam (*Jour. Textile Inst., 19 (1928), No. 2, pp. T37–T58, pls. 2, figs. 7*).—Research at the Manchester College of Technology dealt with the influence of the degree of twist in yarns on the properties of fabrics and the effect of yarn settings and of the weave on the physical properties of the fabrics. Using 50's single yarn of fine Sakellaridis cotton, the warp yarn was spun twist way and the weft yarn weft way with four different twist

constants, and the four types of yarn were each woven into fabrics with different degrees of openness and with four standard weaves. The results of extensive textile tests on this material, shown tabulated and graphically, evidenced the influence of weave type, setting, and yarn structure on the accession of strength over the unwoven yarn strength. The breaking strengths of the fabrics were clearly much influenced by the mutual binding of their constituent yarns. The fabric structure so influences the interaction of the yarns that a definite relationship exists between the breaking strength of a fabric and its structure. For strong fabrics it was indicated that the choice of yarn twist, setting, and weave must be carefully considered.

Strength test for knitted fabrics, W. H. WHITCOMB (*Textile World, 73 (1928), No. 11, pp. 43, 44, fig. 1*).—A knit fabric strength tester is described and compared with similar devices.

The loss of strength (tendering) of cotton exposed to light, P. W. CUNLIFFE and F. D. FARROW (*Brit. Cotton Indus. Research Assoc., Shirley Inst. Mem., 7 (1928), No. 1, pp. 20, figs. 9*).—Cotton fibers exposed to a quartz mercury-vapor lamp lost strength at a constant rate until the tendering amounted to about 40 per cent, after which the rate of loss dropped. The tendering rate over a restricted range was proportional to the light intensity. Specific differences apparent between the susceptibility to light-tendering of cotton fibers from different sources could not be related to any of the fiber characters so far measured. Destruction proceeded more rapidly in the presence of hydrogen, water, or carbon dioxide than in hydrogen, nitrogen, or in vacuum.

Yarns exposed to a carbon arc lost proportionally about half as much as fibers fully exposed under the same conditions, although the component fibers were tendered as much as the yarns. Fine yarns were more rapidly tendered by light than coarse and soft twist yarns more than hard, both for bleached and raw cotton. Tendering decreases for all materials after about 50 per cent of the strength is lost, and with long exposures the percentage lost of equally exposed fine and coarse yarns may appear to be equal. Unbleached (gray) and bleached double yarns tendered slightly slower than the singles from which they were spun. In sunlight bleached single and double yarns lost strength at an equal rate. Bleached cotton and cloth were more rapidly tendered than raw cotton or unbleached cloth, respectively.

Cotton cloth on which a chromium hydroxide (chrome green) was precipitated resisted light damage much more than the undyed scoured material. Cloth dyed mineral khaki by a combination of chrome and iron salts was similarly resistant. The protection conferred by these dyes sufficed to extend the life of fabric subject to strong light to as much as 5 or 6 times that of untreated material. Tannic acid alone or methylene blue on tannic acid gave good protection against the carbon arc light, but not on cloths exposed to the weather in England or in the Tropics.

Considering the influence of structure, bleaching, and illumination, the work suggested that for fabrics requiring long life in bright sunlight, the yarns should be as coarse and as hard twisted as is consistent with the mechanical properties demanded. Bleaching should be avoided, and, where permissible, dyeing the material with mineral chrome green would be definitely advantageous.

In an appended article, The Effect of Structure and of Bleaching on the Strength of Cotton Yarns, Cunliffe and E. Midgley (pp. 19, 20) describe determinations of the strength of specially spun cotton yarns in the above tests. Comparable results of breaking tests on yarns of different counts showed that for the same twist constant $\left(\frac{\text{turns per inch}}{\sqrt{\text{counts}}}\right)$ coarse yarns are inherently stronger than fine. Doubled yarns were stronger than the two component singles,

although weaker than a single yarn equal in actual counts to the doubled. Bleached yarns were almost invariably weaker than raw, though the bleached doubled yarns used in these tests were stronger than the gray. Bleached cloth was weaker than gray.

Note on the measurement of the colours of light sources and of the colours of materials, J. Guild (*Jour. Textile Inst., 19 (1928), No. 2, pp. T73–T76*).—Critical comment is made on the method of Cunliffe and Farrow (E. S. R., 57, p. 598).

Color and its applications, M. Luckiesh (*New York: D. Van Nostrand Co., 1927, 3 ed., pp. XII+419, pls. 4, figs. [149]*).—"The aim of this book is to present a condensed treatment of the science of color."

The therapeutic application of dyes, W. C. Holmes (*Amer. Dyestuff Rptr., 17 (1928), No. 8, pp. 327–329*).—This is a contribution from the U. S. D. A. Color Laboratory.

Humidity and the fading of dyestuffs on wool, J. J. Hedges (*Jour. Soc. Dyers and Colourists, 44 (1928), No. 2, pp. 52–54, fig. 1*).—Further experiments (E. S. R., 58, p. 597), using the identical experimental method, were made to trace the action of the relative humidity or the corresponding regain on the rate of fading. Aside from their agreement with the known increase in rate of fading with humidity, examination of the fading results showed that a much simpler relationship exists between the percentage fading and the regain than between the percentage fading and the relative humidity. A linear relationship seemed to exist between the amount of fading and the regain.

Deflocculation and detergency not entirely correlative, R. M. Chapin (*Oil and Fat Indus., 5 (1928), No. 4, pp. 95–106, figs. 12*).—A device for washing laboratory samples of cotton fabric, soiled with standard carbon black mixtures, in standardized solutions of the soaps to be tested is described and figured, and a means for converting a colorimeter into a reflectometer for the evaluation of soil remaining on the fabric is described.

The experiments included detergency tests on cotton fabric soiled in simple aqueous suspensions of non-oily carbon black. The most powerful detergent in this case appeared to be an alkaline solution of sodium stearate or palmitate at 70° C. or above, the effects of alkali deflocculation and detergency being in this case parallel, though other possible correlations were but vaguely defined. It is stated that the method as given will not suffice for the selection of the best among competing commercial soaps.

Comparative tests of the power of soap solutions to prevent adsorption of suspended carbon black by clean fabric were also included, acid soaps being in this case the more effective. This is considered probably due to the masking of adsorptive tendencies by a fatty acid film. Capacity to prevent adsorption was therefore considered not to be correlated with detergent power in the special case of the prevention of the adsorption of the suspended carbon by fabric.

Colorimeter readings, designed to show the effectiveness of a considerable variety of washing solutions, are tabulated.

Damage caused by mildew, F. Pickles (*Wool Rec. [Bradford], 33 (1928), No. 990, pp. 1085, 1087*).—Cases of loss of strength in woolen yarn and cloth traceable to mildew are described. To avoid defects arising from mildew development, materials should be stored unconditioned in a fairly dry atmosphere.

Sun suits for children, R. O'Brien (*U. S. Dept. Agr. Leaflet 24 (1928), pp. 8, figs. 14*).—An attractively illustrated leaflet showing adaptations of the familiar Dutch rompers for small boys and girls to suits for sun baths. All of the suits are sleeveless, and in some the waists are made of loosely-woven

fabrics such as marquisette, net, or other open-weave materials, the rest of the garments being gayly colored cotton prints or light-weight cretonnes.

The reorganization and direction of clothing clubs (*Illinois Sta. Circ. 327 (1928), pp. 32, figs. 4*).—This circular supersedes one of the same title issued in 1924 (E. S. R., 51, p. 796).

MISCELLANEOUS

The Fortieth Annual Report of the Colorado Agricultural Experiment Station for the year 1927, C. P. GILLETTE ET AL. (*Colorado Sta. Rpt. 1927, pp. 53*).—This contains the organization list, a financial statement for the fiscal year ended June 30, 1927, a report of the director on the work of the station, and departmental reports. The experimental work reported is for the most part abstracted elsewhere in this issue.

Fortieth Annual Report [of Georgia Station], 1927, H. P. STUCKEY (*Georgia Sta. Rpt. 1927, pp. 39, figs. 4*).—This contains the organization list, a report by the director of the station on its work during the year, and a financial statement for the fiscal year ended June 30, 1927. The experimental work reported is for the most part abstracted elsewhere in this issue. Meteorological observations are also included.

Agricultural experiments, 1927: Annual Report of the Director of the New Hampshire Agricultural Experiment Station, [J. C. KENDALL] (*New Hampshire Sta. Bul. 232 (1928), pp. 35, figs. 8*).—This contains the organization list, a report of the director on the work of the station, and a financial statement for the fiscal year ended June 30, 1927. The experimental work reported is for the most part abstracted elsewhere in this issue.

Thirty-eighth Annual Report [of New Mexico Station, 1927], F. GARCIA (*New Mexico Sta. Rpt. 1927, pp. 79, figs. 8*).—This contains the organization list, a report of the director on the work and publications of the station, and a financial statement for the year ended June 30, 1927. The experimental work reported is for the most part abstracted elsewhere in this issue. Meteorological observations are also reported.

Forty-sixth Annual Report of [Ohio Station], 1927, C. G. WILLIAMS (*Ohio Sta. Bul. 417 (1928), pp. 118, figs. 19*).—This contains the organization list, a financial statement for the fiscal year ended June 30, 1927, and a report of the director summarizing the work of the station during the year. The experimental work reported not previously noted is for the most part abstracted elsewhere in this issue.

Thirty-seventh Annual Report of [Wyoming Station, 1927], J. A. HILL (*Wyoming Sta. Rpt. 1927, pp. 125–159*).—This contains the organization list, a financial statement for the fiscal year ended June 30, 1927, a report of the director on the work of the station, and meteorological observations by F. E. Hepner (see p. 205). The experimental work reported is for the most part abstracted elsewhere in this issue.

NOTES

California University and Station.—A. W. Christie, associate professor of fruit products and associate chemist, has resigned effective June 30 to accept a position with the California Walnut Association. H. A. Wadsworth, assistant professor of irrigation investigations and practice and assistant irrigation engineer, has been granted a year's leave of absence to organize irrigation work at the University of Hawaii.

Purdue University and Station.—Dr. G. I. Christie, director of the station and the department of agricultural extension, has accepted the presidency of the Ontario Agricultural College vice Dr. J. B. Reynolds resigned, entering upon his new position September 1. His former duties are to be carried by J. H. Skinner, who will also continue as dean of the School of Agriculture.

Iowa College.—To meet a demand for graduates equipped for the teaching of more than one subject, the vocational education department, which has heretofore offered courses only in agricultural education and in agricultural and manual training, has arranged a course in agriculture and science. This will include a major in agriculture and two minors selected from the fields of bacteriology, biological science, botany, economic science, English, geology, economic history, journalism, manual arts, mathematics, physical education, physics, sociological science, and zoology. One of the minors may also be taken in the departments of animal husbandry, farm crops and soils, horticulture, or dairy industry. The course is expected to provide for men desiring to work in rural consolidated schools or in other schools attended by relatively large numbers of rural pupils.

Minnesota University and Station.—The new agricultural biochemistry building previously described (E. S. R., 56, p. 196) was dedicated June 7, the dedicatory address being delivered by President R. W. Thatcher of Massachusetts College.

The Emil Christian Hansen prize, consisting of a gold medal and 2,000 crowns, was conferred at Stockholm May 8 in absentia on Dr. E. C. Stakman, professor of plant pathology and plant pathologist, in recognition of his contributions on plant diseases.

Pennsylvania College and Station.—A sheep barn of brick and stucco is under construction. The barn is 44 ft. wide by 126 ft. long, with an open shed 165 by 30 ft., and will accommodate over 200 breeding ewes and several experimental sheep. One end will contain four rooms, one a large classroom and another a wool-grading room.

Construction is also under way for the first section of the new college hospital and infirmary. This building, ultimately to cost $150,000, is to be built by the State Potato Growers' Association, which has already contributed nearly $8,000 for the purpose.

The resignations are noted of J. M. Vial as professor of animal husbandry extension, effective June 30, and R. W. Evans as instructor of horticulture, effective May 1. W. D. Hemker has been appointed assistant professor of farm machinery, effective May 1, and Thomas B. Keith, assistant in animal husbandry, effective July 1.

Oberlin Agricultural Experimental and Demonstration Station in China.—Under the auspices of Oberlin College plans are being made to open in the fall of 1928 an agricultural experimental and demonstration station in the

interior of China. This station will operate as a part of the agricultural division of the Oberlin-Shansi Memorial School and will give special prominence to cereal and fruit improvement, seed and plant introduction, and ultimately with livestock. Instruction and extension work will be taken up as rapidly as possible.

Raymond Moyer, a graduate of the New York State College of Agriculture at Cornell University and later a special student at the Colorado Agricultural College, has been selected to organize this work and is now at the North China Language School at Peking making preliminary arrangements for the new institution.

New Journals.—*Quarterly Journal of Pharmacy and Allied Sciences* is being published by direction of the council of the Pharmaceutical Society of Great Britain. The initial number contains about 100 pages of abstracts of papers published in other journals and also several original articles, among which are the following: A Method of Assay of the Antirachitic Vitamin D, by K. H. Coward; The Oestrous Cycle in the Guinea-Pig and the Suitability of the Uterus for the Estimation of Pituitary Extract, by M. Goettsch; The Solubility and Rate of Solution of Arsenious Oxide, B. P., by G. E. Trease; and The Growth-Promoting Properties of Vitamin D, by A. L. Bacharach.

The *Journal of the Board of Agriculture of British Guiana* has been rechristened *The Agricultural Journal of British Guiana*. In its new form the journal will be conducted along more technical lines, consisting primarily of original articles by members of the staff of the Department of Agriculture. The initial number contains, among other material, accounts of Agricultural Organisation in British Guiana, by J. S. Dash, director of agriculture, and The Imperial College of Tropical Agriculture and Its Functions in the Caribbean, by G. Evans, principal of the college; The Biological Control of Insect Pests, by L. D. Cleare, jr.; and Preparation of Flour from Colony Grown Plantains, by W. Francis.

Zeitschrift für Parasitenkunde is being published from time to time as Section F, a new section of *Zeitschrift für Wissenschaftliche Biologie*. It presents original reports of botanical and zoological work in the field of general and special parasitology. The initial number contains seven such articles, among them being Investigations of the Cercospora Leaf Spot Disease of Sugar Beets, by E. W. Schmidt, and Contributions to the Study of Infections Preceding Plant Virus Diseases, I, by K. Böning.

The Rural School Board Magazine, dedicated to "the betterment and administration of village, township, and rural schools," is being published monthly. The initial number contains several original articles, among which are Problems in the Improvement of Rural School Buildings, by H. W. Schmidt; Why Supervise the Rural School? by W. C. Hoppes; More Efficient Machinery for Rural Schools, by E. S. Richardson; and Rural School Heating, Ventilating, and Sewage Disposal, by G. D. Carrington, jr.

Roosevelt Wild Life Annals of the Roosevelt Wild Life Forest Experiment Station, New York State College of Forestry at Syracuse University, is being issued as a new series of more technical nature than the *Roosevelt Wild Life Bulletin*. The initial number deals with A Study of the Beaver in the Yancey Region of Yellowstone National Park and Notes on the Beaver Colonies in the Longs Peak Region of Estes Park, Colorado, both by E. R. Warren.

Coleopterological Contributions is being published by Frank J. Psota, M. D., of Chicago, Ill. The initial number contains articles entitled A Review of the Cleridae of Costa Rica, and Descriptions of a New Genus and Four New Species of American Cleridae, both by A. B. Wolcott.

EXPERIMENT STATION RECORD

VOL. 59 SEPTEMBER, 1928 No. 4

The United States Department of Agriculture, like most agencies of the Federal Government, is supported mainly by annual appropriations, and for this reason the successive acts providing for its maintenance have considerable public interest. They serve as indicators of the Department's prospective financial resources and lines of development, and when supplemented by other data and duly interpreted they permit of comparisons which are often useful as well as enlightening.

Reference has often been made in these columns to the difficulties which are sometimes encountered in attempting to utilize these acts as bases of comparison without considerable interpretation. In recent years the appropriation acts themselves have become relatively stabilized in form, but for various reasons they are still seldom completely comparable. This is partly because subsequent to their enactment supplementary appropriations are often made to carry out new legislation or take care of deficiencies. These special appropriations often prove elusive if a recapitulation of all the Department's resources is attempted, as do also the so-called "permanent appropriations" which accrue annually to the Department without reenactment.

All of these factors are present to complicate the situation as regards the fiscal year ending June 30, 1929. The act covering this year, approved by President Coolidge May 16, 1928, carries as its total $139,138,793.88. To this, however, must be added the permanent appropriations of $11,010,500, funds aggregating $313,239.12 available from a reappropriation of certain previous balances, and supplementary funds carried in the Second Deficiency Appropriation Act of May 29, 1928, totaling $4,574,500. These items collectively aggregate $155,037,033.

This figure represents the appropriations which have been actually made to the Department thus far, but it seems likely to be exceeded considerably, as it includes no funds to comply with at least two pieces of legislation authorized by Congress and regarded as in full effect. One of these is the extension to Hawaii of the Smith-Lever Act under a provision whereby the permanent appropriations therein

are authorized to be increased by such amount as may be necessary for this purpose, an amount estimated at $22,935.43. The other is the so-called Welch-Smoot Act of May 28, 1928, increasing from July 1, 1928, the salaries of about 135,000 Federal employees. Under this measure the salary rates prescribed by the Classification Act of 1923 for employees in Washington are extensively revised, chiefly by the elimination of the lowest salary rate in each grade and with general reallocations of positions in some of the upper grades and with many automatic increases of compensation. Provision is also made for a corresponding readjustment of salaries of field employees by department heads and for a survey of the field service by the Personnel Classification Board and a report by that board to Congress at its next session as to a classification of these positions on a permanent basis. A tentative estimate of the additional funds which will be required for salaries under the Welch-Smoot Act in the Department of Agriculture is from 8 to 9 per cent.

In all probability the Department will also be the beneficiary of certain additional funds, the expenditure of which has been entrusted to other agencies. One of these is an item of $40,000 for an investigation of conditions in the State of Washington resulting from the drifting of poisonous fumes from smelter plants in British Columbia, granted to the State Department but with authority to transfer the appropriation to the Department of Agriculture for direct use. The other has to do with the Government's extensive building program in Washington. Under this program an expenditure of $7,750,000 has been authorized to provide new buildings for the Department, and $1,600,000 has been appropriated for immediate use by the Treasury Department in this construction. Excavation has already been completed and the foundation well begun for a five-story central administration building connecting the two laboratory wings erected some years ago, and condemnation proceedings are under way to acquire three city blocks near-by as a site for an extensible office building 1,000 feet in length and six stories high.

Returning to the appropriations made directly to the Department, the situation from the standpoint of agriculture is as usual obscured by the large proportion of these appropriations which is devoted to road construction. The act itself carries no less than $83,697,294 for this purpose, of which $5,197,294 is for the restoration of roads and bridges in the flood areas of Vermont, New Hampshire, and Kentucky, and the Second Deficiency Appropriation Act provides $2,500,000 additional for the construction and maintenance of the Mount Vernon Memorial Highway, which is to be built as a part of the celebration of the two-hundredth anniversary of the

birth of George Washington. There are also included $6,805,500 of Forest Service and wild-life conservation funds, partly redistributed among the States in lieu of tax levies, and $10,980,000 for payments to the agricultural colleges and experiment stations under the Hatch, Adams, Purnell, Smith-Lever, and Capper-Ketcham Acts. When all these items are deducted there remains for the regular or ordinary activities of the Department itself $51,054,239, as compared with $49,209,299 for similar purposes during the fiscal year 1928. Even these two figures are not entirely comparable, and some of the more significant differences will be brought out in a more detailed statement for the several bureaus and other subdivisions.

The new allotment under the Office of Experiment Stations is $4,216,400 of which $1,440,000 represents the usual payments to the States under the Hatch and Adams Acts and $2,400,000 the allotment under the Purnell Act. In accordance with the terms of that measure the Purnell funds are increased by $480,000, making the quota of each State thereunder $50,000. The appropriation for the Office itself is, therefore, $376,400, an increase of $14,194. Of this amount $5,434 is intended to provide for additional services in connection with experiment station administration, while the remainder is for much-needed building construction and repairs at the Alaska Stations.

The increases to the Extension Service in consequence of the passage of the Capper-Ketcham Act have already been discussed in these columns, but in addition $400,000 is provided to carry into effect an act approved January 26, 1928, for the purpose of rehabilitating farm lands in flood devastated areas. On the other hand, a decrease is made from $108,045 to $103,300 in the appropriation for agricultural exhibits at fairs and a net decrease of about $3,000 in the funds for seed-grain loan collections in the Northwestern States, New Mexico, and Florida. The total of the Extension Service funds is $9,192.480.

The allotment to the Weather Bureau is increased from $2,653,733 to $2,771,500. Much of the increase is to provide additional meteorological service to aviation, but $6,380 is allowed for salary adjustments and $6,360 for additional personnel, while $14,000 is granted to establish full meteorological stations at Greensboro, N. C., and Yakima, Wash.

The appropriations for the Bureau of Animal Industry aggregate $14,415,030, of which $5,244,660 is for the meat inspection and $5,744,710 for the tuberculosis campaign. There is a net increase of $247,095, mainly the resultant of a considerable number of small increases and some decreases from previous allotments. Among

the largest items of increase are $199,680 to provide for adjustments in the pay of field veterinarians and $50,000 to extend the meat inspection service to additional plants and a like amount for cattle grub area control tests and demonstrations, while the chief decreases are $256,870 in the appropriation for tuberculosis eradication, and $10,000 in the funds for the enforcement of the Packers and Stockyards Act, the administration of which has been transferred to the bureau. Increased facilities are authorized for the Glendale, Ariz., poultry station, the New Iberia station at Jeanerette, La., the Range Livestock Experiment Station at Miles City, Mont., and the beef cattle investigations at Beltsville, Md., and $25,000 additional is granted for abattoir and other equipment in the cooperative and other meat investigations. Among new projects provided for are turkey production in Montana with $7,500, poultry nutrition studies in cooperation with Johns Hopkins University $5,000, incubator studies $10,200, anaplasmosis of cattle $20,000, a survey of loco weed in the Southwest $5,000, and $40,000 for additional studies of animal parasites.

The Bureau of Dairy Industry receives $565,165, an increase from $546,909. A portion of this increase is for new construction and repairs at Beltsville, Md., and Huntley, Mont., but $8,746 additional is allotted for dairy cattle breeding and herd improvement work, $2,400 for studies of condensed milk and milk powder production, $1,860 for the bacteriology and chemistry of milk, and $6,260 for the nutrition of dairy cattle.

The total for the Bureau of Plant Industry is $4,415,512, an increase of $484,197, distributed among over 30 items. The largest of the new projects is the establishment of a dry land agriculture station at or near Cheyenne, Wyo., for horticultural experimental and demonstration work in accordance with an act approved March 19, 1928, for which $100,000 is appropriated. A dry land field station is also authorized for Umatilla County, Ore., at a cost of $10,000. The remaining increases range from $1,260 for tobacco fertilizer studies and $2,500 for blueberry investigations in Florida to $33,000 for special studies of the effect of borax and other mineral constituents in irrigation water on the growth of trees and other plants and $55,000 for enlarging the rubber investigations, including experiments with different systems of producing rubber in the Philippines and Tropical America.

The Forest Service receives $8,870,105, together with $2,000,000 for the acquisition of additional lands at the headwaters of navigable streams (an increase of $1,000,000), $75,000 for the cooperative distribution of planting stock, $1,200,000 (an increase of $200,000)

for cooperative fire protection, and $7,500,000 (a decrease of $880,000) for the construction of forest roads and trails. These various appropriations, together with $3,430,500 from the permanent appropriations, make a total of $23,075,605 available for forestry work, a net decrease of $528,215. This expenditure will as usual be offset to a considerable degree by the receipts from the national forests, which in 1927 amounted to $5,166,605.74.

For the Bureau of Chemistry and Soils there is an increase from $1,125,005 to $1,293,613. Of this amount $63,053 is divided among the problems of utilizing to better advantage sugar cane, citrus and other fruit, and sweet potato products, studying the causes of food deterioration and the composition of various oils, fats, and waxes, lignin research, and the handling and curing of hides and skins. There is also provided $10,000 additional for the studies of farm fires and $5,000 for beginning studies of new processes and equipment for the production of naval stores. The remaining increase is mainly for the soil and fertilizer work, including among other items $9,485 for soil erosion studies, $11,000 for expediting and expanding the soil survey, and $66,710 for various fertilizer and soil fertility studies.

Apparently there is a large reduction for the Bureau of Entomology, but this is occasioned by one of the most important innovations brought about by the act, the organization of the Plant Quarantine Control Administration of the Department. Under the new unit were consolidated on July 1 the regulatory and control activities affecting plants and plant products hitherto conducted by the Federal Horticultural Board, the Bureau of Entomology, and to a slight extent the Bureau of Plant Industry. The new arrangement will enable the Bureau of Entomology to devote its attention exclusively to research. For this purpose $1,969,658 is appropriated, an increase of $200,613 over the allotment for similar activities last year. This is apportioned among over 20 projects, ranging from $50,000 for researches in the entomological phases of European corn borer control and $25,000 for studying the biology of the cattle grub to $5,000 for additional specialists to expedite the identification and classification of insects and $3,365 for investigating the insect transmission of sugar cane root rot in cooperation with the Bureau of Plant Industry.

For the Bureau of Biological Survey there is an increase in working funds for general purposes from $1,035,020 to $1,177,500, as well as an appropriation of $200,000 for the establishment of a migratory bird refuge at Bear River Bay, Utah, as authorized in an act approved April 23, 1928. Much of the bureau's increase has to do

with the maintenance of the various mammal and bird reservations and the enforcement of the migratory bird act, but $80,500 is provided for an extension of the campaigns for the destruction of injurious rodents and other predatory animals, $5,000 for studies of fox diseases, a like amount for extending inquiries as to the food habits, diseases, and parasites of game, fur-bearing, and predatory animals, and $2,500 each for the perfection of animal poisons and the rabbit experiments in California.

The total for the Bureau of Agricultural Economics, $5,625,780, represents a net increase of $527,029. Of this amount $265,000 is for the collection of statistics of the grade and staple length of cotton, $50,000 to carry out an act approved May 17, 1928, for the investigation of wool standards, and $7,500 to enforce an act approved May 21, 1928, fixing standards for hampers and other baskets for fruits and vegetables. Other relatively large increases are those of $68,220 for developing and extending the agricultural outlook work, $39,560 for expanding the cooperative marketing projects, and $48,510 to meet the increased demands under the U. S. Grain Standards Act and establish and administer standards for flax. There are also many smaller increases for economic studies of various commodities, transportation problems, rural credit, cooperative insurance, and taxation, prices, and marketing, including $10,000 for fruit, cotton, and other marketing investigations in the Orient.

The new Plant Quarantine and Control Administration receives as its initial allotment $2,971,050, as compared with $2,663,230 for the corresponding activities last year. This appropriation consists of $68,610 for administrative expenses, $500,000 for plant quarantine enforcement, and $30,000 for export inspection and certification. The remainder is allotted to the control of various plant pests, including $887,660 for the European corn borer, $687,800 for the pink bollworm of cotton, $556,380 for the gipsy and brown tail moths, $265,800 for the Japanese and Asiatic beetles, $32,800 for the Thurberia weevil, $26,500 for the white pine blister rust, and $15,500 for the Parlatoria date scale. In addition there was made available $5,000,000 to compensate farmers for loss due to the enforced nonproduction of cotton during the 1928 crop year in any noncotton zones which any State may establish as a means of checking the spread of the pink bollworm, the States concerned being required to match the Federal contribution.

Reference to the European corn borer situation is also carried in another section of the act, which authorizes the use of $150,000 from the $10,000,000 appropriation of February 23, 1927, in special nonentomological researches relating to adjustments in farming methods

as a result of the corn borer infestation. This sum is to be distributed among the Bureaus of Animal Industry, Plant Industry, Chemistry and Soils, and Public Roads for work in animal feeding, possible forage crop substitutes, corn culture and breeding, the economic utilization of corncobs and stalks, and the devising of more effective insecticides, machinery, and equipment. With appropriations of $219,920 for entomological studies and $887,660 for control operations, this makes a total of $1,257,580 available to the Department. Legislation authorizing the use of $7,000,000 for reimbursement to farmers for clean-up work was also approved by Congress in an act signed May 24, 1928, but no appropriation was made under its provisions prior to adjournment.

The work of the remaining branches of the Department is continued substantially on the present basis. The Bureau of Home Economics receives $137,281, an increase of $10,037, of which $5,000 is to be used for additional dietary studies and the remainder for the development of the national project on meat production, in which 21 States have been cooperating, by a study of the standardization of cooking methods and the economy and management of electric cooking. The appropriations for the general work of the Bureau of Public Roads are reduced from $457,170 to $440,880, but no change is made in its allotment for construction for Federal aid roads of $71,000,000. The Food, Drug, and Insecticide Administration is increased from $1,389,385 to $1,470,605, chiefly for the expense of moving the New York field laboratory. For the Grain Futures Administration $135,000 is again appropriated, while the Library receives $90,300, an increase of $6,120. The Office of Information is increased from $1,115,000 to $1,121,500, but no change is made in its largest single item, $742,000, for the printing and binding of the Department. The Office of the Secretary receives $1,219,880, of which $149,214 will be required for the settlement of certain rental claims in the District of Columbia.

A number of miscellaneous appropriations are also embodied in the bill. One of these provides $10,000 for participation by the United States in the Eighth International Dairy Congress, held in Great Britain in June and July, 1928. Another continues the appropriation of $25,000 for cooperation with the South Carolina Experiment Station in experimental work looking to the development of agriculture in the Sandhill section of the Southeast.

Taken as a whole the appropriation act and its supplementary legislation present few spectacular innovations, but it is none the less noteworthy for its enlarged provision for an unusual number of the existing projects. This recognition is especially marked in the field

of research. It is estimated that of the total net increase of about $5,300,000 in what may be termed the working funds of the Department, about $1,818,000 will be available for additional research by the Department itself and of the remainder $480,000 is the increase to the State experiment stations under the Purnell Act. The increases in this direction are not only numerous but well distributed, and not for many years has so widespread development been made possible. Such an outcome is very gratifying to all who are interested in research and augurs well for the consistent and orderly growth of the Department during the coming year.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

A contribution on the basic proteins [trans. title], A. Kossel and W Staudt (*Hoppe-Seyler's Ztschr. Physiol. Chem., 171 (1927), No. 1–3, pp. 156–173*).—The general properties, physical and chemical, of a considerable number of protamines and histones, together with an account of their hydrolytic products, are presented in comparative tables, and the experimental work is described in some detail.

The sulfonation of amino acids and polypeptides [trans. title], P. Baumgarten (*Hoppe-Seyler's Ztschr. Physiol. Chem., 171 (1927), No. 1–3, pp. 62–69*).—Using pyridinium-N-sulfonic acid as sulfonating agent, the author was able to obtain potassium glycine-N-sulfonate and the free acid, the compound of the potassium salt of glycyl-glycine-N-sulfonate with glycyl-glycine, the compound of the potassium salt of cystine-N, N′-disulfonic acid with cystine, and the potassium salt of the O, N-disulfonic acid of tyrosine.

Titration of amino acids and proteins with indicators [trans. title], K. Felix and H. Müller (*Hoppe-Seyler's Ztschr. Physiol. Chem., 171 (1927), No. 1–3, pp. 4–15*).—In a brief review of related literature the authors note, inter alia, the work of Harris (E. S. R., 50, p. 802) on the theory of the titration of amino acids, polypeptides, and proteins, according to which, it is stated, the titration and points of proteins and amino acids may be estimated from the dissociation constants. These end points may also be determined accurately and conveniently, according to the present paper, by adding the theoretical quantity of standard acid or alkali to a solution of known concentration of the amino acid or other ampholyte, and determining the resulting pH as the point to which titration is to be carried in determining the compound in a solution of unknown concentration.

Inasmuch as the amino and carboxyl groups of most substances of the type here discussed are but very weakly dissociated, indicators for the extreme ends of the pH scale will be most frequently required. The authors prefer to use the acid range (pH 1.2 to pH 2.8) of thymol blue and for the upper end of the scale, alizarin yellow, to which latter indicator the useful range pH 10.1 to 12.1 is attributed. It was found with respect to arginine, for example, that while the strongly dissociated guanidine group has the titration end point pH 5.0 the weakly dissociated amino groups of this base are titrated to completion only at pH 0.35 and the carboxyl group has in this compound a titration end point of over pH 15.95. For the two lysine amino groups the end points found were pH 5.0 and pH 0.05, respectively, and for the carboxyl group of this amino acid pH 12.7 to pH 13.0. With histidine the basic groups showed end points at pH 3.76 and pH —0.3, and the carboxyl group at pH 10.65. The end points found for the acid groups of aspartic acid were pH 5.83 and pH 11.85, and for the amino group pH 0.08. It is noted that the amino group of histidine and the carboxyl group of arginine are the extreme cases met with among the hydrolysis products of proteins. While better indicators for the extreme ranges

involved in such titrations are considered desirable, it is stated that, with but few exceptions, the dyes above noted serve for the titration of the amino acids and polypeptides investigated.

In the following list the figures are in the order, respectively, of the percentages of the theoretical found in titrating basic groups with thymol blue and carboxyl groups with alizarin yellow as indicator: Leucine 100, 95; tryptophane 39, 114; proline 90, 67; taurine 20.5, 100; glutaminic acid 102, 100; aspartic acid 96, 103; arginine chloride 100, 50; dibenzoyl-arginine —, 116; histidine hydrochloride 103, 106; histidine carbonate 103, 121; glycyl-glycine 110, 98; and leucyl-glycine 118, 104.

A study of the proteoclastic activity of flour, A. Cairns and C. H. Bailey (*Cereal Chem., 5 (1928), No. 2, pp. 79–104*).—The following procedures were compared as means for measuring the progress of proteolysis occurring in the flour suspensions studied: (1) Precipitation of unattacked protein by cupric hydroxide, (2) precipitation with stannous chloride, (3) Sørensen's titration method (E. S. R., 19, p. 808), (4) Van Slyke's amino nitrogen determination (E. S. R., 26, p. 22), (5) trichloracetic acid, (6) tungstic acid, (7) determination of water-soluble protein, and (8) Foreman's amino acid titration (E. S. R., 44, p. 411). Procedures (5) and (7) are noted as proving of limited value. Method (2) was found somewhat cumbersome and productive of results more variable than those secured by either (1) or by (6). Method (8) was "apparently less acceptable than the Sørensen formol titration method" (3), the last named having been chosen, therefore, as best suited for the measurement of flour proteolysis. Van Slyke's amino nitrogen determination was found "as useful but more laborious than the Sørensen method." The results are summarized in part as follows:

Proteolysis measured in terms of the amino nitrogen of the digest held for 48 hours at 37° C. was found small in the case of suspensions of high-grade flours milled from sound wheat. Ash as a measure of the degree of refinement of the flour was found positively correlated with the proteolysis rate, the coefficient of correlation of the ash content with the amino nitrogen being given as +0.84 P. E. ±0.0195. There did not appear to be any relation between the variety or region of origin of the wheat and the proteolytic activity. Sprouted wheat showed a very high proteoclastic activity, but as much as 3 per cent of the flour milled from the sprouted wheat did not appreciably alter the proteolysis rate of flour milled from sound wheat not sprouted. Decreases in the viscosity of incubated flour suspensions were found to be associated with increases in the proteoclastic activity of the flour used in making the suspensions, but difficulties in the precise determination of flour suspension viscosities are considered such that at present the method can not be applied to the distinguishing of small differences in the proteoclastic activity among flour samples. Other points regarding the significance of the observations made are discussed.

Relation of hydrogen-ion concentration of dough to baking properties, E. Grewe and C. H. Bailey (*Cereal Chem., 4 (1927), No. 4, pp. 261–270, fig. 1*).—According to the experiments reported in this contribution from the Minnesota Experiment Station, the gluten proteins appear to have an isoelectric point slightly above the pH value ordinarily encountered in doughs made with untreated patent or high grade flour. Dough extensibility passed through a maximum on the alkaline side of the original H-ion concentration of the simple flour water doughs. The conclusion was reached that the extensibility and gas retention might be improved by the addition of alkali to the dough. Diastatic activity in the dough was found to be inhibited by the addition of

alkali, so that material containing active diastasis had to be added in determining the baking properties of alkaline doughs, but, with the necessary added diastase, alkaline dough made better bread than did the untreated controls. The relation of diastatic activity to increasing H-ion concentration was found not to be constant, the flour having the greatest original activity showing the greatest increase in activity upon the addition of acid.

It is not considered that these observations indicate that alkali should be added to the dough in ordinary processes of bread making, but rather that the improvement noted in the bread as a result of increase in H-ion concentration (decrease in pH) results from accelerated enzyme action and not from an improved physical condition of the dough.

A gravimetric penetrometer for measuring stiffness or toughness of doughs, C. G. Harrel (*Cereal Chem., 4 (1927), No. 4, pp. 283–290, fig. 1*).—When the same flour was used, the time of mixing, the machine speeds, and the percentage of water had little effect upon the depth of penetration. The stiffness of doughs, however, decreased with increase of temperature, according to the indications of the instrument described. With a constant percentage of added water, the resistance to penetration decreased with increasing salt content.

It is noted that the apparatus described is cheap, simple, and easy to duplicate, is frictionless, and is not affected by grease or other factors that might change its surface. Several determinations in one minute are stated to be possible, and the fact that the results are given a definite numerical expression is believed to give the apparatus an advantage over methods whose results are expressed in descriptive terms.

Influence of size and shape of pan on the baking test, J. P. Lewis and W. O. Whitcomb (*Cereal Chem., 5 (1928), No. 2, pp. 146–158, figs. 8*).—Noting the importance of the size and shape of the pan in the experimental baking test and the wide variations in both commercial and experimental pans, the authors present the results of tests of 7 types of baking pans, carried out at the Montana Experiment Station, with the use of 7 flours varying in strength and behavior. Observations on the following points were especially the objectives of the investigation: The influence of the type of pan upon (1) loaf volume, (2) quality, (3) the proof period in relation to quality, loaf volume, and the height of the loaf, and (4) the height of the pan in relation to the height of the loaf. The following conclusions, among others, appeared to be justified:

With both strong and weak flours, pan shape markedly influenced both the size and the quality of the loaf. The deeper pans yielded taller, but not larger loaves. The pan top area was more closely related to loaf size than was any other dimension of the pan. The deep pan yielded a loaf smaller and of somewhat poorer quality than that formed in the shallow pan, so that a flour capable of producing a good loaf in the deep pan can be depended upon to be satisfactory in the bakeshop where the shallow pan is used. Some uniform type of pan, which, it is considered, must of necessity differ from the commercial bakeshop type, should be adopted for laboratory tests.

An automotic proof box, C. G. Harrel (*Cereal Chem., 4 (1927), No. 4, pp. 278–282, figs. 2*).—The minute current permitted to pass when the rising dough makes contact with a metal upper shelf of adjustable height is amplified by two radio tubes and accessory apparatus so as to give a sharp sound signal, stated to be similar to the familiar time signals, insuring that a single operator can secure exactly uniform proofing in a large number of loaves simultaneously.

Value of experimental milling test, R. S. Herman (*Cereal Chem., 4 (1927), No. 4, pp. 270–274*).—The author summarizes his opinions on this subject in the following terms:

The experimental milling test is valuable for separating from wheat samples a definite amount of flour which closely resembles in terms of routine analytical factors and baking characteristics the product of commercial milling of approximately the same percentage from the same wheat or blend. Tests made on this definite amount of flour allow close assumptions as to the anticipated characteristic nature of different extractions when obtained in commercial milling from the same wheat or blend. The experimental milling test gives precise and concise information which can not otherwise be obtained. It foretells in close approximation milling quality, yield of wheat, and the characteristics of the flour from it. If practiced in connection with experimental baking it will foretell the utility of the flour in terms of value for specific purposes.

Annual report on essential oils, synthetic perfumes, etc., SCHIMMEL & CO. (*Miltitz, near Leipzig: Schimmel & Co., 1926, pp. 247, pls. 3, figs. 5*).—Under the heading of "analytical notes," brief accounts are given of the procedure for the determination of essential oil content of spices and of the water content of various essential oils; the detection of traces of aldehydes and the determination of cinnamic aldehyde, pulegone, vanillin, piperonal, and coumarin; the determination of phenols; the detection of diethyl phthalate, etc. Under the head of "chemical notes" are given, under the subheads of (1) hydrocarbons, (2) alcohols, (3) aldehydes, (4) ketones, (5) acids, esters, and lactones, (6) glucosides, and (7) nitrogenous bodies, condensed reviews of the progress of synthetic and structural investigations on organic compounds of value by reason of their odorous or pharmaceutical properties.

Determination of the sulfur content of arable soil [trans. title], G. BERTRAND and L. SILBERSTEIN (*Bul. Soc. Chim. France, 4. ser., 41 (1927), No. 7, pp. 950–954*).—The following method is proposed:

Place 5 gm. of air-dried soil in a porcelain dish with 15 cc. of fuming nitric acid (sp. gr. 1.5) and cover with a funnel a little smaller in diameter than the dish; heat 1 hour on the water bath; carefully wash down the funnel into the dish, evaporate the mass on the water bath to a paste and add a 10 per cent sodium carbonate solution until effervescence just ceases, then add a further quantity of the carbonate just equal to that already used in neutralizing the acid; transfer the mixture to a nickel crucible of 75 cc. capacity, and add enough of an equimolecular mixture of sodium carbonate and sodium nitrate to make the total quantity of this mixture present, including that formed in the neutralization, about 10 gm.; evaporate on the water bath to dryness and then heat to fusion, stirring the pasty mass from time to time with a stiff nickel or iron wire. When there is no further evolution of carbon dioxide, cool, take up in water, add 20 cc. of hydrochloric acid, evaporate to dryness, and again treat with hydrochloric acid (10 cc.) and evaporate; take up in dilute hydrochloric acid, and determine sulfur in the usual way.

Loss of sulfur by calcination in air, loss of sulfur by calcination with the nitrate-carbonate mixture (without the previous treatment with nitric acid), the determination of preexisting sulfate in the soil, and the determinaion of organic sulfur are also discussed.

Investigation of the total sulfur content of some cultivated soils [trans. title], G. BERTRAND and L. SILBERSTEIN (*Bul. Soc. Chim., France, 4. ser., 41 (1927), No. 10, pp. 1380–1383*).—Noting the essential character of sulfur as a constituent of plant tissue and the comparative infrequency with which any attention has been given to the question of the adequacy or inadequacy of the sulfur content of cultivated soils, the authors present determinations, by the method noted in the preceding abstract, of 50 samples of 7 soils, together with the results of experiments emphasizing the necessity of avoiding sources of heat

capable of contaminating the fusions with extraneous sulfur. The gas flame introduced sulfur equivalent to 0.1 gm. per kilogram in the course of a 0.5-hour fusion.

METEOROLOGY

Meteorology and agriculture (*Jour. Min. Agr.* [*Gt. Brit.*], *34* (*1928*), *Nos. 11, pp. 1035–1043; 12, pp. 1099–1106*).—Abstracts are given of papers presented at a later conference of representatives of British research institutions engaged in investigations on various aspects of the relation of meteorology to agriculture than that previously noted (E. S. R., 56, p. 113). The papers presented were as follows:

The week as a phenological time unit, W. N. Shaw (pp. 1035, 1036).—It is stated that "in so far as the application of meteorological data to agriculture or phenology is concerned, the week is a much more convenient unit of time than the month." It is suggested that "for the purposes of a weekly report it is well to commence the statistical year on January 8, to group the weeks in fours and fives, which by analogy may be called months, so arranged that the four groups of five weeks have the solstices and equinoxes in their middle weeks." The system in use by the British Meteorological Office is explained. The weekly record is in form of accumulated temperatures above 42° F.

Rothamsted temperature records, T. N. Hoblyn (pp. 1036, 1037).—Analysis of daily records of maximum and minimum temperature recorded at Rothamsted for nearly 50 years shows that "the greatest variation of the maximum temperature is found in the spring and early summer, the winter being comparatively even; the minimum temperature, on the other hand, varies greatly in the winter months, while the summer months are very even. It would appear, then, that maximum temperature is likely to have a decided influence on an annual crop during the spring and early summer, while the minimum temperature is most likely to have an influence during the winter and early spring. The variation of the mean temperature during the summer months is greatly influenced by the low variation of the minimum; the mean tends, therefore, to give a poor idea of fluctuations of temperature during this time.

"Considering now the variation between the same months in different years, whereas in the spring and autumn months the variation of the maximum temperature within months is high, the mean maximum temperature varies comparatively little from year to year. In the winter and summer, however, the maximum varies very considerably between years. The minimum temperature has its greatest variation from year to year in the winter, but is extraordinarily constant in the summer months. Whether a summer be hot or cold, there will be very little difference in the minimum temperature in either case. The mean of the maximum and minimum probably gives a fair idea of the variations in temperature from year to year in the winter months, but the mean tends to follow the maximum temperature from year to year during the summer months."

The effect of temperature and humidity on the change in weight of crops in storage, G. V. Jacks (pp. 1037, 1038).—The results of experiments with wheat, oats, and barley indicate that "the effect of climatic variations on the weight of stored crops is relatively small, since the greatest change observed over a period of four months was only 5 per cent."

An investigation into the losses that occur during the storage of farm crops, W. S. Gibson and W. Goodwin (pp. 1039, 1040).—Observations on wheat and oats left in the stack for varying lengths of time under ordinary farm conditions indicate that "when grain is stored in the stack under good average conditions the loss of weight is extremely small and probably does not exceed 1 per cent."

The effect of temperature on the keeping quality and bacterial count of milk, H. Barkworth (pp. 1040–1043).—From the results of his investigations, the author concludes that "any lengthy exposure to a temperature of 65° would have a serious effect on both the bacterial count and the keeping quality of milk. Where the initial bacterial count is really low, exposure to this temperature may be survived without any great effect, but a short period at 70° is usually fatal to any milk supply."

Meteorological conditions and the amount and nutritive value of pasture and hay, R. G. Stapledon (pp. 1099–1101).—It is indicated that the growth and nutritive value of pastures and hay are influenced more by the character of the herbage and the inherent capacity of the constituent plants for growth than by the accident of weather, although experiments extending over seven years are referred to which showed that the highest yields were obtained during those years which were wettest in the period from April to June. "Clovers and grasses attain to maximum productivity at decidedly different times of the year, and clovers require a higher mid-temperature before they start really active growth than do grasses. The precise date at which clover growth fairly starts is far more dependent on temperature than on rainfall. Excess of rain early in the year, although it will make for a measure of grass growth even if the temperature is low, will have practically no influence on clover until the mean temperature also advances considerably." Orchard grass (cocksfoot) produced in a wet season "a greater bulk of leaf with a higher protein content" than in a dry season. "The chief effect of a dry year is undoubtedly to make for slow growth which matures and dries off prematurely, and which will not have the same nutritive value as herbage of reasonable height produced under adequate conditions of soil moisture."

Meteorological conditions and the rate of growth of pasture grass, H. E. Woodman (pp. 1101-1103).—Observations on the growth and composition of pasture grasses on light sandy and stiff clay soils during two seasons, one wet and the other dry, are reported.

Temperature and food requirements of animals, T. B. Wood (pp. 1103, 1104).—From observations on a fasting pig and from theoretical computations, it is concluded that "fall in temperature only does not directly increase food requirements in the case of full-fed animals under practical conditions. Fall or rise of temperature may do so indirectly by occasioning discomfort, which results in excessive muscular movement."

The physiological action of ultra-violet light, H. E. Magee (pp. 1104, 1105) — The important part that ultra-violet light plays in the growth and health of animals is discussed.

Meteorological factors affecting fertility in sheep, J. E. Nichols (p. 1106).—This is a brief account of studies more fully reported elsewhere and previously noted (E. S. R., 56, p. 508).

Report of weather observations, C. H. Steelman (*New Jersey Stas. Rpt. 1927, pp. 193, 194, 195, 196*).—Observations at the college farm at New Brunswick on temperature and precipitation during the year ended June 30, 1927, are briefly summarized, and the outstanding features of the weather of the year are noted. The mean temperature for the year was 50.95° F., 0.82° below normal. The total precipitation was 46.67 in., 2.09 in. below normal. Seventy-five per cent of the total precipitation occurred during the first six months of the year (July to December, 1926), the highest precipitation, 8.3 in., being in August.

"The excessive rainfall during the summer months caused a heavy loss of peaches through brown rot and made the fruit that did not rot watery and

inferior in quality. . . . Starting with January and continuing through April, the weather was mild, except for cool periods lasting three or four days only. It was not mild enough to start the buds on trees, however. . . . The spring was rather cold. . . . Conditions were unfavorable for the pollination of apples, resulting in a relatively light set in some orchards. . . . The total snowfall for the year was 18.75 in. The first killing frost occurred on October 22, 1926, and the last on April 25, 1927."

SOILS—FERTILIZERS

Studies on the colloidal behavior of soils, H. C. McLean and J. S. Joffe (*New Jersey Stas. Rpt. 1927, pp. 333, 334*).—This work has been continued (E. S. R., 57, p. 19), the results from two lines of attack being noted.

With respect to the aluminum toxicity the work reported consisted of a study of the influence of various anions on the state of aggregation of the colloidal hydrated aluminum oxide. The experiments indicated that aluminum is likely to become a toxicity factor only in soils having a pH value lower than 4.7, the inorganic anions in the soil tending to prevent the formation of soluble aluminum salts. The reaction limits within which aluminum may attain a state of molecular dispersion were found specific for the various anions. It is stated that the nitrate anion may permit the formation of aluminum nitrate at a pH value of nearly 6.0 in the absence of other anions, but in the presence of the sulfate ions usually present in the soil the transformation of aluminum gels and sols into true molecular dispersions is suppressed. Traces only of sulfate and of other ions, mono-, di-, and trivalent, inhibited aluminum solution. The sulfate ion appeared to have in addition a tendency to eliminate the sol state of soil aluminum. Dialysis indicated the presence of but very little molecularly dispersed aluminum even in soils at pH 4.8, this being especially noted in the presence of sulfate or phosphate ions. The aluminum was found almost always present in the gel condition, aluminum in this state being considered to constitute the readily soluble aluminum of the soil and to be that extracted in the determination of active aluminum.

The availability for plant nutrition of cations absorbed in the base exchange complex was also investigated, a series of soil samples having been saturated with the ammonium, calcium, potassium, and hydrogen ions, respectively, and then used as nutrients in sand cultures of buckwheat. The absorbed nutrients were utilized by the plants, and various cations replace each other.

The influence of electrolytes upon solid soil dispersions [trans. title], P. Köttgen (*Fortschr. Landw., 2 (1927), No. 22, pp. 730–738, figs. 12*).—Suspensions of clay soils were boiled to remove the air, passed through a 0.2-mm. sieve, and concentrated to a water content such that the soil did not take up more water on standing. In most cases the moisture content was at this point about 75 per cent, but the limit was found to be not sharp and depended upon the degree of dispersion, and especially on the electrolyte content of the soil. The coagulation likely to result from the boiling was destroyed by careful preparation. In order to secure a means of comparison, shrinking curves for the soils with their natural electrolyte content were made. The purpose of the experiments was to secure an understanding of the possible conditions of a given soil, with the ultimate object of ascertaining the exact form and quantity of salts productive of the best granulation in the solid soil dispersion.

Similar experiments were carried out with soils to which potassium chloride, sodium carbonate, calcium chloride, and calcium hydroxide were added in various normalities. Among the observations recorded are the following:

The coarsely dispersed soil system behaved rather like suspension colloids than like emulsion colloids. The shrinking curves agreed well with the degree of heaviness of the soil. On the addition of varying quantities of electrolytes the course of the curves showed that both the volume and the dispersity were permanently altered. This change showed itself especially in the region of the turning point of the curve. The volume increase and coagulation were not so marked as to justify speaking of a granulation of the soil, but rather of a tendency toward granulation. The calcium ion was no more effective than the monovalent cations. The method described is considered sufficiently sensitive so that it should be applicable to the determination of that normality of a salt best suited to bring about the tendency to granulation in a given soil.

Soil and land utilization, L. L. Lee (*New Jersey Stas. Rpt. 1927, pp. 334–341*).—The indication from incomplete figures that of nearly 361,000,000 acres of cultivated land in the United States about 12.9 per cent is marginal is noted. Brief statements and tabular presentation of data are given with regard to fertilizer experiments of the usual type on the Heal and Warnock fields in Burlington and Monmouth Counties, respectively.

Soil survey of Green Lake County, Wisconsin, W. J. Geib et al. (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1922, pp. III+1801–1840, pl. 1, fig. 1, map 1*).—Green Lake County, slightly southeast of the geographic center of the State, comprises 230,400 acres of, for the most part, gently rolling land including level river terraces, flat marshland, rolling to gently rolling prairie, etc. The county is almost entirely within the Fox River drainage basin.

The present report, prepared in cooperation with the Wisconsin Geological and Natural History Survey and the University of Wisconsin College of Agriculture, maps and describes, in its main portion, the soils of the county in 14 series including 31 types, the most extensive areas occupied by these classified groups being those of Parr silt loam, which accounts for 13.7 per cent of the total area, and the Bellefontaine fine sandy loam, noted as a dark colored phase, which covers 11.1 per cent. However, peat, unclassified, covers 17.3 per cent of the area.

A brief supplementary portion of the report gives suggestions for soil improvement under the subheads of lime and fertilizers and of crop rotations.

Soil microbiology (*New Jersey Stas. Rpt. 1927, pp. 36, 37*).—A number of new cellulose-decomposing bacteria have been isolated and described. It has been shown that when the reaction of the soil is at pH 6.0 or less the decomposition of celluloses is carried out almost entirely by fungi, while at pH 6.0 or above the aerobic bacteria are largely responsible for this process. Although celluloses are decomposed completely by various soil organisms without leaving any residual substances which would contribute to the soil humus, the microorganisms utilize about 30 to 40 per cent of the carbon of the celluloses decomposed for the synthesis of microbial protoplasm. This protoplasm forms one of the important sources of humus in the soil.

When organic matter is added to the soil, the pentosans, celluloses, proteins, and the various other soluble and a number of insoluble constituents of organic matter are rapidly decomposed, while the lignins are left to accumulate. It is these lignins together with the synthesized substances that go to make up the soil humus. This so-called humus is only very slowly attacked by the numerous soil fungi and bacteria. The Actinomyces and certain nonspore forming bacteria seem to be about the only organisms that are capable of attacking these resistant substances. Methods have been developed for the isolation and determination of this soil humus.

Comparison of aerated and non-aerated cultures for nitrogen fixation studies by soils, L. W. Erdman and P. W. LeCornu (*Iowa Acad. Sci. Proc., 33*

(*1926*), *pp. 59–63*).—This is a contribution from the Iowa Experiment Station reporting a comparative study of aerated and nonaerated solution cultures prepared by adding to dextrose solutions samples of Carrington loam without fertilizer treatment since 1914, of the same soil under annual treatment with 4 tons of stable manure, and of 2 soils from Colorado and from Kansas, respectively. Tabulated data with respect to nitrogen fixation are presented, and the conclusion is stated that "aeration of solution cultures for nitrogen fixation studies increased the rate of nitrogen fixation, and this was especially noticeable if fresh soil was used for the inoculum. In agricultural practices these results may be taken to indicate the importance of recommending those soil treatments which tend to maintain sufficient soil aeration for the maximum fixation of atmospheric nitrogen by the nonsymbiotic nitrogen fixing microorganisms."

A contribution to the study of the nitrification of the nitrogen of stable manure in field soils, V [trans. title], C. Barthel and N. Bengtsson (*Meddel. Centralanst. Försöksv. Jordbruksområdet* [*Sweden*], *No. 311* (*1926*), *p. 16; Eng. abs., p. 15*).—According to the authors, "in our preceding experiments [E. S. R., 52, p. 622] we have found that in the incorporation of barnyard manure into field soils only the ammonia nitrogen of the manure undergoes nitrification. In order to confirm further the foregoing results, we have now investigated the course of the nitrification of stable manure which had been wholly or largely freed from the ammonia nitrogen present by distillation with or without vacuum. The experiments were carried out in clay, sand, and humus soils. No nitrification of the higher nitrogen compounds of the manure was obtained, so that the previously secured results must be looked upon as confirmed by the present experiments." A second and fuller summary (in English) adds some experimental detail.

Synopsis of the results of green manuring tests in native agriculture in Java [trans. title], J. G. Ossewaarde (*Landbouw* [*Buitenzorg*], *3* (*1928*), *No. 8, pp. 453–474; Eng. abs., pp. 473, 474*).—From the author's English summary, the results of these experiments would appear to have been in part as follows:

Green manuring gave, in general, excellent results. It was found necessary, however, in judging the results, to take into consideration the entire crop rotation system and the general farming conditions. In some cases it was found possible to replace artificial fertilizer (ammonium sulfate) with green manuring treatment, but in others it appeared to be preferable to combine the green manuring treatment with the use of artificial fertilizer. In some cases green manures appeared to replace stable manure. Each soil, variety of climate, and system of crop rotation demands separate consideration in the choice of the green manuring crop, and the exact times of planting and applying of green manuring crops were found to be, under some circumstances, of great importance. In wet rice fields the application of green manure harvested from special plats and used in the form of a mulch yielded as large an increase in crop as green manure grown on the field itself.

Handbook of fertilizers, A. F. Gustafson (*New York: Orange Judd Pub. Co.; London: Kegan Paul, Trench, Trübner & Co., 1928, pp. 122, pls. 11*).—"This little book is an attempt to supply accurate, up-to-date information as to the source and make-up of commercial fertilizers. Special stress is laid on the effects of fertilizers on soils and crops in the hope of aiding the user to make a wise choice for his individual soil conditions." The principal subjects covered are requirements for plant growth, nitrogenous, phosphatic, and potassic fertilizer materials, fertilizer effects on soils and crops, factory-mixed fertilizers,

home mixing of fertilizers, purchase and use of fertilizers, and liming in relation to fertilizer practice.

A critical investigation of the Neubauer method for the determination of fertilizer requirements of soils [trans. title], R. Rudel (*Fortschr. Landw., 2 (1927), No. 22, pp. 725–730*).—The influence, in the application of the Neubauer method (E. S. R., 53, p. 319), of nitrogen and potassium additions on the removal of phosphorus from sand cultures by seedlings of various types of rye, including the behavior of superphosphate (acid phosphate), Rhenania phosphate, pulverized Thomas slag, "colloid phosphate," and "Leunaphos," formed the subject of this investigation.

With respect to the effect of added nitrogen and potassium, the experiments indicated that so far from increasing the phosphorus absorption, these nutrients, especially the nitrogen, distinctly reduced the phosphorus utilization. The phosphorus utilization was also found to be better in proportion as the quantity available to the seedlings was less, and it is concluded that the seedlings were never able to take up all of the root-soluble nutrients of the soil samples. With regard to the various sources of phosphoric acid, the water-soluble phosphoric acid of superphosphate and the citric acid soluble of Rhenania phosphate were found about equally well utilized. The water-soluble phosphoric acid of Leunaphos, the citric acid soluble of Thomas slag flour, and the total phosphoric acid of colloid phosphate followed with lesser differences. Various differences in the behavior of the rye varieties used are also detailed.

Crop yields from Illinois soil experiment fields in 1927, F. C. Bauer (*Illinois Sta. Bul. 305 (1928), pp. 341–369, fig. 1*).—This is the customary annual report of the results of the soil fertility experiments, the yields and treatments being tabulated for 31 experiment fields. For the most part the work is a continuation of that previously noted (E. S. R., 57, p. 813).

Soil fertility tests, E. B. Ferris and W. S. Anderson (*Mississippi Sta. Bul. 246 (1927), pp. 10, 11, fig. 1*).—The progress during 1926 and 1927 of the experiments with various legumes (peas, soy beans, and velvet beans), already noted in previous years (E. S. R., 56, p. 135), is here briefly summarized. Cotton, the crop used as a check on the soil improvement obtained from the rotations, showed material increases as a result of the previous growing of legumes alone or of legumes with corn.

Report of the department of soil chemistry and bacteriology, J. G. Lipman and A. W. Blair (*New Jersey Stas. Rpt. 1927, pp. 323–333*).—Work with soils and fertilizers during the year included the following, continuing earlier work (E. S. R., 57, p. 714):

The availability of nitrogen in nitrate of soda, ammonium sulfate, and dried blood with varying ratios of phosphoric acid and potash, season 1926 (pp. 323–327, 329).—Results for 1925 have been noted from another source (E. S. R., 53, p. 619). Yields of barley grain and straw and of sorghum, the residual crop, are tabulated in this report. It is noted that the check cylinders always gave lower yields than did the treated cylinders, and that, considering the first crop only, the sodium nitrate and ammonium sulfate gave generally higher yields and nitrogen recoveries than did dried blood or combinations of the three nitrogen sources. With the single portion potassium treatment, dry matter yields and nitrogen recoveries were a little better with sodium nitrate than with ammonium sulfate. The single potassium treatment gave better yields than did the double. For the combined crops, in the majority of cases, the yields with blood were below those with the nitrate.

The influence of lime on the yield and nitrogen content of alfalfa hay, seasons 1925 and 1926 (pp. 328, 329, 330).—The quality of the hay was improved with

the use of lime, 1- and 2-ton applications of finely pulverized limestone having kept the soil near the neutral point. From the 1926 yields of 180.65 lbs. of nitrogen recovered from limed alfalfa plats as against from 30 to 60 lbs. per acre in neighboring plats planted to nonlegume crops, and from similar observations of previous years, it is tentatively concluded that if the alfalfa used no more soil nitrogen than did the nonlegume crops there must have been a symbiotic nitrogen fixation of more than 100 lbs. per acre in the alfalfa plats. It is considered a certainty that the lime has increased the value of the hay far beyond the cost of the lime, that the feed value of the hay has been increased, and that the treatment has left the soil in better condition for succeeding crops. Electrometric H-ion concentration determinations on samples taken from four plats in August, 1926, are tabulated.

Continuous rye and wheat with and without a legume green manure crop, season 1926 (pp. 330, 331).—A brief progress report, with tabulated yields, for the 1926 season is given, as formerly (E. S. R., 57, p. 715).

The continuous growing of corn with a legume and a nonlegume green manure crop, season 1926 (pp. 331–333).—This continues previous reports (E. S. R., 57, p. 715).

A summary of collective fertilizer experiments in the Tula Province [*trans. title*], A. V. Kazakov (*Trudy Nauch. Inst. Udobr.* (*Trans. Sci. Inst. Fert.* [*Moscow*]), *No. 35* (*1926*), *pp. 7–42, figs. 7*).—This is a summary of fertilizer experiments for a 15-year period (1903–1917) conducted throughout the Province of Tula in cooperation with farmers on podsolized loam and sandy loam soils, gray and dark forest soils, weathered chernozem, and leached chernozem. The results are presented for each crop separately in tables and diagrams.

Rye responded to phosphates, especially when planted after clovers. Oats did not respond to phosphorus as well as did rye, but better to nitrogen. The results of a small number of potato experiments indicated that a complete fertilizer is the best, followed by phosphorus, and potassium and phosphorus applications. Vetch and oats responded very favorably to Thomas slag. Superphosphate (acid phosphate) and nitrogen on gray forest soils increased the yield of spring wheat 50 per cent and of barley 70 per cent. In the latter case no greater increase was observed with a complete fertilizer. With sugar beets the fertilizer experiments were not conclusive. Additions of Thomas slag on podsolized loams increased the yield of winter wheat from 12 to 15 per cent, and phosphate rock doubled the yield of winter wheat on leached chernozem. Meadow hay responded to applications of phosphorus and calcium oxide.

Agricultural limestones and marls of North Carolina, J. L. Stuckey (*North Carolina Sta. Agron. Inform. Circ. 16* (*1928*), *pp.* [*1*]+*9*).—This mimeographed paper briefly considers the limestone and marl deposits of the State, including both deposits now being worked commercially and deposits not at present being worked but of apparent value either commercially or locally.

Recent experiments of the Agronomic Research Institute on the fertilizing action of sulfur [trans. title], E. Roux (*Compt. Rend. Acad. Agr. France, 14* (*1928*), *No. 17, pp. 616–621*).—Brief notes on the application of sulfur to a number of crops in a variety of soils are followed by the statement of the following, among other conclusions: Sulfur alone increased yields in soils rich in organic matter even when these soils contained appreciable quantities of sulfates. It is considered that the sulfur, transformed in the soil into sulfuric acid, is able to play a direct part in the nutrition of plants, but that it plays a more important rôle in soils rich in organic matter through an active bacterial mobilization of nitrogenous reserves. A small quantity of finely divided sulfur

was found capable of producing a marked fertilizing action under the conditions specified.

Studies of sulfur in relation to the soil solution, W. L. Powers (*Calif. Univ. Pubs. Agr. Sci., 5 (1927), No. 4, pp. 119–170, figs. 13*).—This is a further contribution to a study of sulfur in its relation to soil fertility initiated at the Oregon Experiment Station (E. S. R., 50, p. 724). Pot tests with sulfur and sulfates in Madera sand carrying alfalfa or held fallow, together with analyses of the displaced soil solution of several sulfured and unsulfured soils from fertilizer experiment fields, constituted the experimental work upon which the discussion here presented is based. The recorded observations and conclusions are in part as follows:

In the pot tests sulfur and sulfates markedly increased the calcium ion and produced a definite increase in other bases in the displaced soil solution. The calcium and sulfate ions were found to be taken up especially well together by alfalfa plants. Heavy applications of sulfur increased the soil acidity, thereby increasing the phosphate and iron contents of the soil solution up to a certain point, beyond which the bases dissolved or replaced tended to precipitate these two ions from the soil solution. Heavy sulfur applications tended to inhibit nitrification, though applications up to 100 lbs. per acre, spoken of as a normal application, appeared capable of increasing growth and nitrogen in arid soils. Sulfur oxidation was found to increase the concentration of the H-ion and then of other cations. Fixation and exchange of bases applied as sulfates, for example, potassium sulfate, was observed.

Analyses of soil solutions displaced from the field soils tended to confirm the pot results with Madera sand, and further showed that at certain seasons the sulfate content of some of these soils was very low. Sulfur was found to be most needed by alfalfa during the early weeks of the growth period. Sulfur applications were found to increase sulfofication and the sulfate content of the soil solution, and it is considered that they may in turn serve to bring bases into solution, with the result of a more concentrated soil solution and a decreased transpiration.

A concentration of from 48 to 24 parts per million of sulfate was found the most favorable for alfalfa growth in water culture experiments under the conditions of the test. Per milligram of sulfur the maximum production secured is stated to have been 0.18 gm. of alfalfa, this result being reported as that obtained with a solution having initially a sulfate content of 15 parts per million. An average application of sulfur appeared to improve the reaction of arid soils for alfalfa nutrition and to result in increased growth, higher chlorophyll content, and higher sulfur content.

It is concluded that "ordinary applications of sulfur for alfalfa on the arid basaltic soils or soils liberally supplied with calcium compounds is probably good practice, especially where the growth secured is consumed on the farm."

Practical carbon dioxide fertilization in gardening and agriculture, E. Reinau (*Praktische Kohlensäuredüngung in Gärtnerei und Landwirtschaft. Berlin: Julius Springer (1927), pp. V+203, figs. 35*).—This is a monograph discussing in detail the theory, history, and practice of carbon dioxide fertilization of greenhouse, garden, and field crop plants, together with the apparatus necessary for the practical production and purification of carbon dioxide for this use. Much of the charcoal burning, gas purifying, and gas distributing apparatus described is of the author's design, and a number of the experiments cited are also his own. Photographs of gassed and of control plants indicate marked improvement of the former in rate and in total amount of growth in greenhouse and truck garden plants, in field crops, and even in tree seedlings. The author

appears to be of the opinion that carbon dioxide fertilization can be practically and economically applied in the growing of almost any economically important vegetation. The principal divisions of the text are the fundamentals of carbon dioxide fertilization, its history and points of special interest (kuriosa), the carrying out and application of carbon dioxide fertilization, and the economics of the subject. An index of technical contributors to the literature on carbon dioxide fertilization is appended.

Inspection of commercial fertilizers for 1927, T. G. Phillips and T. O. Smith (*New Hampshire Sta. Bul. 231 (1927), pp. 15*).—Together with the usual analyses this bulletin notes the beginning of an attempt to limit fertilizer formulas to the "New England Standard Nine." A review of the fertilizer sales of New Hampshire for 1927 shows, however, that though the standard nine includes no grade carrying over 7 per cent potash, 14 brands of 10 per cent potash guarantee and 1 brand of 8 per cent potash guarantee were offered for sale this year.

AGRICULTURAL BOTANY

Plant physiology (*New Jersey Stas. Rpt. 1927, pp. 30–32*).—In investigations of the influence of light intensity on the H-ion concentration of plant tissue fluids, it was established that the H-ion concentration of the tissue fluids varied considerably with changes in light intensity from day to night, low H-ion concentration corresponding to high light intensity and high H-ion concentration to low light intensity. In all the species studied, the acidity of the plant juices is said to have reached its maximum in the early morning hours just before daylight and its minimum in the late afternoon just before dark. The range in pH values from day to night was quite pronounced in the fleshy-leaved plants, but not nearly so marked in the thin-leaved species.

The investigations are believed to show that a comparison of the pH values of tissue fluids of different species has no significance whatever unless the determinations are made upon samples of material collected at the same time from plants grown under approximately identical conditions.

In all the plants studied, the pH values of stem and leaf juices differed, and this difference in acidity is considered to have important significance with respect to iron mobility and its distribution in plants in which pH values of the tissue fluids lie close to the precipitation point of iron. Considerable evidence is said to have been accumulated that iron distribution to the chlorophyll-bearing tissues of the agricultural plants is very largely, if not entirely, determined by the reaction of the tissue fluids.

Studies of the relative rates of absorption of nitrogen from electropositive ammonia and electronegative nitric acid are said to indicate very high absorption rates of nitrogen as ammonia during the early growth phases and relatively very low ones during the late growth phases. On the other hand, the absorption rates of nitrogen as nitric acid are said to indicate very low absorption rates during the early growth phases and relatively high ones during the late growth phases. The requirement of young growing tissues for nitrogen in the form of ammonia is said to be relatively very high and that for nitrogen in the form of nitric acid correspondingly low. This was clearly brought out in a study of the oat plant, which at a certain phase in its development tillers readily when grown in culture solutions. The average hourly absorption rates of nitrogen as ammonia and nitric acid took the usual course up to the time when tillering began. At this point the curve of ammonia absorption took an abrupt upward slope and that of nitric acid absorption an abrupt downward slope, indicating that with the development of young, active,

growing tissues there comes an increased demand for nitrogen as ammonia with a corresponding decreased requirement for nitrogen in the form of nitric acid.

In continuation of the work on the weight of seed as influencing growth of plants (E. S. R., 57, p. 23), additional studies were made with soy beans, in which it was found that plants grown from mutilated seed and from normal seed, all containing the same amount of initial food reserve, were approximately equal in their ability to produce plant material when grown under like environmental conditions. With corn, however, mutilation of the seed produced injurious effects on the subsequent growth of the plants. Evidence was obtained that indicates, other things being equal, that the growth of the plant is determined by the food reserve in the seed.

The agency of various radiations in photosynthesis [trans. title], R. Wurmser (*Compt. Rend. Acad. Sci. [Paris], 181 (1925), No. 12, pp. 374–376*).—The author gives details of a study involving radiation and photosynthesis which is related to work previously reported (E. S. R., 55, p. 22).

The question of direct action of light on leaf chlorophyll decomposition in autumn [trans. title], R. Combes (*Compt. Rend. Acad. Sci. [Paris], 181 (1925), No. 3, pp. 129, 130*).—The results of two series of experiments, inaugurated in 1923 and 1924 and employing leaves, respectively, of chestnut and *Acer platanoides*, are said to show that light does not exert a direct action in connection with the disappearance of chlorophyll in autumn. Nutritive conditions are discussed in this connection.

Variations in respiratory intensity of Sterigmatocystis nigra during its development [trans. title], A. Hée (*Compt. Rend. Acad. Sci. [Paris], 183 (1926). No. 26, pp. 1351–1353*).—From the experimental data here presented, it is concluded that if there exists a relation between the chemical constitution of a plant organism and its respiratory intensity, the important variations in gaseous exchanges observed from day to day during the development of such a fungus as *S. nigra* in their progressive development should lend themselves to chemical analysis by showing corresponding variations of one or more constituents.

Pigments of Sterigmatocystis nigra [trans. title], A. Frey (*Compt. Rend. Acad. Sci. [Paris], 182 (1926), No. 25, pp. 1552–1554*).—It is claimed that the yellow pigment of *Aspergillus niger* is not a transition product, but a stable body comparable to aspergillin. The chromogenic pigment, said to have been recently discovered, is claimed to be a preliminary stage of the black pigment.

Data from measurements of suction force within plants grown in the open [trans. title], G. Blum (*Mitt. Naturf. Gesell. Freiburg, Bot., 4 (1926), No. 1, pp. 34, figs. 2*).—The author presents in detail, with references, his own data regarding variatons of suction force in plants in relation to external factors, differences within the tissues or organs in a plant and in different situations, and suction force in various species and in various plant societies and ecological groupings.

Method for growing small-seeded plants under sterile conditions, A. B. Beaumont and G. J. Larsinos (*Science, 67 (1928), No. 1735, pp. 350, 351, fig. 1*).—A method is described for growing small-seeded plants whose plantlets are small, slow growing, and difficult to transplant under aseptic conditions. It is claimed that this method has been successfully applied at the Massachusetts Experiment Station for growing tobacco plants.

Nitrates in living tissues [trans. title], E. Kohn-Abrest and S. Kawakibi (*Compt. Rend. Acad. Sci. [Paris], 183 (1926), No. 12, pp. 522–524*).—These studies on nitrates in both animal and plant tissues are said to show that,

notwithstanding the use that is made of nitrates in nutrition, but little nitrate is to be found in plant tissues except occasionally in certain stock beets, and that this is in such cases suspected of being harmful.

Types of grains based upon the nature of their carbohydrate reserves [trans. title], H. Colin and A. Cugnac (*Compt. Rend. Acad. Sci. [Paris], 182 (1926), No. 26, pp. 1637–1639*).—Data obtained at different times of the year are tabulated for levulosans and for saccharose in several of the Gramineae.

Oat morphology in relation to water utilization [trans. title], W. Gieren (*Jour. Landw., 75 (1927), No. 1, pp. 1–41, pls. 2, figs. 4*).—Oat varieties very well adapted to damp conditions have the greatest total leaf surface, dry land varieties the least. The hydrophytic oats show for the most part the fewer stomata per unit area and the larger stomata, the xerophytic the more numerous but the smaller stomata. Vascular bundles appeared to be more numerous in the hydrophytic oats, but this does not furnish a really reliable criterion. Several other differences are detailed.

Influence upon the development of young rice plants of sodium chloride added to a complete solution, F. de Peralta (*Philippine Agr., 15 (1927), No. 8, pp. 471–479*).—As the result of work in three sets of experiments, it is stated that the addition of a moderate quantity of sodium chloride to Espino's culture solution (E. S. R., 45, p. 527) on the 4-salt type A materially improved the nutritive value of the solution, the chlorine ion and not the sodium ion being to all appearances beneficial to the rice seedling. Potassium chloride was found to be a better source of chlorine than sodium chloride. NaH_2PO_4 proved harmful to the young rice plants.

The relation of boron to the growth of the tomato plant, E. S. Johnston and W. H. Dore (*Science, 67 (1928), No. 1734, pp. 324, 325*).—Experiments carried on at the Maryland and California Experiment Stations with tomato plants grown in nutrient solutions containing boron supplied as boric acid in a concentration of 0.5 part per million showed normal growth and blossoming. Plants grown without boron ceased growth in 3 or 4 weeks. Chemical analysis of plants grown in the California experiments is said to have shown approximately twice as much total sugars in the leaves of the boron-deficient plants as in those from normal plants grown in a similar manner with boron. Leaves from the boron-deficient plants also contained more starch than those from normal plants. On the other hand, the quantity of total sugars in the stems of the boron-deficient plants was found to be about two-thirds of that in the stems of normal plants. Leaves of plants grown at the Maryland Experiment Station, in which there was a boron deficiency, developed, after 13 days, a distinct purple color, probably anthocyan, which is said to be frequently associated with an excess sugar accumulation. Another striking characteristic of the boron-deficient plants was the extreme brittleness of the leaf petioles.

Other observations, as well as chemical analysis, indicated a failure on the part of the boron-deficient plants to remove sugar from their leaves. This is believed to be related to a breaking down of the conducting tissues, and microscopic examinations of the petioles and stems appeared to bear out this view. In the boron-deficient plants the phloem was broken down and apparently gave a much more acid reaction than the corresponding regions of normal plants.

The general conclusions from this investigation are said to be in agreement with the anatomical studies of Warington on *Vicia faba* grown in boron-deficient solutions (E. S. R., 58, p. 725).

Superficial calcium oxalate crystals occurring in case of certain Caryophyllaceae [trans. title], P. R. Bohn (*Compt. Rend. Acad. Sci [Paris], 181 (1925), No. 3, pp. 135–137, figs. 2*).—Crystals of calcium oxalate have been found

on the leaf surfaces in a number of the Caryophyllaceae (Silenaceae), which are listed. The quantity of calcium oxalate found on the surfaces of plants is considered to confirm the view that this salt is a waste product, in the elimination of which the epidermis thus plays an important part.

Sleep and awakening in primordial leaves, grafted or not grafted, of beans [trans. title], C. T. Popesco (*Compt. Rend. Acad. Sci. [Paris], 181 (1925), No. 10, pp. 340–342*).—The appearance of movements of sleep and of awakening is influenced in grafted bean by the functional capacities of the different strains and by the water content of their tissues, but more particularly by the different biological states in which graft and stock meet. The relations are particularized.

Grafts of woody nightshade on roots of belladonna [trans. title], L. Daniel and E. Potel (*Compt. Rend. Acad. Sci. [Paris], 181 (1925), No. 11, pp. 357, 358*).—The authors continued in 1925 the line of study reported by Ripert (E. S. R., 50, p. 223) in 1921, and the results are shown in tabular form, with discussion, for deadly nightshade and belladonna.

Seasonal occurrence of the larger fungi, V. O. Graham (*Ill. State Acad. Sci. Trans., 19 (1926), pp. 182–186*).—Instances, habitats, and individual factors are discussed.

Cacao yeasts [trans. title], O. A. von Lilienfeld (*Tropenpflanzer, Beiheft, 24 (1927), No. 1, pp. [4]+48, pls. 2*).—So far as the tests go they indicate that the same or nearly the same yeast flora, as regards species, exists on cacao beans found in practically all countries. These forms include *Saccharomyces ellipsoideus tropicus, Schizosaccharomyces bussëi,* and several forms not named, four of these appearing to play no part in fermentation. As advantageous forms, only *S. ellipsoideus tropicus* and *S. bussëi* are regarded as significant.

Ceratostomella querci n. sp., P. Georgévitch (*Compt. Rend. Acad. Sci. [Paris], 183 (1926), No. 18, pp. 759–761*).—Certain special bodies found frequently to fill wholly or partly the peripheral vessels of oak (*Quercus pedunculata*) are claimed to be conidia of *Graphium* sp., which is described as the accessory form of the fructification of a Ceratostomella. This is here designated, with a description, as *C. querci.*

GENETICS

Types in animal breeding and their analytical study, D. Kislovsky (*Jour. Heredity, 18 (1927), No. 10, pp. 447–455, figs. 3*).—The author suggests means of differentiating statistically between similar morphological types in horses. There are used as a basis for the study five relative indexes, together with the weight and height of the mares in two stud farms of the Ardenn breed.

The standard deviations are determined for the individuals in each stud and weighted by dividing by their respective standard deviations, and the standard deviation from each type determined. The final diagnosis of the stud to which an individual belongs is thus based on the mean square deviation for all the measurements of the individual which are recorded.

The production of mutations and rearrangements of genes by X-rays, A. Weinstein (*Science, 67 (1928), No. 1736, pp. 376, 377*).—The results of experiments at Columbia University in which males and females of *Drosophila melanogaster* were X-rayed and the production of mutations and rearrangements of X chromosomes identified are briefly described. Mutations and gene rearrangements were observed similar to those noted by Muller (E. S. R., 58, p. 25).

Economical significance of sex-linked inheritance, W. C. Thompson (*New Jersey Stas. Rpt. 1927, p. 250*).—The reliability of identifying the golden chicks as females and the silver chicks as males when resulting from a cross of

Columbian Wyandotte hens with Brown Leghorn roosters was established by cross matings.

Ovarian secretion and tumor incidence, W. S. Murray (*Science, 66 (1927), No. 1720, pp. 600, 601*).—Nonbreeding and spaying female mice of a strain which showed almost 100 per cent of mammary tumors in normal breeding females at the University of Michigan were found to delay the age at which the tumors appeared to much the same degree. Castration followed by subcutaneous implantation of an ovary in males caused the production of tumors in 4, and later 7 more,[1] of 210 individuals, a condition previously unknown in the males. From these results it was concluded that the onset of the cancer was caused by a lack of the ovarian hormones after having had the use of them for a time.

FIELD CROPS

The naming of agricultural plants, F. L. Engledow (*Jour. Roy. Agr. Soc. England, 87 (1926), pp. 31–43*).—The inaccuracy of many current varietal names in Great Britain is discussed, and scientific and practical objections to synonymous names are cited. It is thought that the remedial measures of other countries might not be applicable to conditions in England. See also an earlier note by Parker and Chambers (E. S. R., 46, p. 129).

[Field crops experiments at the South Mississippi Substation], E. B. Ferris and W. S. Anderson (*Mississippi Sta. Bul. 246 (1927), pp. 4, 5, 7–10, 11, 13, 14, fig. 1*).—Variety tests with sorgo and grain sorghums and sugar cane, fertilizer tests with sweet potatoes, trials of winter cover crops, rotation experiments, and field trials with the 6-weeks cowpea and bright leaf tobacco are reported on, supplementing previous work (E. S. R., 56, p. 731). Work with corn has been noted (E. S. R., 59, p. 131).

Oats appeared to respond best to a complete fertilizer, and January applications were more effective than those in February or March. Excellent pasture was furnished by lespedeza in oats well fertilized and grazed, whereas the rank growth of the ungrazed oats completely smothered the lespedeza. The different kinds and rates of fertilizers applied to oats did not seem to influence control of rust during a severe attack.

Sagrain selections and Schrock kafir were outstanding among the sorghums. Little was gained in hill selection with Nancy Hall sweet potatoes.

[Agronomic experiments in New Jersey], L. G. Schermerhorn, W. R. Robbins, and H. R. Cox (*New Jersey Stas. Rpt. 1927, pp. 178, 179, 317–322*).—Varietal trials with wheat and rye, soy beans, red clover, alfalfa, and timothy, a fertilizer test with Washington bent grass turf, and breeding work with corn are reported in continuation of previous work (E. S. R., 57, pp. 32, 727).

Investigations on the sweet potato grown in sand cultures showed that the composition of the sweet potato may be markedly influenced by the proportion of salts of the nutrient solution, especially of nitrogen. A correlation was indicated between the shape of the sweet potato and the proportion of the nutrient salts supplied in the cultures. The sweet potato plant was observed to respond to slight changes in the nutrient supply.

A pasture survey in southern New Jersey showed that important forage plants occurred in about the following percentages: Kentucky bluegrass 48 per cent, redtop 10, orchard grass 10, timothy 12, white clover 8, and others 12 per cent. In general New Jersey permanent pastures appeared to occur either on alluvial

[1] A Note on Ovarian Secretion and Cancer, W. S. Murray. Science, 67 (1928), No. 1737, pp. 396, 397.

soils too poorly drained or too subject to overflow or on upland soils too droughty, stony, or hilly to make tillage profitable.

Influence of crop rotation and soil treatments upon the yield of crops in rotations on Norfolk sandy loam soil, C. B. Williams, H. B. Mann, and R. E. Currin, Jr. (*North Carolina Sta. Bul. 255 (1928), pp. 12*).—Crop rotation experiments were carried on at the Upper Coastal Plain Substation during the period 1918–1926.

Fertilized, or limed and fertilized, in the 2-year rotation of cotton and corn without legumes the two crops produced somewhat more than when grown in continuous culture. Fertilized and limed in a similar rotation with legumes turned under for green manure, cotton slightly outyielded cotton in the above sequence and in a 3-year rotation with legumes. The major crops in these rotations gave their greatest responses to applications of complete fertilizer. While limestone supplementing a complete fertilizer gave fair results with corn, the increases with cotton were slight, and the yield of oats and vetch for hay in a 3-year rotation with legumes was actually depressed by liming.

Lodging in oats and wheat, F. A. Welton (*Bot. Gaz., 85 (1928), No. 2, pp. 121–151, figs. 13*).—Field and laboratory studies, evidently carried on largely at the Ohio Experiment Station, were concerned with the physical, chemical, and anatomical characteristics of lodged and unlodged wheat and oats (E. S. R., 45, p. 127).

Field observations on wheat and oats varieties showed that the average percentage of straw was generally higher in lodged than in erect grain, probably due chiefly to the greater number of and longer culms in the lodged grain. The heads were longer and lighter and the grain was lighter in the lodged plants. Analyses showed that culms of oats and wheat contained more water, less dry matter, and less total dry matter than those on relatively high ground. This relation was also noted in grain grown on manure v. sand or soil, grown under shade or glass cover v. in the open, and per unit length of culm from heavy v. light seeding rates and from large v. small seed. Thickening of the stand affected the strength of the culms adversely in all cases.

The several studies led to the conclusion that lodging results from low dry matter per unit length of culm, which in turn may be due to a relatively low composition of lignin and various reserve materials, such as disaccharides and polysaccharides, or from the development of relatively small, slender culms. While culms small in diameter but medium or high in carbohydrates may result from thick seeding or the planting of small seeds, they exhibit a low dry-matter content per unit length of culm. Culms low in carbohydrates are due to the development within the plant of a low carbohydrate nitrogen relation which may result from hypernutrition, shading, or relatively high temperature. Under field conditions lodging results from the interaction of all these environmental factors. Hypernutrition tends to induce a greater elongation of the culms, and through a stimulation of the tillering processes increases the density of stand and results in a greater degree of shading around the base of the plants. In warm, rainy, cloudy seasons, therefore, the conditions are most favorable for the development of lodging on rich soils.

Observations on heating hay in the flooded regions of northern Vermont, L. H. James and D. J. Price (*Science, 67 (1928), No. 1734, pp. 322–324, fig. 1*).—After flood waters (early in November, 1927) in Vermont had receded, studies by the U. S. Department of Agriculture on different farms revealed that from 0.5 to 17 ft. of hay in the hay mows of barns had been under water. Some heating had occurred in each pile of wet hay, often appearing dangerous. Heat generated in the bottom layers of piles escaping up through the hay caused

drafts of hot gases or "flues" rising to the surface. The moisture carried up with the gases condensed on the upper cooler hay or in the air above and was the cause of many hay piles being soaked throughout.

The maximum temperature noted was 74° C. (165.2° F.). Farmers observed the most marked evidence of excessive heating on the second and third days after the waters receded. Charred hay was recorded in only one instance. The details of a case of spontaneous combustion are set forth.

A census of an acre of barley (*Jour. Roy. Agr. Soc. England, 87 (1926), pp. 103–123, figs. 12*).—Counts made in a field of Plumage Archer barley 6 weeks after drilling at the Norfolk Agricultural Station showed the number of plants per foot of drill to vary from 3 to 35, about three-fourths of the samples having between 14 and 23 plants per foot. Areas with populations of from 0 to 15 plants per foot yielded at the rate of 12.3 cwt. per acre, 16 to 19 plants 15.3 cwt., 20 to 23 plants 17.4 cwt., and 24 to 35 plants 20.8 cwt. It was also observed that variation in surviving plant populations followed the variation in the spring stand which depends upon irregularity in deposition of the seed by the drill. Within wide limits of density the death rate did not rise with increase in number of plants, although the proportion of plants bearing more than one spike decreased. The total number of plants with more than one spike increased with the density of population. Grain from tiller spikes was not of high malting value, and the size of spike and kernel dropped as the plant population increased in spite of the increase in yield.

Some causes for variability in plant populations, discussed with suggested remedies, include the drill in relation to inter-coulter differences in seeding rate and irregularity in dropping the grain by any one coulter, seed bed conditions, and surface cultivation. See also a contribution by Engledow (E. S. R., 58, p. 830).

Malting barley trials (*Jour. Roy. Agr. Soc. England, 87 (1926), pp. 300–307*).—Barley investigations at the Norfolk Agricultural Station dealt with factors causing differences in yield and quality within a single acre (noted above) and the influence of cultivation and fertilization on yield and quality.

A 10-pk. seeding rate yielded somewhat better and produced grain of higher quality than 6- or 16-pk. rates. Grain yields were similar from 0.75-, 1.25-, and 2-in. depths, all surpassing surface planting, although the 1.25-in. depth made grain of highest value.

Where nitrogen (1 cwt. ammonium sulfate), potassium (1.5 cwt. potassium sulfate), and phosphorus (3 cwt. superphosphate (acid phosphate)) were applied in different combinations for barley, nitrogen increased the straw yield by 30 per cent and the grain yield by 18.7 per cent. Phosphorus and potassium had little effect on the straw, phosphorus increased the grain yield by 15.5 per cent, and potassium had slight influence on the grain yield but affected the yield of the clover following. Nitrogenous fertilizers tended to depress the value of the barley as malt unless they accompany both phosphorus and potassium. Combined with only one of either of these, the barley as malt has usually been worth less than barley grown without fertilizer or without nitrogen. The use of more than 1 cwt. of ammonium sulfate per acre appeared to result in a yield decrease, but when extra phosphorus and potassium were added the barley responded profitably to as much as 3 cwt. of ammonium sulfate per acre. The heavier rates of nitrogen noticeably depressed the malting value of the grain.

Varieties of cotton for Oklahoma, L. L. Ligon (*Oklahoma Sta. Bul. 175 (1928), pp. 22*).—Varietal tests at the station, the Granite Substation, and outfield stations during the period 1922–1927 are reported on, with data on yields

and lint length and percentage. Acala, Oklahoma Triumph 44, and Lightning Express are indicated as desirable, and Dixie-Triumph, Trice, and Mebane and its strains Kasch, Triumph 406, and New Boykin, are suggested for certain conditions.

New cotton characters from Colombia and Ecuador, O. F. Cook and J. W. Hubbard (*Jour. Heredity, 19 (1928), No. 4, pp. 177–190, figs. 6*).—Species of cotton studied on the west coast of South America, and found to possess characters not recognized in certain Mexican cottons (E. S. R., 57, p. 230), or in varieties cultivated in the United States included *Gossypium evertum, G. tridens, G. calycotum, G. auritum,* and *G. quinacre.*

Flax as a fiber and oil plant, F. Tobler (*Der Flachs als Faser- und Ölpflanze. Berlin: Julius Springer, 1928, pp. VI+273, figs. 71*).—Prepared in collaboration with G. Bredemann, K. Opitz, J. J. Rjaboff, and E. Schilling, this book treats of the types, characteristics, and internal structure of the flax plant; improvement of flax, production regions, environmental and cultural requirements of the crop, diseases, insect pests, and weeds; and harvesting, preparation, and utilization and by-products of the straw and seed. An extensive bibliography is included.

Svalöf oats, Guldregn II [trans. title], Å. Åkerman (*Sveriges Utsädesför. Tidskr., 38 (1928), No. 1, pp. 6–26*).—The origin and history of Guldregn II, a new variety of oats, are noted, and the results secured with it in comparative tests in different localities for the past eight years are reported and discussed. The variety was compared with Guldregn I and Seger, the two parent sorts, and with Stjärn, Eko, and other leading varieties widely grown.

In yield of grain Guldregn II generally surpassed the other varieties, while in straw production it often stood slightly below them. In 1927, compared with three varieties in five different localities, the average growing period of Guldregn II was about 113 days or nearly a day longer than the growing period of Guldregn I. In strength of straw, according to the tests made at Svalöf, the variety stood above the average of the two parent sorts. The weight per bushel and the percentage of kernel in grain for Guldregn II in comparative tests in six different localities were generally equal to or higher than for the varieties with which it was compared.

[Potato investigations in Germany in 1923–1926, inclusive], G. Schneider, O. Schlumberger, and K. Snell (*Mitt. Biol. Reichsanst, Land u. Forstw. No. 36 (1928), pp. 125*).—Research activities with potatoes (E. S. R., 57, p. 432) reported on from a number of centers in Germany dealt with tillage and crop sequences, fertilizer, seed, planting, varieties, origin of and effect of growth conditions on seed stock, breeding work, diseases and their control, harvesting, storage, and miscellaneous problems.

Determination of potato varieties by the arrangement of leaves [trans. title], M. Klein (*Landw. Jahrb., 65 (1927), No. 3, pp. 399–436, figs. 34*).—Numerous German potato varieties are grouped according to the classification of Snell (E. S. R., 54, p. 133), special attention being given to the arrangement of the leaflets. The results of biometrical measurements on the subdivisions of the leaf of 15 important varieties are tabulated. The influence of different physiological, environmental, and heredity factors on the expression of the leaf characters and the relative value of the several leaflets in classification work is discussed briefly.

Calcium as a factor in soybean inoculation, R. W. Scanlan (*Soil Sci., 25 (1928), No. 4, pp. 313–325, figs. 6*).—Studies at the University of Missouri indicated that common soil amendments, such as crop residues, manure, and potassium, did not significantly influence the degree of nodulation of soy

beans on three acid soils. The nodulation of soy beans was not greatly affected by superphosphate (acid phosphate), sodium acid phosphate, and bone meal on Putnam silt loam, and rock phosphate and sodium acid phosphate on Gray silt loam, although both calcium acid phosphate and sodium acid phosphate stimulated nodule formation on Bates fine sandy loam. Limestone caused great increases in nodulation in all cases. The fact that calcium acetate used on acid plats of each soil, although not greatly altering the soil reaction, increased nodulation to large extents showed that soil reaction was not the controlling factor on nodulation.

Calcium carbonate, hydrated lime, and superphosphate used separately in the field, both on the soy bean seed and in the row, did not increase nodulation on Putnam silt loam, although calcium carbonate with superphosphate seemed to benefit nodule formation somewhat. Calcium nitrate and calcium chloride used on soy bean seed on this soil increased nodulation and the percentage of plants with nodules on their roots. While infection of soy beans by *Bacillus radicicola* occurred much more readily during the early stages of plant growth, the plants were susceptible to infection until the first stages of maturity, suggesting that the influence of calcium toward increasing inoculation may be one of keeping the bacteria viable and infective during a long period of time. Calcium chloride seemed to aid viability of the bacteria in water and soil extract and to stimulate nodulations of soy beans grown in distilled water and tap water.

The manuring of sugar beet, B. Thomas (*Jour. Bath and West and South. Counties Soc., 6. ser., 2 (1927–28), pp. 89–109, pl. 1*).—A review of fertilizer experiments with sugar beets in England during recent years recommends moderate applications of manure, if used in the autumn before planting. Other organic fertilizers are not advised. Soluble nitrogenous fertilizers in moderation may give profitable beet yields without depressing quality noticeably. Potassium needs are rather slight, and the ordinary salts differ little. Moderate dressings of phosphatic fertilizers are suggested, with superphosphate (acid phosphate) preferred to other forms. Fertilizer combinations are suggested for different soil types, with comment on continental practice.

Close spacing as a means of increasing yields under curly-top conditions, S. B. Nuckols (*Facts About Sugar, 23 (1928), No. 15, p. 355*).—Closer than 12-in. spacing in 20-in. rows did not give a profitable increase in sugar beet yields in tests in the Salt Lake valley, Utah, in 1925, a year with no curly top injury, whereas in 1926, when curly top seriously harmed the crop, closely spaced beets outyielded those spaced 12 in. or wider. In 1925 beet sizes decreased with the spacing but not in 1926.

Seedling propagation and selection, A. J. Mangelsdorf and C. G. Lennox (*Hawaii. Sugar Planters' Assoc. Proc., 47 (1927), pp. 160–169*).—Largely a discussion of sugar cane breeding technique, this report deals with hybridization, sterility and incompatibility, seedling selection and testing, sampling methods, bud selection, and attempts to induce mutation by means of X-rays. When varieties unburned were allowed to lie in the field after cutting, after 7 days Yellow Tip had lost 58.8 per cent of its recoverable sucrose, and D. 1135, P. O. J. 213, P. O. J. 36, Striped Mexican, Yellow Caledonia, and H. 109 followed in decreasing order down to Badila with 16.2 per cent. Hard body seed stored for several days with 0.01 per cent of ethylene gas showed a marked increase in germination.

Study of the composition of the cane crop, G. R. Stewart (*Hawaii. Sugar Planters' Assoc. Proc., 47 (1927), pp. 141–143*).—Experiments by the author and J. A. Verret with mature H. 109 sugar cane showed that a large proportion of

the total nutrients contained in the crop at harvest time is present in the cane tops. The cane juice contains a much larger portion of the total potassium, phosphates, lime, and nitrogen than does the bagasse. The largest portion of the phosphates taken from three field areas was contained in the juice. It is observed that returning the mud press to the fields will restore this phosphate to the soil. The potassium and nitrogen of the juice will be entirely lost to the fields, however, if the molasses is removed from the plantation.

The ultimate limits to sugar production O. W. WILLCOX (*Facts About Sugar, 23 (1928), No. 7, pp. 158–160, 162, figs. 2*).—The maximum possible production of sugar beets is estimated to be 53.5 short tons of commercial beets per acre and of net sugar cane 157 tons per acre.

Sweet clover, A. J. PIETERS (*U. S. Dept. Agr. Leaflet 23 (1928), pp. 8, figs. 3*).—Popular information on the characteristics, species and varieties, adaptation, cultural needs, and utilization of sweet clover.

Tobacco, É. BOUANT (*Le Tabac. Paris: J. B. Baillière & Sons, 1928, pp. 328, figs. 94*).—This practical manual describes cultural methods and field practices suitable for growing the crop in France, with notes on diseases and insect pests, and details its manufacture into cigars, cigarettes, smoking and chewing tobacco, and other products.

The development of the wheat kernel, C. E. SAUNDERS (*Sci. Agr., 8 (1928), No. 8, pp. 524–531, fig. 1*).—A detailed report is presented on the study with Prelude wheat noted earlier (E. S. R., 53, p. 138) from another source.

The effect of harvesting rusted wheat early, J. B. HARRINGTON (*Sci. Agr., 8 (1928), No. 8, pp. 481–491, figs. 4*).—Six varieties of wheat, growing under heavy stem rust epidemic conditions at the University of Saskatchewan in 1927, were cut August 24, when all were in the soft dough stage, and at from 2 to 3 day intervals until maturity, which was from 5 to 12 days later.

The average kernel weight, considering all varieties, showed a significant increase from August 24 until 2 days before maturity, and there was a definite gain in kernel plumpness and an apparent tendency for the wheat to improve in grade during the week before maturity. No significant differences in grade were obtained. The results indicated that rusted wheat, like unrusted, should be harvested at the normal time, 2 or 3 days before it is fully ripe.

Effect of delayed harvesting on quality of wheat, A. F. BRACKEN and C. H. BAILEY (*Cereal Chem., 5 (1928), No. 2, pp. 128–145*).—Experiments at the Nephi, Utah, Substation in cooperation with the Minnesota Experiment Station were made to determine whether wheat deteriorates through standing uncut after ripening and subjected to the alternate wetting and drying caused by summer showers, conditions often met with in the intermountain region. Kanred wheat was cut in 1925 and 1926 when ripe and after 10 days intervals up to 50 days after maturity.

Study of the grain obtained from the six cuttings of each year showed that the weight of a kernel does not change when dried to a uniform moisture content after wetting, but that the decreased weight to a measured volume is due to an increased volume of the kernel. High density was associated with high protein content, and wheat with low density and low protein content showed a greater increase in volume after being wet than wheat higher in protein and density. The opaqueness of grain which had been wet seemed due to air spaces developed through the cracking of the kernel, which would account for the increase in volume. Cracking would also make it difficult to thresh such grain without a high percentage of broken kernels.

Titratable acidity and H-ion concentration showed no change, and the diastatic activity for both the whole wheat-meal and the flour was about the same for the whole series of cuttings. Microscopic study of starch grains gave no indi-

cation of diastatic activity. Measurement of the epithelial cells of several wheat kernels revealed no increase in lengh, thus partly precluding the possibility of diastatic or proteoclastic activity. Deterioration as a result of prolonged harvesting as expressed in a greater solubility of the protein material was not shown by determinations of total nitrogen, water-soluble nitrogen, and Sn nonprecipitable and Cu nonprecipitable nitrogen. The volume and texture of loaf in baking tests also gave no indication of deterioration.

Effect of severe weathering on certain properties of wheat, W. O. Whitcomb and A. H. Johnson (*Cereal Chem., 5 (1928), No. 2, pp. 117–128*).—Quality, germination, and milling and baking tests were made at the Montana Experiment Station on 1925 crop hard red spring wheat from different sources, part of which was threshed in April after wintering in the shock, and part threshed from snow covered shocks between December 15 and January 12. Similar studies were made on Marquis wheat harvested August 28, 1926, well shocked, and bundles sufficient to yield about 1 pk. of grain threshed at intervals from September 25 to April 27.

The several observations showed that the wheat grade was lowered and the color impaired by exposure to weather in all cases considered. More damaged kernels were found in wheats subjected to alternate freezing and thawing than in wheats subjected to continuous cold, and the quantity increased as the exposure continued, whereas dark kernels, test weight per bushel, and weight per kernel decreased as the weathering progressed. Weathering had a greater depressing effect on germination than on any other factor considered.

The protein content remained practically constant after the initial reduction, which occurred during the first 2 months of weathering. The ash of the wheats decreased during weathering, while that of flours milled from them increased. The pH of flours milled from weathered wheats were the same as those of flours from normal wheats.

The loaf volume of bread produced from wheats exposed to different degrees of weathering showed no significant variation. In color and texture bread produced from weathered wheat in 1925 was equal to that from normal wheat, while it was slightly inferior in 1926. In quality of gluten and proteoclastic activity of flour weathered wheat was equal to normal wheat.

Viability of legume bacteria on stored inoculated seed, A. G. Lochhead (*Canada Expt. Farms, Div. Bact. Rpt. 1926, pp. 7–10*).—Further studies (E. S. R., 56, p. 513) were made on the effect of storage upon the nodule-forming capacity of *Bacillus radicicola* on inoculated alfalfa seed. Inoculated alfalfa seed retained numbers of viable organisms after 6 months' storage which could produce root nodules when the seed was planted. Inoculation of seed by moistening with a suspension of culture in sweetened skim milk was better than mixing inoculated sand with the seed. Storage of inoculated seed in a refrigerator at from 3 to 5° C. was found better than storage at ordinary room temperature. Temperatures fluctuating with the outside winter temperature seemed to affect adversely the nodule forming capacity. While the effect of inoculation was still noticeable after 6 months, the nodule-forming capacity of inoculated seed decreased immediately upon storage and more rapidly during the first weeks after inoculation than later. Inoculation immediately before planting is recommended for best results in practice.

Modern methods of weed destruction, S. L. Bastin (*Jour. Bath and West and South. Counties Soc., 6. ser., 2 (1927–28), pp. 17–36*).—A practical discussion of the economic importance of weeds, how they spread, and general control measures is presented, with special methods for controlling a number of weeds important in Great Britain.

Chemicals in puncture vine control, E. JOHNSON (*Calif. Dept. Agr. Mo. Bul., 16 (1927), No. 6, pp. 354, 355*).—Arsenic trichloride, even in dilute solutions, is said to be effective in destroying the top growth of many species of weed plants. It appears to have some effect on the germination of seeds in green burs attached to growing plants, although the germination of mature puncture vine seeds was affected little even by the concentrated form. Vegetation sprayed with this chemical appeared to be repulsive to grazing animals. It is corrosive to many metals and destructive to clothing, especially cotton.

Wild mustard and related weeds, W. C. MUENSCHER (*N. Y. Agr. Col. (Cornell) Ext. Bul. 168 (1928), pp. 18, figs. 7*).—Wild mustard, black mustard, rutabaga, wild radish, wormseed mustard, hedge mustard, tumble mustard, and winter cress are described, with control methods. Mustards may be controlled by cultivation in cultivated crops, and in grain fields by hand pulling small areas, harrowing, and spraying (E. S. R., 57, p. 633). Destruction of mustard seeds in the soil is also an important control measure.

Winter cress is not affected by the common sprays in solutions not harmful to grain. Scattered plants may be killed if cut off below the soil surface while young, while growing a cultivated crop for one or two years will kill out the weed in badly infected fields or pasture which can be plowed. If plowing is impracticable, mowing the winter cress at the time of blooming or before seeds mature is advised.

HORTICULTURE

[Horticultural investigations at the South Mississippi Substation], E. B. FERRIS and W. S. ANDERSON (*Mississippi Sta. Bul. 246 (1927), pp. 12, 13, 14–18, figs. 2*).—Fertilizer studies with the tomato continued from the preceding year (E. S. R., 56, p. 739) failed to show any consistent results from variations in the quantity of different constituent materials used. All the formulas gave increases above the control areas, and the maximum yield was obtained on the plat receiving 320 lbs. of nitrate of soda, 600 lbs. of superphosphate (acid phosphate), and 100 lbs. of muriate of potash in addition to the basic treatment given all plats. Fertilizer studies were also conducted with pecans, peaches, and strawberries.

A freeze in February injured plum and peach trees in the variety test to the extent that no fruit set. In a few instances apple varieties set a light crop. The varieties of Japanese persimmons yielded well. Figs bore light crops as they have always done at the station under orchard conditions. Species added to the tests during the year include Japanese cherries, jujubes, plums, and chinquapins. Of the many grapes tested, the muscadines alone have proved successful, yields as high as 85 lbs. per vine having been obtained. Vinifera grapes planted in 1923 were practically extinct. Satsuma oranges carefully protected withstood winter temperatures as low as 16° F. and bore fruit. Kumquats and tangerines bore normal crops, but most forms of citrus were severely injured.

Of seven varieties of watermelons, Florabama and Wonder yielded the largest fruits. Among small fruits the Van Fleet raspberry and the Thornless dewberry appeared well adapted to local conditions. Various forms of introduced Rubus proved unsatisfactory. Failure beset attempts to propagate *Pyrus calleryana* by cuttings.

[Horticultural investigations at the New Jersey Stations] (*New Jersey Stas. Rpt. 1927, pp. 157–178, 180–193, 197–203, pls. 2*).—Further studies (E. S. R., 57, p. 39) by M. A. Blake upon the growth of Elberta peach fruits showed the fruits to follow definite cycles of development. In 1926, a late blooming season,

the fruits grew very rapidly between the thirtieth and the forty-fifth days following blooming. Fruits were longer and more pointed in 1926 than in 1925. Ripe Elberta peaches picked September 17 and held at ordinary room temperature shrank in size at the rate of approximately 0.02 in. in all three dimensions each day. Tabulated measurements are presented upon the sepal spread of a considerable number of peach varieties, and phenological data are given for peaches, apples, and various ornamental and fruiting plants. The Roberta and Augbert peaches are deemed identical. A number of promising new station seedling peaches are described.

Peach blossoms held in the advanced pink stage for some time by cold weather failed to set satisfactorily, although the temperature was not low enough to actually injure the flowers. Observations showed a considerable number of late blooms on every peach tree which usually failed to set.

Again discussing (E. S. R., 56, p. 344) the growth in the absence of light of asparagus roots in nitrogen and nonnitrogen nutrient cultures, G. T. Nightingale points out that nitrates increased the green weight and the diameter and length but not the number of spears. There was also observed a loss of carbohydrates in the nitrated roots. The advisability of spring applications of nitrogen fertilizers on asparagus is deemed to be determined by the type of growth exhibited the preceding autumn. Very vigorous autumn growth would indicate a sufficient amount of nitrogenous materials coupled with a moderate carbohydrate supply. Under such conditions spring applications of nitrates might prove deleterious by reducing the reserve carbohydrates. It is suggested that nitrates be applied in the spring while the temperature is high enough to induce spear growth. In cultures below 55° F. nitrates remained in the fibrous roots for a long period, apparently unassimilated. Above 65° the nitrates disappeared rapidly. Paper white narcissus growing in continuous darkness was also found able to assimilate nitrates. The composition of the storage scales was found radically different from that of the meristematic center tissue.

Studies with under vegetative 1-year-old pear and blackberry plants growing in the field in a nitrogen-deficient sandy soil indicated the ability of these plants to assimilate nitrates during the dormant period. Following application of nitrate of soda solutions in November and December nitrates were found in late December in the tissues. The absence on March 12 of nitrates in these same plants is considered evidence of assimilation, assuming that nitrogen is not excreted from the roots. Furthermore, less starch was found in the fibrous roots of the nitrated plants, an indication of carbohydrate-nitrogen synthesis. Grown in distilled water sand cultures, the nitrated pear and blackberry plants did not exhibit nitrogen deficiency until some 3 weeks later than the nonnitrated plants and also produced shorter and thicker fibrous roots.

Peach breeding operations conducted in the spring of 1926 by C. H. Connors yielded a total of 1,525 seedlings living in 1927. J. H. Hale was again used extensively as an ovule parent. By top-working seedlings into bearing trees many seedlings fruited in 1926. Breeding work in 1927 was concentrated on the development of late-ripening peaches. Additional data (E. S. R., 57, p. 737) are given on the inheritance of pollen sterility in the J. H. Hale seedlings. An amended list is given of peach species, types, and varieties obtained from the U. S. Department of Agriculture.

As reported by Connors carnation breeding was continued with the aim of producing improved red varieties. Carnations grown on benches in which soy beans were cultivated as a cover crop failed to grow as freely as plants on freshly composted soil. Dried blood benefited Columbia roses in their third year but had no significant effect on the production of first-year plants.

In the report of the vegetable department presented by L. G. Schermerhorn there are included the tabulated results of extended fertilizer tests with carrots, celery, tomatoes, asparagus, cauliflowers, peppers, and sweet corn. Data as to sweet potatoes are noted on page 325.

Spraying experiments with peaches conducted by A. J. Farley at New Brunswick and at Bridgeton showed that the leaf injury resulting from the spraying of trees with the New Jersey dry mix and arsenate of lead may be greatly reduced but not eliminated by the addition of lime.

As recorded in the number of fruits harvested, Jonathan, Delicious, McIntosh, Melba, and Rome were sastifactory pollinizers for Stayman Winesap, while Gravenstein and Smokehouse were distinctly unfavorable. The importance of uniform recording of the results of pollination experiments is stressed. A study of the effect of the time of pollinating emasculated Gravenstein pistils showed quite positively the value of immediate pollination, bearing out the observation of Auchter (E. S. R., 47, p. 743). Data obtained by Farley in a study of the effect of pruning Wealthy apple trees showed that severe pruning greatly reduces wood growth and fruit-bud development in the succeeding year. Notes are given on the propagation and distribution of peach seedlings. Golden Jubilee is deemed the most promising commercial variety developed by the station. Blooming records are given for peaches, apples, and various small fruits.

Cultural studies with the strawberry conducted by J. H. Clark at Moorestown failed to show any permanent effects of modifications in time of planting on vigor or yields. The source of the plants had, on the other hand, a potent influence on yield. Among new varieties of strawberries tested the Aberdeen was found outstanding in productivity and vigor but rather lacking in firmness of fruit. Latham, Newman 23, and Viking raspberries were found promising, the first two for commercial and the last for home use.

Bush Lima beans as a market garden crop, J. W. Lloyd (*Illinois Sta. Bul. 307 (1928), pp. 390–399*).—Overhead irrigation proved of material benefit in increasing the production of bush Lima beans. The average yield for 5 varieties over a 5-year period was 44 per cent larger on the irrigated than on the nonirrigated plats. Without irrigation inoculation of the seed increased the average yield during the 5 years by 19 per cent, but on irrigated plats the effects of inoculation were not consistent. On the 5-year basis, nitrate of soda increased the yield of irrigated beans 7 per cent. On the nonirrigated plats steamed bone meal increased yields approximately 16 per cent above that of comparable plants grown without bone.

Of the 5 varieties used, namely, Burpee Improved Bush, Burpee Bush, New Wonder Bush, Fordhook Bush, and Dreer Bush, the last was by far the most productive. Suggestions are given on the preparation of Lima beans for market.

Ultimate effect of hardening tomato plants, J. W. Crist (*Michigan Sta. Tech. Bul. 89 (1928), pp. 22, figs. 16*).—Measurements of growth, anatomy, and yield taken on Grand Rapids Forcing tomato plants, part hardened by cooling prior to planting in the greenhouse and part sown later and grown without check, led to the conclusion that the practice of hardening tomato plants is not advantageous. Hardening apparently caused a morphological condition in the stem which was characterized by an excessive tissue differentiation and maturation. This trend resulted in a permanent check to the development of the leaves and fruits, a condition which was not overcome by application of nutrient salts prior to setting the plants in the greenhouse beds. The upper portion of the plant which developed subsequent to the

period of hardening had a different morphological trend and was not affected adversely, behaving in the same manner as an unhardened plant. A hardened plant is in effect, therefore, a combination of both an old and a young plant in one. The fruits of the hardened portion were fewer to the cluster and were inferior in shape and size, and hence the hardened plants gave lower yields of early ripening, marketable fruits, with the result that profits from the tender plants were larger. Furthermore the tender plants were less expensive to produce.

Experiments in the culture and forcing of Witloof chicory, C. B. Sayre (*Illinois Sta. Bul. 309 (1928), pp. 442–462, figs. 5*).—That Witloof chicory may be successfully produced under Illinois conditions was indicated in experiments at the station. Plants grown from seed sown about June 15 developed roots of a medium size most satisfactory for forcing. Comparison of the product of roots forced immediately after digging in early October with that of roots dug in November and held in cold storage failed to show any need of a rest period. The roots proved unable to withstand freezing at low temperatures. Stored in proper environment, temperature from 28 to 45° F., roots kept satisfactorily for several months but had a tendency to develop seed stalks instead of heads after long storage. Temperatures between 55 and 80° proved satisfactory for forcing, thus showing an unusual range of adaptability. The optimum forcing temperature was found to be about 70°.

In respect to size, medium roots, from 1 to 1.75 in. in diameter, produced the largest proportion of marketable heads. Larger roots produced compound heads and smaller roots small yields. A second marketable crop can not be taken from the same roots. Although Witloof chicory may be forced in the field by the use of manure, better results were secured by placing the roots in boxes of soil with a covering of sand. For home use satisfactory production was obtained by forcing in darkness without any covering.

Report of the Cranberry Substation, C. S. Beckwith and B. F. Driggers (*New Jersey Stas. Rpt. 1927, pp. 134–136, 137*).—Further records (E. S. R., 57, p. 45) taken in a study of the comparative value of nitrate of soda and dried blood as fertilizers for cranberries growing on a Savannah soil were in favor of nitrate of soda. However, the authors point out that the results have varied from year to year, although on the whole nitrate of soda has given the larger yields. Annual applications of 30 lbs. of nitrogen per acre gave good results on this soil. Quantitative studies with a fertilizer composed of 125 lbs. of nitrate of soda, 300 lbs. of rock phosphate, and 50 lbs. of sulfate of potash indicated that on Savannah cranberry soils annual applications of 528 lbs. per acre would be satisfactory. The percentage gain from fertilizers was greater in good crop years than in light crop years.

The sanding of old bogs increased the number of upright shoots and incidentally the cropping capacity. Frost injury was much less on sanded portions of bogs, a result believed to be due to greater plant vigor and also to the warming influence of the sand. Increased rotting usually followed sanding. Height of the water table studies indicated the desirability of holding the water level at about 9 in. below the surface. Holding the water table high until blooming time and then lowering it gave better results than where it was not lowered until the end of the season.

Studies preliminary to the establishment of a series of fertilizer trials in a bearing citrus grove, L. D. Batchelor, E. R. Parker, and R. McBride (*California Sta. Bul. 451 (1928), pp. 49, figs. 13*).—Growth and yield records taken in an experimental citrus orchard during the first 10 years of its existence and prior to the establishment of differential fertilizer treatments showed

large variations between plats and between individual trees despite unusual care exercised in the selection of the site and of planting stock and in laying out the prospective plats. The methods employed in handling the orchard during this developmental period are discussed in detail. Differences in size, as measured by trunk circumference and volume of the top, were very consistent from year to year, large trees tending to remain large and small trees small. The differences in top volume were somewhat larger than those indicated by trunk measurements, but there was a close correlation between top volume and trunk measurement.

In respect to production, the largest trees were as a rule the most productive. There was a difference of practically 109 per cent between the lowest and the highest yielding plat, and in some cases from 30 to 40 per cent between adjacent plats. Since the original trees were distributed by chance over the whole area, it is believed that the variations are due primarily to soil heterogeneity. Determinations of the nitrates and the wilting coefficients of the soil, of the distribution of the main roots, and of parasitism failed to account for variability. Comparisons of this orchard with commercial plantings showed the orchard to be unusually uniform, a fact also borne out by superficial observation.

In the light of the data obtained a new system of plats selected on the basis of their performance during the period of uniform treatment was planned, leaving 25 scattered plats to receive uniform fertilizer and cultural treatment and to serve as a basis of further studies in variability. It is believed that with 4 unit plats scattered at regular intervals differences of 50 per cent or more would be required to establish significance.

The differential fertilizer treatments are outlined and discussed and data appended on the cost of developing and maintaining the experimental grove during this first 10-year period.

FORESTRY

Farm forestry for agricultural students (*Ames: Iowa State Col. Agr., 1926, pp. 100, figs. 11*).—A compilation, prepared by the staff of the forestry department of the Iowa State College, of useful information on forestry in the United States as a whole and in Iowa in particular.

Cooperative forestry in Rumania, M. Mosandreï (*La Coopération Forestière en Roumanie. Paris: Jouve & Co., 1926, pp. 152*).—A dissertation presented to the faculty of law of the University of Paris.

Light intensities required for growth of coniferous seedlings, C. G. Bates and J. Roeser, jr. (*Amer. Jour. Bot., 15 (1928), No. 3, pp. 185–194, fig. 1*).—Observations on the development of 20 lots of conifer seedlings representing 16 species uniformly exposed to artificial light, the intensity of which immediately below the lamp was about ⅛ that of sunlight but grading out to $\frac{1}{160}$ at the outer edge of the bed, showed redwood (*Sequoia sempervirens*) to be outstanding in tolerance to low light intensity. At 10 per cent intensity the redwood seedlings in the 9 months of 10 hours' light exposure per day increased their original size almost 10 times. Engelmann spruce and Douglas fir were next to the redwood in photosynthetic efficiency but required almost twice as much light. The pines in general required from 3 to 4 times the light needed by the redwood. Piñon pine was outstandingly high in its light requirements, having a minimum need of 5 per cent light intensity.

The authors point out that the experimental behavior of the various species conforms closely with expectations derived from observation of the normal environment under which the various species grow. Wide variations in the weights of individuals within a single species suggest the possibility of using

similar experimental tests to develop strains with high photosynthetic efficiency under low light intensities.

Relation between subcortical temperature and size of white pine (Pinus strobus) slash, A. W. Gottlieb (*Ecology, 9 (1928), No. 2, pp. 243–248, figs. 3*).—A study in the Harvard Forest, Petersham, Mass., showed considerable variation in the rate of decay of white pine slash of different diameters. To determine the possible rôle of temperature variations on the rate of decay, thermocouple readings were made under the bark of various sized sections and branches of a freshly cut white pine tree. The highest temperature was found in pieces from 4 to 6 in. in diameter, and ranging in order of decreasing temperature were pieces from 6 to 8 in., 2 to 4 in., 8 to 10 in., and 0 to 2 in. The variations were believed sufficient to influence the rate of decay.

DISEASES OF PLANTS

Plant pathology (*New Jersey Stas. Rpt. 1927, pp. 26–29*).—In addition to reports of investigations noted elsewhere (p. 338), summary accounts are given of other activities of the department of plant pathology of the station.

In a spray test for apple blotch control, check trees were said to have shown only 12.2 per cent of the picked fruit and 1.4 per cent of the fallen fruit free from blotch. Where concentrated lime sulfur was applied to the trees there was an increase of 36.6 per cent in clean fruit as compared with 58.2 per cent where a 2–4–50 Bordeaux mixture was applied.

Studies of water requirements of tomato plants are said to have shown that Bonny Best, a variety quite susceptible to wilt, took up only about one-fourth the amount of water absorbed by healthy plants of the same variety. Marglobe, a resistant variety, showed no diminution in ability to take up water, although the wilt organism was found in stems as high as 45 cm. (18 in.) above the ground.

Studies on the host range of the beet scab organism showed that infection followed on the potato, Globe and Milan turnips, and beets to a slight extent. Sulfur was found to reduce infection on beets.

Experiments for the control of early blight of celery showed an average of 240 crates per acre from untreated plats, 241 when dusted with copper-lime dust, 272 when the plants were given one application of Bordeaux mixture, and 282 crates when they were sprayed twice during the season.

Paris green is reported to injure cantaloupe vines. Bordeaux mixture 3–6–50 and copper-lime 20–25–55 increased yields by about 20 per cent in the number of fruit and 33.4 per cent in total weight without any injury to the vines.

Cabbage clubroot is said to be limited by soil reaction, none appearing in soils with a pH higher than 7.4. At pH 7.1 there was always a slight infection, and at from pH 5.7 to 5.8 there was usually 100 per cent infection of plants.

No appreciable difference in germination or plant growth was found to follow the treatment of diseased or disease-free corn with organic mercury compounds for the control of corn root rot.

In studies of potato diseases, a test was made of 49 lots of certified seed potatoes, and 27 yielded more and 22 less than the average of 250.1 bu. for all lots. Green Mountain potatoes were found more susceptible to scab than Irish Cobbler, and Rural Russet appeared very resistant. A comparison of Green Mountain potatoes grown for 1, 2, and 3 years in southern New Jersey with the same strain grown in Maine showed higher yields in every instance for the New Jersey grown stocks. Organic mercury compounds used as dips gave excellent control of scab, nearly equaling the 1½-hour treatment with corrosive sublimate solution, 1–1,000.

Soil moisture was found to influence the development of *Rhizoctonia solani*, extensive cankering of stems occurring where the soil moisture was low, but the injury was almost wholly absent in soils maintained at a higher moisture content. Sprouts from tubers planted 1.5 in. deep were free from Rhizoctonia, while no sprouts were clean that were planted 3.5 in. deep. Organic mercury dip treatments gave good control of Rhizoctonia under field conditions.

In a comparison of applications of lime and sulfur for the control of Verticillium wilt, eggplants were more severely wilted and the disease appeared earlier on the limed plats. The sulfured plats produced a much greater yield of marketable fruits.

In an investigation of root rot of peas caused by *Aphanomyces euteiches*, it was found that the optimum soil reaction for the development of peas was also the optimum for the development of the Aphanomyces root rot.

Report of the department of plant pathology, W. H. MARTIN ET AL. (*New Jersey Stas. Rpt. 1927, pp. 205–238, fig. 1*).—Detailed accounts are given of investigations carried on by the department of plant pathology in addition to those noted on page 337.

New Jersey plant diseases, W. H. Martin (pp. 205–216).—A list is given of the plant diseases recorded in the State, together with a summary of the temperature and rainfall, both of which are considered important factors in the occurrence of plant diseases.

Apple blotch control studies, W. H. Martin (pp. 216–218).—By means of bagging fruit on unsprayed trees in 1926, it was found that blotch infection did not become severe until sometime between June 3 and June 10 or just after the 17-day spray. As a result of 2 years' studies, the importance of the 17- and 28-day spray applications is shown for the control of this disease.

In spraying experiments for the control of apple blotch, in which Bordeaux mixture and concentrated lime sulfur were used, leaf injury was observed, but it was more severe where the trees were sprayed with concentrated lime sulfur than where Bordeaux mixture was employed. The results are said to be in accord with those secured previously in indicating the superiority of Bordeaux mixture over concentrated lime sulfur for the control of blotch.

Apple scab studies, W. H. Martin and E. S. Clark (pp. 218–221).—A report is given of studies on the discharge of ascospores of the apple scab fungus as correlated with temperature, rainfall, stage of tree development, and dates of spraying.

Potato spraying, W. H. Martin (pp. 221–224).—In continuation of experiments in spraying and dusting potatoes for the control of foliage diseases (E. S. R., 57, p. 741), copper-lime dust is said not to have given as efficient control of leafhoppers as was secured by the use of a 5–5–50 Bordeaux mixture. The use of a commercial Bordeaux mixture gave a smaller increased yield than did standard Bordeaux mixture. The use of a 10–10–50 Bordeaux mixture at approximately 20-day intervals was found to give very good control of leafhoppers when compared with 5–5–50 Bordeaux mixture applied at 10-day intervals. In a spray test with late planted Irish Cobbler potatoes a double application of 5–5–50 Bordeaux mixture gave good control of early blight but failed to give a yield increase over the check plats. This is believed to be due to injury to the vines.

Studies of sweet potato stem rot control, W. H. Martin (pp. 225–232).—A comparison was made of varieties and strains of sweet potatoes to determine their relation to stem rot, and the author reports that White Yam, Red Brazil, and Yellow Yam proved to be very resistant to stem rot. Certain strains of the Yellow Jersey variety were more resistant than other strains of this variety.

No correlation was found to exist between the susceptibility to stem rot and the yielding power of various strains of the Yellow Jersey variety.

In most instances the planting of 2 and 3 plants per hill gave a yield increase as compared with 1 plant, in the case of both resistant and susceptible varieties.

Effect of organic mercury seed treatments on germination and yield of peas, C. M. Haenseler (pp. 232–238).—The author reports that treating seed with various organic mercury compounds in dry form caused no injury to germination. Seed treated with these compounds in solution or in water in some cases reduced germination, possibly because of mechanical injury from handling the swollen seeds. Dusting seed with organic mercury compounds is said to have given increases in germination ranging from 1.5 to 11 per cent in 4 out of 5 tests. When seeds with high vitality were planted under favorable environmental conditions, seed treatments gave no appreciable increase in germination, but when seeds with low vitality were used or strong seeds planted under unfavorable conditions, treating with organic mercury dusts appreciably increased germination. In a soil heavily infected with Pythium and other seed decaying organisms the organic mercury seed treatments are said to have resulted in a large increase in germination. No increase in yield was found to be brought about by seed treatments except in those cases where germination was appreciably increased. Organic mercury seed treatments did not control Ascochyta foot rot.

Relation of storage temperature to lag in growth of fungous cultures, D. H. Rose and L. F. Butler (*Phytopathology, 17 (1927), No. 1, p. 55*).—Petri dish cultures of *Physalospora rhodina* held for from 6 to 8 days at temperatures ranging from 13 to 3° C. (55.4 to 37.4° F.), when removed to room temperatures for 2 days or longer are said to have shown a lag in growth in direct proportion to the temperatures at which the cultures were previously held.

A theory to account for the bactericidal action of sodium silicofluoride and lack of injury to host tissues, H. W. Anderson (*Phytopathology, 17 (1927), No. 1, p. 50*).—The author claims that a 1–200 solution of sodium silicofluoride used as spray on peach trees controlled bacterial spot, caused by *Bacterium pruni,* without serious injury to the host. A theoretical discussion is given of the action of the fungicide.

Correction of unproductive muck by the addition of copper, E. L. Felix (*Phytopathology, 17 (1927), No. 1, pp. 49, 50*).—It is stated that there are in western New York areas of muck soils that are unproductive for lettuce and onions. The plants grow normally in these soils for a time, but generally fail to produce crops. Applications of pulverized copper sulfate at the rate of from 100 to 200 lbs. per acre prior to sowing resulted in the production of normal crops. Painting the leaves of affected lettuce with a weak solution of copper sulfate also caused the plants to outgrow the abnormalities, as did also dusting lettuce grown on unproductive muck with a 20–80 copper-lime dust at the rate of 55 lbs. per acre. The author claims that the experiments indicate that copper may be a vital factor in the growth of plants on such soils.

Tests with organic mercury compounds, E. B. Ferris and W. S. Anderson (*Mississippi Sta. Bul. 246 (1927), p. 7*).—Cooperative experiments with the State Plant Board are reported, in which tests were made of two organic mercury compounds for the control of root and ear rots of corn and of a compound that was claimed to act as a stimulant to germination. No detectable differences were observed in the growth of the plants, and the variations in yields at the end of the experiments were so small as to be considered to fall within the limits of experimental error.

Fungicidal control of brown-patch of turf, J. Monteith, jr., and T. C. Harmon (*Phytopathology, 17 (1927), No. 1, pp. 50, 51*).—Experiments have shown

that mercury fungicides have been most effective in controlling brown patch of turf. Out of a number of organic and inorganic compounds tested, all except mercury sulfide controlled the disease when applied in the same amounts of metallic mercury. Injury to the grass was found to depend on the chemical combination, mercuric cyanide being the most toxic and mercurous chloride the least. From the standpoint of control, toxicity, and cost, the most satisfactory chemical was mercurous chloride. Less than 0.2 lb. of this compound proved fully effective as 1 lb. of Uspulun or Semesan, which cost approximately 10 times as much. Repeated applications of copper fungicides resulted in an accumulation of copper which was toxic to grass roots. Sulfur sprays or dusts were likewise injurious. Formaldehyde, superkalimat, phenol, and sodium silicofluoride were found toxic to grass when used in amounts sufficient to control brown patch.

Correlation of virulence and acid agglutination of a smooth and a rough strain of Bacterium phaseoli sojense, C. G. SHARP (*Phytopathology, 17 (1927), No. 1, p. 49*).—The author reports having isolated a smooth and a rough strain from a culture of *B. phaseoli sojense*. Both strains have continued constant in cultures. Roughness and lesser virulence were found correlated with greater agglutinability. The rough strain was found to agglutinate spontaneously in distilled water, while the smooth one did not. The organism of the smooth strain is said to be very motile, while the rough one is either sluggish or nonmotile. It is said that the strains can not be differentiated by agglutination and precipitin tests.

Serological differentiation of Bacterium campestre from Bact. phaseoli, Bact. phaseoli sojense, and Bact. flaccumfaciens, G. K. K. LINK and C. G. SHARP (*Phytopathology, 17 (1927), No. 1, pp. 53, 54*).—The authors claim that the above species of bacteria, all of which attack beans, are quite similar in their morphology and physiology. Agglutination tests were made to learn whether by this means the different species could be differentiated. In low dilutions, the authors obtained group agglutination with antisera of the bean organisims against *B. campestre*, but did not obtain agglutination in any dilution with the antiserum of *B. campestre* against *B. phaseoli, B. phaseoli sojense*, and *B. flaccumfaciens*. It is considered that the results show that *B. campestre* contains no protein capable of stimulating production of an antibody which will react with the other species, but that the bean pathogenes contain proteins which cause production of antibodies that do react with *B. campestre*. The investigation is held to show that these organisims, although closely related, are serologically distinct.

Serological and physiological studies of Bacterium phaseoli, Bact. phaseoli sojense, and Bact. flaccumfaciens, C. G. SHARP (*Phytopathology, 17 (1927), No. 1, p. 54*).—Agglutination tests are said to indicate that these three organisms contain serologically different proteins, and that they can be differentiated by agglutination tests. Physiological reactions are also indicated whereby the species can be recognized.

Some effects of mosaic on the content of the cell, M. T. COOK (*Phytopathology, 17 (1927), No. 1, p. 57*).—The author made a study of mosaic and healthy plants of sugar cane and tobacco, and found that the chloroplasts in a mosaic plant were smaller and fewer than those in a healthy plant, but they tended to become normal with age. The chloroplasts were not destroyed or even injured by the mosaic disease, but their development was inhibited. The nuclei of many mosaic cells were found to be enlarged and otherwise deformed, but they tended to become normal with increased age. Areas of diseased cells were found in apparently healthy tissues and healthy cells in diseased tissues.

No indication was found of recovery from the disease. Intracellular bodies were commonly found in diseased tobacco but rarely in diseased sugar cane.

The corn mosaic of Hawaii distinct from sugar cane mosaic, L. O. KUNKEL (*Phytopathology, 17 (1927), No. 1, p. 41*).—Experiments with the corn leafhopper (*Peregrinus maidis*) from North Carolina are said to have shown that this insect is unable to transmit the virus of sugar cane mosaic of the United States to the corn plant. Studies in Hawaii indicate that this insect does transmit the virus of corn mosaic in that country, and this is considered to suggest that the destructive corn mosaic of Hawaii is distinct from sugar cane mosaic and the mosaic of corn occurring in Louisiana and other Southern States.

Plant tumors, the supposed effect of chemical stimulation [trans. title], C. REHWALD (*Ztschr. Pflanzenkrank u. Pflanzenschutz, 37 (1927), No. 3–4, pp. 65–86, figs. 9*).—Neither in *Daucus carota* nor in any other plants could growths be induced by the use of lactic or other acids that could not be induced by non-chemical means.

Anatomy of plant cancer or crown gall [trans. title], J. MAGROU (*Compt. Rend. Acad. Sci. [Paris], 183 (1926), No. 21, pp. 986–988*).—Noting anomalies observed to occur frequently in stem tumors obtained after inoculation with *Bacterium tumefaciens* in case of *Helianthus annuus, Solanum lycopersicum,* and *Ricinus communis,* the author states that the formation of galls under the influence of *B. tumefaciens* results essentially from an acceleration of the rhythm of cellular divisions, in ways which are discussed. Comparison is made as to plant galls and animal cancers.

Bacterium tumefaciens in tissues of plant cankers [trans. title], J. MAGROU (*Compt. Rend. Acad. Sci. [Paris], 183 (1926), No. 19, pp. 804–806*).—Following up the work of others, notably of Smith (E. S. R., 48, p. 142) and (more recently) of Pinoy (E. S. R., 58, p. 543), in studies of cauline tumors of *Solanum lycopersicum,* the author observed, after staining with pyronine, very numerous bacteria situated at or near the surfaces of the crown galls. Observations, said to agree with those of Pinoy and of Robinson and Walkden (E. S. R., 52, p. 146; 54, p. 144), suggest that the agent causing plant cankers acts at a distance, by or through a mechanism which is still to be discovered, on the cells, which are thus induced or caused to multiply.

Strains of Pseudomonas tumefaciens, M. K. PATEL (*Phytopathology, 17 (1927), No. 1, pp. 46, 47*).—Isolation studies of *P. tumefaciens* from overgrowths of nursery stock and from nursery soils are said to have shown pathogenic and nonpathogenic strains. Fifteen nonpathogenic strains were recovered in isolations from 200 3-year-old grafted apple trees. Ten of these are said to resemble the pathogenic strains of *P. tumefaciens* in morphological characters and in 32 different physiological reactions. The remaining five strains reacted like the pathogenic strain except in one characteristic. Four of these liquefied gelatin and one reduced nitrates. Repeated applications of these strains failed to cause infection with them on tomatoes and castor beans. The nonpathogenic strains were found most abundant in the apple nursery row. The pathogenic strain isolated from soil retained its pathogenicity for 10 months. The pathogenic strains maintained in culture were still virulent after 2 years.

Pythium ultimum and Pythium debaryanum, C. DRECHSLER (*Phytopathology, 17 (1927), No. 1, pp. 54, 55*).—In a previous publication (E. S. R., 58, p. 47) the author reported an infection of cabbage heads by an undetermined species of Pythium. As a result of further study he is convinced that the organism is identical with *P. ultimum,* which was originally reported to be a saprophytic species. For the fungus, which is frequently concerned with damping-off, root rot, and rootlet decay and which produces zoospores and has

other morphological differences from *P. ultimum*, the author claims that the name *P. debaryanum* should be adopted.

A peculiar type of Pythium, C. Drechsler (*Phytopathology, 17 (1927), No. 1, p. 55*).—Three closely related species of Pythium isolated from diseased stems and rootlets of bean, peony, ragweed, touch-me-not, and other hosts are briefly described.

A study of the downy mildew, Sclerospora graminicola, I. E. Melhus, F. Van Haltern, and D. E. Bliss (*Phytopathology, 17 (1927), No. 1, p. 57*).—Recent studies of the downy mildew of foxtail grass and corn have shown that a completely saturated atmosphere, turgid leaves covered with a film of moisture, and a temperature between 10 and 27° C. (50 and 80.6° F.) favor sporulation of *S. graminicola* on foxtail grass (*Setaria viridis*). The fungus is believed to hibernate by means of oospores rather than by intraseminal mycelium. The minimum period of incubation following sporangial infection of corn by either oosporic or sporangial conidia was 6 days. On corn, 11 per cent infection resulted from sporangia and 91 per cent from oospores. The oospores were not killed after soaking 10 minutes in a 2 per cent solution of copper sulfate or when heated at 50° for 1 hour. Five minutes in a 1 per cent solution of formaldehyde inhibited oospore germination, while 0.1 per cent mercuric chloride for 40 minutes at room temperatures did not do so.

Strains of Ustilago nuda and certain host relationships, W. H. Tisdale and M. A. Griffiths (*Phytopathology, 17 (1927), No. 1, p. 42*).—Studies of the loose smut of barley are said to have shown variants within the species *U. nuda*. Loose smut collected from Tennessee Winter barley was found to contain two strains of the fungus, and spores from this collection smutted the varieties Han River and Alaska. Spores from Han River smutted Hannchen 100 per cent, while spores from Alaska, which produced 100 per cent smut in the variety Orel, produced none in Hannchen. Of 32 collections of smuts from various sources, 26 produced smut in Tennessee Winter barley while only 9 produced smut in Hannchen.

The fungous flora of the nodes of corn, C. L. Porter (*Phytopathology, 17 (1927), No. 1, p. 41*).—Isolations of fungi from the nodes of cornstalks from 20 different States are said to have shown that species of Fusarium, Alternaria, and Helminthosporium are the most prevalent species. In addition to the above, nine morphologically distinct types of bacteria were found. None of the organisms were consistently associated with any type of nodal breakdown.

No correlation was found between the specific organisms and the iron content of the stalks, although generally the higher iron content was present in the more highly decomposed tissues.

The permeability of the seed coat of corn to mercury compounds, C. R. Orton (*Phytopathology, 17 (1927), No. 1, p. 51*).—Tests were made of the permeability of the seed coats of four varieties of sweet corn and three varieties of dent corn by solutions of mercuric chloride, chlorophenol-mercury sulfate, nitrophenol-mercury sulfate, and cyan-cresol mercury. It is considered that the portion of the seed coat covering the embryo side of the seed is more slowly permeable than that covering the endosperm, and it also appears that the rate of permeability of seed coats to each mercury compound varies with the corn varieties. Mecuric chloride and cyan-cresol mercury passed through in approximately 30 minutes or less, nitrophenol mercury in an average of about 60 minutes, and chlorophenol mercury required an average of approximately 80 to 145 minutes.

Smut resistance in corn, M. A. Griffiths (*Phytopathology, 17 (1927), No. 1, p. 42*).—Field and greenhouse experiments have shown that strains of corn

resistant to smut under field conditions were quite susceptible to infection when conidial suspensions of spores were injected into young, actively growing tissues. Pouring the inoculum into the tops of growing plants did not result in a high percentage of infection. Resistance to smut in these strains of corn is considered to be due to the failure of the inoculum to reach the young growing tissues.

Certain factors influencing the development of the mosaic disease in winter wheat, R. W. Webb (*Phytopathology, 17 (1927), No. 1, p. 41*).—A brief account is given of the factors found to influence the development of mosaic in winter wheat. Experiments in growing wheat in infested soil showed that the infection period was confined to the seedling stage. Seedlings transplanted to infested soil appeared most susceptible to rosette when four weeks old and less susceptible when younger or older. Under favorable environmental conditions an exposure to infested soil of one week from date of seeding was sufficient to cause a high percentage of diseased plants. The disease was found to develop only at relatively low constant or low average soil temperatures, and it was favored by relatively high constant soil moistures.

The effect of leaf rust, Puccinia triticina, on the seed production of wheat, E. B. Mains (*Phytopathology, 17 (1927), No. 1, p. 40*).—From a study of rusted wheat plants, the author found that the reduction in seed produced depended on the severity of infection, infection period, and varietal susceptibility. When susceptible varieties were heavily infected from the seedling stage to maturity, little or no seed was produced. Severe infection from the beginning of heading to maturity caused a reduction of from 15 to 25 per cent in seed formation.

Susceptibility of wheat varieties and hybrids to wheat scab in Minnesota, J. J. Christensen and E. C. Stakman (*Phytopathology, 17 (1927), No. 1, pp. 40, 41*).—The authors report on experiments with more than 250 varieties of species of Triticum artificially subjected to wheat scab. The amount of seedling blight and head blight in the same variety in different years was found to vary with the date of sowing and with the temperature and humidity at flowering time. There was some circumstantial evidence to indicate that different parasitic strains of the pathogene may have been present in different years. Durum wheats as a class were more susceptible than common ones, although there were susceptible and resistant varieties in both groups. Lists are given showing the reaction of various common varieties of wheat and of some hybrids to scab infection.

Effect of seed treatment on growth, yield, and disease control in vegetable crops, E. E. Clayton (*Phytopathology, 17 (1927), No. 1, p. 44*).—Seed treatment experiments conducted over a 3-year period in the greenhouse and in the field are said to have shown disease control of two sorts. Seed-borne parasites, such as *Phoma lingam* and *Pseudomonas campestris*, were destroyed, and seedlings were protected during the early stages of growth from attack by soil inhabiting parasites. Stimulation of early plant growth was produced by treating the seed with chemicals, such as manganese sulfate, arsenic iodide, and arsenate of lead. Greenhouse tests with cucumbers are said to have given striking results, while field tests showed no significant differences in yield. Retardation of plant growth was found also to result from seed treatment. Potatoes soaked in corrosive sublimate shortly before planting occasionally showed retarded sprouting and reduced yield. Lima bean seed dusted with a mercury chlorophenolate seed disinfectant regularly produced smaller vines and yields than untreated seed.

Cercosporella leafspot of Chinese cabbage, W. H. Davis (*Phytopathology, 17 (1927), No. 1, p. 42*).—A leaf spot of Chinese cabbage characterized by the

presence of paper-white lesions is reported from the Massachusetts Experiment Station. The causal organism, for which the name *Cercosporella* (*Cercospora*) *albo-maculans* is suggested, is briefly described.

Inoculation experiments with a number of vegetables, including common cabbage, failed to produce the disease on any except the Chinese cabbage.

Leafhopper injury to clover, E. A. HALLOWELL, J. MONTEITH, JR., and W. P. FLINT (*Phytopathology, 17 (1927), No. 1, p. 58*).—Leafhopper injury to clover in Illinois is described. The affected leaves, sometimes simply yellowed or bronzed, are often slightly curled and usually show tip and marginal browning, while frequently the entire leaf turns brown. The infected plants remain dwarfed, and many die. Zigzag, alsike, and white clovers showed similar symptoms in varying degree. Alfalfa in Italian clover plats, as well as in extensive plantings near by, was likewise severely dwarfed and had the typical yellows or yellow-top appearance. The investigations point to leafhoppers (*Empoasca mali*) as responsible for the injury.

A mosaic resistant variety of cucumbers, O. H. ELMER (*Phytopathology, 17 (1927), No. 1, p. 48*).—The cucumber variety Chinese Long received from Nanking, China, is reported to be resistant to the mosaic disease. Inoculation tests showed no infection of Chinese Long cucumber, while nearly all of the plants of the variety White Spine were infected.

In a field experiment aphids transferred from mosaic cantaloupes failed to produce mosaic on cucumbers.

Bacterial halo spot of kudzu, F. HEDGES (*Phytopathology, 17 (1927), No. 1, p. 48*).—A bacterial spot of kudzu is briefly described. The author found the disease present in fields in Georgia and Florida where plantings had been made of roots from diseased stands. The cause of the disease is tentatively described as *Bacterium pueriae.*

Leaf temperature in relation to tip burn of lettuce, E. L. LECLERG (*Phytopathology, 17 (1927), No. 1, pp. 44, 45*).—No relation was found to exist between the temperature and tipburning of lettuce. Variations in the temperature of the different parts of the leaf in comparison with air temperatures were found, and hourly temperature readings showed that lettuce leaves during the process of tipburning were approximately 5° C. (9° F.) cooler than the surrounding temperature.

The relation of Mycosphaerella pinodes to Ascochyta blight of peas, L. K. JONES (*Phytopathology, 17 (1927), No. 1, p. 44*).—The author reports two closely related species of Ascochyta that produce distinct diseases of the pea plant. The two forms are similar in many respects, but host and cultural relations of one form are quite distinct from those described for *A. pisi.* It is claimed that *M. pinodes* is not the ascigerous stage of *A. pisi.*

Variation of strains of Alternaria solani isolated from lesions on potato tubers, R. BONDE (*Phytopathology, 17 (1927), No. 1, p. 56*).—Variations in cultures of *A. solani* are reported, in which it is claimed that the strains can be differentiated on the basis of formation of pigment in potato agar, rate of growth, macroscopic appearance of mycelium in culture, production of conidia, and pathogenicity on leaves and tubers. Saltations were found to occur rather frequently in some strains. The red pigment associated with chromogenic strains was intensified by high temperatures and was retarded or absent at low temperatures. Sunlight intensified the pigmentation of certain strains. Other strains remained nonchromogenic under all circumstances. The chromogenic character of the strains in media was not found to be correlated with pathogenicity.

Radish black-root caused by Aphanomyces raphani n. sp., J. B. KENDRICK (*Phytopathology, 17 (1927), No. 1, p. 43*).—A brief description is given of this

radish disease, a more detailed account of which has been noted (E. S. R., 58, p. 243).

Sulphur and copper carbonate dusts as efficient fungicides for the control of sorghum kernel smut and millet smut, L. E. Melchers and C. O. Johnston (*Phytopathology, 17 (1927), No. 1, p. 52*).—Experiments at the Kansas Experiment Station are said to have shown that copper-carbonate treatment is the most practical and efficient method for the control of millet smut. Four season's results from plantings of smutted sorghum seed treated with flowers of sulfur and the more reduced sulfur dusts, such as Sulfodust and Kolodust, are said to indicate a control of sorgum kernel smut equal to that obtained with copper carbonate. The various sulfur dusts were not found satisfactory for the control of millet smut.

Curly-top of squash, M. B. McKay and T. P. Dykstra (*Phytopathology, 17 (1927), No. 1, pp. 48, 49*).—A severe disease of squash in Oregon, Washington, and Idaho is reported. Infected plants are said to be yellow and badly stunted. The leaves were small and usually had yellow upturned margins, although in some varieties the leaf margins were turned down, and the blades were crinkled. Circumstantial evidence suggested that the disease was caused by the virus from curly-top sugar beets, and transfers of viruliferous leafhoppers, *Eutettix tenella*, confirmed the supposition.

The Fusarium wilt of sweet potatoes on infested soils, R. F. Poole (*Phytopathology, 17 (1927), No. 1, pp. 42, 43*).—The author reports that the Fusarium causing sweet potato wilt may be abundant in the field but through an uneven distribution of the organism it may not infect all plants in the field. The disease was found not to spread from plant to plant, even when healthy susceptible varieties were grown only a few inches from diseased ones.

Multiplication of the virus of tobacco mosaic in detached leaves, H. A. Purdy (*Phytopathology, 17 (1927), No. 1, p. 58*).—The author claims that the virus of tobacco mosaic, when inoculated into detached leaves, produces no macroscopic symptoms of disease but causes the production of intracellular bodies similar to those associated with tobacco mosaic in the leaves of growing plants. A series of experiments was undertaken in which leaves were inoculated, and after a period of incubation the sap was extracted from the leaf, diluted with distilled water, and inoculated into a second detached leaf. This was repeated a number of times. When this process was continued the dilution used in the inoculation of the ninth leaf was estimated to be not less than 256×10^{-18}. This is said to be many millions of time the water dilution necessary to inactivate the virus and indicates multiplication in the detached leaves.

Bacterial canker of tomatoes, M. K. Bryan (*U. S. Dept. Agr. Circ. 29 (1928), pp. 8, figs. 7*).—The Grand Rapids or bacterial canker of tomato, described by Smith as caused by *Bacterium michiganense* (E. S. R., 23, p. 452), is reported as being widely spread in the United States from Illinois eastward and also present in Georgia, Utah, Montana, and British Columbia. A table is given of contrasting characters of this disease with those of southern bacterial blight and Fusarium wilt, with which the canker may be confused. Thus far the canker has not been found to occur on any other crop nor has it been possible to inoculate any other solanaceous plant.

For the control of bacterial canker, sterilization of seed with corrosive sublimate, as suggested by Gardner and Kendrick (E. S. R., 45, p. 248), is recommended. The avoidance of old seed beds and the rotation of crops where the disease is known to be present are also suggested.

Separation of fern leaf from mottling in tomato mosaic, S. H. Eckerson and H. R. Kraybill (*Phytopathology, 17 (1927), No. 1, pp. 57, 58*).—The authors

claim that by means of sintered glass filters it was possible to retain on the filter all of the infectious principle which produces mottling symptoms, and to recover in the filtrate substances which produce fernleaf and filiform symptoms in tomato plants similar to those frequently associated with tomato mosaic. Tomato juice, allowed to stand in an ice box and then centrifuged, when filtered through the glass filter was found capable of producing mottling symptoms. None of the filtrates from collodion membranes produced typical mottling symptoms, but some produced the fernleaf and filiform symptoms.

The development of nailhead spot of tomatoes during transit, G. B. RAMSEY and A. B. BAILEY (*Phytopathology, 17 (1927), No. 1, pp. 43 44*).—A brief report is given of the development of nailhead spot at the time of shipping tomatoes and upon their arrival at market after 6¼ days in transit.

Watermelon wilt infection studies, D. R. PORTER (*Phytopathology, 17 (1927), No. 1, pp. 47, 48*).—A large number of isolations of *Fusarium niveum* were said to have shown that the fungus occurred in stems, leaves, petioles, pedicels, fruit, and roots, and probably in the seed. The fungus was found to cause cankers on roots at any point, but the lesions were most prevalent at from 6 to 24 in. below the surface of the soil. Vascular invasion followed the development of the lesions. The maximum wilting occurred in 1926 after the watermelons had set. The author claims that *F. niveum* pathogenic to watermelon seedlings was isolated from supposedly immune citron vines.

Details in the life-history of the apple blotch fungus, E. J. KOHL (*Phytopathology, 17 (1927), No. 1, pp. 45, 46*).—The author reports a study of the spores of the apple blotch fungus, in which it was found that they germinated readily in water on slides but did not form appressoria on the slide. Spores germinated on leaves form appressoria. The period of incubation was found to be from 20 to 24 days, being shorter on the leaf blade than on the petiole. The mycelium of the fungus was found to be intercellular and confined to the collenchyma layer. At a considerable distance below the visible margin of the petiole lesion the mycelium was traced in this layer into the abscission layer.

Studies of apple scab and cherry leaf spot infection under controlled conditions, G. W. KEITT (*Phytopathology, 17 (1927), No. 1, p. 45*).—Further studies of apple scab infection confirmed those previously reported (E. S. R., 58, p. 553).

Similar experiments on leaf infection of cherry by *Coccomyces hiemalis* showed that the initial stages of infection occurred at constant temperatures ranging from 12 or 13 to 28° C. Minimal incubation periods varied from 6 days at 24° to 11 days at 28°. The minimal period of wetting observed to permit infection was 5 hours at 20°.

A possible reorientation of aims and methods for apple scab control, G. W. KEITT and E. E. WILSON (*Phytopathology, 17 (1927), No. 1, p. 45*).—It has been shown by Keitt and Jones that abundant and timely ascospore discharge is of primary importance in the incidence and control of apple scab (E. S. R., 56, p. 550). In order to protect fruit through spraying it is considered necessary to reduce the ascosporic inoculum, and for three years the authors have sought to reduce infection by the use of fungicides applied after harvest but before leaf fall. Tests were made of a number of copper, sulfur, mercury, and arsenic preparations and fluosilicates. The experiments, while incomplete, showed that a number of the preparations tended to inhibit or prevent the production of ascospores. It is believed that the postharvest season prior to leaf fall offers a potentially vulnerable phase in the life history of the fungus.

Pleospora rot of lemons and apples, D. H. ROSE and L. F. BUTLER (*Phytopathology, 17 (1927), No. 1, p. 47*).—The authors report the isolation from

decayed lemons from California of a form of Pleospora, probably *P. herbarum citrorum*. What appeared to be the same fungus was isolated from apples obtained from Washington, Oregon, and California. Cross inoculations showed that cultures from both lemons and apples were pathogenic to both kinds of fruit, and suggest that the fungus making the initial attack is the same in both cases. Culture characters are said to indicate that the conidial stage of this species is a Macrosporium.

Nematode control experiments, E. B. Ferris and W. S. Anderson (*Mississippi Sta. Bul. 246 (1927), p. 18*).—In studies of cultural methods for nematode control on peach trees, the entire block of trees in the experiment is said to be infested, but the growth of the trees in diameter, average height, and spread of branches was decidedly in favor of clean culture as compared with trees grown in permanent sod.

Mosaic of red and black cultivated raspberries, W. H. Rankin (*Phytopathology, 17 (1927), No. 1, p. 46*).—Attention is called to the varying degree of control of raspberry mosaic in different parts of New York by planting mosaic-free stock and roguing the plantings. The causes of variation are believed to include the relative abundance of the principal insect vector, *Amphorophora rubi*, variations in the frequency and intensity of aphid dispersion, and the escaping of inoculation by the variety. Mosaic is believed to spread almost entirely by the mechanical disperson of the vector by wind, rain, and cultivation operations. A biological relation between the aphid and the virus is indicated by the fact that infection in red and black raspberries is initiated only by aphids in the first and second instars. Mosaic in red and black raspberries is said to have been proved identical, and it is the most important virus disease of both sorts in New York.

[Cranberry disease control in New Jersey], C. S. Beckwith (*New Jersey Stas. Rpt. 1927, pp. 136, 137*).—Investigations on the control of cranberry rot showed that a Bordeaux mixture soap spray increased the yield and lowered the amount of rot. Copper-lime dust was not as effective a fungicide, but copper sulfate and hydrated lime 50–50 gave better results than any other copper-lime combination used. One season's test with colloidal sulfur, dry ground Bordeaux mixture, and 25–27 copper-lime dust failed to control rot fungi on a badly infected bog. One season's results, in which a comparison was made of copper carbonate and colloidal sulfur, are said to indicate that these dusts are not suitable for the control of cranberry rot fungi. Colloidal sulfur burned the fruit and foliage.

Six years of spraying with Bordeaux mixture soap showed excellent control of rot fungi, and the results are considered to be cumulative. Plats sprayed for five years and then left unsprayed the following year are said to have produced a crop of berries.

False blossom of cranberries is said to be increasing in the State. It is suggested that until control measures are known the variety Howe should not be planted on account of its susceptibility to the disease. Circumstantial evidence is said to indicate that the disease may be carried by leafhoppers.

Investigations on citrus "blight," wilt, or leaf-curl in Florida, A. S. Rhoads (*Phytopathology, 17 (1927), No. 1, pp. 58, 59*).—Continuing observations on citrus blight or wilt (E. S. R., 57, p. 652), the author shows that the disease is not transmitted by grafting or budding, and no evidence was obtained to indicate that a pathogenic organism was responsible for the disease. It is believed to be of nonparasitic origin and traceable to extremes in soil-moisture conditions.

The effect of spraying with fungicides on the keeping quality of Florida citrus fruits, H. R. Fulton and J. J. Bowman (*Phytopathology, 17 (1927), No.*

1, p. 47).—A single application of Bordeaux mixture 3–3–50 plus 1 per cent oil emulsion, made either on April 15 or May 5, is said to have reduced the total rot of citrus fruits in Florida, while midsummer and fall applications were relatively ineffective. The effect of the treatment is mainly on the common Phomopsis type of stem-end rot, which was reduced more than one-half. The Diplodia stem-end rot was reduced by the treatment about one-fifth, while the Penicillium rots were not materially affected.

The x-bodies in the cells of "mosaic diseased" and "dwarfed" dahlias, B. Goldstein (*Phytopathology, 17 (1927), No. 1, p. 52*).—The author reports the presence of x-bodies in cells of dahlia plants affected with mosaic and dwarf types of disease. These bodies were found to occur in all the tissues of young leaf primordia, growing points, and blotched leaves, and the intracellular bodies are said to have given very clear evidence that they are not mere reaction products of the cell protoplasm.

Clytocybe root-rot of trees and other woody plants in Florida, A. S. Rhoads (*Phytopathology, 17 (1927), No. 1, pp. 56, 57*).—The author observed at various places in Florida mushroom root rot of trees caused by *C. tabescens*. The fungus was found on guava, Australian pine (*Casuarina equisetifolia*), rose apple (*Carophyllus jambos*), and poinsetta (*Euphorbia pulcherrima*).

Cryptoporus volvatus and its relations with forest trees and insects, A. H. R. Buller (*Phytopathology, 17 (1927), No. 1, p. 53*).—The author claims that *C. volvatus* is favored in its attack on coniferous trees by various beetles which tunnel the wood and also carry the spores.

Tree injection for control of fungous diseases and insect pests, C. M. Scherer (*Phytopathology, 17 (1927), No. 1, p. 51*).—A report is given on the effect of a considerable number of compounds injected into chestnut, birch, apple, and elm trees for the control of some diseases and insect pests. The results were all negative with the exception of the apple trees which were injected with thymol. These seemed to show a definite resistance to the progress of *Bacillus amylovorus*.

Soil treatments for the control of damping-off in coniferous seed-beds, J. S. Wiant (*Phytopathology, 17 (1927), No. 1, pp. 51, 52*).—Experiments are briefly reported on the control of damping-off of conifers in seed beds, the principal organism causing the destruction of the seedlings being *Rhizoctonia solani*. Effective control was secured with chlorophenol mercury, mercuric chloride, and nitrophenol mercury in beds of *Pinus strobus* and *Picea excelsa*. In beds of *Pinus resinosa* satisfactory results were obtained with aluminum sulfate, Uspulun, mercuric chloride, Bayer Compound, and sulfuric acid. Few differences were noted in the effectiveness of the different control agents.

A serious disease of birches, P. Spaulding (*Phytopathology, 17 (1927), No. 1, p. 59*).—A serious disease of birch trees in the eastern portion of the United States is reported to be caused by *Nectria* sp.

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Rats and how to kill them, A. M. Hogarth (*London: John Bale, Sons & Danielsson, 1928, pp. 46, figs. 8*).—This is a practical account.

Report of the department of biology, T. C. Nelson (*New Jersey Stas. Rpt. 1927, pp. 77–83, figs. 3*).—This is a further report of oyster work (E. S. R., 57, p. 754). As in the preceding year the set was a complete failure in Barnegat Bay and but very light on the natural beds of Delaware Bay. The work is discussed under the headings of weather and water conditions, spawning and setting, vertical distribution of the oyster larvae, temperature and spawning of the oyster, and the Bayhead—Manasquan Canal.

It is pointed out that in Barnegat Bay the number of larvae produced was sufficient to have yielded a fair set had it not been for the presence of swarms of ctenophore jellyfish (*Mnemiopsis leidyi*), which reduced the larvae to numbers which were negligible.

Report of the department of entomology, T. J. Headlee (*New Jersey Stas. Rpt. 1927, pp. 111–156, pls. 2*).—The first part of this report consists of a list of the insects concerning which inquiries were made during the year, together with supplementary data concerning them.

In a discussion of the climate and insect investigations, reference is made to codling moth activity at five stations, in the northern area at Pattenburg, the middle area in New Brunswick, and in the southern area at Riverton, Glassboro, and Bridgeton. The results obtained in the study of the relation of effective day degrees of temperature to emergence of codling moth larvae, the details of which are presented in tabular form, show that in 10 sets of experiments in 6 different years the average number of day degrees of effective temperature required in the New Jersey experiments was 360, and that in 5 sets of experiments in 5 different years the number of day degrees of effective temperature required for the beginning of emergence of the first summer generation was 1,339.91. The results obtained in the application of the bioclimatic law to codling moth emergence in 1926, as given in tabular form, indicate that it does approximately apply to the occurrence of the beginning of emergence of the overwintering generation of codling moth in the areas where the study was made. Reference is made to investigations of the codling moth at Glassboro, the details of which have been noted from another source (E. S. R., 57, p. 454; 58, p. 61).

In a search for a combined spray which would destroy the overwintering eggs of the European red mite and the eggs of the apple aphid, work was conducted with oil emulsions consisting of lubricating oil emulsified with fish-oil soap to which crude cresol and carbolic acid were added in various proportions. The results, the details of which are given in tabular form, show that oil emulsion alone gave 100 per cent control, no damage being done to the buds. It was found that (1) lime sulfur and nicotine destroy the aphid but not the red mite eggs; (2) oil emulsion alone destroys the red mite but only a portion of the aphid eggs; (3) soluble sulfur, oil emulsion, and nicotine destroy the eggs of both species but damage the foliage; (4) oil emulsion and crude carbolic destroy the eggs of both species but burn the foliage seriously; (5) oil emulsion and crude cresol up to and including 0.5 per cent destroy the eggs of both species without injury to the plants; (6) oil emulsion and crude cresol from and including 1 per cent upward to 2 per cent destroy the eggs of both species but do serious damage to the plants; (7) oil emulsion plus nicotine sulfate fails to destroy all of the eggs of both species; and (8) oil emulsion and free nicotine destroy the eggs of both species and do not damage the plants.

Work was also conducted in the orchard, details of which are also given in tabular form. In such work, oil emulsion plus 40 per cent nicotine (free) gave 100 per cent control of both species without appreciably injuring the host plant. Oil emulsions plus 0.5 per cent crude cresol gave the same results. Oil emulsion plus soluble sulfur burned the host plant, and Sunoco spray oil in this instance gave 100 per cent control with no appreciable damage to the host plant.

It is pointed out that these studies of the apple aphid included three species, the oat aphid, the green aphid, and the rosy aphid. The oat aphid had hatched at the time of the field applications, and the green and the rosy were just beginning to hatch.

In an investigation of dusts, spreaders, stickers, and diluents for spraying and dusting mixtures, by J. M. Ginsburg (pp. 127–133) (E. S. R., 57, p. 743), a study was made to determine the power of 18 organic and inorganic compounds to take up soluble arsenic from arsenical spray mixtures. The oxides of iron, of zinc, and of aluminum, aluminum palmitate, and charcoal allowed a remainder of less soluble arsenic than did hydrated lime. Zinc oxide proved best of all. When the 4 lbs. of $Ca(OH)_2$ of the sulfur-lime dry-mix were replaced by 4 lbs. of zinc oxide the soluble arsenic was reduced to 25 per cent of that found in the lime mixture, whereas in the presence of 8 lbs. of zinc oxide practically no soluble arsenic was found. Zinc oxide, however, was found to be very toxic to peach and apple foliage, 0.5 lb. to 50 gal. of water being sufficient to cause severe injury to plant tissue as well as considerable leaf drop, and work with it was discontinued and field tests begun with ferric oxide, aluminum oxide, aluminum palmitate, calcium silicate, and charcoal. The results, as reported in tabular form, show injury to have occurred when hydrated lime, calcium silicate, aluminum oxide, aluminum palmitate, and charcoal were used, but no injury was detected with 3 or 4 lbs. of ferric oxide. The ferric oxide mixture exhibited exceptionally good sticking qualities and remained on the trees for a long time afterwards.

The experiments with ferric oxide were continued in the spring of 1927, when two different ferric oxide spray mixtures were tested, one containing a compound of ferric oxide similar to that used the preceding year, the other containing an iron ore which analyzed about 85 per cent ferric oxide and 15 per cent of insoluble impurities. In addition to these two sprays the ordinary sulfur-lime dry-mix containing no corrective, 4 lbs., and 8 lbs. of hydrated lime, respectively, to 50 gal. of water was used for comparison.

The spray was first applied on May 20 and repeated every two weeks, the trees having received three sprays at the time the report was prepared. A heavy coat of spray mixture remained on the trees from one spray to another, and an apple tree sprayed once with this material, on May 20, still maintained an appreciable coat of spray on June 30, when the last observation was made. This, however, was not observed with the spray containing the iron ore. No arsenical injury had occurred at the time of writing from the spray containing ferric oxide, whereas slight foliage injury was already showing up on trees sprayed with the other mixtures, being particularly noticeable where no lime or other corrective was used. No injurious effects had been noticed on peach and apple trees sprayed with only ferric oxide in concentration of 4 lbs. to 50 gal. of water, indicating that, unlike zinc oxide, ferric oxide is innocuous to peach and apple trees.

While no definite conclusions could be drawn at the time of writing, the results obtained suggested that colloidal ferric oxide can be used advantageously as a sticker and possibly as an efficient corrective to eliminate arsenical injury. Furthermore, the great adhesion of ferric oxide to peach and apple foliage may offer a solution for the problem of stickers in dust insecticides. Two explanations for the remarkable adhesion of ferric oxide are offered, one being based upon the particles bearing a positive electrical charge, the other upon the great absorbent properties.

In work with stickers in dusting mixtures greater adhesion was obtained with the dust in which $PbHAsO_4$ was coated with 2 per cent ferric oxide than when 20 per cent ferric oxide was mechanically mixed in the dust. These results are considered significant, and suggest that if both the sulfur and the lead arsenate should be thoroughly coated with colloidal ferric oxide a complete insecticidal dust may be obtained possessing sufficient adhesion on fruit and foliage successfully to replace spray mixtures.

In further observations of the effect of different mineral, vegetable, and animal oils on foliage, sperm oil and Nujol were the only two that did not cause injury to apple or peach foliage when applied in concentrations of 2 per cent or less.

The report of the Cranberry Substation, by C. S. Beckwith and B. F. Driggers (pp. 134–139), noted on pages 335 and 347, discusses some of the factors influencing the use of lead arsenate on cranberry bogs. Three-year spraying tests with acid lead arsenate and bog water indicate that there is a cumulative injury to the vines when acid lead arsenate is used as a spray from year to year. The weight of evidence points to the breakdown of the acid lead arsenate after it reaches the soil, with liberation of soluble arsenic which, in turn, is absorbed by the roots of the cranberry plant with resulting injury.

Observations of the life history of the blossom worm, commenced in 1926, are briefly referred to, including notes on its several parasites, namely, *Sagaritis oxylus* (Cress), a tachinid, *Sarcophaga helicis* (Tns.), and several braconids.

An account of blueberry investigations is also included (pp. 139–141). The cranberry root worm (*Rhabdopterous picipes* Oliv.) has proved to be a pest of the cultivated blueberry. The beetles emerge from the pupal cases in the soil during the latter half of June and feed on the foliage of the blueberry. The principal damage, however, is caused by the larvae feeding on the small fibrous roots during the late summer, this sometimes being serious enough to kill a small plant. Control work with this pest was aimed at killing the adults in time to prevent oviposition. Sodium fluosilicate and calcium cyanide were both tested, the granular form of the latter destroying over 95 per cent of the beetles when sprinkled around the plants, 0.5 oz. to the plant, in a circular area extending about a foot from the plant, and the soil then raked toward the plant. Applications were made about noon on a clear July day with the temperature of the air at 32° C. (89.6° F.). Observations of its effect were made 3 hours later. No injury was caused to any of the plants thus treated. The average moisture content of the soil around the treated plants was 15.6 per cent and the average soil temperature was 28.4°.

Brief reference is made to the occurrence of insect galls caused by *Hemadas nubilipennis* Ashm. on some varieties of blueberry plants, particularly the Sam variety. It is pointed out that such galls when cut from the plant should be burned rather than thrown on the ground.

In an account of bee investigations by R. Hutson (pp. 142–149) the relation of honeybees to pollination (see page 358), moving overwintered bees for orchard use with the effect of short and long hauls, package bees, and breeding disease-resistant and high-producing bees are considered. Experiments with gaseous chlorine as a disinfectant for American foulbrood have been noted from another source (E. S. R., 58, p. 62).

Brief notes on cranberry false blossom, a solar wax extractor, artificial insemination of queen bees, ants, and calcium cyanide are included.

The report concludes with an account of mosquito-control work by Headlee and F. W. Miller (pp. 149–156), which includes an account by Ginsburg on the spreading of mineral oils by the aid of coal-tar acids and other chemicals. The field results confirm those obtained in the laboratory and suggest that a small amount of cresylic acid may prove a valuable adjunct to oil sprays in mosquito work. In the laboratory it killed larvae instantly when diluted 1:1,000 and within 30 minutes when diluted 1:5,000. More recent field experiments have shown that fuel oil containing only 1 per cent cresylic acid kills pupae much more rapidly than oil alone. See also a previous note (E. S. R., 59, p. 158). A brief account by Miller on county mosquito accomplishments is also included. The more important mosquito species of the year are noted.

[Report of the] entomological branch [of Canada], W. R. MOTHERWELL (*Canada Min. Agr. Rpt. 1926–27, pp. 105–123*).—A general account of the occurrence of insects and work of the year therewith, the order being that of the several divisions of the branch.

Report of assistant entomologist, Vernon, M. H. RUHMANN (*Brit. Columbia Dept. Agr. Ann. Rpt., 21 (1926), pp. 38–42*).—A brief account of the occurrence of and work with the more important insect and other animal pests of the year.

Control of insect pests, E. A. WALTERS (*West Indies Imp. Dept. Agr., St. Lucia Agr. Dept. Rpt. 1926, pp. 9, 10*).—This brief account deals with several minor pests of sugar cane, citrus, coconuts, bananas, and cotton.

Entomology [in Bengal], G. P. HECTOR (*Bengal Dept. Agr. Ann. Rpt. 1926–27, pp. 37, 38*).—A brief statement is made of observations of work with a few of the more important crop pests during the year under report.

[Annual reports of entomologist, 1925–26 and 1926–27], E. JARVIS and R. W. MUNGOMERY (*Queensland Bur. Sugar Expt. Stas. Ann. Rpts., 26 (1925–26), pp. 19–26; 27 (1926–27), pp. 18–27*).—These reports deal with the occurrence of and work with the cane beetle *Lepidoderma albohirtum* Waterh., lepidopterous and other pests of sugar cane, and means for their control.

Recent investigations on contact insecticides, F. TATTERSFIELD and C. T. GIMINGHAM (*Jour. Soc. Chem. Indus., Trans., 46 (1927), No. 36, pp. 369T–372T, figs. 6*).—This is a contribution from the Rothamsted Experimental Station.

Further experiments with tar-distillate washes, A. H. LEES and L. N. STANILAND (*Jour. Min. Agr. [Gt. Brit.], 34 (1928), No. 10, pp. 923–931, pls. 4*).—In field trials with tar distillate washes known as Mortegg and Carbokrimp at 4, 8, and 10 per cent, the eggs of Psylla and Aphis were controlled effectively by all three strengths. The 10 per cent strength of both washes gave a small but consistent improvement over the amount of control obtained by the 8 per cent on caterpillars and capsid bugs.

Cyanogas calcium cyanide for the fumigation of flour mills, S. W. BROMLEY (In *Research in the Development of Cyanogas Calcium Cyanide. [New York]: Amer. Cyanamid Co., [1928], Sect. 3, pp. 89–110, figs. 6*).—This discussion of fumigation control of insects in flour mills includes a report of experimental work conducted by the author, the details of which are presented in tabular form.

The results obtained show that when properly applied Cyanogas calcium cyanide is effective as a fumigant for the control of insect and rodent pests in flour mills. It is pointed out that the margin of safety to the operator and the ease and simplicity of handling make the method a much more satisfactory means of utilizing hydrocyanic acid gas for the fumigation of flour mills than any other method hitherto employed.

Work with parasites of sugar cane insects in Hawaii, H. P. AGEE (*Planter and Sugar Manfr., 80 (1928), No. 4, pp. 64, 65*).—This is a brief statement of control work with leafhoppers, the cane borer (*Rhabdocnemis obscurus*), and *Anomala orientalis* in Hawaii, presented before the second conference of the International Society of Sugar Cane Technologists.

A memorandum of exploration trips by entomologists of the Hawaiian Sugar Planters' Experiment Station for the purpose of discovering and introducing beneficial insects, compiled by O. H. Swezey, is included.

The relation of the collembolous insect Isotomodes to sugar cane growth failure, R. H. VAN ZWALUWENBURG (*Assoc. Hawaii. Sugar Technol. Rpts., 6 (1927), pp. 21–24, figs. 3*).—The author's studies show that this insect becomes of importance when the absence of humus in the soil causes a heavy population to turn from their natural habits to feed on cane roots. Under such conditions,

and especially in the presence of pathogenic fungi, this insect may cause an appreciable amount of damage, resulting in a lessened growth of stalk and in the reduction of stalk numbers.

The relation of Pythium and the collembolous insect Isotomodes to growth failure in Lahaina cane, C. C. Barnum and R. H. Van Zwaluwenburg (*Assoc. Hawaii. Sugar Technol. Rpts., 6 (1927), pp. 24–29, figs. 6*).—The authors find that the combined attacks of Pythium and Isotomodes caused more serious effects on Lahaina cane than did either organism separately. In combination, the reduction in growth amounted to about 20 per cent and in the number of shoots to about 27 per cent.

Experiments in the control of scavenger termites in India and Ceylon by means of calcium cyanide, W. H. Brittain (In *Research in the Development of Cyanogas Calcium Cyanide. [New York]: Amer. Cyanamid Co., (1928), Sect. 4, pp. 115–124, figs. 2*).—This is a report of experiments conducted at Dacca, Bengal, with white ants, particularly *Termes obesus*?, and at Peradeniya, Ceylon, with *Odontotermes obscuriceps* Washm. and *O. redemanni* Washm., the details of which are presented in tabular form.

Promising results were obtained from the use of this insecticide against these species under the conditions met with, and experience indicates that this method can be expected to produce satisfactory results when material and a foot pump are kept constantly on hand and used whenever new colonies become evident.

Poison bait for grasshoppers: Report as to danger to stock, H. R. Seddon (*Agr. Gaz. N. S. Wales, 39 (1928), No. 1, pp. 64–66*).—This is a discussion of the subject as related to stock poisoning. It was found that when distributed on a bare surface at 300 lbs. per acre, no bait was gathered in sufficient quantity to cause death, although the author is of the opinion that the illness in the sheep used in one experiment was due to bait that it had gathered.

Studies of the anatomy and histology of Stenopelmatus fuscus Hald., A. C. Davis (*Calif. Univ. Pubs. Ent., 4 (1927), No. 7, pp. 159–208, pls. 5, figs. 7*).—This is a report of studies of an orthopteran in connection with a list of 47 references to the literature.

The Crotalaria bug [trans. title], P. van der Goot (*Landbouw [Buitenzorg], 3 (1928), No. 7, pp. 419–438, figs. 3; Eng. abs., pp. 434, 435*).—This is an account of a small capsid bug, *Ragmus importunitas*, which is becoming a serious pest of *C. anagyroides* and *C. juncea*, both of which are important green manure crops in Java. The life history has been worked out and is reported upon. Its natural enemies include three hymenopterous parasites, the most abundant being a mymarid which at the beginning of the rainy season may be found to parasitize 70 per cent of the Ragmus eggs.

The food of orchard birds with special reference to the pear psylla, T. T. Odell (*New York State Sta. Bul. 549 (1927), pp. 19, pls. 2, figs. 3*).—This is a report of an investigation undertaken in a pear orchard at Geneva during the years 1923 to 1926 with a view to determining the value and the possibility of increasing the number of insectivorous birds in the orchard.

Censuses were made at frequent intervals of birds living in the orchard or visiting it, and some of the birds were collected and examinations made of the stomach contents. Nesting boxes were provided, and two feeding stations were kept stocked with suet, sunflower seeds, and grain.

The work showed that the birds that eat psyllas in large numbers are the chickadee, the kinglets, and the red-breasted nuthatch. None of these birds will live in an orchard such as the one in which these observations were made during the summer. The number of psyllas taken during the winter was large,

however. The effort to increase the number of insectivorous birds nesting in the orchard was successful only in the case of the bluebird and the flicker, neither of which is considered particularly useful from the point of view of the orchardist, their chief food being ground beetles and ants, respectively.

The common coffee mealy-bug (Pseudococcus lilacinus Okll.) in Kenya Colony, T. W. KIRKPATRICK (*Nairobi: Govt., 1927, pp. VIII+110, pls. 6*).—Following a brief introduction, the author gives a description of this mealy bug, with notes on other species and allied insects found in Kenya Colony, and reports upon its life history and habits, the mealy bug complex, and the nature and extent of its damage.

Strawberry root-louse, J. H. CLARK (*New Jersey Stas. Rpt. 1927, pp. 194, 196, 197*).—Brief reference is made to field experiments for the control of the strawberry root aphid begun in the spring of 1927. Since the pest is usually introduced to new plantings on the plants themselves, dipping in a solution of some insecticide, usually a solution containing nicotine, will destroy them without injuring the plant, but will not kill the unhatched eggs. Therefore, if effective, it must be practiced after all the eggs have hatched, before October 1 and after April 15. In control work, dusts containing nicotine and nicotine and calcium cyanide were applied on plats near Moorestown, but the temperatures prevalent in April limited the possibilities of the nicotine dusts. Work with the ants that disseminate the aphids is under way.

A new Ripersia (Homop.) attacking wheat, R. W. DOANE and J. B. STEINWEDEN (*Pan-Pacific Ent., 4 (1927), No. 2, pp. 85, 86, fig. 1*).—Under the name *R. arenaria* n. sp. the authors describe a new coccid found on the roots of June grass, its native host plant, in Salt Lake County, Utah. From this host it transfers to the roots of wheat, in some instances infesting as much as from 75 to 80 per cent of the wheat plants in infested areas.

Efficient white fly control, W. R. WOOD (*Calif. Cult., 70 (1928), No. 8, p. 222, fig. 1*).—A brief discussion of control work with the white fly under way in California.

The celery leaf-tyer, Phlyctaenia rubigalis Guen., in California (Lep.), R. E. CAMPBELL (*Pan-Pacific Ent., 4 (1927), No. 2, pp. 77–84*).—The author reports upon the history of this insect as an outdoor pest, the character of its injury, the extent of damage, distribution, description, life history, habits, and seasonal history in California, where it has caused serious loss to the celery industry and attacks several other outdoor crops. Of the internal hymenopterous parasites found, *Rhogas rufocoxalis* Cress. was the most common and *Campoplex phthorimaeae* Cush. was occasionally taken, and it is thought probable that the egg parasite *Trichogramma minutum* Ril. is quite effective.

The microbes pathogenic in Galleria mellonella [trans. title], V. CHORINE (*Ann. Inst. Pasteur, 41 (1927), No. 10, pp. 1114–1125, figs. 6*).—The microbes here reported upon include *Bacterium galleriae*, types 1, 2, and 3, *B. subtilis galleriae*, and *Streptococcus galleriae*.

The European corn borer and its controlling factors in Europe, W. R. THOMPSON and H. L. PARKER (*U. S. Dept. Agr., Tech. Bul. 59 (1928), pp. 63, figs. 3*).—This report is based upon investigations conducted in Europe that were initiated in the fall of 1919. The data are presented under the headings of history and scope of the investigations in Europe; the geographical boundaries, topography, climate, and agriculture of the areas studied; distribution, host plants, and number of generations of *Pyrausta nubilalis* in Europe; the controlling factors of *P. nubilalis* in Europe, including its parasites, inorganic factors of natural control, and artificial control; interrelations and effects of the controlling factors in various parts of Europe; conclusions and recommendations; with a list of 18 references to the literature.

It is pointed out that the European corn borer is very generally distributed throughout Europe and practically always present in corn-growing areas, but that it is rarely of any real economic importance except in certain areas in central Europe. It appears that it is normally controlled by environmental factors over the greater part of its range on the European Continent. The control in Europe is not due to any simple cause, but is produced by a complex group of agricultural, meteorological, and parasitic factors. As the parasites discovered do not all exist together in any one zone yet studied in Europe, and since the composition of the parasitic fauna differs in every region, it is not probable that all the species introduced into America will become acclimatized in any particular zone inhabited by the borer.

The status of the European corn borer problem [trans. title], S. Wilke (*Arch. Naturgesch., 91 (1925), Abt. A, No. 9, pp. 31–72, figs. 14; abs. in Rev. Appl. Ent., 15 (1927), Ser. A, No. 9, p. 480*).—This is a review of the European corn borer problem. It includes three maps showing its distribution in Europe, Germany, and North America, a list of its host plants and its distribution throughout the world, and a table showing the flight periods in various countries. Its bionomics and control are discussed, and a list is given of its insect parasites.

The oriental peach moth, an orchard pest of probable importance in Indiana, L. A. Stearns (*Hoosier Hort., 10 (1928), No. 3, pp. 35–46*).—A practical summary of information on this insect, based upon investigations by the author previously noted (E. S. R., 58, p. 60).

The codling moth: Measures necessary more effectively to control the pest, F. W. Pettey (*Union So. Africa Dept. Agr. Bul. 9 (1926), pp. 15, pls. 7*).—A practical account of the more effective control measures for this pest in South Africa (E. S. R., 56, p. 556; 57, p. 166).

Pericyma cruegeri (Butler): Its life history and economic importance (Noctuidae, Lepidoptera), H. A. Roxas (*Philippine Agr., 16 (1927), No. 4, pp. 229–233, pls. 2*).—This noctuid appears as early as the middle of February in great numbers and defoliates *Peltophorum inerme* (Roxb.), a common shade tree in Manila. This leguminous host plant is indigenous in the Philippines, being found in the wild state along the seacoasts from Batangas to Negros and on the coasts of Mindoro and Palawan. The pest is attacked by the chalcid *Chalcis albotibialis* Ashm. and by other enemies, including the common rice bird.

Strawberry leaf-roller control, B. B. Fulton and M. H. Brunson (*Iowa Sta. Circ. 110 (1928), pp. 8, figs. 4*).—This is a practical summary of information on the control of the strawberry leaf roller, accounts of which by Webster (E. S. R., 40, p. 755) and by Wadley (E. S. R., 48, p. 651) have been noted.

Juniper webworm, Dichomeris marginella Fabr.: Infestation in Los Angeles apparently eradicated, H. J. Ryan (*Calif. Dept. Agr. Mo. Bul., 17 (1928), No. 1, pp. 17–19, fig. 1*).—A brief account of the juniper webworm (*D. marginella*), a European pest which was first recorded from California, at Los Angeles, in January, 1922. The improvement of the infested section of the city appears to have resulted in the eradication of the pest. It is however, known to occur in several eastern localities.

A new larvicide for mosquitoes, R. Matheson and E. H. Hinman (*Amer. Jour. Hyg., 8 (1928), No. 2, pp. 293–296*).—In the authors' work borax in concentrations of 1.5 or more grams per liter of water proved an efficient larvicide for mosquito larvae. Such concentrations of borax retained their lethal action for a considerable period of time, from July 25 to September 7, at which latter time they were as effective as at the beginning of the experiment. The authors

believe that borax will prove to be a practical and safe larvicide in cisterns, rain water barrels, or any type of container where water is stored for purposes other than drinking. Reference is also made to a similar recommendation by Van Dine and King as reported by Pierce in 1921 (E. S. R., 45, p. 658).

Chara fragilis and mosquito development, R. MATHESON and E. H. HINMAN (*Amer. Jour. Hyg., 8 (1928), No. 2, pp. 279–292, fig. 1*).—The authors' studies of *C. fragilis* are said to confirm the observations in Spain in 1919 of A. Caballero[2] who found *C. foetida* to have a marked inhibitory effect on mosquito development. Ponds in which *C. fragilis* grows normally were found by the authors to be free from mosquito larvae. Taken from the pond and cultivated in aquaria, this stonewort was found to be lethal to at least four species of culicid larvae, namely, *Culex pipiens, C. territans, Aedes vexans,* and *Anopheles punctipennis.* The lethal action of this plant seems to be closely associated with high pH, the pH varying directly with the degree of photosynthetic activity.

While the problem of introduction and cultivation of *C. fragilis* in temporary and permanent pools, slow flowing streams, marshy areas, etc., has yet to be attempted, it is pointed out that if successful this plant should be a practical aid as an antimosquito measure.

A list of 22 references to the literature in included.

Studies on the infectivity of plasmodia of birds for mosquitoes, with special reference to the problem of immunity in the mosquito, C. G. HUFF (*Amer. Jour. Hyg., 7 (1927), No. 6, pp. 706–734, figs. 4*).—Two species of mosquitoes, *Culex territans* and *C. salinarius,* are recorded for the first time as susceptible to infection with three species of Plasmodium of birds, namely, *P. cathemerium, P. praecox,* and *P. inconstans. C. pipiens,* previously known as a vector of at least one species of Plasmodium, was found to be a vector of two of the three species and susceptible to infection with the other. *C. quinquefasciatus* and the yellow-fever mosquito, previously known as vectors of one species, were found to be susceptible to two of these species of Plasmodium. Although no infections of these two species of mosquitoes were obtained with the third species of Plasmodium, they can not be considered nonsusceptible to it until a larger number of feedings have been made.

A list of 21 references to the literature is included.

A mosquito survey of certain parts of South Africa, with special reference to the carriers of malaria and their control, Part I, A. INGHAM and B. DE MEILLON (*So. African Inst. Med. Research Pubs., No. 22 (1927), pp. 81, pls. 15*).—The first section of this account deals with a preliminary mosquito survey of portions of the northern Transvaal, the second section with a mosquito survey of the coastal belt of Zululand, and the third section with descriptions of new mosquitoes collected in Zululand and of the larvae and pupae, not hitherto described, of certain other mosquitoes.

The spontaneous regression of malaria in some regions of Italy [trans. title], A. MISSIROLI and L. W. HACKETT (*Riv. Malariol., 6 (1927), No. 2, pp. 193–243, figs. 6; Ital., Fr., Eng. abs., pp. 483, 487, 491*).—The authors' observations and experiments in four regions of Italy noted for the gradual but complete disappearance of malaria during the past century confirm in general the conception of Roubaud (E. S. R., 43, p. 853) and Wesenberg-Lund (E. S. R., 46, p. 459) that the transmission of malaria has ceased because of a change in the habits of *Anopheles maculipennis,* which causes it to seek stabled domestic animals to the virtual elimination of man. The change seems to be an inherited adaptation, amounting to specificity, in the parasitic relationship between *A. maculipennis* and domestic animals.

[2] Bol. R. Soc. Españ. Hist. Nat., 19 (1919), No. 8, pp. 449–455.

Fifth report of the proceedings of the Hayling Island Branch of the British Mosquito Control Institute, R. GREGORY ET AL. (*Brit. Mosquito Control Inst., Hayling Isl. Branch, Hayling Mosquito Control Rpt., 5 (1925–1926), pp. 15, figs. 10*).—This report covers the work during the period from May 1, 1925, to January 1, 1927.

Larviphage fish and antimalarial control with Gambusia in the territory of Rovigno, Istria [trans. title], M. SELLA (*Riv. Malariol., 6 (1927), No. 6, pp. 881–909, figs. 10; Eng. abs., pp. 1010, 1011*).—It is pointed out that Gambusia become perfectly acclimatized in waters with a salt content greater than that tolerated by the larvae of *Anopheles claviger* and *A. elutus*, and that Gambusia of average dimensions are the most resistant to transportation. As a general rule these fish are resistant to freezing when they find mud for shelter. The lack of a soft bed is said to be the cause of the slight resistance observed during the cold season in certain localities of Venetia.

Tabanids breeding in rice fields, W. B. HERMS (*Pan-Pacific Ent., 4 (1927), No. 2, pp. 91, 92*).—An investigation of rice fields in California, particularly in Colusa County, a great rice-producing and dairy section, has shown *Tabanus punctifer* O. S. to occur in great abundance as a pest of the dairy industry. Anthrax, which is known to be transmited by tabanids, is very common in that county, and recently cases of anaplasmosis have occurred in several dairy herds, as reported by Boynton (E. S. R., 59, p. 79).

The cherry fruit fly (Rhagoletis cerasi L.) [trans. title], M. VERGUIN (*Pubs. Agr. Co. Chemins de Fer Paris, Lyon, Méditer., No. 28 (1927), pp. 10*).—A brief practical summary of information on this pest.

Mexican fruit fly situation, Rio Grande Valley, D. B. MACKIE (*Citrus Indus., 9 (1928), No. 1, pp. 14, 26, 32, 37*).—This is a summary of the control work under way based upon observations made by the author along the Mexican border.

A comparative study of the early larval stages of some common flies, S. M. TAO (*Amer. Jour. Hyg., 7 (1927), No. 6, pp. 735–761, pls. 7*).—Through the laboratory rearing of larvae from known flies, here reported upon, the author found it possible to make generic differentiation of the early larval stages of some common flies belonging to the families Muscidae, Calliphoridae, Sarcophagidae, and Anthomyiidae. The structures used to differentiate the early larval stages of different genera are the cephalopharyngeal sclerites, the presence and extent of complete segmental spinose rings or spinose areas, the form of the spines, and the shape of the posterior end of the larva. The general shape of the body is occasionally of value.

A list of 42 references to the literature is included.

The May beetles of Haiti (Scarabaeidae: Coleoptera), G. N. WOLCOTT (*Ent. Soc. Wash. Proc., 30 (1928), No. 2, pp. 21–29, figs. 5*).—The author recognizes seven species of Phyllophaga from Haiti, of which five, namely, *P. kenscoffi*, *P. mali*, *P. audanti*, *P. latiungula*, and *P. minutissima*, represent new species. *P. hogardi* and *P. neglecta* are the other two recorded from the island.

The control of wireworms, H. W. MILES (*Agr. Prog. [Agr. Ed. Assoc., London], 4 (1927), pp. 11–15*).—The author reports upon investigations conducted in Lincolnshire with trap baits and soil insecticides, particularly calcium cyanide.

Land with approximately 170,000 wireworms per acre, largely *Agriotes obscurus*, was cleared, and selected baits were set 2 to 4 in. deep in triplicate rows each 10 yds. long and 5 ft. apart. These were left undisturbed for 14 days and then sifted out, when it was found that wheat had attracted an average of 40 wireworms per row, bran 54, oats 53, peas 45, beans 43, and potatoes 27.

In tests of the possibilities in baiting land before the sods had decayed, wheat attracted 45 wireworms, oats 24, brewers' grains 15, rape meal 10, castor meal 7, rape cake dust 9, wet bran 8, dry bran 4, bran sweetened with sugar 7, bran sweetened with treacle 9, bran and wheat mixed 11, and malt culms 4, 14 samples being used in each case. While there was a large depletion of the stock of wireworms by birds, additional evidence was obtained of the toxicity of calcium cyanide.

Beekeeping in Oregon, H. A. SCULLEN (*Oreg. Agr. Col. Ext. Bul. 401 1927), pp. 32, figs. 17*).—This is a revision of the bulletin previously noted (E. S. R., 49, p. 762).

The use of honeybees as pollinating agents on cranberry bogs, R. HUTSON (*Amer. Cranberry Growers' Assoc. Proc., 57 (1926–1927), pp. 10, 11*).—A brief account in which it is pointed out that the use of honeybees on cranberry bogs depends upon whether it is profitable to use them as an insurance against a lack of pollinators in years when the number of bumblebees is insufficient. See also a previous note (E. S. R., 55, p. 663).

Peculiarities in the structure of the Caucasian queen bee (Apis mellifera) [trans. title], V. O. PIKEL (*Trudy Kuban. Selsk. Khoz. Inst. (Arb. Kuban. Landw. Inst.), 3 (1925), pp. 145–148*).—The peculiar condition of many queens of the Caucasian bee led the author to conduct the anatomical study here reported.

Further studies of Bacillus larvae, the cause of American foulbrood of bees, A. G. LOCHHEAD (*Canada Expt. Farms, Div. Bact. Rpt. 1926, pp. 13–16*).—This report of further studies of *B. larvae* (E. S. R., 56, p. 362) includes an account of its growth requirements, cultural and biochemical characteristics, and nitrate production.

New coccid-inhabiting chalcidoid parasites from Africa and California, H. COMPERE (*Calif. Univ. Pubs. Ent., 4 (1928), No. 8, pp. 209–230, pls. 3*).—Three genera and eight species of chalcidoid parasites reared from coccids are here described as new. One species, *Microterys claripennis* n. sp., commonly reared from *Eulecanium corni* Bouché, is a serious pest of deciduous fruit trees. *Neococcidencyrtus alula* n. g. and sp. is a fairly effective internal parasite of *Diaspis zamiae* Morg., but is relatively unimportant as it is only known to attack cycads.

Two undescribed aphelinid scale parasites from Delaware (Aphelinidae: Hymenoptera), H. L. DOZIER (*Ent. Soc. Wash. Proc., 30 (1928), No. 2, pp. 35–38, figs. 2*).—In this contribution from the Delaware Experiment Station the author describes *Azotus americanus* n. sp., reared from the San Jose scale, and *Prospaltella forbesi* n. sp., reared from the cherry scale.

ANIMAL PRODUCTION

Physiology of the ruminant stomach (bovine): Study of the dynamic factors, A. F. SCHALK and R. S. AMADON (*North Dakota Sta. Bul. 216 (1928), pp. 64, figs. 26*).—By means of a gastric fistula, the authors have made a study of the stomach of ruminants, using direct visual inspection, direct palpation, and graphic records (E. S. R., 55, p. 768) in this work. The latter records were made with toy balloons in the various stomachs, hooked up with water manometers and air transmission which recorded the movements of the muscles on glazed kymograph paper coated with carbon.

During the eating period both forage and grain were but partially and incompletely masticated, approximately 50 per cent of shelled corn kernels reaching the stomach uncrushed. All food is deposited from the cardia in the region of the rumino-reticular fold. From here the light forage is carried posteriorly

to the depths of the rumen, the heavier grain remaining in the reticulum and anterior rumen sac where it disintegrates.

The movements of the rumen and reticulum are characteristic and well established for each phase of activity. A primary wave of peristalsis, which requires about 60 seconds to complete, starts in the region of the cardia and spreads posteriorly, terminating in the ventral rumen. A second wave, requiring about 30 seconds, starts in the area about the anterior pillar and follows the same course as the preceding wave. These waves constitute a rather constant one to two rhythm in these parts. Motility of the waves is slowest during rumination, increases perceptibly during the resting period, and is markedly accelerated when the animal is eating.

Rumination was found to depend upon proper stimuli, the nature and quantity of food, and definite moisture requirements. When these requirements are fulfilled there is an extra reticular contraction just previous to the diaphragmatic contraction and immediately previous to the regular reticular contraction. The cardia is submerged with a volume of porridge-like material, the glottis closes, the cardia opens funnel-like, the ingesta rushes in, the cardia closes, and the bolus is formed and goes up the esophagus helped by antiperistalsis and possibly by a vacuum-like suction. Neither the esophageal groove, special contractions of the rumen, nor abdominal muscles take part in regurgitation, and the bolus is composed almost entirely of forage.

Practically all of the ingested water is deposited in the rumen and reticulum and does not follow the course of the esophageal groove. An adequate supply of water is essential for physiological rumination, and many cases of suppressed rumination are due to insufficient water. Saliva, which enters the stomach at intervals during the resting stage, is also a source of moisture.

The study led to the conclusion that the esophageal groove functions only in the nursing calf and in animals on an exclusive milk diet. Foreign bodies ultimately lodge in the reticulum. The ingesta of the rumen and reticulum enter the omasum only when reduced to a certain finely ground condition. The passage to the omasum opens during the latter phase of the second reticular contraction, allowing a small quantity of food to pass at approximately 60-second intervals. A graphic record shows the movements of the omasum to be slow and deliberate. The ingestion of food diminishes the power but increases the frequency, while rumination decreases the frequency but improves the regularity of these movements.

The ingesta of the abomasum is always in a semiliquid condition, and since the walls are thin and usually more or less dilated, the pressure changes frequently, giving fluctuations in the graphic record of its movement.

The composition of the urine of steers as affected by fasting, T. M. Carpenter (*Amer. Jour. Physiol., 81 (1927), No. 3, pp. 519–551*).—In this study of the effect of fasting upon the urine of steers, the data have been taken from work previously reported by the Nutrition Laboratory of the Carnegie Institution of Washington (E. S. R., 57, p. 863.)

The minimum nitrogen excretion for adult steers was found to be from 1.6 to 1.7 gm. per hour and between 0.064 and 0.075 gm. per kilogram of body weight per 24 hours. The rate of elimination of urinary constituents tended to decline as the fast progressed, depending upon the previous ration, with the exception of a rise in inorganic sulphates and a marked increase in urea, which were determined only in fasts following a submaintenance ration. The greatest decline took place in the first 4 to 6 days, and the rise in the chlorides and total fixed bases following this fall indicated the destruction of tissues or diminution of body fluids as the fast progressed. The increase in the total nitrogen excre-

tion was an exception to the general trend during fasts following submaintenance feeding for both adult and young steers.

Fasting had no effect upon the value of the creatinine coefficient. Creatine was present in short fasts with adult animals, but disappeared as the fasts progressed, while with the younger steers it increased in amount. There was a lowering in the percentage of amino-acid and hippuric-acid nitrogen and an increase in the percentage of urea nitrogen during fasting. The percentage of inorganic sulfur was low and ethereal sulfate high at the start of fasting, with a reversal in the relative proportions as the fast progressed.

The disappearance of the effect of previous food is reached by the fourth to sixth day, as indicated by the constancy reached at this time in the chlorides, phenols, fixed bases, organic acids, and nitrogenous constituents.

Methods and cost of raising lambs to marketable age, R. S. Curtis and F. T. Meacham (*North Carolina Sta. Bul. 253 (1928), pp. 28, figs. 9*).—The methods of management for producing early lambs, the cost of maintaining the ewe flock, and the cost of getting lambs into marketable condition have been the objects of a study at the Piedmont Substation. The test was started with native and crossbred ewes in 1915, and these were crossed with purebred Hampshire rams to the close of the study in 1927.

The system of breeding ewes in July for lambing in December and January proved very satisfactory. Under this system the lambs could usually be marketed within nine months from the time of conception, they escaped hot weather and the ravages of stomach worms, and they sold usually on a high market. The value of pasture was clearly demonstrated in this test, the highest percentage of lambs being raised during the years when pastures were good and the cost of producing the lambs least during such years. The cost of producing lambs to marketable age varied from $7.53 in 1926–27 to $11.87 in 1924–25, but in spite of these high costs the lambs were always worth more than this amount. The ewes returned an average profit of $3.16 per head for the wool over a period of 12 years.

The authors concluded that the keeping of sheep under North Carolina conditions is a profitable side line when proper systems of management are followed.

A study of the value of artificially cured alfalfa for feeding swine, F. G. Helyar (*New Jersey Stas. Rpt. 1927, pp. 73–75*).—In a comparison of alfalfa meal prepared by artificial drying and tankage which had been cooked for 12 hours to destroy the vitamin A content, pigs made fairly satisfactory gains whether fed white or yellow corn. The pigs receiving tankage were slightly more efficient in the use of their feed than those receiving alfalfa meal. During a 56-day feeding period no pigs showed signs of vitamin deficiencies, but it is possible for pigs to have enough vitamins stored to carry them over a period of this length.

Report of proceedings of the World's Poultry Congress, Ottawa, Canada, July 27 to August 4, 1927 (*Ottawa: Mortimer Co. [1928], pp. XX+538, figs. 133*).—The executive material and other miscellaneous information are included in the first section of these proceedings (E. S. R., 55, p. 165; 57, p. 301). In addition the papers presented at the various sections of the congress, with the exception of the section on disease noted on page 369 are as follows:

Breeding.—International Standard for Breeding and Exhibition Fowls, by T. F. Rigg (pp. 51, 52); On the Origin of the Domestic Breeds of Poultry and Their Classification, by A. Ghigi (pp. 52–54); The Origin of the Canadian "Chantecler" Fowl, by M. Wilfrid (pp. 55–57); A New Spanish Breed of General Purpose Poultry "Paradis," by H. Castello dé Plandolit (pp. 57–60); On "Nagoya," One of Dual-Purpose Poultry Breeds Originated in Japan, by S.

Susaki (pp. 60–63); The Breeding of Exhibition Poultry in America, by E. B. Thompson (pp. 63, 64); Exhibition Poultry Breeding, by W. M. Elkington (pp. 64–67); Pedigree Poultry Breeding in Great Britain, by C. A. House (pp. 67–70); The Future of the Poultry Show in the Development of the Poultry Industry in America, by J. H. Robinson (pp. 70–72); Canada's National Poultry Registration Program, by A. G. Taylor (pp. 72–75); Results of the Laying Contests and Record of Egg Production in Poland, by M. Trybulski (pp. 76–78); Egg-Laying Tests, by A. McCallum (pp. 78–81); A New Method of Recording Eggs in the Egg-Laying Contests by the "Quotient System," by E. P. de Villaamil (pp. 81–83); The Significance of Judging Poultry for Production, by J. E. Rice (pp. 83–87); Some Phases of Reproduction in Domestic Fowl, by H. D. Goodale (pp. 87–92); The Inheritance of Persistency and Its Relation to Fecundity, by F. A. Hays (pp. 92–95); An Improved Method of Testing the Quality of a Breeder's Entire Flock, by A. L. Hagerdoorn (pp. 95–98); The Developmental Capon and Poularde, by F. A. E. Crew (pp. 98–102); The Application of Genetic Principles to a Farm Flock Breeding Program, by J. H. Martin (pp. 103–105); On the Sex-Linked Inheritance of Tail-Feathering in Chicks and Their Sex-Identification, by Y. Kinugawa (pp. 105–111); The Bearing of Genetics on the Development of the Poultry Industry, by W. A. Lippincott (pp. 111–113); Inheritance of Some Genetic Factors in Poultry, by C. W. Knox (pp. 113–118); The Inheritance of Body-Weight in the Brahma-Leghorn Cross in the Domestic Fowl, by H. G. May and N. F. Waters (pp. 118–122); Some Data on the Inheritance of Body Shape in Crosses between Leghorns and Orpingtons, by S. Kopec (pp. 123–126); Results of Some Crosses between Table and Egg Breeds, by A. Ghigi and A. Taibell (pp. 126–129); A Study of the Changes in the Distribution of First Year Eggs within a Flock of S. C. White Leghorns at the University of British Columbia, by V. S. Asmundson (pp. 129–137); Experimental Intersexuality among Gallinaceous Birds and Its Effect on Secondary Sexual Characters, by A. Pezard and Caridroit (pp. 137, 138); Canadian Record of Performance for Poultry, by W. A. Brown (pp. 138–141); Correlation between the External Characteristics of a Hen and Her Egg Production, by H. H. Scholten (pp. 141–143); The Relation of Maturity to Egg Production, by H. L. Kempster (pp. 143–147); Investigation concerning the Heredity of Colour in Ducks, by A. Ghigi and A. Taibell (pp. 147–149); The Method of Awarding Prizes at Exhibitions of Utility Poultry in Germany, by L. Weinmiller (pp. 149–151); Egyptian Methods of Incubation, by M. Askar (pp. 151–156); The Rudimental Copulatory Organ of the Male Domestic Fowl, with Reference to the Difference of the Sexes in Chickens, by K. Masui (p. 156); On the Vitality of the Spermatozoa of the Domestic Fowl in the Egg-White Solution, by H. Motohashi and M. Moritomo (pp. 157–159); A Contribution to the Study of Testicles of Abnormal Appearance in Cocks, by J. Pujiula (pp. 160–165); Producing the Hatching Eggs of the Nation, by F. S. Townsley (pp. 165–167); The Development of the Baby Chick Industry in Relation to Its Influence on the Poultry Breeding Industry of the United States, by H. H. Knapp (pp. 167–170); Poultry Improvement through Official Accreditation and Inspection of Commercial Hatcheries and Breeding Flocks, by H. M. Lackie (pp. 171–174); Problems in the Distribution of Baby Chicks, by G. R. Spitzer (pp. 174–177); and The Early Care and Brooding of Chicks, by R. E. Jones (pp. 177–180).

Nutrition.—Poultry Foods and Feeding from the Research Standpoint, by E. T. Halnan (pp. 181–183); A Consideration of the Protein Requirements of Growing Birds, by W. F. Holst (pp. 183–187); Problems in Poultry Feeding, by G. M. van der Plank (pp. 187–189); Variation in Poultry Feed Ingredients

and the Effect on the Balance of Nutritive Essentials in the Ration, by A. F. Rolf (pp. 189–194); The All-Mash Method of Feeding Chickens, by D. C. Kennard and R. M. Bethke (pp. 194–199); Some Protein Values in Poultry Nutrition, by C. W. Carrick (pp. 200–202); The Basal Heat Production of Cockerels, Pullets, and Capons of Different Ages, by H. H. Mitchell and L. E. Card (pp. 202–207); Nutritional Factors Affecting Hatchability of Eggs, by F. G. Heuser (pp. 207–214); Importance of Ultra Violet Light in the Poultry Industry, by J. S. Hughes, L. F. Payne, and W. R. Hinshaw (pp. 214–221); The Value of Certain Feeds of High Vitamin Content for Laying Hens, by R. T. Parkhurst (pp. 221–226); Increase in Weight of Chicks in Relation to the Carbohydrates in Their Ration Supplemented by Flour of the Chrysalis of the Silkworm, by A. Taibell (pp. 226–228); Importance of Minerals in Rations for Laying Hens and Growing Chicks, by J. G. Halpin (pp. 228–231); The Use of Calcite and Other Natural Deposits of Calcium Carbonate in the Ration of Laying Hens, by B. Alder (pp. 231–234); Calcium Metabolism of the Laying Hen, by G. D. Buckner (pp. 234–236); Sussex Methods of Table Poultry Production, by J. H. Dowden (pp. 236–239); Poultry Feeding in Germany, by R. Roemer (pp. 239–243); British Methods of Poultry Feeding, by T. Newman (pp. 243–246); The Vitamin A and Vitamin D Content of Cod Liver Meal, by E. M. Cruikshank (pp. 246, 247); The Utilization of the Waste Products of the Fishing and Silk Industries in the Feeding of Poultry, by A. Vecchi (pp. 247–250); The Economic Fattening of Rhode Island Red Cockerels, by R. Giuliani and C. Ruiz (pp. 250–252); The Influence of Caponising upon the Metabolism of Cocks, by J. G. Szuman (p. 253); and The Influence of Castration upon Nutrition, by A. Pezard (p. 254).

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General.—Influence of Climate, Food, Conditions, and Tastes on Several Breeds of Standard-Bred Poultry in Connection with Their Names and Standards, by C. S. T. Van Gink (pp. 495–498) ; Poultry Raising in Java, by Hoofd (pp. 498, 499) ; India's Contribution to the Poultry Industry, by Mrs. A. K. Fawkes (pp. 499–502) ; Some Important Examples of Industrial Poultry Raising in Italy, by A. Pirocchi (pp. 502–504) ; Poultry Farming in Ravenna, by M. Marani (pp. 504–506) ; On the Distribution of the Principal Breeds of Fowls in Japan (pp. 506–508) ; Rabbit Breeding in Belgium, by F. Van Hout (pp. 508–510) ; Poultry Keeping in Egypt, by M. Askar (pp. 510–514) ; Turkey Raising in the United States, by H. E. Cushman (pp. 514–518) ; The Position of Women in the Poultry Industry, by Mrs. H. Maciver (pp. 519–521) ; The Promotion of the Poultry Industry in Canada through Farm Women's Clubs, by G. Bouchard (pp. 521–524) ; The Economic Value of the Farm Flock, by Mrs. H. M. Aitken (pp. 525–527) ; Ducks as Egg Producers, by O. C. Brown (pp. 527–529) ; Poultry Housing in England and Wales, by C. H. Eden (pp. 529–534) ; and Encouragement of the Poultry Industry by the Italian Railways, by M. Gisondi (pp. 534, 535).

[**Poultry experiments at the New Jersey Stations**], W. C. Thompson (*New Jersey Stas. Rpt. 1927, pp. 248, 249*).—Two experiments are briefly noted.

Eggshell experiments.—Several flocks of laying birds have been fed rations varying as to mineral content in an effort to determine the cause of weak-shelled eggs. To date the data indicate that the eggs from birds receiving a calcium carbonate grit or oyster-shell grit have strong shells and those from birds receiving noncarbonate grit are generally weak.

Short-time trap-nest records.—The results of predicting annual records of 644 White Leghorn pullets that completed a full laying year at the 1925–26 Vine-

land contest are published in table form. The work has been carried out along somewhat changed lines from those previously noted (E. S. R., 50, p. 779).

The cost of producing eggs with Single Comb White Leghorns, B. F. KAUPP (*North Carolina Sta. Bul. 254 (1928), pp. 1–7, fig. 1*).—Single Comb White Leghorns were used in a test at the Mountain Experimental Farm to determine the cost of producing eggs. The birds were housed in a half-monitor house provided with windows and open front with drop curtains. The ration fed consisted of a dry mash available at all times, 14 lbs. of scratch grain per day, 7 lbs. of green feed per 100 birds, limestone grit or calcite crystals, and fresh water at all times. An inventory was taken at the beginning and end of the test, and all expenses and returns were charged to the birds.

Each hen was charged 70 cts. in the flock depreciation, $2.05 for feed, 24 cts. for labor, 26 cts. for depreciation in buildings, and 12 cts. for interest on investment. Miscellaneous charges brought the total cost to $3.54 per bird. The returns per hen were $5.94, leaving a net profit of $2.40 per hen. It required 6 lbs. of feed to produce 1 doz. eggs, and this with other charges brought the cost per dozen to 25 cts.

Of the 750 birds in the flock at the beginning of the year, 10 per cent died, and of the remainder, 368 were culled and sold for table use.

Studies on the physiology of reproduction in birds.—XXII, Blood fat and phosphorus in the sexes and their variations in the reproductive cycle, O. RIDDLE and F. H. BURNS (*Amer. Jour. Physiol., 81 (1927), No. 3, pp. 711–724, fig. 1*).—Further studies of the blood of ring doves have been made at the Carnegie Station for Experimental Evolution to determine the blood fat and phosphorus during the reproductive cycle (E. S. R., 56, p. 67).

In the female doves the amount of alcohol-ether-soluble substance during the ovulation cycle was increased to 35 per cent over the normal or "resting" value. The phosphorus content in this extract was increased to 50 per cent over normal. This increase in fat and phosphorus of the blood recurs with each ovulation period, and continued egg production caused the metabolism of fat and phosphorus to be brought to and maintained temporarily at a high level. The fat and phosphorus attained their maximum from 45 to 67 hours prior to the occurrence of the ovulation period. This fact, together with the known relations of the ovary to fat metabolism, suggests that the ovary itself is responsible for the observed changes in the reproductive cycle.

Normal male doves were found to have 1.77 gm. of blood fat per 100 cc., as compared to 2.02 gm. per 100 cc. for normal females.

The literature dealing with blood fat as a sex differential is reviewed by the authors.

DAIRY FARMING—DAIRYING

[Experiments with dairy cattle at the New Jersey Stations], (*New Jersey Stas. Rpt. 1927, pp. 58, 102–104*).—Three experiments are noted.

The effect of processing upon the nutritive value of food stuffs, W. C. Russell.—In a study of the effect of artificial curing of alfalfa hay, it was found that the vitamin A content of hay cured at 185° F. was greater than that of hay cured on the ground during rainy, cloudy weather. Samples dried by momentary exposure to temperatures of from 850 to 950° and from 1,250 to 1,350° showed no loss of vitamin A content when compared with samples of the same hay cured in the field under good haying conditions.

Minimum milk requirement for raising dairy calves, C. B. Bender.—Grade Holstein calves fed a dry grain mixture composed of 100 lbs. of yellow corn meal, 150 lbs. of ground oats, 50 lbs. each of linseed meal, wheat bran, and soluble blood flour, and 3 per cent of minerals in place of milk averaged 99.9

per cent normal for height and 99 per cent normal for weight after 80 days' feeding. The hay fed during this trial was of very poor quality alfalfa.

Investigation on the feeding of parsley seed meal, C. B. Bender.—A preliminary feeding trial, using the reversal method, showed no difference in production when parsley seed meal was substituted for oats and bran in a dairy ration. Two mature Holstein cows were fed for a year on such a ration. An analysis of their weights, production, and breeding capacity showed no apparent changes from their history in the preceding lactation period.

Studies of protein metabolism, mineral metabolism, and digestibility with clover and timothy rations, L. A. Maynard, R. C. Miller, and W. E. Krauss (*New York Cornell Sta. Mem. 113 (1928), pp. 33*).—Three experiments consisting of two trials each, one in which a clover hay ration was fed and one in which a timothy ration was fed, and using three purebred Holstein cows, were conducted to determine the protein and mineral metabolism and the digestibility of the rations as affected by these roughages. Each trial was divided into a transition, a preliminary, and a collection period. The ration of hay, grain, and silage was arranged to supply total digestible nutrients according to the Morrison standard, but the protein intake was limited to an amount that would cause the animals to be in slight negative nitrogen balance.

In the first two experiments there was a marked drop in milk production when the cows were placed on test, but during the experimental periods the decline was in general no greater than would be expected in view of advancing lactation. In the third experiment the cows had been on restricted protein intake for 40 days prior to the experiment proper, causing a drop in production which continued during the experimental periods, indicating that the lower plane of protein intake had a tendency to accelerate the normal drop in production which occurs with advancing lactation. The live weight of the animals was well maintained throughout the experiments, indicating that the rations were adequate from this standpoint. There was an average percentage utilization of the protein with the clover ration of 54.82±1.7 and with the timothy ration of 58.05±2. The difference was not significant, but does show that the use of clover hay in a ration makes it no more efficient from the standpoint of protein utilization than when timothy hay is used. A positive balance was maintained on a protein level much below the theoretical requirements of the Morrison, Armsby, and Eckles standards. The authors believe that the protein requirements of the lactating cow are lower than those of the nonlactating cow, assuming that the above standards are correct for the mature, nonlactating animal.

The mineral metabolism study showed that while the calcium balance was negative in all but one case it was nearer to positive when clover hay was fed. The phosphorus balance was negative in all but two cases, but the balance was nearer positive when timothy was fed. The calcium and phosphorus content of the milk varied but little in the study, although the phosphorus content tended to increase slightly with an increase in this nutrient. The data suggest the desirability of further study of the supply of calcium and phosphorus and the ratio between them to secure better assimilation of either.

A comparison of the theoretical and observed digestibility showed a marked depression from the calculated coefficients of protein and crude fiber and a slight depression for nitrogen-free extract, while the fat results were variable. The depression of the digestibility of protein was greater with the clover than with the timothy hay ration, and this was also true for crude fiber in 2 of the 3 experiments. It is suggested that the differences in depression of the digestibility noted were the result of some modifications in the fermentation processes of the digestive tract.

Studies in the normal depositions of minerals in the bones of dairy calves, J. H. KRUGER and S. I. BECHDEL (*Jour. Dairy Sci., 11 (1928), No. 1, pp. 24–34*).—The composition of the frontal, ribs, femurs, and humeri of seven normal male Holstein calves was studied at the Pennsylvania Experiment Station. The calves were purchased when 3 to 4 days old and gradually changed from whole to skim milk during a 2-week period. The feeding schedule suggested by Eckles (E. S. R., 50, p. 577) was followed, and in addition to skim milk the calves received alfalfa hay and a calf grain mixture. One calf was killed at each of the following ages: 60, 90, 120, and 150 days, and 3 at 180 days.

The analyses indicated that all the bones except the frontal are suitable for the study of mineral deposition. The early calcification of the frontal bone makes it of little value. The complete bones gave truer results than a cross-section portion of them. The calcium and phosphorus percentage in the bone ash is nearly constant and varies but slightly with age. The percentage of water decreases and the percentage of ash and organic matter increases with age. Ash replaces the greater part of the decrease in percentage of water. The authors point out that the data reported represent but a beginning since but little work has been done previously regarding the mineral requirements of growing animals.

On the weight of newborn calves [trans. title], N. N. PELEKHOV (PELECHOFF) (*Trudy Vologodsk. Moloch. Khoz. Inst. (Arb. Milchw. Inst. Vologda) Bŭl. 56 (1925), pp. 17*).—The birth weights of calves over a period of nine years were recorded at the Vologda Dairy Institute, Russia. There were indications that the birth weight was influenced by better feeding during pregnancy. However, a prolonged lactation period reacted unfavorably on the dam and hence on the offspring. The weight of the offspring tended to increase with the age of the dam due to the increase in size of the dam.

Influence of temperature on the changes produced in milk by certain bacteria, R. S. SARKARIA and B. W. HAMMER (*Jour. Dairy Sci., 11 (1928), No. 1, pp. 89–101*).—Duplicate tubes of milk inoculated with different organisms were studied at the Iowa Experiment Station at room temperature and at 37° C. (98.6° F.). The organisms used were the lactic acid bacteria and those belonging to the proteolytic type. Acid and soluble nitrogen determinations and bacterial counts were made on each tube at various intervals over an extended period.

With the true lactic forms the type of change in the milk was not influenced by the temperature although the rate was. The difference in temperature did influence the gas-forming lactic acid organisms, and the greatest difference was noted with certain of the proteolytic organisms and involved the formation of a more definite curd at 37° than at room temperature. From these results the authors deem it necessary to give definite information as to temperatures used when changes produced in milk are recorded in the descriptions of organisms.

Bacteria count limits and the transportation of milk, J. D. BREW and R. C. FISHER (*New York Cornell Sta. Bul. 460 (1928), pp. 37, fig. 1*).—Two experiments are reported in which the bacterial content of milk upon leaving the shipping point and on reaching its destination was determined. In one trial the milk was hauled approximately 60 miles and in the other about 4 miles. Samples of both night and morning milk were taken before shipping and upon arrival at destination for bacterial analysis. The temperature of the milk at shipping time, the temperature of the outdoor air, and the temperature of the milk on arrival were also noted. The milk samples were plated as soon after

taking as possible and plate counts made as soon as stained. The detailed counts of samples are given in tabular form.

The bacterial counts of the milk both at shipping time and upon arrival at destination varied greatly, due largely to the manner of handling by the producer. The authors believe, however, that a count as low as 100,000 per cubic centimeter is entirely possible in cities where the milk is on the road for only a few hours. Many of the standards of cities in the State for bacterial count are so lenient as to promote carelessness by the producers. However, where a hard and fast ordinance for low bacterial count is enforced, the authors believe that there should be a certain percentage of tolerance allowed because of the fact that it is impossible to set any definite number beyond which milk is not clean. Differences in individual counts make a percentage of tolerance advisable. Even though the temperature of milk was increased during a shipping period of 5 hours the increase in bacterial growth should be negligible if the milk was properly handled.

A comparison of three methods of pasteurizing milk for Cheddar cheesemaking, W. V. Price and P. S. Prickett (*Jour. Dairy Sci., 11 (1928), No. 1, pp. 69–78*).—The flash, the flash-holder, and the holder methods of pasteurizing milk were compared at the New York Cornell Experiment Station for making Cheddar cheese. Cheese was also made from raw milk. The milk pasteurized by each method was made into the best possible cheese following the procedure previously described (E. S. R., 57, p. 374). Bacterial analyses were made of the raw and pasteurized milk, and the cheeses were scored for quality at 4 and 8 months of age.

The flash method destroyed 98.31 per cent of the bacteria in the original milk, the flash-holder method 98.65, and the holder method 98.96 per cent. The gain in total score of the cheese made from milk pasteurized by the flash method over the raw milk cheese was 1.91 points, for the flash-holder cheese 2 points, and for the holder cheese 1.94 points at 4 months of age, and 1.89, 3.12, and 2.7 points, respectively, at 8 months of age. From 100 lbs. of raw milk 9.92±0.16 lbs. of cheese was made, from 100 lbs. of milk pasteurized by the flash and flash-holder method 10.18±0.16 lbs., and from the holder method milk 10.32±0.17 lbs. Analysis of the cheese indicates that the increase in yield of the pasteurized cheese is due largely to its increase in moisture content.

Variability in composition of butter from the same churning in relation to working, V. C. Manhart (*Jour. Dairy Sci., 11 (1928), No. 1, pp. 52–65*).—In an investigation at the Indiana Experiment Station to determine the effect of prolonged working of butter upon the distribution of the water, salt, curd, and fat content, 9 samples were taken from each of 10 churnings for analysis. During the working process 3 samples were taken when the butter had been worked 30 revolutions. 45 revolutions, and 60 revolutions, respectively. One of each set of samples was taken from the gate end of the churn, 1 from the middle, and 1 from the gear end. The cream used in the test had been handled in the usual method followed at the station creamery.

The variations in the composition of the butter diminished as the working process was prolonged. The coefficient of variability in salt content was 7.31 per cent at 30 revolutions, 5.73 per cent at 45 revolutions, and 4.51 per cent at 60 revolutions; in curd content 7.20, 6.53, and 5.49 per cent; in fat content 0.26, 0.23, and 0.21 per cent; and in water content 0.73, 0.75, and 0.83 per cent, respectively. Of the nonfatty constituents, salt exerted the greatest influence on variability, water next, and curd the least. In large churnings the variability in water content was greater at 60 revolutions than at 30.

[Experiments with dairy products at the New Jersey Stations], F. C. Button (*New Jersey Stas. Rpt. 1927, pp. 104–106*).—Results of two experiments are noted.

The effect of different pasteurizing temperatures and different homogenizing pressures on the viscosity of ice cream mixes, and their effect on the frozen product.—Ice cream mixes were pasteurized as follows: (1) 145° F. and held for 30 minutes, (2) 155° and held for 20 minute, (3) 180°, cooled immediately to 145° and held 30 minutes, and (4) 180°, cooled to 155° and held 20 minutes. Samples from each method of pasteurizing were homogenized at 1,500, 2,500, and 3,500 lbs. pressure, and a fourth portion used as a check was not homogenized. Each batch was aged for 24 hours, the viscosity determined at 68°, and then frozen and hardened in the usual manner. After hardening 24 hours samples of each batch were allowed to melt completely. Titratable acidity was determined on each sample both before and after hardening.

Pasteurization above 145° decreased the viscosity of the mix, but had no apparent effect upon the frozen product. Homogenization increased the viscosity of the mix both before and after aging, and each increase in pressure caused a corresponding increase in viscosity regardless of the temperature of pasteurization. Homogenization improved the body, texture, and ability of the frozen samples to stand up under melting conditions. The titratable acidity did not increase during aging.

These results indicate that 145° is the best temperature for pasteurizing and 2,500 lbs. the best pressure for homogenizing.

The effect of viscolization on the wheying off properties of culture skimmed milk and buttermilk.—The use of a viscous starter aided in preventing whey formation, and the presence of fat increased the ability of the product to stand up without wheying off. Violent agitation of the soured product and viscolizing the milk before culturing increased the wheying off. Viscolizing after culturing did not retard wheying off unless acidity was low and at least 2 per cent fat was present. Temperatures below 50° F. retarded wheying off. Cultured skim milk, viscolized when acidity was present in just the right amount to start coagulation and with 2 per cent of fat present, did not whey off when stored for one week at 45°.

The manufacture of buttermilk drinks, W. H. E. Reid (*N. Y. Prod. Rev. and Amer. Creamery, 65 (1928), No. 16, pp. 628, 630, 632*).—After a brief discussion of the history and manufacture of various fermented milks, the author gives the results obtained at the Missouri Experiment Station designed to demonstrate methods of producing such milk that will not "whey off" in a reasonable length of time.

Five 1-pint samples of milk with an acidity of 0.16 per cent were heated to 190° F. for 40 minutes to destroy all bacteria present, cooled to 70°, inoculated with 1 per cent of a culture of *Streptococcus lacticus* and *Bacterium acidi lactici*, and held until coagulation started, which took place in 7 hours. They were then cooled to 42°, held until the next day, and examined. Samples were also prepared in the same manner as above, except that before heating gelatin was added to four of them in the following amounts: 0.25, 0.55, 0.75, and 1 per cent, respectively. These samples were scored the next day and again after aging 6 days.

After standing 1 day, the check sample had an acidity of 0.7 per cent and was free from gas and whey. Before shaking, the body was medium firm and the aroma medium full, clean, and pleasant. After shaking, the body was smooth, velvety, and fairly firm and the flavor clean and desirable. After standing 6 days, there was a decided wheying off, the body was weak, the

aroma improved, and the flavor unchanged. Adding gelatin prevented wheying off, but except in the sample containing 0.25 per cent gelatin the body after standing 6 days was entirely too firm. Gelatin had no apparent effect upon the flavor or aroma, although it did cause the product to acquire a slight yellowish color in samples in which the larger amounts were used. Repeating the tests using 0.1, 0.25, 0.5, and 0.75 per cent gelatin gave practically the same results. The author concludes that the use of 0.1 and 0.25 per cent gelatin prevents wheying off for as long as it is customary to retain the product, and that these amounts give the best results as to firmness of body.

VETERINARY MEDICINE

Anaplasmosis of cattle in the United States, L. T. GILTNER (*Jour. Amer. Vet. Med. Assoc., 72 (1928), No. 6, pp. 919–928; also in U. S. Livestock Sanit. Assoc. Rpt., 31 (1927), pp. 919–928*).—The author discusses briefly the history and occurrence of this disease in the United States, its geographical distribution throughout the world, symptoms, changes in the blood, nature of the causative organism, incubation period, ticks and flies as vectors, post-mortem findings, differential diagnosis, treatment, and immunization with "incubation virus."

The disease is known to occur in the United States in California, Kansas, Oklahoma, and Florida. The author reports upon an outbreak among dairy cattle in Florida, where it assumed a very virulent form, the losses amounting in some instances to 30 per cent of the herd.

In the discussion which follows, G. W. Stiles (pp. 928–930) reports upon an investigation made of the disease in Oklahoma and Kansas. From a questionnaire that he sent to practitioners in these two States the disease was found to occur in 22 of the 77 counties in Oklahoma and in 22 of the 87 counties in Kansas. Of the 71 reports received from practicing veterinarians in Kansas, 17 reported 324 cases, with 128 deaths, or about 39 per cent mortality. Of the 32 reports received from practitioners in Oklahoma, 12 reported 114 deaths and 303 cases, or a mortality of 26 per cent.

D. M. Campbell (pp. 931, 932), in discussing the occurrence of the disease in Kansas, reported that the administration of 120 grains of sodium cacodylate to 1,400-lb. animals intravenously brought about recovery of the animals.

"Anaplasmosis" in cattle, C. C. HISEL (*Vet. Med., 24 (1928), No. 1, p. 14*).—The author reports more or less wide distribution of anaplasmosis in cattle in Oklahoma, where it occurs in at least 10 or 12 counties. Several hundred head of cattle succumbed to the disease in Oklahoma within a period of 90 days previous to the time of writing, and the disease is also known to occur in southern Kansas and Florida. An account of its occurrence in California by Boynton has been noted (E. S. R., 59, p. 79).

The relation of the agglutination test to the presence of Brucella abortus in the body of the bovine, I. F. HUDDLESON, J. P. TORREY, and E. R. CARLSON (*Jour. Amer. Vet. Med. Assoc., 72 (1928), No. 6, pp. 889–901, fig. 1; also in U. S. Livestock Sanit. Assoc. Rpt., 31 (1927), pp. 889–901, fig. 1*).—This is a contribution from the Michigan Experiment Station which considers some aspects of the agglutination test as regards its significance in interpreting the presence of *B. abortus* in the body of the animal. Much of the information is presented in tabular form.

[Proceedings of the disease section, Third World's Poultry Congress] (In *Report of World's Poultry Congress, Ottawa, Can., 1927. Ottawa: Mortimer Co., [1928], pp. 255–380, figs. 48*).—Papers on avian pathology presented at the meetings held in Ottawa from July 27 to August 4 are as follows:

New Developments of the Control of Poultry Diseases in the United States of America, by J. R. Beach (pp. 255–261); Combating Poultry Diseases by the State Serum Institute: Data from Six Thousand Autopsies, by B. J. C. te Hennepe (pp. 261–269); Preventable Losses from Poultry Diseases, by D. C. Matheson (pp. 270–272); The Action of the State in the Fight against the Communicable Diseases of Poultry (pp. 272–275); A Recapitulation of the Most Important Treatises on Poultry Diseases Published in Germany in 1925–1926, by F. Schmidt (pp. 275–277); National and International Control of Poultry Diseases, by J. R. Mohler (pp. 278–281); Fowl Paralysis (Neuro-lymphomatosis Gallinarum), by A. M. Pappenheimer and L. C. Dunn (pp. 282–285), a more extended account of which has been noted (E. S. R., 58, p. 76); Entero-hepatitis in Turkeys and Its Transmission through the Agency of *Heterakis vesicularis*, by E. E. Tyzzer (pp. 286–290); Diphtheria and Pox in Chickens and the Combating of this Disease, by L. de Blieck (pp. 290–294); Infectious Hepatic Enteritis of Young Turkeys, by N. Tortorelli (pp. 294–296); Experimental Studies on Avian Diphtheria, by N. Nakamura (pp. 297–300), noted on page 371; A Few Facts regarding Roup, by C. H. Weaver (pp. 300–305); A Disease of the Wattles of Fowls Due to Infection with a Strain of the Fowl Cholera Organism of Apparently Low Virulence, by J. E. Thomas (pp. 306–308), noted on page 371; Leucaemia and Pseudoleucaemia in Fowls, by P. Stazzi (pp. 308–310); Avian Typhus and Avian Cholera in Italy, by G. Finzi (pp. 310–313); An Experimental Study on the Virus of Fowl Pest on the Susceptibility of the Pigeon, by N. Nakamura and Y. Kawamura (pp. 313–316), noted on page 371; The Use of the Bacteriophagum "Lactozym alfa Mezzadroli" in the Treatment of Diarrhoea and Enteritis (Colibacillosis) in Chickens, by G. Mezzadroli (pp. 361–318); Septicemia of Ducks, by F. R. Beaudette (pp. 318–321); Fowl Spirochaetosis, by H. Cooper (pp. 321, 322); Fowl Typhoid in South Africa, by G. Martinaglia (pp. 322–326); Coccidiosis of Chickens—Its Outbreak in the Argentine, by S. S. Quiroga and R. Scasso (pp. 326–332); Some Intestinal Worms of Chickens and Their Control, by J. E. Ackert (pp. 333–335); The Use of Nicotine Sulphate in the Control of the Intestinal Roundworm, by S. B. Freeborn (pp. 336–339); On the Life History of the Chicken Nematode, *Ascaridia perspicillum*, by S. Itagaki (pp. 339–344); Physical Study, Economic Value of Birds, Transmission to Progeny, and the Influence of Males and Females in the Transmission of Bacillary White Diarrhoea, by B. F. Kaupp and R. S. Dearstyne (pp. 345–352), noted below; Fowl Typhoid and Fowl Cholera, by L. D. Bushnell (pp. 353–355); The Agglutination Test as Applied to the Control of Bacillary White Diarrhoea, by C. P. Fitch and R. E. Lubbehusen (pp. 356–360), noted on page 372; The Importance of the Dilution Factor in the Agglutination Test for Bacillary White Diarrhoea, by R. Gwatkin (pp. 360–364); Bacillary White Diarrhoea of Chicks, State-wide Agglutination and Control Work, by L. F. Rettger and R. E. Jones (pp. 364–369), noted on page 371; Sanitary Regulations in the Control of Bacillary White Diarrhoea, by F. A. Laird (pp. 369–371); The Incubator as a Means of Transmitting Bacillary White Diarrhoea, by W. R. Hinshaw (pp. 372–374); Bacillary White Diarrhoea in Belgium, by Leynen (pp. 374–377) (E. S. R., 58, p. 75); and Investigation of Diarrhoea in Young Chicks in Japan, by N. Nakamura (pp. 377–380) (E. S. R., 56, p. 679).

Physical study, economic value of birds, transmission to progeny, and the influence of males and females in the transmission of bacilliary white diarrhoea, B. F. Kaupp and R. S. Dearstyne (In *Report of World's Poultry Congress, Ottawa, Can., 1827. Ottawa: Mortimer Co., [1928], pp. 345–352, figs. 2*).—This contribution from the North Carolina Experiment Station is based

upon investigations previously noted (E. S. R., 57, p. 577). The account presents tabulated data on the site of focalization infection in bacillary white diarrhea, and deals with the persistence of agglutinins in carriers, respiration, temperature, body weight, tendency to nest, hematology, infected eggs laid by carriers, and economic value of birds.

Bacillary white diarrhoea of chicks, State-wide agglutination and control work, L. F. Rettger and R. E. Jones (In *Report of World's Poultry Congress, Ottawa, Can., 1927. Ottawa: Mortimer Co., [1928], pp. 364–369*).—The authors deal with the problem of detecting carriers, the establishing of white diarrhea flocks and the safeguarding of such flocks against future infection, brief progress report of work in Connecticut, and work outside of Connecticut. An outline of reports from various laboratories on testing is given in tabular form.

An experimental study on the virus of fowl pest—on the susceptibility of the pigeon, N. Nakamura and Y. Kawamura (In *Report of World's Poultry Congress, Ottawa, Can., 1927. Ottawa: Mortimer Co., [1928], pp. 313–316*).—The results of the authors' studies, conducted at the Veterinary Laboratory, Ministry of Agriculture and Forestry of Japan, are as follows:

"The transmission of the disease to pigeons was successfully accomplished by feeding a large amount of the virus, instillation into the conjunctival sac, application to the scarified skin, or by cloacal injection, but not by the cohabitation of pigeons with affected fowls or pigeons.

"The virus does not seem to be equally distributed in the organs of the affected pigeons, its virulence being very high in the brain, less in the liver, kidney, and spleen, least in the testicle, and no trace whatever in the cornea.

"The susceptibility of the pigeon differs with the age, young and old pigeons being less susceptible while the ones weighing about 300 gm. are most susceptible.

"The successive passages of the virus through the pigeon is possible, and the virus passed through pigeons is able to produce the disease in chickens.

"Our observations on the changes in the blood of the diseased pigeons showed that within 3 to 4 days before the appearance of symptoms, the pseudoeosinophilic leucocytes increased, reaching more than two to three times the numbers found in normal birds, while the number of lymphocytes decreased."

A disease of the wattles of fowls due to infection with a strain of the fowl cholera organism of apparently low virulence, J. E. Thomas (In *Report of World's Poultry Congress, Ottawa, Can., 1927. Ottawa: Mortimer Co., [1928], pp. 306–308*).—In an investigation by the Department of Agriculture in Victoria, Australia, a bipolar staining, Gram-negative pasteurella was obtained on agar culture from the majority of the wattles examined. This organism is said to be very virulent for rabbits, producing a fatal septicemia within 18 hours. It was found to be quite avirulent for the fowl when administered subcutaneously. It produces typical edema of the wattles with the usual sequelae after injection of a small amount into the wattles of normal birds.

Experimental studies on avian diphtheria, N. Nakamura (In *Report of World's Poultry Congress, Ottawa, Can., 1927. Ottawa: Mortimer Co., [1928], pp. 297–300*).—This is a contribution from the Veterinary Laboratory, Ministry of Agriculture and Forestry of Japan, in which the conclusion is reached that the coccobacillus isolated from the local lesions in the earlier stage of avian diphtheria played some important rôle as a causal agent in the disease. Treatment with the serum taken from the animals hyperimmunized against this organism proved to be uniformly favorable in the prevention of the disease. Indications were that cases treated in the earlier stages of the disease might be benefited, but that no marked effects followed in advanced cases.

The agglutination test as applied to the control of bacillary white diarrhoea, C. P. Fitch and R. E. Lubbehusen (In *Report of World's Poultry Congress, Ottawa, Can., 1927. Ottawa: Mortimer Co., [1928], pp. 356–360; also in Cornell Vet., 18 (1928), No. 1, pp. 19–27*).—In investigational work at the Minnesota Experiment Station with the cloudy reactions met with in the agglutination test, the authors found the precipitate to be largely protein and that little fat is present, thus confirming the findings of Mathews (E. S. R., 55, p. 275). The author's report that the addition of sodium hydroxide as recommended by Mathews is not entirely satisfactory. The change of pH materially affected the results in some cases in serum of weak agglutinating properties. The authors experienced trouble from bacterial contamination, smears from tubes which appeared to be the typical cloudy reaction showing enormous numbers of rod-shaped organisms occurring in long chains when examined under the microscope. A study of these bacteria showed them to belong to the mycoides group. The addition of boric acid solution to the tubes in which the blood was drawn as recommended by A. H. Baker,[3] gave good results. It has been determined that the first prerequisite for a satisfactory test is a serum which is fresh and nearly sterile. The unsatisfactory tests largely occurred when the serum was not fresh or properly drawn. The authors found birds the blood serum of which remained cloudy for eight months, although there were intervals when the cloudiness was not pronounced.

The results of a questionnaire sent by R. A. Runnels to 15 laboratories are reported in tabular form.

In the course of their studies of the disease, the authors in 1925 applied the agglutination test to approximately 400 birds in a flock that had suffered very little if at all from *Salmonella pullorum* infection, but in which it had appeared the preceding season following the purchase of breeding stock. Sixteen birds reacted and were isolated, and the flock was tested at intervals to detect other reactors in the noninfected group and the constancy of reaction in the positive birds, the results of the latter being reported upon in tabular form. The authors found 70.6 per cent of the reacting birds to show active infection with *S. pullorum*. The reaction of individual birds was variable, due to a negative phase, rendering retests imperative for proper control. Reference is made to the cross-agglutinability of *S. pullorum* and certain members of the colon typhoid group and the difficulty of interpretation of results in the lower serum dilutions.

In the cooperative testing of 92 birds by three laboratories in 1926, the efficiency in detecting infected birds was 91, 87.8, and 87.8 per cent, respectively. The results are considered to emphasize the importance of adopting a uniform technique in conducting the agglutination test. It is pointed out that the efficiency of individual laboratories in detecting infected birds is relatively high. It is considered that the major portion of the discrepancies occur in the negative and suspicious zones, and are caused by so-called "close" reading, in which slight clumping or a partial agglutination in one or more dilutions is interpreted as a positive reaction by some and disregarded by others.

A brief reference is made to the "false" positive and negative reactions, so called because they are unsupported bacteriologically.

Report of the poultry pathologist, F. R. Beaudette and J. J. Black (*New Jersey Stas. Rpt., 1927, pp. 251–258*).—In diagnostic work a total of 1,104 specimens originating on 468 farms were examined, the distribution of which is listed by counties in the State, together with 32 from 5 other States. No new diseases were met with during the year, but the parasite *Tropisurus fissispina*, first observed the preceding year, was found to be very common in New Jersey

[3] Brit. Jour. Expt. Path., 6 (1925), No. 4, pp. 201, 202.

fowls. Another outbreak of a paratyphoid infection was found in a flock of small chicks, and additional cases of fowl typhoid infection in baby chicks were also observed. Fowl cholera continues to reappear every year in the same yards after it has once occurred, this being true in at least six cases under observation.

Brief reference is made to the progress of the study of *Ascaridia perspicillum*. Three lots of birds were reared under the following conditions: On a concrete slab protected by fly screen, and a house similarly protected; on a concrete slab without screen protection; and on range. In the fall of 1926 each of these lots was placed in respective laying quarters, and an accurate record kept of their egg production, body weight, mortality, etc. At time of writing the birds reared in confinement and protected with fly screen had shown a markedly greater production than the other two lots. In no case had a tapeworm infestation been found in this lot. The egg production of the lot reared in confinement, but without screen, was but slightly better than that reared on range.

Observations of the occurrence of oocysts of *Eimeria avium* in the cecal contents of domesticated fowls continued to demonstrate that a very high percentage of adult birds have a slight infestation of this protozoal disease, and that these birds undoubtedly serve as reservoirs of infection.

A repetition of the work of the preceding year (E. S. R., 57, p. 772) confirmed the findings that the fowl typhoid organism will not remain viable even for a week in soil with a reaction of pH 6.2 or lower, whereas between pH 6.4 and 7.0 the organism seems not to be affected and will live for at least 12 weeks. Similar tests with the fowl cholera organism showed it to be much more sensitive to the reaction of the soil.

Mention is made of the work with the avian paratyphoid organism, a large amount of material having been collected for study. The results show that the different strains isolated from cage birds and from two outbreaks of paratyphoid in pigeons are absolutely alike in all respects and are identical with the human paratyphoid type B organism in their fermentation and other biochemic reactions. Furthermore, these strains cross-agglutinate to the extent that they can not be differentiated by this means. However, by means of agglutinin absorption tests these strains can be differentiated from the human type. Paratyphoid organisms have also been isolated from the common fowl, but while these are similar to the other paratyphoid types, their agglutination reactions are different.

A cooperative study of fowl cholera is being carried on with the Rockefeller Institute of New York. A search was made for carriers of the organism. Two lots of 50 birds each were inoculated intranasally in order to determine the percentage mortality from a fixed dose, one of which developed several cases of ocular, nasal, and sinus roup in addition to giving several fatalities. Bacteriological examination of the nasal cavities of the survivors showed that some of them continued to harbor the organism in spite of the fact that they had not suffered from the inoculation. One of the lots of 50 birds was divided into two groups, and one of the groups inoculated intranasally as before whereas the other was given a dose of culture per os in a capsule. None of the latter group died, whereas losses were sustained in the former.

In work in southern New Jersey 1,388 birds, originating on 607 farms, were autopsied. Experimental work was conducted to determine the possible carriers of tapeworms, the results being presented in tabular form. A total of 90,697 birds were given the agglutination test for bacillary white diarrhea, nearly double the number of the preceding year. Fifty-five flocks have been tested consecutively for 2 years for the purpose of determining the value of the test. In 1925–26 these flocks contained 15,351 birds and they showed 8.19

per cent infection, while in 1926–27 there were in the same flocks 18,227 birds with only 4.02 per cent infection. Ten of these flocks are said to show no infection.

The death rates of three standard breeds of fowl, J. A. HARRIS and D. C. BOUGHTON (*Poultry Sci., 7 (1928), No. 3, pp. 120–131, figs. 2*).—The study here reported is based upon data provided by the long series of records of the international egg-laying contest conducted at the Connecticut Storrs Experiment Station from 1911–12 to 1921–22.

Recommendations regarding accreditation of flocks for freedom from disease, W. R. HINSHAW ET AL. (*Jour. Amer. Vet. Med. Assoc., 72 (1928), No. 6, p. 715; also in U. S. Livestock Sanit. Assoc. Rpt., 31 (1927), p. 715*).—Six recommendations regarding accreditation of flocks for freedom from disease, including bacillary white diarrhea and tuberculosis, are presented by the committee on poultry diseases. It is recommended that the word "accredited" be used only to indicate freedom from disease.

Studies of the agglutination and pullorin tests for bacillary white diarrhea as to the efficiency of each in detecting carriers of Salmonella pullorum infection, H. J. STAFSETH and F. THORP, JR. (*Jour. Amer. Vet. Med. Assoc., 72 (1928), No. 6, pp. 745–756; also in U. S. Livestock Sanit. Assoc. Rpt., 31 (1927), pp. 745–756*).—In studies conducted at the Michigan Experiment Station it was found that antigen containing sodium hydroxide is superior to the other antigens used since it gives the clearest reaction, shows no tendency to produce proagglutinations, and will almost entirely eliminate cloudy reactions. Formalinized antigen produced very indefinite reactions, showed marked zone phenomena or proagglutinations, and seemed decidedly lacking in sensitiveness, as some of the strongest sera failed to react with this antigen.

The results obtained with the rapid test indicate that it may become the most practical and useful test employed in the control of bacillary white diarrhea. It is pointed out, however, that it is not so simple that it can be used indiscriminately by anyone regardless of training or experience. It is further pointed out that in order to obtain the best possible results with any modification of the agglutination test a satisfactory way of standardizing or titrating antigens must be found. Fresh antigens are usually more satisfactory than those that have been kept for more than two weeks. An incubation period of not more than 24 hours is considered sufficiently long when sodium hydroxide treated antigen is used. The authors' experiences with the pullorin test led to the conclusion that it is decidedly inferior to the agglutination test in its ability to detect carriers of *S. pullorum*.

Comparison of mortality in chicks suffering from bacillary white diarrhea and normal chicks, H. M. SCOTT, W. R. HINSHAW, and L. F. PAYNE (*Jour. Amer. Vet. Med. Assoc., 72 (1928), No. 6, pp. 756–761, figs. 3; also in U. S. Livestock Sanit. Assoc. Rpt., 31 (1927), pp. 756–761*).—This is a contribution from the Kansas Experiment Station which includes graphic presentation of data by the use of charts. It was found that the average mortality in a 14-day brooding period for 18 groups (1,162 chicks) infected with bacillary white diarrhea was 42.59 per cent, while the average mortality for 14 groups (919 normal chicks) was 6.31 per cent. The mortality varied considerably in the diseased groups, ranging from 17.3 per cent to 91.5 per cent. The mortality commenced earlier, reached a higher peak, and continued for a greater length of time in diseased chicks than in normal chicks. Mortality was greatest in diseased chicks from the sixth to the twelfth day, and the peak (6.88 per cent) occurred on the eighth day. In normal chicks the period occurred between the sixth and tenth days, and the peak (1.08 per cent) was reached on the ninth and tenth days.

The possible cost of roup in production and how one outbreak was handled, B. F. Kaupp (*North Carolina Sta. Bul. 254 (1928), pp. 8–11*).—This is a discussion of the economic effect of roup on egg production in a flock in which an outbreak occurred. Of the 1,000 birds in the flock 224 succumbed, 406 recovered and were sold during the year for food, and 370 remained. The roup appeared in the flock during the latter part of December and was not eradicated before about the first of March. Elimination from the flock was brought about through isolation and treatment of the affected birds as fast as traces of the disease appeared, none of those that were treated and recovered having been returned to the laying house in order to avoid the danger of introducing a chronic carrier.

The summary of the accounts kept, which record the receipts and expenditures, showed a flock depreciation per bird of $1.47 as a result of the attack of roup.

The experiment is considered to have shown that if quick and proper steps be taken roup can be eliminated from the flock, and that during the two or three months that roup attacks the flock there will be a considerable slump in production, which will not be made up later in the year but will cause a total loss.

Results of some avian tuberculosis studies, A. F. Schalk (*Jour. Amer. Vet. Med. Assoc., 72 (1928), No. 6, pp. 852–863; also in U. S. Livestock Sanit. Assoc. Rpt., 31 (1927), pp. 852–863*).—This contribution from the North Dakota Experiment Station deals with the following topics: The transmissibility of avian tuberculosis to other species of animals; typing localized swine tuberculosis lesions; lesions of avian tuberculosis in swine; an experimental tuberculosis cage barnyard; results of exposure experiments; sensitization but temporary; degree and extent of infection—lesions; the pigeons and sparrows; fate of avian tubercle bacilli in contaminated barnyard during winter months; transmissibility of avian tuberculosis to common rats, barn mice, and field mice; pigeons, sparrows, and rats as mechanical carriers of avian tuberculosis; rats carry avian tuberculosis organisms through the alimentary tract in viable condition; sensitization of cattle with avian tuberculosis; the incidence of avian tuberculosis reactors in feeder cattle; possible eradication of avian tuberculosis from farm poultry flocks by testing; studies with soils, manure, fly larvae, and angle worms; the fly larvae developed in infected fowl carcasses apparently transmit the disease; and angleworms fail to transmit the disease.

The susceptibility of fowls and reptiles to the vaccine virus, H. B. Andervont (*Amer. Jour. Hyg., 7 (1927), No. 6, pp. 804–810, pls. 2*).—The author found newly hatched White Leghorn chicks to be more susceptible to the vaccine virus than full-grown chickens of the same breed. It was possible to demonstrate (1) the correctness of earlier observations that the fowl responds to infection with the vaccine virus by the production of Guarnieri bodies; (2) that newly hatched chicks are susceptible to cutaneous, corneal, and intracranial inoculation of the neurovaccine virus; and (3) that serial transmission of the neurovaccine virus through four chick brain passages can be accomplished. It is shown that the vaccine virus can be carried through a series of three passages upon the skin of 2-months-old turtles.

The most important diseases of the rabbit, with particular consideration of the infectious, parasitic, and invasive diseases, O. Seifried (*Die Wichtigsten Krankheiten des Kaninchens, mit besonderer Berücksichtigung der Infektions- und Invasionskrankheiten. Munich: J. F. Bergmann, 1927, pp. VIII+160, figs. 54*).—This account of the diseases of the rabbit, which includes separate lists of references to the diseases considered, has been noted from another source (E. S. R., 58, p. 581).

AGRICULTURAL ENGINEERING

Experiments with irrigation and subirrigation [trans. title], C. CERASINO (*Bari Staz. Agr. Sper. Pub. 10 (1927), pp. 31, pls. [4]*).—Comparisons of three different systems of subirrigation with surface irrigation on a number of field and vegetable crops are reported. In the majority of cases subirrigation gave the better results, cotton and tomatoes being exceptions. Subirrigation, however, presents the disadvantage of consuming greater amounts of water and of being considerably more expensive.

Plants as indicators of ground water, O. E. MEINZER (*U. S. Geol. Survey, Water-Supply Paper 577 (1927), pp. V+95, pls. 12, figs. 15*).—The substance of this report has been noted from another source (E. S. R., 56, p. 679).

Surface water supply of lower Mississippi River basin, 1924 (*U. S. Geol. Survey, Water-Supply Paper 587 (1928), pp. IV+123, fig. 1*).—This report, prepared in cooperation with the States of Missouri, Colorado, Kansas, and Texas, presents the results of measurements of flow made on streams in this basin during the year ended September 30, 1924.

Resistance to flow in floodway of St. Francis River, C. E. RAMSER (*Engin. News-Rec., 100 (1928), No. 14, pp. 541, 542, figs. 4*).—In a contribution from the U. S. D. A. Bureau of Public Roads data from measurements of flow through standing timber, made in the St. Francis River floodway in northeastern Arkansas, are reported. The measurements were made at depths of flow ranging from 4.1 to 9.5 ft.

Values determined from the more accurate gaugings showed a continuous decrease in n from 0.152 for the highest stage at an average depth of 9.46 ft. to 0.095 for the lowest stage at an average depth of 4.08 ft. The values determined from the surface gaugings likewise showed a continuous decrease with depth, although they averaged slightly lower than the other group. It is believed that this decrease in n with decrease in stage is due to the fact that fewer branches on the trees were encountered by the flow at the lower stages. It appears, therefore, that the value of n for high stages in this floodway could be reduced appreciably by cutting all branches that will be submerged at the highest stage of the water.

The theory of structures, C. M. SPOFFORD (*New York and London: McGraw-Hill Book Co., 1928, 3. ed., rev. and enl., pp. XV+587, figs. 414*).—This, the third, revised edition of this book, contains chapters on outer and inner forces; laws of statics, reactions, shears and moments, and influence lines; concentrated load systems; beam design; plate girder design; simple trusses; bridge trusses with secondary web systems, including the Baltimore and Pettit trusses; trusses with multiple web systems, lateral and portal bracing, transverse bents, and viaduct towers; cantilever bridges; three-hinged arches; design of columns and tension members; pin and riveted truss joints; graphical statics; deflection slope and camber; statically indeterminate girders and trusses; space framework; swing bridges; masonry dams; earth pressure; masonry arches with fixed ends; and framed bents for high buildings.

Manufacture and uses of concrete products and cast stone, H. L. CHILDE (*London: Concrete Pubs., 1927, 2. ed., pp. X+248, pls. 5, figs. 160*).—This book deals in a practical way with several phases of the manufacture and use of precast concrete products. It contains chapters on materials; proportioning and grading; water content; mixing; consolidation; surface treatment; curing; crazing, efflorescence, and fading of color; manufacture and care of molds; design of molds; plaster, sand, glue, and other molds; and roofing tiles.

A comparison of the effect of high temperatures on concretes of high alumina and ordinary Portland cements, A. L. MILLER and H. F. FAULKNER

(*Wash. Univ.* [*Seattle*], *Engin. Expt. Sta. Bul. 43* (*1927*), *pp. 23, figs. 7*).—Studies are reported, the results of which are taken to indicate that in structures where the possibility of exposure to greater than ordinary temperatures is remote and the probable period of exposure is short high alumina cement is a satisfactory substitute for ordinary Portland cement if the allowed unit stresses are no greater than those for ordinary Portland cement concrete. Where there is a possibility of thorough heating at greater than ordinary temperatures for any considerable period, high alumina cement should not be used for vital structural members until a complete investigation of its qualities under the anticipated conditions is made.

The effect of steam treatment of Portland cement mortars on their resistance to sulphate action, T. Thorvaldson and V. A. Vigfusson (*Engin. Jour.* [*Canada*], *11* (*1928*), *No. 3, pp. 174–179, figs. 8*).—The results of a study conducted at the University of Saskatchewan under the auspices of a research committee of the Engineering Institute of Canada, with the financial support of the National Research Council of Canada and two commercial concerns, are reported. Expansion measurements of Portland cement mortar bars were used to study the effect of steam treatment of mortars on their resistance to the action of the sulfates of magnesium, sodium, and calcium.

Treatment of mortars with saturated water vapor at 50° C. (122° F.) reduced their resistance to sulfate action. Saturated water vapor at temperatures of 75° or above increased the resistance. The higher the temperature the more effective was the treatment and the shorter the time of treatment required. Steam treatment of mortars at the boiling point of water made them practically completely resistant to the action of sodium sulfate solutions and very materially increased their resistance to the action of magnesium sulfate solutions.

Immersion of mortars in hot water was nearly as effective in increasing the sulfate resistance as was treatment with steam at the same temperature.

The addition of tricalcium aluminate to Portland cement speeded up the rate of expansion of its mortar in solutions of the sulfates of sodium, magnesium, and calcium. Steam treatment of these mortars was not as effective in preventing expansion in solutions of sodium and calcium sulfate as was steam treatment of mortars from the same cement without the addition of tricalcium aluminate.

It is suggested that the greatly increased resistance to sulfate action brought about by steam treatment of Portland cement mortars is primarily due to the action of the steam on the aluminate in the cement. The speeding up of the hydration of the silicates by the steam treatment, while increasing the strength, is considered to be probably of secondary importance in relation to sulfate resistance.

Volatility data from gasoline distillation curves, O. C. Bridgeman (*S. A. E.* [*Soc. Automotive Engin.*] *Jour., 22* (*1928*), *No. 4, pp. 437–448, figs. 6*).—In a contribution from the Bureau of Standards, U. S. Department of Commerce, an analysis is presented of data from a variety of gasolines which appears to indicate a definite relationship between the results on volatility and those obtained by the standard distillation method of the American Society for Testing Materials. It is thus apparently possible to deduce from the latter, with reasonable accuracy, the information on volatility which is pertinent to satisfactory engine performance It is also pointed out that volatility can be regarded as the tendency to escape into the vapor or gaseous state, and this tendency is determined by factors which must be precisely specified so that numerical values for volatility may have significance. It is concluded that the A. S. T.

M. distillation curves give a true indication of the relative volatilities of gasolines.

Draft measurements as valuable aids in agriculture [trans. title], REIMANN (*Technik Landw., 7 (1926), No. 5, pp. 108–112, figs. 6*).—Data from measurements of the draft of a number of different agricultural machines are graphically presented and discussed.

Previous investigations on the plowing resistance of soils and a new implement for its measurement [trans. title], MARKS (*Technik Landw., 7 (1926), Nos. 11, pp. 232–235; 12, pp. 255–266, figs. 14; abs. in Biedermann's Zentbl., 57 (1928), No. 2, pp. 86, 87*).—A review of work by others bearing on the subject is presented, and a new apparatus for the measurement of the resistance of soils to plowing is described. Some results from the use of this apparatus are presented graphically and discusesd.

Safeguarding of machinery and other dangerous plant used on farms ([*Gt. Brit.*] *Min. Agr. and Fisheries, Misc. Pub. 59 (1927), pp. 34, figs. 26*).—This is an illustrated pamphlet which indicates the nature of the risks associated with farm machinery, and affords some guidance concerning the precautions necessary to secure proper standards of safety in connection with its working. In addition, it deals briefly from the same standpoint with other classes of machinery sometimes found installed on farms, such as steam boilers, electrical apparatus, and the like.

Recent changes in tractors as noted from the Nebraska tractor tests, H. L. WALLACE (*Agr. Engin., 9 (1928), No. 3, pp. 85–91, figs. 11*).—Data from the tractor tests being conducted by the Nebraska Experiment Station are presented, the purpose being to indicate some of the recent changes and modifications in tractors. It is pointed out that there has been a very marked improvement in tractors, especially during the past two years. This is reflected especially in the more economical fuel consumption, greater power per unit weight, greater drawbar efficiency, and greater speed of travel. It is also stated that the present-day tractors are more accessible for repairs and are better designed.

Gray cast iron and black cast iron for harvesting machinery [trans. title], H. JUNGBLUTH (*Technik Landw., 9 (1928), No. 3, pp. 54–62, figs. 22*).—Data are presented on the relative merits of gray and black cast iron, plain and heat treated, for use in the moving parts of harvesting machinery.

Is the vibrating shaker as efficient as the shovel shaker? [trans. title], VORMFELDE and KNOLLE (*Technik Landw., 9 (1928), No. 2, pp. 28–39, figs. 25*).—Studies of the comparative efficiencies of vibrating and shovel shakers in threshing machines indicated that vibrating shakers give about the same results as shovel shakers. The vibrating shaker, however, presents the advantage that it simplifies the threshing machine, decreases the price, increases safety in operation, and reduces the power and labor requirement.

Binding twine tests [trans. title], KLOTH (*Technik Landw., 8 (1927), Nos. 9, pp. 210–213, figs. 5; 10, pp. 232–234, figs. 9*).—Data are presented on tests of the physical properties of binding twine. These indicate that a variability in physical properties of from 10 to 15 per cent will occur in good binding twine.

Blowing stackers for hay and straw [trans. title], DENCKER (*Technik Landw., 8 (1927), Nos. 9, pp. 197–202, figs. 9; 10, pp. 229–232, figs. 8*).—A fundamental study of the principles of operation of blowing stackers for the handling of hay and straw is presented, bringing out especially the influence of the diameter and length of the blow pipe on the efficiency. It was found that the efficiency of blowers ran around 60 per cent. The coefficient of friction was found to be about 0.01. Under these conditions the air velocity was 20 meters per second. The best relative proportions of air and hay were 1 kg. of hay to 3 cubic meters of air.

Electric hay hoists, H. L. Garver (*Washington Col. Sta. Pop. Bul. 139 (1928), pp. 16, figs. 8*).—The results of a study of electric hay hoists are presented from which the conclusion is drawn that there are no serious problems to be solved in applying the electric motor to this type of farm work. Very frequently the hoist can be used for other purposes, such as lifting machinery, sacks of grain or feed, and the like. The actual cost of power per day for operating the hoist is very small.

Dehydration of fruits and vegetables in Canada (*Canada Dept. Agr. Bul. 90, n. ser. (1927), pp. 29, figs. 13*).—This is a summary of four years' work of the dehydration committee of the Canadian Department of Agriculture. The results indicate that it is possible for a dehydrator to make a good product from low-grade fresh fruit. Considerable information on the mechanical details and operation of dehydrating plants is presented.

Poultry house ventilation in Washington, L. J. Smith (*Agr. Engin., 9 (1928), No. 3, pp. 83, 84, fig. 1*).—Progress results of experiments conducted at the Washington Experiment Station on poultry house ventilation are reported. In mechanical ventilation tests, including the use of artificially heated air, it was found that if the flues were made sufficiently large the velocity at the outlets farthest away would always be greater than those nearest the blower room. The temperatures of the air leaving the first and third elbows from the blower room were 65 and 64.5° F., respectively, while the temperatures of the air leaving the sixth and eighth elbows were 62 and 58°, respectively.

It was found that this ventilating system was able to keep the litter dry. When the fan and heater were operated during the night while the birds were on the roosts, the litter was well dried out by morning. The birds in the ventilated pens showed a somewhat larger proportion of small eggs, which adversely affected the income. The birds in the ventilated pens laid 1.7 per cent more eggs in December, 5 per cent more in January, 0.3 per cent more in February, and 6.8 per cent more in March than the birds in unventilated pens.

The decided advantage of the control of heat and moisture conditions was demonstrated during a period of freezing weather. It was found that a 1° increase in heat decreased the moisture content of the air about 4 per cent. The conclusion was drawn that the heat and moisture conditions can be controlled adequately by use of the forced ventilation plan with no injury to the health of the birds.

Digestion of vegetable wastes and screenings in sewage treatment plants, W. Rudolfs and H. Heukelekian (*Water Works, 67 (1928), No. 3, pp. 113–116, figs. 3; also in Munic. News, 74 (1928), No. 4, pp. 91–94, figs. 3*).—Studies conducted at the New Jersey Experiment Stations are reported, the results of which indicate that the digestion of vegetable wastes is possible in treatment plants receiving domestic sewage. However, it requires an increase in digestion capacity equivalent to the increase in weight of the solids to be handled and also a greater digestion capacity on account of the slower rate of digestion. Anaerobic digestion of vegetable wastes, and possibly of garbage, is possible, but requires a longer time. The low content of nitrogen results in a poor nitrogen-carbon relation which affects the proper growth of the organisms responsible for decomposition. It does not appear that separate digestion of mixed carbonaceous vegetable matter is economical.

Annual report of the department of sewage disposal, W. Rudolfs et al. (*New Jersey Stas. Rpt. 1927, pp. 263–315, figs. 15*).—This report includes several papers noted below (E. S. R., 57, p. 779).

Behavior of two separate sludge digestion tanks, W. Rudolfs and P. J. A. Zeller (pp. 264–272).—Tests of two 16-sided separate sludge digestion tanks

which were seeded and received fresh solids and partly decomposed material over a period of 7.5 months are reported, indicating their behavior.

Studies on the decomposition of cellulose, H. Heukelekian (pp. 272–284).—Studies of the fate of cellulose and cellulosic materials in sludge digestion showed that native cellulose of fresh solids as well as cellulose added to ripe sludge in the form of filter paper decomposes rapidly, taking place in the early part of the digestion and giving rise to acidity, which retards the general course of the digestion. Cellulose decomposition takes place under acid conditions, but the addition of lime accelerates it. The decomposition is accompanied by the production of gas, the volume of which is smaller than that produced in the decomposition of an equal amount of mixed organic matter in fresh solids. There is a lag period of 5 or 6 days before the decomposition of cellulose starts.

The rapidity of decomposition of cellulosic substances, such as toilet paper, is correlated with their cellulose content, but the poorer grades of toilet paper and newspaper with low cellulose content were found to decompose slower than the better grades. The cellulose content of the solids collected from the inlet end of an Imhoff tank was higher than that from the outlet end. The material from the outlet end had a shorter period of acid digestion, lower acidity, and a higher alkalinity, and a higher ash increase than the material from the inlet end.

Seeding new tanks, W. Rudolfs (pp. 284–294).—Experiments on the seeding of fresh sewage solids with horse and cow manure and muck in comparison with ripe Imhoff sludge showed that neither manure nor muck is as effective for seeding as ripe sludge. If sludge from a polluted stream is available for seeding it is to be favored, while the second choice would be horse manure without straw, and the last cow manure. Either of these substances is better than nothing. Seeding with horse manure and additions of lime were found to be beneficial but inferior to seeding with ripe sludge. Additions of lime to fresh solids when ripe sludge is present for seeding keep floating solids down.

Notes on Achorutes viaticus in sprinkling filters, D. H. Peterson (pp. 294, 295).—A study of this organism in sprinkling filters is briefly reported.

Preliminary results on relation between total acidity, carbon dioxide in solution, organic acids, and colloidal material in the course of fresh solids digestion, W. Rudolfs (pp. 295–299).—In this study it was found that the accumulation of organic acids did not begin until 3 days after fresh solids were collected, indicating that they decomposed as rapidly as produced. After 3 days they accumulated rapidly, and in from 10 to 20 days about half of the total acidity could be accredited to organic acids. After 20 days they decreased rapidly until after 30 days only traces were left, indicating that the rate of destruction was greater than the rate of production. The more organic acids accumulated the longer was the duration of digestion. Acid colloidal material in suspension increased rapidly during the decline of accumulated organic acids, and soon these were decomposing as rapidly as produced. Alkaline colloidal material appeared in suspension. The decomposition of nitrogenous substances seemed most rapid after the organic acids had disappeared.

Reaction and distribution of solids in an Imhoff tank, W. Rudolfs (pp. 299, 300).—The results of this study are very briefly discussed.

Studies on controlling Psychoda alternata Say in sprinkling filters, D. H. Peterson (pp. 300–310).—The results of this study showed that no economical method for controlling *P. alternata* has yet been found, aside from flooding of the filter bed. Orthodichlorobenzene mixed with an equal part of kerosene killed over 90 per cent of the larvae when a liter per square foot was applied. Flit, at 75 cc. per square foot, was equally satisfactory. Oils were always found

to be better than emulsions. Paradichlorobenzene in crystalline form caused a high percentage of deaths if 50 gm. per square foot was applied. Carbon disulfide was lethal in an emulsion of 1 to 100. Chlorine in the amount supplied was never lethal to the larvae. A continuous application of chlorine reduced the number of larvae, but not sufficiently to warrant the expense.

Euglena in relation to combined nitrogen, D. H. Peterson (pp. 310–314).—This experiment showed that colorless Euglena in a nutritive medium consumes rather than increases the amount of combined nitrogen.

A study of factors affecting the efficiency and design of farm septic tanks, E. W. Lehmann, R. C. Kelleher, and A. M. Buswell (*Illinois Sta. Bul. 304 (1928), pp. 299–339, figs. 25*).—The results of these studies led to the conclusion that inasmuch as the flow of sewage per person for farm homes is subject to wide variation, the tank should be so designed as to make an average allowance for sewage flow of from 18 to 25 gal. per person per day, depending upon the size of the family. Ordinarily it is not practical to build a tank smaller than that required for 7 people, and in a single-chamber tank a 72-hour retention period should be provided for. In a 2-chamber tank a 72-hour retention period should be provided in the first chamber and an additional retention period of 36 hours in the second chamber, the capacities being in the ratio of 2:1, or a total retention period of 108 hours.

It was found that, when properly designed, the 2-chamber tank is more efficient than the 1-chamber tank, particularly if the former is provided with 50 per cent larger capacity. It was also found that the rate of sewage flow from farm homes varies considerably for different hours of the day, and that the monthly variations in sewage flow depend to a large extent upon the monthly variations in water consumption.

RURAL ECONOMICS AND SOCIOLOGY

[Investigations in agricultural economics at the New Jersey Stations, 1926–27] A. G. Waller (*New Jersey Stas. Rpt. 1927, pp. 59–72*).—Investigations are reported upon as follows:

Farm business surveys.—Averages, based upon records for the calendar year 1924 from 48 Burlington County dairy farms, are shown covering total receipts, total expenses, farm income, sales of different kinds, items of expense, crops, capital, production per cow, and price received for milk.

A preliminary report of a farm business survey covering 31 owner-operated truck farms in Gloucester County during 1925 is given, together with comparisons with a survey of 125 farms made in the same area in 1914, 1915, and 1916. The same seven truck crops produced 91.1 per cent of all the crop receipts in 1925 and 87.3 per cent in 1914–1916. Sweet potatoes, asparagus, and early tomatoes produced 70.2 and 74.2 per cent, respectively, of the total receipts in the two periods.

A survey of 25 dairy farms in northern Mercer County showed in 1925 that on the 8 most profitable farms the milk production per cow was 27 per cent and the crop yields per acre 14 per cent above the average, size of herd about the general average, crop receipts 25 per cent of total receipts, and the acreage of pasture about the average of the 25 farms.

Based on 7 farm business surveys, including 332 farms of different types in different sections of the State, it was found that of the capital required 67 to 82 per cent was in real estate; 4.5 to 19 per cent in livestock; 4.4 to 9 per cent in machinery; and feed, supplies, and cash took from 3.2 to 8.7 per cent. From 19.6 to 33.4 per cent of the sales was left as net income.

Costs of production.—Tables are given showing, by items, the average cost per acre of the production of Cobbler potatoes on 23 and of Redskin potatoes on 21 south Jersey farms in 1926, of potatoes on 30 Monmouth County farms in 1926, of onions on 16 Cumberland County farms, and of sweet corn on 34 Monmouth County farms in 1926. The average total costs were found to be 65.6 cts. and 70.8 cts., respectively, per ⅝-bu. baskets on the south Jersey farms growing Cobbler and Redskin potatoes, 77.8 cts. per bushel on Monmouth County farms growing potatoes, $1.52 per bushel for onions, and $1.33 per 100 ears of sweet corn. The labor incomes per farm were $1,028.16 and $594.35, respectively, on the south Jersey farms growing Cobbler and Redskin potatoes.

Analysis of the New York peach market.—In cooperation with the Bureau of Agricultural Economics, U. S. D. A., and the Port of New York Authority, records of over 20,000 actual commission sales of New Jersey and Georgia peaches during 1924 and 1925 were analyzed. The analysis showed, among other things, that New Jersey shippers have a differential of 42 cts. per crate over Georgia shippers; that a crate of New Jersey Elbertas sold on an average for 39 cts. more than a bushel basket of New Jersey Elbertas; and that Georgia growers pay 7 or 8 per cent commission to New York receivers, as compared with an average of 10 per cent paid by New Jersey growers, the difference being due chiefly to New Jersey peaches not being reliably marked and not being uniform as to quality and pack.

Agricultural economics, C. S. Orwin (In *Agricultural Research in 1925. London: Roy. Agr. Soc. England, 1926, pp. 35–43*).—The advisory and investigational aims and plans of the Ministry of Agriculture are described, and the results given of investigations of the economics of sugar beet cultivation and the cost of mole draining.

Agricultural economics, C. S. Orwin (In *Agricultural Research in 1926. London: Roy. Agr. Soc. England, 1927, pp. 62–73*).—The results are given of investigations of the cost of production of clean milk, milk production costs, and costs, yields, and returns for sugar beets. The work and publications regarding a farmers' bookkeeping society in Wiltshire and the marketing of farm produce are described.

General economic history, M. Weber, trans. by F. H. Knight (*New York: Greenberg, 1927, pp. XVIII+401, fig. 1*).—Part 1 (pp. 3–111), household, clan, village, and manor, covers the development of property systems and social groups and other phases of agrarian organization. Other parts cover industry and mining and commerce and exchange prior to the capitalistic age, and the origin of modern capitalism.

[Report of the Land Division of the Great Britain Ministry of Agriculture and Fisheries, 1926] ([*Gt. Brit.*] *Min. Agr. and Fisheries, Land Div. Rpt. 1926, pp. 92*).—This is the first annual report of the Land Division, and includes sections on the proceedings under the Small Holdings and Allotments Acts, 1908 to 1926; the Small Holding Colonies Acts, 1916 and 1918; the Sailors and Soldiers (Gifts for Land Settlement) Act, 1916; the Copyhold Acts; the Inclosure Acts, 1845 to 1899; and the Commons and Property Acts.

The land allotment system in Namori Township, Anpachi County, Mino Province, Japan, I. Okuda (*Gifu: [Author], [1927], pp. 5*).—A brief description is given of the development, advantages, and disadvantages of the present system of periodical division of land.

Essay of investigation in agricultural economics and geography, taking North America as example, G. A. Studenskiĭ (Studensky) (*Problemy Ėkonmii i Geografii Sel'skogo Khozĭaĭstva Opyt Issledovaniĭa na Primere Severnoĭ Ameriki. Moscow: "Novyĭ Agronom," 1927, pp. XVII+301, figs. 75; Eng. abs.,*

pp. 293–301).—This is a study of the laws of agricultural geography and dynamics, using the agriculture of North America as a basis. The development of the ideas and methods of agricultural geography, the statistical foundations for agricultural geography, the genesis and present condition of the theory of the localization of agriculture, and the dynamics of agriculture are described and discussed.

Agricultural regions of North America.—I, The basis of classification. II, The South. III, The middle country, where South and North meet. IV, The Corn Belt. V, The hay and dairying belt, O. E. Baker (*Econ. Geogr., 2 (1926), No. 4, pp. 459–493, pl. 1, figs. 39; 3 (1927), Nos. 1, pp. 50–86, figs. 39; 3, pp. 309–339, figs. 30; 4, pp. 447–465, figs. 22; 4 (1928), No. 1, pp. 44–73, figs. 26*).—This series of articles is an introductory survey of the agricultural resources of North America. Numerous maps and graphs are included presenting physical and climatological data; acreages, yields, production, prices, etc., of different crops; number of fruit trees; number of different kinds of livestock; production, prices, etc., of poultry and livestock products; population; utilization of lands; type of farming; size of farms; tenancy; value of farm property; and other agricultural data.

Report of the special advisers on reclamation and rural development on their investigation of opportunities for reclamation and planned group settlement in the southern States, December 2–13, 1926, H. Elliott, D. C. Roper, and G. Soule (*Washington: U. S. Bur. Reclam., 1927, pp. V+38, fig. 1*).—This is the report of the special advisers appointed by the U. S. Department of the Interior in 1926.

The economics of land reclamation in the United States, R. P. Teele (*Chicago and London: A. W. Shaw Co., 1927, pp. XV+337, figs. 14*).—This book discusses from an economic standpoint the experience of the United States in the reclamation of land for agricultural use by irrigation and drainage. The development, extent, future need, and the possibilities of extension are described. The Federal and State reclamation policies, the organization of irrigation and drainage enterprises, financing reclamation, the rate of utilization of reclaimed land, cost and returns, water rights, and the relations between physical and economic conditions are analyzed.

Irrigation development is found to bear out the conclusion that lands reclaimed by irrigation can not, except under unusually favorable conditions, compete with other lands on the basis of paying for their reclamation, and therefore must either be subsidized or wait until the scarcity of other land increases the returns from agriculture. The policy of a Federal or State subsidy is discussed.

The author believes that the future reclamation policy of the United States and the States should include (1) the control of the rate of expanson, which, he believes, will be effected by letting those who demand a project assume an effective liability for its cost; (2) the apportioning of costs to benefits, including those to cities, towns, and other territory benefited indirectly; and (3) methods of protecting the farmers from exploitation by the more numerous urban population within the districts. On this last point he suggests that construction and operation and maintenance costs be made general obligations of the districts, to be met by a general property tax, while water users would be charged rates for the use of water fixed on the basis of the value of the water to the farmers rather than on the basis of yielding a return on the investment.

Some observations on Federal agricultural statistics, J. S. Davis (*Jour. Amer. Statis. Assoc., 23 (1928), No. 161A, pp. 5–22*).—Some observations on the

adequacy, shortcomings, and other phases of the statistics, estimates, and analyses published by the Federal Government are presented from the viewpoint of a "consumer" of such statistics. The paper is discussed by J. W. Tapp and L. E. Truesdell.

Cost of government in the United States (*New York: Natl. Indus. Conf. Bd., Inc., 1926, pp. 138, figs. 11*).—This investigation, made under the supervision of the economic council of the National Industrial Conference Board, covers the volume of taxes, Federal, State, and local, in 1924 and 1925; the burden of taxation by States and localities; public expenditures; and public indebtedness.

An aggregative index of farm purchasing power, F. B. ASHBY (*Jour. Amer. Statis. Assoc., 23 (1928), No. 161, pp. 49–54, figs. 2*).—The author advocates the use of an index of the aggregate values of commodities sold rather than an index of agricultural prices alone in studies of the economic phases of agriculture. Such an aggregative index of farm purchasing power is computed for the period 1913 to 1926, inclusive, using wheat, corn, oats, cotton, cattle and calves, hogs, and sheep.

Farm relief, J. E. BOYLE (*Garden City, N. Y.: Doubleday, Doran & Co., 1928, pp. V+281, figs. 7*).—A brief presenting the arguments and data for and against the McNary-Haugen plan of farm relief in the United States.

The market surplus problems of colonial tobacco, L. C. GRAY (*William and Mary Col. Quart. Hist. Mag., 2. ser., 7 (1927), No. 4, pp. 231–245; 8 (1928), No. 1, pp. 1–16*).—A discussion of the problems and the solutions attempted.

Poultry and egg marketing in North Dakota, A. H. BENTON (*North Dakota Sta. Bul. 215 (1928), pp. 38, figs. 16*).—Tables and graphs are given showing the annual production and the annual and monthly prices for poultry and eggs in the United States and North Dakota and other northern States for periods of years.

The cost of marketing eggs from country town until sold on the Chicago wholesale market was found to range from 4 to 5 cts. per dozen in the eastern part of the State and 1 ct. higher in the western part. Of this cost 76.2 per cent was for freight, 6 per cent cartage, and 17.8 per cent commission. The cost on a carload of live poultry shipped from Fargo to Chicago in October, 1925, was 3.93 cts. per pound, of which 38.6 per cent was for freight, 11.1 cartage, sorting, etc., 24.4 commission, 17.7 feed, and 8.2 per cent expenses of caretakers. Local packing-house charges and freight to Chicago for three representative North Dakota plants were 7.82 cts. per pound for fowls and 9.22 cts. per pound for spring chickens.

The quality of North Dakota poultry and eggs and the methods of improvement are discussed. Appendixes give the North Dakota egg law and the rules and regulations governing licensed egg dealers.

The study was made in cooperation with the U. S. D. A. Bureau of Agricultural Economics.

The poultry industry in New Jersey, A. G. WALLER and H. B. WEISS (*New Jersey Stas. Bul. 457 (1927), pp. 48, figs. 2*).—This bulletin embodies the results of a statistical and economic survey. Tables and graphs are included showing for periods of years the production of poultry and eggs in the United States, New Jersey, and States shipping heavily into the New Jersey market territory; the monthly receipts, 1921–1925, and States of origin of eggs and dressed poultry received in the New York and Philadelphia markets; the cold storage holdings in the United States by months for different periods of eggs and different kinds of poultry; the estimated monthly price per dozen received by producers in the United States and certain States, 1910–1926, and prices of nearby hennery white eggs in New York City, 1908–1926; the purchasing power of eggs, 1910–1925; and the foreign trade in eggs and poultry, 1924–1925.

A preliminary report is also included of a farm management survey covering the year beginning November 1, 1924, of 120 commercial poultry plants in New Jersey.

Cherries, sulphured or in brine, T. O. MARVIN ET AL. (*Washington: U. S. Tariff Comn., 1928, pp. VI+54*).—This is a report of the U. S. Tariff Commission covering the differences in costs of production of cherries in their natural state, sulfured, or in brine, in the United States and Italy, and the proclamation by the President, December 3, 1927, increasing the rate of duty on cherries, sulfured or in brine, stemmed or pitted, from 2 to 3 cts. per pound.

The farmer's part in cooperative marketing, W. W. FETROW (*Oklahoma Sta. Bul. 174 (1928), pp. 23*).—This bulletin is based on data secured by personal interviews in the fall and winter of 1925–26 with members and nonmembers of the Oklahoma Cotton Growers' Association in southwestern, south-central, and eastern Oklahoma.

Of the members, 56 per cent read all of the official organ of the association, 31 per cent more read parts or scanned it, and 21, 84, and 55 per cent, respectively, read books or bulletins on cooperative marketing, took farm papers, and read agricultural books and bulletins during 1925–26, as compared with 9, 66, and 42 per cent, respectively, of the nonmembers; 48 per cent of the members delivered cotton to the association all three years 1922–1924, 24 per cent for two years, 16 per cent for one year, and 12 per cent made no delivery; 16 per cent believed it was the duty of the members to see that deliveries were made to the association, 48 per cent that the duty was on the officers, and 30 per cent that it was on the members and officers; 52 per cent believed members should report contract violations, and 3 per cent more that they should report depending on conditions; 55 per cent believed contract violators should pay a penalty, and 16 per cent more that they should, except in case of forced violations; 55 per cent got their information regarding the association from the association's paper, 17 per cent from papers in general, and 8 per cent from the officers; only 7 per cent of the members had visited the association's central office from 1921 through 1925; only 45 per cent voted for directors in 1923, 40 per cent in 1924, and 30 per cent in 1925; and 90 per cent of the members and 73 per cent of the nonmembers of the association wished the association continued.

Of the nonmembers, 82 per cent believed that the association had helped the farmers, but only 51 per cent said they were willing to sign a contract if 75 per cent of all growers signed.

Population problems in the United States and Canada, edited by L. I. DUBLIN (*Boston: Houghton Mifflin Co., 1926, pp. [XIII]+318, figs. 9*).—This book is a collection of 18 papers presented at the eighty-sixth annual meeting of the American Statistical Association, held in December, 1924, dealing with the increase of population, the outlook for the future, and the relations of population and natural resources, immigration, and the labor supply, together with an introductory paper. The following papers bearing directly on agriculture are included:

Urbanization of population, H. Hart (pp. 52–59).—An analysis of the United States Census data indicates that between 1930 and 1940 the population of cities in the United States of over 8,000 will exceed 50 per cent of the total population, and that between 1890 and 1910 about one-third of the growth of cities of over 25,000 was due to the excess of births over deaths, one-third to one-half to foreign immigration, and the remainder to migration from rural sections. Migration from the country was more important in cities with populations of 100,000 or less, and four-fifths of the migrants were between the ages of 10 and 30. From 1910 to 1920 the net gain in Chicago was approximately 237,000 persons, of whom 154,000 were foreign born, 63,000 negroes,

and 20,000 native white Americans. Approximately 45,000 native whites at ages of from 15 to 25 entered the city, but this gain was counterbalanced by a marked exodus of persons between the ages of 30 and 60, chiefly women.

Mental tests of 825 children in a Middle Western city of 50,000 population showed that the average of those reared in the city was 2.3±0.6 higher than that of those in families who had migrated from smaller places or rural districts.

Population and agriculture, D. D. Lescohier (pp. 77–93).—Until the present time, the bringing in of new cheap fertile land has enabled agricultural production to keep pace or outdistance the increase of population. Future increase in production depends upon (1) increased world's crop acreage, (2) future tropical agriculture, and (3) marked increase of production. It is pointed out that the chief food-exporting countries are rapidly approaching the point of merely taking care of their own needs; that the increase of crop acreage in the Temperate Zone is limited and will be made at increased cost of production and increased danger of crop failures; that the expense of reclamation, low human efficiency, and unhealthful conditions limit increase of production in the tropical countries; and that the greater production, such as the 41 per cent in Germany, Belgium, the United Kingdom, and France, over the United States has required an agriculturally employed population per 1,000 acres 278 per cent greater than in the United States.

Agricultural capacity and population increase, A. E. Taylor (pp. 94–110).—This article deals with the probable changes in agriculture and food ration necessary to take care of a population of 175,000,000 in the United States in 1980. Estimates are based on the following daily ration: Milk 550 calories, cereals 1,300, meats 600, vegetal oils, nuts, fruits, and vegetables 600, and sugar 450 calories, making a total of 3,500 calories, which allows 500 or 600 calories that may be salvaged as population and costs of food increase.

Assuming that increases will be made in yields of wheat and other crops per acre, milk production per cow, improvements in cattle and hog raising, development in mechanical power, and reductions in the present consumption of pork, lard, and beef, the author estimates that only 50,000,000 acres additional will need to be used for harvested crops, and that the future exigency for the time and population specified is lumber, paper, and fibers rather than human food or animal feed.

Proceedings of the World Population Conference, edited by M. Sanger (*London: Edward Arnold & Co., 1927, pp. 383, pl. 1, figs. 8*).—The following papers, presented at the conference held at Geneva, August 29 to September 3, 1927, and having a direct bearing on agriculture, are included:

Optimum Population, by H. P. Fairchild (pp. 72–85); Food and Population, by E. M. East (pp. 85–92), with discussion (pp. 92–111); Is the Increase in the Population a Real Danger for the Food Supply of the World? by J. Bourdon (pp. 111–113); Population and Food Supply in India, by R. K. Das (pp. 114–118); Considerations on the Optimum Density of a Population, by C. Gini (pp. 118–122); Some Needed Refinements of the Theory of Population, by T. N. Carver (pp. 123–128); International Migration and Its Control, by A. Thomas (pp. 256–265), with discussion (pp 265–301); The Principles of Migration Restriction, by J. W. Gregory (pp. 302–305); Some Aspects of the Migration Problem, by A. Koulisher (pp. 305–309); The Phenomenon of Emigration in Italy, by L. Livi (pp. 309–311); and Australia and Its Immigrants, by C. H. Wickens (pp. 312–324).

A population study of three townships in Cortland County, New York, D. Sanderson (*New York Cornell Sta. Mem. 111 (1928), pp. 19, figs. 3*).—This

publication is based on data obtained in connection with the study noted on page 388.

The percentages of the total population in villages and outside of villages were found to be as follows: Under 5 years of age 4.88 and 9.04, respectively, from 5 to 19 years 20.40 and 28.62, from 20 to 44 years 25.28 and 30.94, from 45 to 64 years 31.71 and 23, and 65 years and over 17.74 and 8.40. Of the farm operators, about 60 per cent were between 35 and 60 years of age, 17.8 per cent were under 35 years, and 22.8 per cent over 60 years, the mean age being 49.2 years for the operators and 44.4 years for their wives. In the 4 villages in the townships, 47 per cent of the population were males, as compared with 53.6 per cent outside the villages. Of the farm population, 42.3 per cent had been on the present farm less than 5 years, 10 per cent 1 year or less, and 42.6 per cent 10 years or more. Of the parents, 28.2 per cent were born in the same township, 11 per cent in the next township, and only 15.7 and 5.6 per cent, respectively, in other States than New York and in foreign countries. Of the population over 15 years of age, 69.4 per cent were married, 19.3 per cent single, 7.8 per cent widowed, and 3.5 per cent status not ascertained. The average number of children at home, the percentage of families with no children at home, and the average number of persons per household were 1.52, 31 per cent, and 3.77, respectively, outside the villages, and 0.90, 51 per cent, and 3 in the villages.

Analysis of migration of population to and from farms, C. J. GALPIN (*U. S. Dept. Agr., Bur. Agr. Econ., 1927, pp. [2]+45*).—This is a mimeographed article embodying the results of two studies, one of 2,745 farm operators who have migrated from the farm, and the other of 1,167 persons who have migrated to the farm. The first includes from 2 to 200 farmers from each State and the District of Columbia, 84 per cent being owners and 16 per cent tenants. The latter includes persons from each State except Delaware, New Mexico, and Arizona. Of the latter number 776 became owners, 344 tenants, and 47 hired men.

Tables are given showing the distribution of migrants from the farm by age; place of birth and schooling of migrants and their wives; number, sex, and schooling of children; year of migration; present ownership of farm; present occupation; tenure and number of acres operated at the time of leaving the farm; number of years spent at occupations other than farming; number of years on last farm; percentage of income obtained from the farm; relation of present operator to migrants; and reasons for leaving the farm. For the migrants to farms tables are included showing the age, year of migration, farming experience, tenure history of those having farming experience, reasons for migrating to farm, how migrants like farming, and whether a better living is being made on the farm than was made in the city.

Rural changes in western North Dakota, E. A. WILLSON, H. C. HOFFSOMMER, and A. H. BENTON (*North Dakota Sta. Bul. 214 (1928), pp. 110, figs. 29*).—This is a study of the social and economic factors involved in the changes in number of farms and movement of settlers from farms. It is based on records of 377 present and 669 former operators obtained from surveys of 12 townships in 10 counties.

Part 1 describes the physical features, soil and climate, crop yields, settlement, development, changes in number and size, and factors affecting the number and size of farms in western North Dakota, and discusses the 12 areas surveyed, the records secured, the changes in number and size of farms, uses made of land, tenure, and source of new operators in these areas.

Part 2 describes the motives of settlement; reasons for operators leaving; previous occupations, marital conditions, nationalities, nativity, and education

of present and former operators; the church connections and present occupations of former operators; the effect of relationship on stability of tenure; and the effects of the church and church activities, social organizations, education, farmstead surroundings and conveniences, and living conditions upon the present stability of the population in western North Dakota.

Farmers who left prior to 1920 operated an average of 194.9 acres, those who left between 1920 and 1926, 259.7 acres, while present operators are farming an average of 604 acres. The percentage of all or part owner operators decreased from 1919 to 1926, and that of renters increased. Counties in which Russians and Germans predominated showed the least decrease in number of farms. Of the settlers who left, nearly 50 per cent acquired land merely as a speculation. Most of them had no farming experience, many had other sources of income, more than one-fifth did not farm the land themselves, and over 90 per cent of the speculative group left prior to 1920. Of the operators who left from 1920 to 1926, inclusive, 40 per cent left for economic reasons, and three-fourths of these left because of financial difficulties.

Of the present operators, 80 per cent occupied or lived on farms before settling in western North Dakota, 80 per cent are married, and 30 per cent are foreign born, as compared with 50, 55.7, and 18 per cent, respectively, in the case of former operators. Of the present operators, 90 per cent liked their community, over 93 per cent of the renters planned to own farms, and of these 85 per cent planned to own in their present community. Three-fourths of the present operators attend church, as compared with 60 per cent for the former operators. Three-fourths of the farmers take weekly or daily papers, 92.5 per cent read farm papers, two-thirds read agricultural bulletins, and over 50 per cent use their county agents. Almost 70 per cent of the farm residences are good or fair, but very few have modern conveniences.

A survey of sickness in rural areas in Cortland County, New York, D. SANDERSON (*New York Cornell Sta. Mem. 112 (1928), pp. 27, figs. 7*).—This publication is based upon a survey made in three townships in Cortland County in 1923 and 1924. Included in the townships were four unincorporated villages and one hamlet with a total population of 477 persons, 1,357 persons living on farms, and 226 others living in the country.

The average length of sickness in the country was found to be 23 days, as compared with 28 days in the villages. The number of days of sickness per capita from all causes, including confinements and accidents, was 5.17 in the country and 7.37 in the villages. Excluding accidents, the number of days per capita was 4.18 and 6.94, respectively, and excluding accidents and confinements 3.91 and 6.43, respectively. It is estimated that from two-thirds to four-fifths of the apparently greater amount of sickness in the villages was due to differences in the age groupings, the villages having a greater proportion of older people. It is also estimated that one-sixth of the per capita rate in the three townships was due to the abnormal age groupings, chiefly the excess of persons over 50 years of age. The villages had 0.226 case of sickness of all kinds per capita, as compared with 0.185 case among the farm and nonvillage population.

The average cost of professional services (doctors, dentists, oculists, and nurses), extra help, hospital service, and medicines was $40.81 per family.

Farm youth: Proceedings of the Ninth National Country Life Conference (*Natl. Country Life Conf. Proc., 9 (1926), pp. [5]+153, pl. 1*).—This contains the proceedings of the Ninth National Country Life Conference, held at Washington, D. C., in November, 1926. Included are the following addresses and papers of the conference: The Special Needs of Farm Youth, by W. M. Jardine (pp. 3–5); Our Rural Youth, by K. L. Butterfield (pp. 6–9); Objectives of Rural Education, by J. J. Tigert (pp. 10–13); Wanted: A Real Farm Bloc,

by C. S. Vrooman (pp. 14–16); A Laboratory of Farm Life, by M. Dana, jr. (pp. 17–19); As a Student Sees Farm Life, by L. Amos (pp. 20–24); The Intangibles in Farm Life, by P. Sanders (pp. 25–28); My Experience as a Mother on the Farm, by Mrs. G. T. Powell (pp. 29–34); Europe's Farm Youth, by C. J. Galpin (pp. 35–37); Some Conditions in Europe Affecting Farm Youth, by A. R. Mann (pp. 37–42); Some Observations of Denmark, by E. C. Lindeman (pp. 43–45); The Peasants of Russia, by E. T. Colton (pp. 45–48); Rural Women of Europe, by G. E. Frysinger (pp. 49–52); and The International Conference, 1926, by K. L. Butterfield (pp. 52–55).

Part 2 contains the discussions at the several meetings of the conference: What is the Situation Faced by Farm Youth? What are the Special Problems of Farm Youth? and What Should be Done? and Report of Student Section, by A. M. Clark.

Part 3 contains the reports of the board of directors, business transacted, finances, and a list of the committees of the association.

Annual report of the chairman of the Social Science Research Council, 1926 (*Social Sci. Research Council, Ann. Rpt. Chairman, 1926, pp. 23*).—The organization of the council, its administration, budget, significant activities during the year, present and future policies, and the work of its several committees are described.

FOODS—HUMAN NUTRITION

The behavior of sulphur compounds in cooking vegetables, J. Simpson and E. G. Halliday (*Jour. Home Econ., 20 (1928), No. 2, pp. 121–126*).—Observations are reported on the palatability of cabbage and cauliflower cooked in small pieces in a large volume of water for varying periods of time and on the amounts of hydrogen sulfide and total volatile sulfur evolved during the cooking.

The cabbage was pronounced most satisfactory after a 5-minute cooking period for summer and a 7-minute period for winter cabbage, and the cauliflower after 8 minutes, 4 minutes being allowed in all cases for the water to reach the boiling temperature.

In the cabbage, the evolution of hydrogen sulfide increased from the fifth to the twentieth minute of boiling, the greatest rate of increase occurring between the fifth and seventh minutes. The amount of total volatile sulfur increased between the seventh and thirtieth minutes of boiling. The amount of hydrogen sulfide evolved by the cauliflower also increased with the time of boiling. At the end of 8 minutes about twice as much hydrogen sulfide had been evolved as from cabbage cooked the same length of time. It is concluded that the sulfur decomposition products are responsible for the disagreeable taste and odor associated with cabbage and cauliflower when overcooked.

Scientific research applied to the canning industry (*Natl. Canners Assoc. Bul. 103–A [1928], pp. 44*).—A brief review of the organization and activities of the research laboratories of the National Canners Association and its cooperating institutions, with a summary of the results obtained in investigations on tin plate, technological operations, processing, and the nutritive value and wholesomeness of canned foods. Contributions to the canning industry in various fields of agricultural science, including entomology, plant pathology, and horticulture and plant breeding, are also discussed.

[Canned foods] (*Natl. Canners Assoc. Buls. 97–A, rev. (1927), pp. 14, figs. 7; 99–A, rev. (1927), pp. 14, figs. 10; 101–A, rev. (1927), pp. 11, figs. 6; 96–A (1928), pp. 17, figs. 5*).—This series of popular bulletins on canned fruits (96–A), canned tomatoes and tomato products (97–A), canned peas (99–A), and canned

corn (101–A) deals with the preparation, nutritive value, and uses of the canned products listed, with recipes in which the qualities of the canned food are indicated by the size of the can.

Pickling olives by the modern Greek process, S. A. KALOYEREAS (*Fruit Prod. Jour. and Amer. Vinegar Indus., 7 (1928), No. 8, pp. 14–16*).—This paper includes a description of ancient and modern methods of pickling olives in Greece and the report of experiments undertaken in an attempt to duplicate the modern Greek methods at the fruit products laboratory, University of California.

Data are included on the content of water, oil, salt, sugar, protein, and total carbohydrates in the flesh of fresh ripe olives and of the same variety pickled by the California process, the Spanish green process, and the Greek process, together with similar data for two sample of pickled olives imported from Greece. The Greek process olives had a much higher content of oil and total carbohydrates than the olives prepared by the other methods.

Candy (*Jour. Amer. Med. Assoc., 90 (1928), No. 13, p. 1040*).—An editorial discussion on the increasing consumption of candy in the United States as determined by a survey made by the U. S. Department of Commerce. Based upon the returns of about 80 per cent of the candy makers of the nation, this report shows a candy consumption for the year 1926 of about 9 lbs. per person at an average per capita cost of more than $2. It is pointed out that inasmuch as candy is not universally eaten, its consumption by the smaller number of actual users must be much higher than these figures.

The composition of human milk, G. D. ELSDON (*Analyst, 53 (1928), No. 623, pp. 78–82*).—Data are reported on the average, minimum, and maximum percentages, by subjects, of total solids, solids-not-fat, and fat in 529 samples of human milk obtained from 86 different subjects. Similar data are given on a smaller number of samples obtained from the left and right breast of the same subjects and on samples taken at different times after nursing, on variations in the composition of the milk at different periods of lactation, and on the analytical constants of the fat of a number of samples.

A comparison of the individual and the inventory methods of dietary study, G. N. SEABLE and R. M. ARNOLD (*Jour. Home Econ., 20 (1928), No. 2, pp. 84–88*).—Data for this comparison were obtained at the home management house of the Iowa State College during the 4 weeks' residence of a group of 8 normal young women of similar age and activity. For the inventory method, the procedure commonly employed was followed, careful records being made of all foods on hand at the beginning and the end of the period, with calculations from these records of the per capita consumption. For the individual method, the food consumption at each meal was determined by carefully weighing all of the food placed on and coming from the table. The average results by the individual and inventory methods were, respectively, as follows:

Protein 64.6 and 73.8 gm., fat 114. 3 and 124.4, carbohydrate 263.7 and 295.8, calcium 0.863 and 0.932, phosphorus 1.187 and 1.397 gm., iron 11.35 and 13.49 mg., and energy 2,342 and 2,599 calories per person per day. The distinctly higher figures by the inventory method suggested the question of waste, and on making allowance for the waste of protein, fat, carbohydrate, and energy by deducting the average percentages of waste for these constituents reported by Murlin and Hildebrandt in a study of meals served in army camps during the war, the resulting figures approached those of the individual method more closely. No figures were available, however, for the calculation of waste of minerals.

In discussing the advantages and disadvantages of the two methods it is concluded that the inventory method is of questionable value in cases where the

subjects vary greatly in food needs or intake, but is adequate if the subjects are fairly uniform as to food requirements and habits and if a reliable method is employed for computing waste. In the study reported the inventory method required less than one-tenth the time of the individual method.

A "field respiration apparatus" for a medical and physiological survey of racial metabolism, F. G. Benedict (*Boston Med. and Surg. Jour., 197 (1927), No. 25, pp. 1161–1175, figs. 10*).—A simplified form of the student respiration apparatus of Benedict and Benedict, which has been developed for field metabolism research in an extensive investigation of racial metabolism now being undertaken by the Nutrition Laboratory of the Carnegie Institution, is described in detail, with complete directions for its use, including a method of generating oxygen from a commercial preparation of sodium peroxide when it is impossible to secure cylinders of compressed gas. The principle of the apparatus is described as follows:

"The subject respires into a closed circuit of highly oxygenated air by means of a mouthpiece, the nose being closed with a clip. The expired air, rich in carbon dioxide, passes into one side of a can which contains soda-lime and which is covered with a light-weight rubber bathing cap to provide for expansion and contraction of the air without resistance. The carbon dioxide is absorbed by the soda-lime, and the air thus returns to the mouth free from carbon dioxide. Two rubber valves allow the air to pass continuously in one direction from the can to the mouth and from the mouth back to the can. In the process of metabolism the total volume of air in the closed respiratory system is gradually decreased by the absorption of oxygen. The object is to measure quantitatively this decrease in volume by introducing into the closed circuit a metered volume of oxygen to compensate exactly for the amount of oxygen withdrawn. An index of constancy in the volume of the apparatus is therefore necessary. The light-weight rubber bathing cap, which offers no resistance to respiration, slowly sinks as the oxygen is consumed. If oxygen is introduced quantitatively by some means so as to elevate the bathing cap at the end of the experiment back to the point at which it was at the beginning of the experiment, the measurement of the oxygen thus introduced is a measure of the oxygen consumed by the subject."

The nature of the foodstuffs oxidized to provide energy in muscular exercise.—I, In the normal animal, D. Rapport and E. P. Ralli (*Amer. Jour. Physiol., 83 (1928), No. 2, pp. 450–465*).—Essentially noted from a preliminary report (E. S. R., 58, p. 190).

Metals in our food, F. B. Flinn and J. M. Inouye (*Jour. Amer. Med. Assoc., 90 (1928), No. 13, pp. 1010–1013*).—This is a general discussion of studies which have been conducted by the authors to determine, by feeding experiments with rats and guinea pigs, the effect of long-continued ingestion of metals and metallic salts such as may be present in foods which have been cooked in metallic utensils. Aluminum is given special attention because of statements which have been made of the possibilities of chronic poisoning from food cooked in aluminum utensils. No evidence was obtained that such poisoning may take place under ordinary conditions, although it is admitted that large doses of aluminum salts will cause gastrointestinal disturbances. The authors' final conclusions are as follows:

"A study of the growth curves, the blood and animal behavior, and a pathologic examination of the tissues indicates that persons do not suffer any ill effects from the small amount of metals present in the food or dissolved from the cooking vessels. We have not found any indication of chronic poisoning from these metals involved, especially copper, which metal we were particularly interested in when we began our study. In spite of our negative observa-

tions, we feel that there is room for further study to learn whether the metals have any part in causing or accelerating some of the degenerative diseases of middle age."

The problem of the iron reserve: An experimental study, C. S. WILLIAMSON and H. N. ETS (*Arch. Int. Med., 40 (1927), No. 5, pp. 668–675*).—In experiments on dogs and on rats, the authors have demonstrated that the liver and spleen act as storehouses for food iron in excess of what is required for ordinary hemoglobin formation. After loss of hemoglobin from bleeding there is a much more rapid regeneration with diminution of the iron content of the liver and spleen in animals possessing this reserve supply of iron than in those without this supply.

Effect on the urine of addition of acids and alkalis to the diet of infants, D. GREENE (*Amer. Jour. Diseases Children, 35 (1928), No. 1, pp. 38–46*).—This investigation, which was conducted at the Home for Hebrew Infants, New York City, consisted of an extensive study of the urinary changes, as determined by microscopic appearance and pH values, occurring following the consumption for several days of milk treated with N/10 and N/30 HCl and with lactic acid, lemon juice, sodium bicarbonate, or sodium hydroxide in varying quantities and concentrations.

Lemon juice in 3 per cent concentration, as recommended by Hess and Matzner (E. S. R., 51, p. 867), did not lead to any evidences of irritation of the kidneys, and the H-ion concentration of the urine ranged from pH 5.5 to 7 in the eight cases studied. Hydrochloric acid even in small amounts, 45 cc. of N/10 solution, added to a liter of milk was followed by the appearance of casts and sometimes of red blood cells in the urine. In older children about 100 cc. of the acid in this concentration was required to bring about similar irritative manifestations. The H-ion concentration of the urine varied from pH 4 to 5, with an occasional value of 6. Calcium lactate in amounts of 8 gm. per liter of milk produced similar results, while lactic acid in quantities of 8 cc. per liter of milk produced casts only occasionally. Large doses of sodium bicarbonate or sodium hydroxide did not produce the same irritating effects as the acid. The reaction of the urine was with one exception slightly alkaline following the administration of sodium bicarbonate, and slightly acid or alkaline, with the preponderance on the acid side, following the administration of sodium hydroxide.

The influence of protein, blood, liver, fat, iron, and potassium in the diet upon the rate of blood regeneration after hemorrhage in the rat and dog, C. M. MCCAY (*Amer. Jour. Physiol., 84 (1928), No. 1, pp. 16–35, figs. 4*).—An elaborate investigation of blood regeneration in rats and dogs rendered anemic through removal of blood by cardiac puncture is reported, with results which cast some doubt on the suitability for dogs of synthetic rations which are satisfactory for the growth and maintenance of the rat.

The data reported indicate that the rat is able to use iron citrate effectively for blood regeneration and can also regenerate hemoglobin on a standard casein diet, while the dog does so only with difficulty. Dried liver promoted rapid blood regeneration in both rats and dogs. The rate of blood regeneration in the rat was found to be independent of the protein level within wide limits, providing there is adequate protein for the maintenance of the body. The rate of regeneration was also independent of the fat content of the diet when the diet was adequate in every other respect.

The technique of cardiac puncture in the rat is described in detail, and a bibliography of 33 titles is appended.

Some aspects of hypertension, F. R. NUZUM and R. D. EVANS (*Amer. Jour. Nursing, 28 (1928), No. 4, pp. 327–333*).—Diet is included in this discussion of the factors which play a rôle in the control of chronic hypertension or high

blood pressure. In the authors' opinion, moderate limitation of protein and a proper balance with alkaline foods, such as milk, vegetables, and fruits, are essential dietary measures.

The dietetic treatment of hypertension, B. M. Wood (*Amer. Jour. Nursing, 28 (1928), No. 4, pp. 333–335*).—This paper supplements the foregoing by a practical discussion of the selection of foods for the dietary treatment of hypertension. Several recipes utilizing oranges and lemons are included.

The influence of yeast on the alimentary rate, W. D. Thorup and A. J. Carlson (*Amer. Jour. Physiol., 84 (1928), No. 1, pp. 90–97, fig. 1*).—To determine whether or not there is any basis for the laxative effects alleged for yeast, a study was first made of the effect of yeast on the rate of passage of food residues through the intestines of rats, and this was followed by observations of the effect of yeast on the number of bowel movements daily in human subjects.

In the first study the addition to the control diet of 7.5 per cent by weight of fresh bakers' yeast had no effect on the alimentary rate as determined by the averages of 43 observations on the two diets. Two series of experiments were conducted on human subjects, the first consisting of a preliminary control period, a yeast period, and a second control period of 16 days each. The diet was uncontrolled, but in the yeast period three cakes of yeast were added daily. The second series differed from the first in that the yeast period continued for 30 days. Complete data are reported for 31 subjects in the first and 51 in the second series. Although 55 per cent showed an increase in the number of movements daily during the yeast period, the variations from the normal were very slight, and in some individuals with a normally sluggish bowel movement there was a decreased number of movements during the yeast period.

It is concluded that the value of yeast as a laxative in adults on average normal diets is questionable.

The influence of yeast on gastric secretion (man, dog), R. S. Allen and G. E. Burget (*Amer. Jour. Physiol., 84 (1928), No. 1, pp. 98–102, fig. 1*).—To determine whether or not bakers' yeast has a gastric secretagogue action, as claimed by some investigators, a comparison was made of the hydrochloric acid content of the gastric juice of three normal human subjects at intervals after a test meal of 20 gm. of yeast in 400 cc. of water and one of a suspension of 5 gm. of powdered soda crackers in 400 cc. of water, the amount of crackers equaling in weight the dry weight of 20 gm. of fresh yeast. Eight experiments were run on each subject. Two of the subjects showed higher acidity in the control than in the yeast period, and the opposite was true of the third subject.

Three dogs with Pavlov pouches were each given by stomach tube 20 gm. of fresh yeast suspended in 100 cc. of water alternating with 5 gm. of a synthetic food mixture of protein, fat, carbohydrate, and ash. From 5 to 7 experiments were run on each dog. The amount of gastric juice excreted and also the percentages of total acid were invariably greater with the synthetic meal than with the yeast meal. The slight increase in acidity is attributed to a slightly higher acidity of the test meal.

It is concluded that "under the conditions set forth in these experiments, bakers' yeast did not exert a gastric secretagogue action as great as that brought about by soda crackers and water or by a synthetic test meal consisting of similar amounts of protein, carbohydrate, and fat as found in yeast."

The influence of yeast in the diet of the rat upon the activity of isolated segments of duodenum and colon, E. A. Smith and B. A. Plummer (*Amer. Jour. Physiol., 84 (1928), No. 1, pp. 200, 201*).—Yeast, added in amounts of 1, 10, and 25 per cent by weight of the basal diet, was found to have no effect upon

the motor activity of isolated segments of the duodenum and colon of rats receiving in addition to the yeast a basal diet supposedly adequate except for vitamin B.

The vitamins as factors in health and in food values, H. C. SHERMAN ET AL. (*Amer. Jour. Pub. Health, 18 (1928), No. 3, pp. 331–337*).—This annual report of the committee on nutritional problems of the American Public Health Association (E. S. R., 55, p. 388) emphasizes the importance of securing the necessary supply of vitamins from foods rather than from drug store concentrates, of conserving as far as possible the natural vitamin value of foods, and of insuring optimal rather than merely adequate vitamin intake. The discussion of recent developments in vitamin literature is limited to vitamin A, particularly its double rôle as a tissue constituent and a regulatory substance concerned with the maintenance of normal conditions and the control of nutritional processes.

Biologic assays for vitamines, P. S. PITTENGER (*Amer. Jour. Pharm., 100 (1928), No. 2, pp. 63–91, figs. 19*).—A description of the technique employed by the author in vitamin studies at the research pharmacologic laboratories of Sharp & Dohme, Baltimore, Md.

Hunting the vitamin, W. H. EDDY (*Amer. Jour. Pub. Health, 18 (1928), No. 3, pp. 313–325, figs. 3*).—This is a review of recent investigations, chiefly from the author's laboratory, on the multiple nature of vitamin B (E. S. R., 58, p. 692) and on the isolation of several bioses from yeast autolysates. Convenient summaries are given of the Kinnersley-Peters technique for preparing torulin (E. S. R., 58, p. 89) and the Kerr method of separating alpha and beta bioses from yeast autolysate.

Immunity and vitamin deficiency (*Lancet [London], 1928, I, No. 13, p. 670*).—A brief review of the rather inconclusive evidence on the subject, with 11 references to the literature.

The creatine metabolism in the brains of starving and polyneuritic pigeons [trans. title], T. LJUBARSKAJA (*Pflüger's Arch. Physiol., 218 (1928), No. 5–6, pp. 627–634*).—Data are reported on the content of total nitrogen and creatine in the brains of 25 pigeons in various stages of polyneuritis and of 18 starving and 19 normally-fed pigeons.

Complete and vitamin B starvation was accompanied by disturbances in the nitrogen metabolism of the brain, particularly the creatine metabolism, the changes being most pronounced in the spastic form of polyneuritis. This was marked by a lowering of total nitrogen and an increase of creatine, that of the paralytic form by a greater loss of total nitrogen and a smaller loss of creatine, and that of the chronic form and of starvation by a small increase in creatine and no change in total nitrogen. The composition of the brain did not return to normal within 24 hours after the administration of yeast.

A dietary deficiency canine disease—further experiments on the diseased condition in dogs described as pellagra-like by Chittenden and Underhill and possibly related to so-called black tongue, F. P. UNDERHILL and L. B. MENDEL (*Amer. Jour. Physiol., 83 (1928), No. 2, pp. 589–633, pls. 2*).—A series of attempts to determine the dietary constituents responsible for the prevention and cure of the pellagra-like disease in dogs described by Chittenden and Underhill (E. S. R., 38, p. 366) is reported, with the conclusion that carbon or some impurity which is not separated from it by ordinary methods of purification is the effective agent.

Of the many natural food materials tested, butterfat, egg yolk, and carrots were the most effective. The discovery that the potency of butterfat diminishes with decrease in natural color suggested the possible part played by carotinoids, and led to the successful tests with egg yolk, carrots, and carotin prepared

from carrots. In regard to the possible connection of the pathological condition, which is described in detail with illustrative color plates, with black tongue in dogs as described by Goldberger et al. (E. S. R., 55, p. 890), the authors state "the discrepancies between the results of Goldberger and his associates and our own are so great as to prohibit attempts at explanation. Moreover, the character of the food they fed and their experimental conditions are so different from our own that comparison of the two investigations is difficult, especially since no detailed report of their experiments has yet appeared. We shall be content, therefore, merely to call attention to the apparent lack of agreement between the results of the two investigations."

An experimental deficiency disorder (*Jour. Amer. Med. Assoc., 90 (1928), No. 14, pp. 1118, 1119*).—An editorial discussion of the paper noted above.

The development of deficiency disease during therapeutic diets, P. B. DAVIDSON (*Jour. Amer. Med. Assoc., 90 (1928), No. 13, pp. 1014, 1015*).—Illustrations are given from the author's clinical experience of deficiency diseases which may result from the strictly limited diets employed in the treatment of certain pathological conditions, in the present instance gastric ulcer.

Note on the attempted activation of tyrosine by ultra-violet irradiation, S. K. KON and T. MOORE (*Biochem. Jour., 21 (1927), No. 6, pp. 1368, 1369*).—The claim recently made by Waltner[4] that pure tyrosine can be rendered antirachitic by irradiation has been tested by preventive feeding experiments with rats on the McCollum diet 3143. The addition of 0.5 per cent of irradiated tyrosine to the diet did not prevent the onset of rickets in the five animals tested, the rachitic condition being as severe as in the five controls receiving nonirradiated tyrosine, while two animals receiving irradiated cholesterol were protected from rickets.

Clinical experiences with the irradiated ergosterol of Windaus [trans. title], H. STROTE (*Klin. Wchnschr., 7 (1928), No. 3, pp. 114–116, figs. 2*).—The author reports success in the treatment with irradiated ergosterol of an unusually severe case of rickets in a boy 5½ years old, of osteomalacia in a 31-year-old patient, and of tetany in a year-old child. The preparation employed was the commercial product Vigantol, and in the case of rickets was given in 1-mg. daily doses, increasing gradually to 3 mg. daily. After 4 weeks' treatment, the preparation was omitted for 3 weeks and then resumed for another 4 weeks.

On irradiated ergosterol as a dressing for wounds, with suggestions as to its mode of action, C. J. BOND (*Brit. Med. Jour., No. 3504 (1928), pp. 339, 340*).—A brief note on the beneficial effect of irradiated ergosterol when used in solution in liquid paraffin as a dressing for wounds is followed by a discussion of the possible mode of action of vitamin D, which is summarized as follows:

"We know from the brilliant work of a number of observers that irradiation will convert ergosterol and other unsaturated sterols into a substance having antirachitic qualities—that is, vitamin D. We have now shown that irradiation will also produce from the ergosterol a fat-soluble substance containing oxygen, some portion of which can be readily liberated. We also know that ozonization (and possibly other methods) will convert ergosterol into an oxidizing substance, but we do not yet know whether ozonization will produce an antirachitic substance. Neither do we yet know whether the vitamin D and the oxidizing substance are one and the same thing."

An analysis of anorexia, W. M. BARTLETT (*Amer. Jour. Diseases Children, 35 (1928), No. 1, pp. 26–35*).—In this paper anorexia is defined as "a subjective complaint of constant loss of appetite persisting long enough to cause objective signs of malnutrition," and the term is further subdivided into "(a) organic

[4] Magyar Orvosi Arch., 28 (1927), No. 1, pp. 19–23, figs. 3.

anorexia in which a definite possible cause for the condition could be determined and (b) functional anorexia in which an organic cause that could possibly explain the condition was not found." From 1,471 children between the ages of 1 and 14 years seen in the outpatient department of the Massachusetts General Hospital, Boston, 121 were selected as suffering from functional anorexia, and these were treated for a period of several months in three groups as follows: (1) Daily administration of saccharated iron, (2) daily administration of cod-liver oil, and (3) the introduction of fresh calf's liver, broiled beefsteak, and lamb's kidneys into the diet at least three times a week.

Although the data obtained did not permit a statistical comparison of the weight gains of the children in the first and second groups, both of these groups could be compared statistically with the third group. The mean total gains of the children in the three groups were (1) 3.50±0.402 lbs., (2) 4.75±0.634, and (3) 7.90±0.276 lbs., respectively. It is stated that the children in the third group who were pale and markedly undernourished at the beginning of the supplementary feeding became robust and healthy and showed an immediate increase in appetite.

The author concludes that "the most efficient and reliable method of treatment for chronic functional anorexia is the introduction of fresh calf's liver, broiled beefsteak, and lamb's kidneys into the diet of the child."

A goiter survey at Northwestern University: First report, G. de Takats and D. Grey (*Jour. Amer. Med. Assoc., 90 (1928), No. 13, pp. 1008–1010, figs. 2*).—Observations are reported on the incidence and type of goiter, previous medication, clinical symptoms, basal metabolic rates, and possible relationship to academic standing in 635 undergraduate women at Northwestern University during the school year 1926–27.

Of the total number, 168, or 26.5 per cent, showed clinical evidence of thyroid enlargement as evidenced by glands filling out the contours of the neck and by definite swelling of the glands. In all but 6 of this number the goiter was of the diffuse colloid type. Over 40 per cent had had iodine treatment, chiefly as iodized salt. Basal metabolic rates were determined for only 71 of the subjects and were reported to be normal in 81.6 per cent, low in 15.4 per cent, and high in 2.8 per cent. No significant differences were found in the academic standing of the students with low and normal basal metabolic rates, but the students with markedly enlarged thyroid glands were lower in academic standing than those with less evident glands. A note of warning is sounded against indiscriminate iodine medication in women over 16 years of age.

MISCELLANEOUS

Report [of] South Mississippi Branch Experiment Station, 1927, E. B. Ferris and W. S. Anderson (*Mississippi Sta. Bul. 246 (1927), pp. 18, figs. 5*).—The experimental work reported is for the most part abstracted elsewhere in this issue.

Forty-eighth Annual Report of the New Jersey State Agricultural Experiment Station and the Fortieth Annual Report of the New Jersey Agricultural College Experiment Station for the year ending June 30, 1927, J. G. Lipman et al. (*New Jersey Stas. Rpt. 1927, pp. XXIX+341, pls. 5, figs. 19*).—This contains the organization list, a financial statement for the fiscal year ended June 30, 1927, a report of the director on the work and publications of the year, and departmental reports, the experimental features of which not previously reported are for the most part abstracted elsewhere in this issue. Meteorological observations are noted on page 314.

NOTES

California University and Station.—Preliminary work is being prosecuted on the plans for the new $500,000 Giannini Hall (E. S. R., 58, p. 603), which is to complete the agricultural quadrangle at Berkeley. It is planned to allocate the space in this building to the offices of the foundation so far as needed, utilizing the remainder for the administration, extension, agricultural economics, and forestry work of the College of Agriculture and the California Forest Experiment Station.

Approximately $70,000 has been made available for the construction of the new poultry husbandry research plant on the university campus in Berkeley, and it is expected that the installation will be available for use in October. The plant includes a laboratory building, various types of poultry houses, and a foreman's cottage.

Gordon H. True, professor of animal husbandry since 1913 and head of the division since 1918, died June 5 at the age of 59 years. He was a graduate of the University of Wisconsin in 1894 and had served successively as instructor in dairy husbandry in the Michigan College from 1894 to 1899, professor of animal husbandry in the University of Arizona from 1899 to 1903, and professor of agriculture and animal husbandman in the Nevada University and Station from 1904 to 1912. From 1912 to 1913 he was director of the Nevada Station. He was widely known for his work in animal husbandry, being selected by the American Society of Animal Production for honor at its 1927 annual dinner, and was also one of the pioneer workers in irrigation investigations, serving as the representative of the U. S. Department of Agriculture for many years in Nevada.

Connecticut College and Storrs Station.—The general science building, for which the last legislature voted $450,000, is well under way and is expected to be ready for occupancy about February 1, 1929.

Dr. Charles Lewis Beach, for 20 years president of the college, has resigned because of poor health and has been designated president emeritus. C. B. Gentry, professor of agricultural education and dean of the division of teacher training, has been appointed acting president.

Dr. Leslie C. Dunn, station geneticist in poultry husbandry, has accepted a position as professor of zoology in Columbia University, beginning September 1, but will continue to act as advisory geneticist. Dr. Walter Landauer has been given charge of the department.

Dr. Charles A. Slanetz, assistant bacteriologist, has resigned, effective September 1, to take up similar work in the Rockefeller Institute and has been succeeded by Dr. Wayne N. Plastridge. Dr. E. W. Sinnott, professor of botany and genetics and dean of the division of agricultural science, has accepted an appointment as professor of botany at Barnard College, Columbia University, effective October 1. Dr. Avery D. Pratt has been appointed assistant professor of dairy husbandry and will devote part of his time to research in animal nutrition.

Florida University.—Dr. John J. Tigert, commissioner of the Bureau of Education, U. S. Department of the Interior, has accepted the presidency of the university, effective September 1.

Louisiana University and Stations.—Dr. C. T. Dowell, formerly dean of the School of Agriculture of the Oklahoma College and director of the Oklahoma Station, has been appointed dean of the College of Agriculture and director

of the stations, beginning August 1, vice Dr. W. R. Dodson, whose resignation has been previously noted.

Michigan College and Station.—Dr. R. S. Shaw, dean of agriculture and director of the station, who for several months had been serving as acting president, was appointed president of the college May 22. J. F. Cox, head of the department of farm crops, has been appointed dean of agriculture, effective June 15, and V. R. Gardner, head of the department of horticulture, the director of the station on the same date. H. C. Rather, who has been in charge of the extension work in farm crops, has been appointed professor of farm crops and placed in charge of that work.

The resignations are noted of Dr. L. C. Wheeting, assistant professor and research assistant in soils, and J. D. Romaine, instructor and research assistant in soils, to engage in commercial work.

Minnesota University and Station.—Effective July 1 several significant changes have been made in the organization of the station. A separate office has been established independent of all divisional activities but adjacent to that of the dean and director of the university department of agriculture. This office will be in charge of Vice Director Andrew Boss, who will give the major portion of his time to the direction and coordination of research, though maintaining a professorship in farm management and participating in the graduate instruction in farm management and agricultural economics. Research projects both at the central station and at the substations will be initiated through the vice director, with the expectation that closer coordination of the different lines of research and better cooperation between members of the staff will be secured in this way.

To make possible the above change, the former division of farm management, agronomy, and plant genetics has been discontinued. The work in agronomy and plant genetics has been constituted as a distinct division with Dr. H. K. Hayes as chief, and the farm management section has been combined with agricultural economics in a division of farm management and agricultural economics with Dr. O. B. Jesness, head of the department of markets and rural finance in the Kentucky College and Station, as chief.

The following resignations are noted: On August 1, Budd A. Holt, assistant professor of agricultural economics and assistant agricultural economist, to accept a position with the division of agricultural economics at the Iowa College; Elmer J. Working, associate professor of agricultural economics, to accept a position in the Division of Historical and Statistical Research, U. S. D. A. Bureau of Agricultural Economics; and Dr. J. H. Beaumont, assistant professor of horticulture and in charge of the section of fruit breeding, to become head of the department of horticulture of the North Carolina College and Station; and on July 1, D. C. Mumford, assistant in farm management, to accept a position in the Division of Farm Management and Costs, U. S. D. A. Bureau of Agricultural Economics, and A. T. Hoverstad, assistant in farm management, to engage in farming.

Juniata L. Shepperd, a pioneer home economics worker in the School and College of Agriculture and later in extension work, died in Minneapolis March 10 at the age of 72 years. Miss Shepperd was a native of Iowa, but a graduate of the university in 1881 and subsequently the recipient of the M. A. degree. After a period of farmers' institute work in 1891–92, she took courses in cooking at Chautauqua and domestic science at Pratt Institute, and in 1894 began to teach cooking at a summer course of domestic science in the School of Agriculture. In 1897 when girls were admitted to the school itself she was given charge of the work of home economics. Subsequently she originated the

corresponding work in the College of Agriculture. Her extension work began in 1914 and had dealt especially with the installation of improved water supply and sanitation systems in farm homes. She was the author of a text on laundry work, another on household science, and joint author of a bulletin on low cost water systems for farm homes.

New York State Station.—The series of so-called popular bulletins that has been a feature of the publication scheme of the station for many years has been discontinued. The station will now publish technical and general bulletins, and it is expected in the latter series to develop to a further extent than has been done in the past the practical applications of the experimental work reported on in bulletin form. Greater reliance will also be placed on the circular series to disseminate information of a purely popular character, and the syndicated press service sent out each week is to be augmented somewhat in an effort to put before the public information on recent developments in station work.

Paul S. Prickett, Ph. D., has resigned as assistant in research bacteriology to accept a position with the U. S. D. A. Bureau of Chemistry and Soils, effective July 9.

North Dakota College and Station.—H. M. Scott, instructor and research assistant in poultry husbandry, has resigned to accept a similar position in the Kansas College and has been succeeded by George P. Goodearl. H. G. Anderson has been appointed assistant in marketing and rural organizations, beginning June 15, and is engaged in a study of farmers' elevators in North Dakota in cooperation with the U. S. Department of Agriculture.

Oklahoma College.—Dr. H. G. Bennett, president of the Oklahoma State Teachers College, has been appointed president, beginning July 1, vice Dr. Bradford Knapp, whose resignation has been previously noted.

Porto Rico Insular Station.—The last legislature gave an increased appropriation for the support of the station and also additional funds for the enlargement of the laboratory building, a new barn, two new greenhouses, and a new insectary.

A substation has been located at Isabela for the study of irrigation problems, with Luis A. Serrano of the division of agronomy in charge.

New lines of work for the year include a study of the various problems of the fruit industry, diseases of livestock, root diseases and insect pests of sugar cane, the West Indian fruit fly, and a soil survey of the island in cooperation with the U. S. Department of Agriculture.

Dr. Melville T. Cook, acting director for several months, has been appointed vice director and editor of the *Journal of the Department of Agriculture.*

South Dakota College and Station.—A contract for building the new chemical laboratory to replace that burned last spring has been let. This building is to cost $66,000, and a section is being set aside to accommodate the station chemist.

Recent appointments include Dr. K. W. Franke, instructor and assistant in agricultural biochemistry in the Minnesota University and Station, as station chemist; Dr. K. H. Klages, assistant professor and assistant in forage crops and pastures in the Oklahoma College and Station, to a position in the department of agronomy; and Frank T. Hady in farm economics.

Washington College and Station.—Dr. Lee E. Miles, assistant professor of plant pathology and assistant plant pathologist, has been appointed plant pathologist in the Mississippi Station vice Dr. D. C. Neal, who has accepted an appointment with the U. S. D. A. Bureau of Plant Industry and is located at Greenville, Tex.

Wisconsin University and Station.—A rural leadership school held from June 25 to July 6 attracted a registration of 80 students, mostly rural clergymen and church lay workers and representing 12 States and 7 religious denominations. Only 16 of the students were from Wisconsin.

According to a report read at the annual meeting of the Wisconsin committee on the application of electricity to agriculture, held at the college July 9, on June 30 there ware 18,156 Wisconsin farms served by high line electric power, as compared to 12,910 farms on June 30, 1927. The average annual energy consumption per farm showed an increase of 33 per cent, indicating that farmers were finding more use for their electrical equiment or installing additional equipment. There was also noted a steady increase in the number of farms adjacent to a power line which are being served by the line. For the ensuing year special emphasis is to be given to studies in dairy refrigeration to aid dairymen selling fluid milk, the use of a 5-h. p. motor for cutting silage, and extension work demonstrating the use of special electrical appliances for use on the farm or in the rural home.

Recent appointments include Dr. E. L. Kirkpatrick, associate agricultural economist in the Division of Farm Population and Rural Life, U. S. D. A. Bureau of Agricultural Economics, as associate professor of agricultural economics primarily for research in rural life studies; Dr. I. F. Hall, extension assistant professor of farm management in Cornell University, as assistant professor of agricultural economics; and W. P. Mortenson, State club leader in Wyoming, as assistant professor of agricultural economics, especially for research and extension in fluid milk marketing.

American Study of Marketing Farm Products in Germany.—At the invitation of a German committee representing agriculture, industry, and finance, a group of 10 Americans was selected to work with a committee of Germans in a study during the summer of 1928 of the marketing of farm products in Germany, particularly dairy products and meats. Dr. George F. Warren of Cornell University was appointed chairman of the American commission. The remaining members were J Clyde Marquis of the U. S. D. A. Bureau of Agricultural Economics; Director F. B. Morrison of the New York State and Cornell Experiment Stations; Dean and Director H. W. Mumford of the Illinois University and Station; Dr. F. A. Pearson, H. A. Ross, and Otto Rahn of Cornell University; and G. E. Gray, Dr. N. W. Hepburn, and I. C. Weld, representing commercial interests.

New Journals.—*Superphosphate* is being published monthly at Hamburg by the International Superphosphate Manufacturers Association. Previously issued as a house organ, its present aim is to set forth the work of the Hamburg-Horn Experimental Station of the association, as well as to review results obtained as to superphosphates elsewhere. It is being printed in English, French, and German in parallel columns.

The Journal of the South African Veterinary Medical Association is being published from time to time. The initial number contains an account of the meeting of the association August 18–20, 1927, several original articles, notes, etc.

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EXPERIMENT STATION RECORD

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The annual meeting of the American Society of Agricultural Engineers, which was held in Washington, D. C., from June 19 to 22, 1928, was a noteworthy gathering in several respects, and one of these was the prominence which was given to research. Needless to say the elevating of research standards is largely a human problem, and the attitude of the various professional societies is a powerful factor in its upbuilding. Where a group of specialists is only mildly interested or is unduly complacent, progress is likely to be slow and uncertain. On the other hand, where there is keen appreciation of what research is, some realization of what it can do and how much it is needed, a recognition of existing shortcomings, and a serious desire for improvement, the outlook is correspondingly encouraging.

Great differences exist between various organizations in these respects, and likewise in the ideals and leadership of the same organization from time to time. In general, the cause of agricultural research has been well served by the various professional societies most closely concerned. For some the task has been comparatively easy, while in others research has been more or less overshadowed by other interests.

The American Society of Agricultural Engineers, now in its twenty-third year, has for some time been devoting a considerable share of its energies to the promotion of research, despite the fact that this phase of its work has been the immediate vocation of a comparatively small proportion of its membership. Unlike such groups as the American Society of Agronomy or the American Society of Animal Production, this society has enrolled a large number of workers in commercial fields. Its membership from the agricultural colleges and the Federal Department of Agriculture is correspondingly less pervasive, and many of those from these institutions are associated with instruction or extension activities rather than with experimentation. In consequence the research workers themselves are probably more largely in the minority in this society than in any similar group except the American Home Economics Association.

Under these circumstances it was especially gratifying to find at the recent meeting so many papers on research permeating the program. Not only in the college division but in the general sessions and the gatherings of the various technical divisions was its importance emphasized and its problems carefully considered.

Thus the presidential address, delivered by Col. O. B. Zimmerman, a representative of a large implement manufacturing concern, was entitled The Ascendency of Applied Science in Agriculture. In this address was embodied a vigorous plea for additional public support of research in the agricultural colleges and the Federal Department of Agriculture, the existing provision being characterized as "pitifully small." Colonel Zimmerman also pointed out the need for greater standardization for farm equipment and methods and the potential possibilities in the more effective utilization of farm by-products. The latter question he deemed one of the most important awaiting development and one in which he considered it vital that agricultural research institutions should take an active share.

Some of these matters were also dwelt upon by Dr. A. F. Woods, director of scientific work of the Department of Agriculture, who made an earnest plea for the strengthening of graduate work in agricultural engineering. Dr. Woods went on to say that "the development of engineering research will be a correlated line of effort that will require adequate funds and personnel not now possessed by most institutions but urgently needed if progress in these fields is commensurate with the needs of the times. This is particularly true of engineering as applied to agriculture and rural life. The problems to be solved here with the cooperation of the engineer are many and have to do with almost every aspect of agriculture and rural-life affairs—the home, the farm, the community contacts with the outer world, roads, telephones, radio, irrigation and drainage, soil erosion, mapping and planning, farm machinery in all its manifold relations, the use of power for labor that man should not do or can not do as economically as can be done by use of power, the economics of power production, utilization, and distribution from the standpoint of the consumer as well as from that of the power company, cooperative or corporate or publicly owned."

In an address entitled The Effect of Industrial Progress on Educational Methods in Land-Grant Colleges, President R. A. Pearson of the University of Maryland paid tribute to the notable progress in agricultural practice of the past half century, but dwelt especially on the need of well-informed leadership if the balance between industry and agriculture is to be maintained. Such leadership presupposes thoroughgoing research into the host of current problems,

and President Pearson pleaded for the encouragement of such research as an aid to a broad and impartial judgment on such questions as a national irrigation and reclamation policy, the conservation of soil fertility, and the economics of the mechanization of farm work and of power utilization.

More specific suggestions were embodied in an address by Dr. Harrison E. Howe, editor of *Industrial and Engineering Chemistry*, entitled The Development of Research Programs and Research Workers. Speaking primarily from the viewpoint of chemical engineering, Dr. Howe pointed out that research institutions are usually beset with demands for practical service, short-time studies, and long-time investigations, and that the three sorts often do not mix very well. Much depends on the careful choice of good problems under a capable and sympathetic director, though this director, he believed, need not be an expert in the particular problem under investigation. While it is still true that some people undertake research before they are ready for it and must be eliminated by the stern law of the survival of the fittest, he saw a distinct trend toward better fundamental training even in industrial research. He deprecated the idea that research can be "made to order," since discoveries often come when least expected, though seldom by mere accident. As publicly supported research will not ordinarily be long continued unless it has practical bearings and can enlist support, he argued for the formulation of and adherence to more or less definite objectives.

A valuable feature of the meeting was the annual review, inaugurated some years ago, of the progress of research in agricultural engineering by Mr. R. W. Trullinger, senior agricultural engineer of the Office of Experiment Stations. This review took the form of four papers, dealing, respectively, with the progress in 1927 in farm structures, land reclamation, rural electrification, and farm machinery and presented before the corresponding divisions of the society. These papers were not merely summaries but contained considerable frank and constructive discussion of the status and needs of the work.

As regards farm power and machinery, tangible progress in 1927 was reported, attributed in part to the activities of the Advisory Council on Research in Mechanical Farm Equipment. At the experiment stations a tendency to close out general and indefinite studies and to substitute more specific and productive projects was noted. "While the total output of results was perhaps smaller during the year than usual, it appears that the general character of the work is of higher quality than ever before. There is every evidence that the work in the subject is being strengthened."

The work of the year in farm structures appears to have been done largely by other than agricultural engineering agencies, though progress has been made in studies of poultry houses by several stations and of dairy barns at Cornell University, the artificial cooling of apples at the Indiana Station, and the durability of fence posts at the Arkansas Station. Recommendation was made for the organization of an advisory council in this subject similar to that on farm equipment.

In the field of rural electrification it was found that considerable of a background of information has been established, though here again largely by agencies other than the agricultural experiment stations. This work has met certain immediately practical needs, but has also drawn attention to a number of fundamental problems demanding thoroughgoing study. Many of these are now receiving consideration, among them the application of electricity to the poultry and dairy industries, to farm machinery, and to cooking.

Investigation in land reclamation during 1927 resulted in numerous contributions along more fundamental lines. In irrigation, especially, much of the old-time empirical testing seemed to be giving way to more adequate experimentation. Similarly, in drainage studies there was a trend toward a study of the hydromechanics of soil to provide a basis for drainage design and to elucidate some of the unknown factors in runoff. "This suggests the probability that future irrigation and drainage practices will rest upon sound scientific basis."

Several other papers reporting the results of investigations or pertaining to research were included in the program, and the society probably devoted over a third of its time to topics of interest from this standpoint. This was a goodly proportion under the circumstances, and the fact that so much of it was spent in a constructive way is even more encouraging. Such a policy broadly planned and consistently developed should prove very useful. It well exemplifies the substantial aid to research which professional groups may render under leadership which is both interested and enlightened.

Attention has recently been directed in these columns to the notably increased provision for research in agriculture which was made by the Seventieth Congress at its recent session. What is thus far the high-water mark in the Federal appropriations for the purpose was attained for the fiscal year ending June 30, 1929, with an increase of nearly $2,300,000. This increase was divided among a large number of specific projects, as set forth in some detail in a discussion of the appropriation act in the September issue. Mention still remains to be made, however, of a number of pieces of related legislation, mostly carrying no immediate appropriations but looking

toward increased activity and of some interest from the research standpoint.

Under one of these acts, approved May 16, 1928, the benefits of the Hatch, Adams, and Purnell Acts, as well as the several agricultural extension measures, are extended to Hawaii. No appropriation has been made under these acts for experimental work for the current fiscal year, so that the Federal funds available will remain at $54,940 during this period. Ultimately, however, this legislation is expected to provide greatly increased funds for the Territory, hitherto served mainly by the Federal experiment station operated under the direct supervision of this Office since its establishment in 1901, and broad provision is made for the expansion and reorganization of the work in an orderly and well-coordinated way. For the fiscal year 1930 a grant is authorized of $15,000 in addition to any amounts which may be appropriated to the Federal Department of Agriculture for use in Hawaii. The following year the authorization is increased to $20,000, and then by $2,000 steps to $30,000 for the fiscal year 1936. An increase is made to $50,000 for 1937, with further steps of $10,000 each to a total of $90,000 in 1941, and thereafter in full parity with the States.

Provision is made whereby the experiment station to be established under the act "shall be conducted jointly and in collaboration with the existing Federal experiment station in Hawaii in enlarging and expanding the work of said Federal station on cooperative plans approved by the Secretary of Agriculture." The Secretary is further directed to coordinate the work of the new Territorial station and that of the Federal station and of the Department in the islands. The Territory is required to make provision for any additional buildings and permanent equipment which may be necessary for the development of the work.

Another development of some significance was the passage of three bills authorizing additional experimentation at regional experiment and demonstration stations of the Department itself. At two of these stations special attention is to be given to horticulture, and the third is to be devoted primarily to dairying.

The first of these three bills, chronologically speaking, became law March 19, 1928, and subsequently an initial appropriation of $100,000 was made, so that it has now become effective. Provision is made for the establishment and maintenance of a new horticultural experiment and demonstration station to be located at Cheyenne, Wyo., where a section of land has been tendered by the city under a long-term lease at a nominal rental. The specific function of this station is set forth as the propagation and free distribution for experimental and demonstration purposes of seedlings, cuttings, and seeds of "such

shade, ornamental, fruit, and shelter-belt trees, shrubs, vines, and vegetables as are adapted to the semiarid or dry-land regions of the United States." Hitherto it has been found that in this area, comprising parts of Wyoming, Colorado, Utah, Idaho, Oregon, and New Mexico, thousands of dollars have been expended for unadapted nursery stock by newcomers, and that many vegetable gardens have failed because of a lack of knowledge of the requirements. It is believed that with the use of effective shelter belts and other specialized methods such fruits as grapes, cherries, plums, and peaches and such garden truck as potatoes, rhubarb, sweet corn, and asparagus can be successfully grown on a scale that will be of material benefit and add greatly to the comforts of farm life in the region.

A second measure, approved April 16, 1928, contemplates the carrying on of corresponding horticultural activities in the southern Great Plains area, composed of those parts of the States of Colorado, Nebraska, Kansas, Texas, Oklahoma, and New Mexico lying west of the ninety-eighth meridian and east of the 5,000 foot contour line. This project, however, does not contemplate the opening of a new station, as the work is to be conducted at one of the existing field stations of the Department within the area. Authority is given in the act for an initial appropriation of $35,000 for the purpose, including the purchase of land and erection of buildings, but operations under its provisions will necessarily be deferred until an appropriation has actually been made.

The third act, dated May 29, 1928, directs the Secretary of Agriculture to establish and maintain a dairy and livestock station for the South at or near Lewisburg, Tenn. This location will afford opportunity for studies in a rapidly developing dairy section and one where considerable dairy manufacturing is being carried on. It is expected that the new station will be devoted to "investigations, experiments, and demonstrations in the dairy industry and the problems pertaining to the development of such industry in the South, and for investigations, demonstrations, assistance, and service in dairy livestock breeding, growing, and feeding and dairy products manufacture." No expenditure is authorized for land, as it is expected that a tract of at least 480 acres will be provided by organizations and citizens of the city and county. The initial appropriation authorized is $50,000 for the construction of buildings, purchase of equipment, apparatus, and livestock, and maintenance, but the act was not signed until the day preceding the adjournment of the session and there has been no actual appropriation of funds.

Provision for still another research activity was afforded by an act approved April 12, 1928, looking toward the investigation of new uses of cotton. Although this act carries no specific appropriation,

it authorizes the Departments of Agriculture and Commerce to engage in technical and scientific research in American grown cotton and its by-products, including both present and potential uses.

An even more significant indication of the favorable attitude of Congress toward research is to be found in the recognition which was given to research in forestry by the McSweeney-McNary Act, which was signed by President Coolidge May 22, 1928. This measure was enacted largely in response to a widespread and active public demand representing all parts of the United States and many diversified interests, including chambers of commerce and development associations, the lumber and wood-using industries, nature, outdoor, and recreation groups, women's clubs, and other bodies. It codifies much scattered legislation pertaining to forestry research which has been enacted from time to time, and it authorizes a comprehensive 10-year program of experimentation on a basis admitting of considerable expansion.

Although the Department has been carrying on experimental work in forestry for many years and its first forest experiment station was established in 1908, there has been no basic measure dealing with its development comparable to the Hatch Act for agricultural experimentation. Dependence has been largely upon general authorizations carried in the annual appropriation acts, supplemented of late by specific acts for the opening of additional forest experiment stations.

This handicap is now removed by a definite authorization for the maintenance of the 11 existing regional stations and the establishment of 5 new stations. The latter are to be located, respectively, in the intermountain region of Utah and adjoining States, the Southern States, Alaska, Hawaii, and the tropical possessions of the United States in the West Indies. For the support of these 16 stations an annual appropriation of not to exceed $1,000,000 is authorized. This is nearly treble the allotment of $354,300 carried in the current appropriation act for silvicultural, dendrological, and other experiments and investigations and under which the stations have been supported, so that a large increase in their resources has been made possible. It is expected, however, that the maximum will be reached by approximately equal increments of about $70,000 per year.

In addition to the provision thus made for station maintenance, several authorizations are included for specific investigations to be carried on at the forest experiment stations, the Forest Products Laboratory, or elsewhere. Among these are investigations of the diseases and insect pests of forest trees and products and of the life histories of forest animals, birds, and wild life. The respective

expenditures authorized may reach $250,000 per annum for plant diseases, $350,000 for insect pests, and $150,000 for the studies of forest animals.

Studies of the relationship of weather conditions to forest fires, forest range research, the utilization of wood and other forest products, and the investigation of such economic problems as reforestation, the proper function of timber growing in diversified agriculture and in insuring the profitable use of marginal land, and the most effective distribution of forest products in the interests of both consumer and grower are likewise provided for. The authorizations for the weather studies are restricted to not to exceed $50,000 per year, the range projects to $275,000, and the economic phases to $250,000. For the forest utilization projects the limit set is $1,000,000 per annum, with not more than $50,000 per year additional for similar tests of foreign woods and products important to the industries of the United States and the field work necessary in connection therewith.

Still another undertaking contemplated by the act is a cooperative survey of the present and prospective requirements for timber and other forest products and of timber supplies. This may include a determination of the present and potential productivity of forest land, and such other data as may be necessary "in the determination of ways and means to balance the timber budget of the United States." The maximum annual appropriation for this work is $250,000, and it is provided that the total expenditure for the purpose shall not exceed $3,000,000.

Thus the appropriations authorized under the act may aggregate $3,625,000 per year, as compared with about $1,200,000 previously available. The maximum is expected to be reached in 1938, and thereafter, with the exception of the timber survey, the funds may be continued on such annual basis as may be "necessary to carry out the provisions of said sections." Provision is also made whereby the limit set for studies of forest diseases, insects, and wild life may be exceeded during any fiscal year to provide "adequate funds for special research required to meet any serious public emergency relating to epidemics."

No appropriations are carried in the act itself, and it is not expected that any funds will be available under it until July 1, 1929. The amounts which may then be expended will be determined by Congress each year, subject to the limits of the authorization. The practical effect of the legislation, however, is to provide a more definite status as a basis for a long-term program. Such a program can now be formulated with reasonable assurance, and will afford one of the most effective means of stimulating men to train for research

and thereby meeting what has been one of the greatest needs in this enterprise. It will also promote the undertaking of more fundamental problems and will stabilize and lend permanence to the institutions through which they will be conducted. For these and other reasons there will be general agreement with the view expressed by Secretary Jardine that the act "strikes at the heart of one of our greatest problems of land use, in fact that of one-fourth of our entire land area, by outlining a systematic plan for the acquisition of the necessary scientific foundation and giving this plan the authority and weight of formal Congressional sanction. In importance this bill ranks along with such other acts as the Clarke-McNary law, the Weeks law, etc., as one of a series of legislative measures which are gradually outlining a Federal forestry policy. Accordingly the Department regards the enactment of this bill as a constructive step of utmost importance."

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

Physico-chemical methods, J. Reilly, W. N. Rae, and T. S. Wheeler (*New York: D. Van Nostrand Co., [1926], pp. XI+735, figs. 453*).—This book "is intended principally for the advanced student who desires to obtain a general knowledge of the subject and for the investigator wishing to know the methods which have been applied to solve particular types of problems. Elementary detail has, therefore, been omitted in many sections, but some of the more important subjects have been treated extensively in order to illustrate more fully the general principles of precise measurement."

Though the book is primarily devoted to laboratory practice, the five chapters of the introductory section (the scope of physical chemistry, experimental errors, nomography, the slide rule, and triangular diagrams) treat with considerable thoroughness the elements of the theoretical groundwork of physico-chemical laboratory work and its interpretation. The remaining sections take up in turn the physical-chemical laboratory and its equipment; general operations; physical measurements; some properties of solution; some properties of gases and vapors; thermochemistry (with a chapter on calorimetry); optical measurements; electrical properties; and miscellaneous (with chapters on rates of reaction, X-ray analysis, and practical methods in colloid chemistry).

Correlation between electromotive series and oxidation potentials and plant and animal nutrition, H. P. Cooper and J. K. Wilson (*Science, 66 (1927), No. 1721, pp. 629–631*).—This note presents a brief outline of a theory of the significance of the correlation between electromotive series and oxidation potentials on the one hand and the nutrition of plants and animals on the other. From preliminary correlations here noted, the authors consider that "the electromotive series and the oxidation potentials afford a new and an important approach to the whole field of biology." Among corollary inferences, it is suggested that "the desirable crop sequence in rotations and the succession of native plants on abandoned crop land, as well as the succession of plants on virgin soil, is probably closely correlated with the ability of various plants to utilize cationic nitrogen or nonionized nitrogenous materials. . . . Apparently many plants can not readily utilize low oxidation potential cationic nitrogenous materials."

Investigations on gelatin, IX, X (*Biochem. Jour., 21 (1927), No. 6, pp. 1284–1304, figs. 4*).—Two papers are presented.

IX. *The scission of gelatin into constituent proteins,* S. B. Schryver and K. V. Thimann.—On the basis of evidence secured by Knaggs,[1] the hypothesis was formed that the intramolecular condition of gelatin might be different in the two cases of the anionic and cationic salts formed by this protein with bases and with acids, respectively. It was, in fact, found that in the electrolysis of gelatin hydrochloride a gel was produced and very little nitrogen remained

[1] Biochem. Jour., 17 (1923), No. 4–5, pp. 488–492.

in the supernatant liquid, while in the electrolysis of the sodium salt of gelatin there were obtained two fractions, designated the soluble and insoluble ana-gelatins, respectively. Both of these products were complex proteins, that described as insoluble being stated to have a solubility of about 15 parts per 100,000 at 15° C. and the soluble ana-gelatin a molecular weight of from 50,000 to 60,000. It was not found possible to produce a gel synthetically by combination of the soluble with the insoluble ana-gelatin.

As explanation of the effect noted, "two possible relationships between the soluble and insoluble proteins into which gelatin is separated on electrolysis of the sodium salt are suggested: (a) That they are independent proteins having no relationship to one another other than their association together in the gelatin complex, [and] (b) that the soluble fraction is a product of the action of water on an insoluble gelatin. The combination of a soluble and insoluble fraction in some form is responsible for the gel formation." As a corollary of the second hypothesis, "on electrolysis of the sodium salt the two fractions separate, undergoing in the process intramolecular change, which prevents their recombination."

Evidence that a highly complex protein results from the action of water on gelatin, the change not being accompanied by any appreciable peptide scission, is also noted, the term "metagelatin" being suggested as a designation for the altered gelatin produced in this way.

X. *The effect of previous treatment with acid and alkali on the diamino-nitrogen fraction of the hydrolysis products of gelatin.* B. Thornley.—According to this brief note, neither hydrochloric acid in concentrations ranging from that of the concentrated acid to N/70 nor sodium hydroxide in concentrations from N/10 to 2 N appeared to have had any very striking effect. The diamino nitrogen figure was 18.0 after the N/10 alkali treatment and 22.5 after the action of the 2 N alkali.

Influence of the absolute soil reaction on the formation and composition of marjoram oil (Origanum majorana) [trans. title], Mr. and Mrs. H. Deel (*Bul. Soc. Chim. France, 4. ser., 41 (1927), No. 7, pp. 955–957*).—The experiments reported included the use of five fertilizer formulas, differing only in the form in which the nitrogen was applied (nitric, ammoniacal, organic, equal parts of nitric and ammoniacal, and equal parts of ammoniacal and organic), as well as six soils having pH values of 2.9, 5.3, 5.6, 6.8, 7.6, and 9.5, respectively.

It was concluded that the optimum reaction is in the neighborhood of pH 9.5. The yield both of the plant and of the oil decreased with decreasing pH values at an increasing rate. Variations in the soil pH value were without great influence on the oil in percentage of the plant except in the very acid region, where the yield was decreased. The optimum pH corresponded with the maximum total alcohol content of the oil. It is considered advantageous, both from the agricultural and industrial viewpoints, that the marjoram should be cultivated in a soil of approximately the optimum pH value as indicated by the experiments here described.

The hydrolysis of wool by means of sodium sulfide [trans. title], W. Küster, W. Kumpf, and W. Köppel (*Hoppe-Seyler's Ztschr. Physiol. Chem., 171 (1927), No. 1–3, pp. 114–155*).—This paper reports a detailed preliminary of the hydrolytic action of 3 per cent aqueous sodium sulfide upon cleaned wool fiber. That this action is not dependent upon the hydrolytic formation of sodium hydroxide is considered established by the fact that a 0.5 N sodium hydroxide solution affected the hydrolysis of hair only after a much longer time than that required by the 3 per cent sodium sulfide solution to carry the

process to the same degree of partial decomposition, although the sodium sulfide concentration could yield, it is stated, not more than a 1.86 per cent concentration of sodium hydroxide under the most favorable conditions.

The present contribution records a detailed study of the products obtained in a 1, 5, 25, and 125-hour exposure of wool to the action of 3 per cent aqueous sodium sulfide solution at ordinary temperatures. In the 5-hour and in the 25-hour treatment approximately one-third of the wool was converted into products not precipitable by acetic acid, while the 125-hour exposure left only about 55 per cent of the original material still precipitable as protein. The nitrogen contents of the precipitable residues were studied, and the evidence of their protein character is presented. An analysis of these precipitated residues by the Van Slyke method (E. S. R., 26, p. 22) gave the following figures for the unaltered wool, the precipitable residue from the 1-hour treatment, and the precipitable residue from the 125-hour treatment, respectively: Arginine, 5.20, 4.78, and 3.48 per cent; cystine 9.21, 8.18, and 5.54; histidine, 5.36, 4.15, and 0.75; and lysine 5.03, 4.72, and 4.03 per cent. The residue from the 125-hour sodium sulfide hydrolysis was further hydrolyzed with concentrated hydrochloric acid until the biurate reaction could no longer be obtained, and the resulting mixture was worked up by esterification and other methods of the usual type, the procedure and the analysis and quantities of the amino acids isolated being fully noted. A similar examination was made of the products of the complete water hydrolysis in an autoclave of the residue from the 125-hour sodium sulfide treatment. Other experimental work is described and discussed.

What constitutes an adequate sample, J. C. Munch and G. L. Bidwell (*Jour. Assoc. Off. Agr. Chem., 11 (1928), No. 2, pp. 220–222*).—This is a very brief discussion of the probable adequacy or inadequacy of a sample drawn in any particular manner. Careful mathematical study is stated to have shown "that adequate samples should consist of such a number of individuals as is proportional to the square root of the number of individuals in the different lots," this square root rule being based on the formula for the probable error of a correlation coefficient. N representing the total number of units in a lot and c being a factor representing the degree of accuracy required, S, the number of units to be included in the sampling, is determined by $S=c\sqrt{N}$. It is stated that for the general run of such material such as flour and feeds, the square root gives an adequate sample, or, for cases of this type, the factor c is unity.

A new automatic hydrogen sulfide generator, H. H. Barber (*Jour. Chem. Ed., 4 (1927), No. 12, pp. 1546–1549, figs. 2*).—The design presented, stated to be capable of supplying the hydrogen sulfide requirements of 200 qualitative analysis students per unit of apparatus, is a contribution from the University of Minnesota. The main parts required are five earthenware pieces, said to be obtainable on specification from ceramic makers for about $37. It is claimed that the apparatus is readily cleaned and refilled, satisfactory in operation, not easily broken, and capable of being made in any size adapted to the needs of the individual laboratory.

The perchlorate method for potassium, J. P. Mehlig (*Jour. Chem. Ed., 4 (1927), No. 12, pp. 1537–1543*).—The purpose of the work reported in this paper, a contribution from the Oregon State Agricultural College, is stated to have been to show "the practicability of the perchlorate method as a . . . substitute, especially in the hands of students, for the chlorplatinate method." The perchlorate method, as here recommended, is slightly modified in a number of ways, especially in the substitution of a 20 per cent solution for pure perchloric acid. The dilute perchloric acid in the author's experience keeps well and is less dangerous to handle than is the pure acid. The following procedure is prescribed:

"Weigh accurately 0.5 to 1-gm. sample (beginners get better results using the larger weight), brushing into a beaker. Dissolve in 25 cc. water, and add a quantity of 20 per cent perchloric acid solution sufficient to combine with all the bases present (ordinarily 5 cc.). Evaporate, covered, over a low flame until the solution becomes viscous (about 5 to 10 cc.), cool, and dissolve the residue in a small amount of hot water. Add 3 cc. perchloric acid solution and evaporate covered until dense white fumes of perchloric acid are evolved. It is advantageous to evaporate with only a slight excess of perchloric acid and to repeat the process a second and sometimes a third time to insure the removal of volatile acids. Cool to room temperature and add 25 cc. of the solution made by mixing 1 cc. 20 per cent perchloric acid with 100 cc. 98 per cent alcohol. If the potassium perchlorate precipitate is caked it should be broken with a stirring rod so that no soluble salts will escape the action of the alcohol. Filter on a prepared Gooch and wash five times with the 97 per cent alcohol solution. Dry at least 1 hour at 120–130° C. and weigh."

A total of 41 determinations by students together with 14 by the author are presented as examples of the accuracy of the method in the form above given. These determinations included the iodide, chloride, bromide, sulfate, dichromate, nitrate, chlorate, and dihydrogen phosphate of potassium. The results vary from acceptable to very close agreement with the theoretical potassium content of the salts analyzed. A similarly satisfactory series of student and author determinations of potassium in soils made by applying the foregoing procedure to soil samples, the potassium content of which had been rendered soluble by a modification of the Smith fusion (for which latter procedure the original must be consulted), are given for 10 soils, the results of the chlorplatinate determinations being taken as the theoretical potassium content of the soil samples.

Effect of silica dishes in the determination of potash, L. D. Haigh (*Jour. Assoc. Off. Agr. Chem., 11 (1928), No. 2, pp. 219, 220*).—From a comparative study of the Official method (E. S. R., 55, p. 11) and a modified form of this procedure under consideration by the author, both procedures having been so carried out as to show the comparative effects of ignitions in platinum and in silica dishes, the conclusion was reached that in the presence of water-soluble phosphoric acid the silica is probably attacked with the result of rendering a part of the potassium insoluble so that low figures are obtained. A number of potassium determinations showing the difference in results when silica and platinum dishes, respectively, were used in the analysis of three fertilizer samples, both by the Official method and by the modified procedure, are presented in support of the view that silica is less suitable than platinum for the ignition of samples containing phosphates. In the absence of water-soluble phosphate the insolubilizing effect of the silica upon the potassium content was very much less.

The reduction of magnesium pyrophosphate by carbon, K. D. Jacob and D. S. Reynolds (*Jour. Assoc. Off. Agr. Chem., 11 (1928), No. 1, pp. 128–132*).—Though precipitates of magnesium ammonium phosphate are said to burn carbon free in an electric muffle furnace at 1,000° C. in 1 hour, the authors consider that this observation leaves undecided the question of the possible loss of phosphate by reduction during this ignition. This point was investigated by igniting 3-gm. portions of a mixture of equal weights of pure magnesium pyrophosphate and a carbon of high purity prepared from petrol coke at temperatures of from 900 to 1,100° in an atmosphere of oxygen-free nitrogen for from 1 to 3 hours, phosphoric anhydride and magnesium oxide being determined in the residues. The data thus obtained are tabulated, together with phosphoric anhydride : magnesium oxide ratios and the percentage of the original phosphoric anhydride volatilized in each case.

Only about 2.5 per cent of the original phosphorus was found to be volatilized under the standard conditions of 1 hour's heating at 1,000°, even in the entire absence of oxygen. In 2 hours, under the same conditions, the loss increased to 5 per cent, and at 1,050° and 1,100° the losses in an ignition of but 1 hour were 12.5 per cent and 32 per cent, respectively. From 900° up to 975°, however, the losses during an ignition of from 1 to 3 hours were only from 0.25 to 0.6 per cent, figures which are considered practically within the limits of error. It is believed possible that these latter losses may have been due to the presence of traces of magnesium metaphosphate.

The determination of nitrates [trans. title], L. Szebellédy (*Ztschr. Analyt. Chem., 73 (1928), No. 4, pp. 145–153*).—Dissolved oxygen was found to exercise a disturbing influence in the determination of nitrates by titration with ferrous sulfate. The removal of such oxygen by means of carbon dioxide is considered essential. The titrant should be standardized against about 0.1 gm. of potassium nitrate. Chlorides and bromides can be rendered harmless by means of silver sulfate, whereby the removal of the chloride and bromide ions and their separation from the nitrate prior to the determination may be avoided. A considerable body of tabular data, presented in support of the author's conclusions with respect to the conditions requisite for this titration, accompanies the paper.

Determination of high-boiling phenols in a coal-tar creosote—castor oil soap disinfectant, J. N. Taylor (*Jour. Assoc. Off. Agr. Chem., 11 (1928), No 2, pp. 222–225*).—From a series of experiments, the technique of which is described, the conclusion is drawn that high-boiling phenols in an emulsion-forming type of disinfectant containing castor oil soap may be determined more satisfactorily and more accurately by direct distillation than by steam distillation.

Determination of carbon disulfide in its emulsions, H. J. Fisher (*Indus. and Engin. Chem., 19 (1927), No. 10, pp. 1201, 1202*).—This contribution from the Connecticut State Experiment Station describes a modification of the method of Weiss, oxidizing the carbon disulfide in an alkaline peroxide solution, precipitating the resulting sulfate, and weighing as barium sulfate. This method estimates as carbon disulfide any sulfur present in an emulsion in any form which will be converted to sulfate by an alkaline peroxide solution.

Method for the rapid determination of carbon, nitrogen, and hydrogen in organic substances [trans. title], R. Vandoni and M. Algrain (*Bul. Soc. Chim. France, 4. ser., 43 (1928), No. 2, pp. 255–260, figs. 3*).—The method consists essentially in effecting combustion of the sample on copper oxide in a small U tube of quartz through which is passed a circulating oxygen current. A known quantity of oxygen, only slightly more than that required for the complete combustion of the sample, is used in a closed system which includes weighed absorption tubes for collecting the carbon dioxide and water, while the nitrogen is measured after treatment with hydrosulfite to remove oxygen. The entire apparatus and details of certain of its parts are shown in three figures accompanying a detailed description of the set-up and its operation.

The claim is made and is supported by tabulated analyses of sucrose, naphthalene, camphor, benzoic acid, and urea that the method is much simpler and more rapid than is the Dumas combustion, and that it will give satisfactory results with any substance containing carbon, hydrogen, and nitrogen, with or without oxygen, and capable of being analyzed with accurate results by the Dumas method. It is noted as a further advantage that but little oxygen and copper oxide are required.

Combination of proteins with phthalein dyes, L. F. Hewitt (*Biochem. Jour., 21 (1927), No. 6, pp. 1305–1313*).—Phthalein and fluorescein dyes which change color on the acid side of the isoelectric point of the proteins used combined with the proteins in acid solution, giving colored oxonium salts, so that serum albumin and serum globulin, egg albumin, and gelatin prevented the discharge or alteration of the color of rose bengal, eosin, erythrosin, and phloxin red. These dyes can not be used as indicators in protein solutions; and it is considered that this observation explains the "protein error" of indicators, the acid-fast staining of tissue sections, and the acid-fast dyeing of fabrics. When any phthalein or fluorescein dye is mixed with a protein solution and acidified, a precipitate was found to be formed at the isoelectric point of the protein and to dissolve at about pH 2.5. Salt formation is believed to be indicated, and physical adsorption is considered an unnecessary postulate in the explanation of any of the phenomena described.

The determination of the acid and saponification numbers of very dark fats [trans. title], H. Dubovitz (*Chem. Ztg., 51 (1927), No. 101, p. 984*).—The difficulty in the indicator titration engendered by the very dark color of such fats as waste greases, sulfonated oils, etc., can in some measure be avoided by the methods here outlined, though it is admitted that these methods "lead to various errors and do not attain the accuracy of the titrimetric." The unsaponifiable matter, it is noted, is especially liable to error in determination, because the direct determination is that of the saponifiable fraction. The procedure proposed may be summarized as follows:

Saponification number.—Weigh out and place in a 150-cc. flask from 0.9 to 1.1 gm. of the fat, add 50 cc. of an alcoholic solution of 2 gm. of potassium hydroxide per liter of alcohol, and boil 1 hour on the water bath. At the same time carry out accurately a blank determination, securing the exast titer of the alcoholic alkali. Transfer the partially saponified fat to a separatory funnel, add 10 cc. of 10 per cent potassium chloride together with 40 cc. of water, and further add about 100 cc. of petroleum spirit, shaking thoroughly. Separate the layers and repeat the extraction, combining the extracts and washing these with a little water. Filter through a small filter, containing calcium chloride in the tip, into a weighed flask, washing the filter with petroleum spirit. Distill off the solvent, dry, and weigh the flask.

Acid number.—Weigh out from 0.3 to 1 gm. of the fat, according to the magnitude of the expected acid number, add 50 cc. of neutral alcohol, bring to a boil while shaking, cool, add thymolphthalein and 0.5 N potassium hydroxide in quantity sufficient so that the margin of the liquid appears dark on shaking, this point being determinable even with very dark fats. From this point proceed as in the above determination of the saponification number.

Ester number.—This determination may be made from the saponification and acid numbers by calculation, or may be made directly by the following procedure: Saponify from 10 to 50 gm. of the fat, according to the magnitude of the ester number to be expected, taking such a sample that the amount of glycerin set free may be about 1 gm., and carrying out the reaction by means of alcoholic potash under a reflux condenser. Transfer the soap solution quantitatively to a porcelain dish, evaporate, set free the fatty acids with sulfuric acid, permit the fatty acids to solidify, separate the glycerin solution, add to it the washings obtained in boiling out the fatty acid cake twice with water, and determine the glycerin by titration with potassium dichromate.

A simple method for determining the oil content of seeds and other oil-bearing materials, D. A. Coleman and H. C. Fellows (*U. S. Dept. Agr., Tech. Bul. 71 (1928), pp. 14, figs. 3*).—The procedure here proposed is that of

Wesson,[2] with some modification of the technique. Wesson's method consists essentially, as summarized in the present paper, of the treatment of a weighed quantity of the cottonseed meats or ground meal with a definite quantity of the solvent for a time sufficient to insure solution of the oil, after which a filtered portion of the oil solution is examined in a refractometer, the oil content being read off from a standard table prepared for this purpose. It is stated that the necessary solvent characteristics were found in an impure monochlornaphthalene, known to the trade as halowax, grade No. 1000 or No. 1007. A specific gravity of approximately 1.25, a boiling point of 350° C., with a refractive index of approximately 1.63500 at 25° are assigned to this preparation, and it is said to have a low coefficient of expansion and to be noninflammable.

It is noted that the method has already been adapted to flaxseed and linseed meal (E. S. R., 57, p. 505). Its adaptation to cacao beans, meats, and hulls, to chocolate-chip liquor, bittersweet chocolate, cocoa, mustard seed, peanuts, sesame seed, soy beans, and other oil-bearing seeds in small amounts was the purpose of the work here reported.

Detailed directions are given for the preparation of the material, the extraction of the oil, the reading of the refractive indices, and the preparation of standard conversion tables, and tabular comparative data, showing the close agreement of the optical with the ether extraction method, are given.

METEOROLOGY

Influence of topography upon temperature, W. D. Albright (*Canada Expt. Farms, Beaverlodge (Alta.) Substa. Rpts. Supt. 1925, pp. 59–65; 1926, pp. 78–86, figs. 2*).—Thermometer readings at different levels on open land at the Beaverlodge, Alta., Substation showed "as much as 14° disparity between the June night temperatures of two points half a mile apart and 107.4 ft. different in elevation; as much as 11° difference on a July night; as much as 12° in August and 13° in September." It was observed that "when a winter cold snap was setting in, little or no difference could be found between the readings on low and high land. . . . By the second or third day, however, an increasing spread would be manifest. . . . During murky weather or during the progress of a rain or snow storm little or no spread [was] found between the readings of any two elevations." "The outstanding practical significance of these tests is an emphasis of the fact that in utilizing northern latitudes the elevated slopes and water-protected areas should be chosen for frost-susceptible crops, such as wheat, flax, barley, and potatoes, while the lower levels are reserved . . . for production of hay, pasture, and 'green feed.'"

The climate of the air near the soil, R. Geiger (*Das Klima der Bodennahen Luftschicht. Brunswick: F. Vieweg & Son, 1927, pp. XII+246, pl. 1, figs. 61; rev. in Met. Ztschr. [Brunswick], 45 (1928), No. 2, pp. 74, 75*).—This book is based on studies at field stations of the Bavarian weather service, or what is termed "microclimatology," that is, detailed study by very refined methods of the layer of air lying below the level (1.5 meters or more) at which meteorological observations are ordinarily made. The conditions in this layer of air are considered to be those most intimately affecting plant growth and constitute what is termed "plant climate." The subjects dealt with are physics of the layer, including temperature variations at different times of the day and night, humidity, and wind movement; orographic and plant relations; and relations to injurious frosts. A bibliography of 267 references is given. This extensive bibliography and the exhaustive treatment of the subject, especially

[2] Cotton Oil Press, 4 (1920), No. 3, pp. 70–73.

that part relating to plant climatology, make the book of particular interest to agriculturists, foresters, and botanists, as well as climatologists.

Distribution and transport of chlorides in the air [trans. title], F. Bordas and A. Desfemmes (*Compt. Rend. Acad. Sci. [Paris], 185 (1927), No. 13, pp. 603–605*).—Observations are reported which showed the equivalent of 8.41 gm. of sodium chloride per square meter of soil in the rainfall at 35 km. from the sea and 100 meters above sea level.

Dust rains and salt rains [trans. title], F. Bordas and A. Desfemmes (*Compt. Rend. Acad. Sci. [Paris], 186 (1928), No. 3, pp. 159–161; abs. in Rev. Sci. [Paris], 66 (1928), No. 4, p. 123*).—Rain occurring during dust storms in different parts of France in 1926 and 1927 was found in one case to bring down to the soil as much as 240 kg. of sodium chloride per hectare (213.6 lbs. per acre). See also the above note.

Rainfall interception by plants, J. Phillips (*Nature [London], 121 (1928), No. 3045, pp. 354, 355*).—Observations supplementing those previously noted (E. S. R., 56, p. 414), but made with greater precautions against possible error, confirmed the conclusion from the earlier observations that plant cover intercepts and increases the precipitation of atmospheric moisture, and showed that the taller the vegetation the greater the precipitation induced.

Corn in Argentina: The production and climatic conditions [trans. title], G. Hoxmark (*Min. Agr. [Argentina], Secc. Propaganda e Informes [Circ.] 697 (1927), pp. 44, figs. 24; abs. in Bul. Amer. Met. Soc., 9 (1928), No. 3, p. 67*).—Tables showing the coefficients of correlation between rainfall and temperature and yield of corn are given for the period 1912–1925. November and December appear to be the critical months. Whether rainfall or temperature or a combination of both is the determining factor varies in different parts of the country. The practical importance of being able to predict the probable yield of corn from the meteorological conditions during the planting season is pointed out.

Meteorological tables, D. A. Seeley (*Mich. State Bd. Agr. Ann. Rpt. Sec., 65 (1926), pp. 129–141*).—Daily and monthly summaries of temperature, precipitation, cloudiness, and sunshine, and monthly summaries of pressure, wind movement, and miscellaneous phenomena (frost, hail, thunderstorms, fog, auroras, and halos), at Lansing, Mich., are given for the year ended June 30, 1926.

Meteorological observations, A. Bisserup (*Virgin Islands Sta. Rpt. 1927, p. 17*).—A condensed summary is given of observations on temperature, rainfall, evaporation, and velocity of the wind at the Virgin Islands Experiment Station during the year ended June 30, 1927.

It is stated that the total rainfall for the year was 48.05 in., approximately 2 in. above normal. "Unusually heavy rains fell from March to May, 1927, inclusive, forcing both plant canes and ratoons into rapid growth and brightening the prospects for a good cane crop in 1928. . . . The absolute maximum temperature of the year, 92° F., was recorded September 8, 9, and 13, 1926. The absolute minimum temperature, 61°, was recorded February 17, 1927." The total evaporation for the year was 65.058 in.

SOILS—FERTILIZERS

Physico-chemical investigations, [M. M. McCool] (*Michigan Sta. Rpt. 1926, p. 299*).—Among other observations noted in this brief general progress report is the fact brought out in a comparative study of northern and southern Michigan soil colloids that the nitrogen in the colloid from some of the northern Michigan soils is remarkably high. In some horizons more than 1 per cent was

found, and "it appears that the majority of the nitrogen and consequently the organic matter of these soils is carried in the colloidal state." Heats of wettins in the colloids containing the larger quantities of nitrogen were found very high, 19.4 calories per gram for example in the colloid from the B horizon of Chippewa sand.

The effect of dehydration of soils upon their colloid constituents, III, J. L. STEENKAMP (*Soil Sci., 25 (1928), No. 4, pp. 327–332*).—Continuing this series of reports (E. S. R., 58, p. 812), the experimental work covered in the present paper consisted in studies of the comparative recovery of air-dried soils as determined by the absorption of decinormal ammonium chloride and of yellow clay soils dried in artificial atmospheres (carbon dioxide, nitrogen, and oxygen) as indicated by the same criterion, and led to the following (among other) observations and conclusions:

A cementation of fine material was found to take place on drying, together with a flocculation of colloidal matter considered to be "under conditions corresponding to those in the field . . . very significant." Soils liable to decomposition on dehydration (unweathered or but partially weathered soils) decreased in degree of saturation on drying, whereas cultivated soils, especially those containing humus, showed an increase in degree of saturation with degree of dehydration. The exchangeable base content followed in the same order, and the content of the acid salt-forming bases in inverse order, as regards the change in degree of saturation in the relatively unweathered and in the cultivated soils, respectively, with the exception that the acid salt-forming bases showed a depressed solubility after prolonged dehydration. Corresponding to the degree of saturation, the exchangeable base content showed the greatest increase on drying in the case of humus-bearing soils.

The optimum moisture content, defined as the point below which the bases in the soil are available, was found lowest for black clay soil, highest for sandy humus, and intermediate for two yellow pasture soils. Only soil of high humus content showed reversibility of the colloid condition 21 days after drying. Yellow pasture soil, when dried out over sulfuric acid in various atmospheres, showed very slight recovery in all cases except in that of drying in an atmosphere of carbon dioxide, in which latter case the recovery is said to have been very significant.

Variations of the colloidal material in typical areas of the Leonardtown silt loam soil, R. S. HOLMES (*Jour. Agr. Research [U. S.], 36 (1928), No. 5, pp. 459–470*).—The experiments here reported from the U. S. D. A. Bureau of Chemistry and Soils were directed to the determination of the degree of variability in the colloidal material in typical samples of Leonardtown silt loam. The chemical composition and the properties of the colloidal material isolated from random typical samples of the soil were studied. The colloids were found, on the whole, fairly constant in H-ion concentration, in adsorptive capacity for water vapor, ammonia gas, and the barium ion, and in their content of silica, alumina, ferric oxide, combined water, and the oxides of titanium, potassium, and magnesium. The manganese and calcium oxide contents were found more variable, but it is noted that the content of these constituents was low in all cases. Organic matter, sulfuric anhydride, and phosphoric anhydride varied widely.

A study of the probable errors of sampling indicated 8 or 10 samples from one type as sufficient to show with considerable accuracy the kind of colloidal material characteristic of the type.

Peculiarities in the development of flax under the influence of an increased osmotic pressure of the soil solution [trans. title], D. S. SMIRNOV

(*Nauch. Agron. Zhur.* (*Jour. Landw. Wiss.*), *3* (*1926*), *No. 5–6, pp. 334–340, figs. 2*).—The influence of an increase in osmotic pressure by the addition of sodium chloride, calcium chloride, and potassium chloride on the development of the flax fiber was investigated. The results are summarized as follows:

The increase in osmotic pressure of the soil solution by the introduction of neutral salts (0.1 per cent of the absolute dry weight of the soil) forces the formation of the tops during the second half of the vegetation period. The specific length of the stems grows regularly with the increase in osmotic pressure and with the decrease in nitrogenous nutrients, as does also a tendency to lodging. The greater the specific length the smaller is the yield of the tops. The specific length may be utilized as a standardization measure of the flax and as a criterion for the quality of the flax. The yield begins to drop at an increase in osmotic pressure above 1.8 atmospheres. Of the three salts, calcium chloride causes the greatest decline in yield and sodium chloride the smallest.

The electrokinetic and chemical behavior of the alumino-silicates, S. Mattson (*Soil Sci., 25* (*1928*), *No. 4, pp. 289–311*).—Applying the results of a previous investigation (E. S. R., 56, p. 415) to the study of artificial alumino-silicates, the author here reports a series of experiments on the electrokinetic behavior of the aluminum chloride—sodium silicate system, the influence of pH on the isoelectric point of the silica-alumina systems and the composition of the precipitates, the influence of anions and cations on the composition of the isoelectric precipitates, the relation between the base exchange capacity and the silica-alumina ratio, and on the mechanism of base exchange. A discussion of the theoretical considerations involved accompanies the presentation of the experimental method and results.

It was found, in part, that on adding increasing quantities of sodium silicate to an aluminum chloride solution there were formed successively an electropositive sol, an isoelectric precipitate, and an electronegative sol. The electropositive sol could be precipitated by the addition of alkali, and the electronegative sol was similarly precipitable by acids provided the proportion of silica was not greater than that capable of electrical neutralization by the alumina. Each proportion of silica and alumina, within certain limits, formed an isoelectric precipitate at a definite pH value, these figures ranging from a little below pH 5 to about pH 7, at which latter point the alumina was itself isoelectric. The molecular ratio of silica to alumina ranged from a value approaching zero at pH 7 to a value somewhat below 3 at a pH value a little below 5.

Evidence obtained in the electrodialysis of feldspar indicated the stability of the kaolinite cation $(AlSiO_3)^+$. Conditions controlling the natural formation of the various soil gels are here discussed.

The base exchange capacities of the precipitates above noted were found to increase with an increasing silica-alumina ratio, and to be of the same order of magnitude as those of the natural gels. Base adsorption by natural gels was found to involve the adsorption of both ions, hydroxyl as well as the cation, so that true adsorption rather than neutralization of an acid was considered to be indicated. The conclusion was reached that the acid-like behavior of adsorbents is associated with a polar orientation of the interfacial layer of the water molecules.

A study of the physicochemical aspects of soil acidity, A. J. Patten (*Michigan Sta. Rpt. 1926, pp. 259, 260*).—A brief statement of the progress of a study of the physical chemistry of soil acidity is made. Adsorbent charcoals purified by the method developed at this station and already noted (E. S. R., 56, p. 111) were used for the study of the sugar inverting property of ad-

sorbed acids. The buffer properties of adsorbed acids were also studied with a result indicating that adsorbed acids can account for the buffer action of acid soils.

The nature of base exchange and soil acidity, H. W. Kerr (*Jour. Amer. Soc. Agron., 20 (1928), No. 4, pp. 309–335, fig. 1*).—This contribution from the Wisconsin Experiment Station is subdivided into sections on the theory and mathematical expression of base exchange equilibrium, under which head are discussed the two cases (1) in which the active masses of exchange complexes are assumed to be constant, and (2) in which these masses are assumed to vary; on the importance of organic matter in the exchange complex; on the application of the proposed theory to zeolite exchange reactions; equilibria between calcium and hydrogen in exchange reactions; application of the equilibrium formula in availability studies; examination of soil for zeolite minerals; discussion of the nature and origin of base exchange in soils; cause and nature of soil acidity; preparation and properties of aluminosilicic acids; nature of acids in the soil solution; etc.

Among numerous experimental findings and conclusions recorded, the following may be noted: Though the great speed of base exchange reactions in soils has resulted in the impression that base exchange is not a chemical reaction, it was found in the present series of experiments that the exchange reaction in crystalline zeolites is particularly rapid, and that in the reaction the crystalline nature of the zeolites suffers little or no change. Crystallographic corollaries of this observation are noted. In the cases both of the natural and artificial zeolites the same mass action equation was found to apply in describing the mechanism of the reaction. It is considered unquestionable that these substances are "definite chemical compounds of characteristic crystalline form, and the fact that they behave in the same manner as do natural soils offers strong evidence for the purely chemical nature of the base-retention phenomena displayed by the soil."

The organic matter of soils was found to have a high base exchange capacity, the same mass action equation noted above as holding for base exchange in both natural and artificial zeolites having been observed to govern base exchange in the case of the soil organic matter as well. The colloidal character of the soil organic matter is adduced as an explanation for the similarity in behavior to mineral exchange complex. Free aluminosilicic acids prepared from the natural and from the artificial zeolites were colloids and possessed properties analogous to those of acid mineral soils.

It is emphasized that the experiments here recorded all indicate that the difference in chemical behavior between substances in colloidal and in true solution is one of degree only and not of kind. The colloidal aluminosilicic acids, for example, were insoluble and not diffusible, but were found capable of producing pH values as low as 1.68 in aqueous suspension. Other observations and conclusions are recorded.

Replaceable bases in some soils from arid and humid regions, M. D. Thomas (*Soil Sci., 25 (1928), No. 5, pp. 379–392*).—Experiments made at the Utah Experiment Station on the exchangeable bases extracted from the following soils are detailed and discussed: (1) Trenton clay from Cache Valley, Utah, a heavy calcareous clay; (2) Ballard clay from the same region, a heavy noncalcareous clay; (3) a mechanically separated colloid from the last named; (4) subsoil of (2); (5) Ramona clay, a moderately heavy clay from California; (6) Dayton light subsoil clay from Oregon; (7) Oktibbeha clay, a very heavy clay soil from Alabama; (8) Putnam subsoil from Missouri; and (9) a colloidal silicate from Marysvale, Utah. Among the observations and conclusions resulting from this work are the following:

When alkali soils were leached with water there was a nearly constant solubility of the sodium on a high level of concentration, as compared with the other bases, after the removal of soluble salts. The alkali soils contained appreciable amounts of soluble silicates which were not present in the humid soils. The arid soils showed a marked tendency to hydrolysis on washing out the soluble salt. The arid soils had higher pH values than the other soils. Drying at 110° C. changed the pH values considerably.

Chemical analyses of the colloid into which different bases had been introduced showed that the material is a hydrated magnesium aluminum silicate in which about one-third of the magnesium is replaceable by other bases. This material has properties closely analogous to those of the soils.

Replaceable bases and the dispersion of soil in mechanical analysis, M. D. Thomas (*Soil Sci., 25 (1928), No. 6, pp. 419–427, figs. 3*).—Several soils from widely separated sources, together with the colloidal mineral described above, were treated either with neutral salts or with 0.05 N hydrochloric acid to replace their exchangeable bases either with a single base or with the H ion and were then subjected to mechanical analysis by the method of Jennings, Thomas, and Gardner (E. S. R., 49, p. 16), with and without the use of sodium carbonate as a deflocculating agent.

It was found that in most cases the sodium-saturated soil was most completely dispersed, a deflocculating agent added to the sodium-saturated soil either failing to increase the dispersion or actually decreasing it, except in the case of calcareous soils; that in some cases as complete a dispersion as by the sodium-saturation treatment could be secured by treatment with 0.05 N hydrochloric acid, followed, after removal of soluble material, by sodium carbonate as deflocculating agent; and that the deflocculating agent markedly increased the dispersion of a calcium-treated sample, but had the reverse effect on a magnesium mineral.

It is concluded that "in view of the experimental difficulty attending the preparation of sodium-saturated soil it seems . . . that the best routine method of dispersing the soil sample for mechanical analysis would consist in preliminary treatment with dilute acid, followed by the use of sodium carbonate as the deflocculating agent."

Aqueous vapor pressure of soils, III, IV, M. D. Thomas (*Soil Sci., 25 (1928), Nos. 5, pp. 409–418, figs. 2; 6 pp. 485–493, figs. 2*).—This continues previous contributions of this series (E. S. R., 51, p. 319) from the Utah Experiment Station.

III. *Soil structure as influenced by mechanical treatments and soluble salts.*—This presents the results of a study of vapor pressure and moisture relations in a soil treated to simulate a thorough puddling, frozen, and wetted sufficiently to make it plastic. The material used was Trenton clay.

Puddling the clay increased its water-absorbing power at vapor pressures above 85 per cent. Freezing had the opposite effect. When the soil was dried further, these differences disappeared but returned when the soil was moistened again. Calculation by means of the thermodynamic capillary equation indicated that the smallest capillary spaces affected by these treatments had a size range from about 5 to 25 millimicrons radius. Addition of the chlorides of sodium, magnesium, calcium, and aluminum modified the water-absorbing power of the soil by an amount which could be calculated on the assumption that the salt was entirely in solution and did not exert any influence on the soil.

Potassium chloride appeared to be partially absorbed from the soil solution, but it may have reacted with the replaceable bases in the soil, giving a potassium silicate complex which has a lower water-absorbing power than the nat-

ural soil, thus indicating a reduction in the concentration of the soil solution which did not occur. Sulfates and carbonates were precipitated by the soil and largely removed from the soil solution. There is considered to be some evidence of base replacement in these reactions also.

IV. *Influence of replaceable bases.*—A group of soils from widely separated localities, described above, were treated with an exchange solution to replace exchangeable bases with a single cation. The excess of soluble salts was removed, and the vapor pressure-moisture relationship was determined.

The vapor pressure-moisture curves were found to be greatly influenced by the nature of the replaceable base in the mineral complex. In dry soils potassium treated material had the least and calcium treated material the most water-absorbing power. The sodium-saturated material curves tended to cross those of the other materials having at high moisture contents the greatest absorbing power. The existence of hydrates in the sodium-saturated material is considered to be established, the effect of these hydrates on the slope of the curve being noted, and it is further considered probable that the characteristic shape of the calcium curve may also be due to the presence of water of hydration.

It was found that when the ratio silica : sesquioxides in the soil colloid is greater than 2.8 its correlation with the properties of the material seems to disappear. The relationship between the water-absorbing power, the replaceable base content, and the colloidal material in soils is briefly discussed in the light of the observations recorded.

Mechanical dispersion as an aid in the chemical study of soils, L. D. Baver (*Jour. Amer. Soc. Agron., 20 (1928), No. 4, pp. 403–410, fig. 1*).—Using a form of stirring apparatus similar to that of Bouyoucos (E. S. R., 57, p. 710), the author of this contribution from the Ohio Experiment Station finds mechanical dispersion a means for shortening various methods for the determination of lime requirements of soils and for the determination of exchangeable calcium, and considers that the procedure should prove applicable to other studies of soils. Dispersion was found to provide "an ideal condition" for intimate contact with the reagent, with the result of a more readily attained equilibrium, and when followed by a washing of the soil with the salt solution used is considered to effect the release of the total possible acidity capable of development by the interaction of the soil and the salt solution so that the factors ordinarily used in soil acidity determinations may be dispensed with. Heavy clay soils are much more readily extracted by the dispersion than by the leaching method.

Making a correct mechanical analysis of soils in fifteen minutes, G. J. Bouyoucos (*Jour. Amer. Soc. Agron., 20 (1928), No. 3, pp. 305, 306*).—This note is a further contribution from the Michigan Experiment Station with respect to the author's recently proposed hydrometer procedure (E. S. R., 57, p. 710) for the mechanical analysis of soils.

In a study of about 30 samples, a complete mechanical analysis of which, according to the U. S. D. A. Bureau of Chemistry and Soils, was available, it was found that the percentage of material settling out at the end of 1 minute in the regular hydrometer method was almost exactly the same as the percentage of all the combined sands as found by the mechanical analysis method. Considering the percentage of material settling out at the end of 15 minutes, diminished by the amount of sand separating in 1 minute, as silt, and the material still in suspension after 15 minutes, as clay or colloids, the mechanical analysis and hydrometer methods were found to agree quite closely in the cases of soils the silt content of which consisted mostly of the coarser sizes. In the cases of

soils the silt content of which consisted mostly of the finer silt particles, however, the disagreement between the two methods was rather wide. The disagreement in the latter case is considered quite to be expected in view of the fact that the finer silt "has practically the same characteristics as the clay and should therefore be classed with the clay, while the coarser silt does not possess the same characteristics. . . . If it is desired to determine only the total sand and the total silt and clay, these determinations can be made by the hydrometer method in only 1 minute and will be astonishingly correct."

Soil survey of Fulton County, Ohio, A. E. TAYLOR ET AL. (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1922, pp. IV+1841–1902, fig. 1, map 1*).—The area considered in this report, prepared in cooperation with the Ohio Experiment Station, comprises 259,200 acres of, for the most part, level to gently undulating plain in northwestern Ohio. Comparatively small portions of the county are well drained, the well-drained areas occurring on old beach ridges, a belt of knolls, an undulating tract in the northwest corner of the county, and generally distributed sand ridges and knolls.

Brookston clay loam 11.1 per cent and Wauseon fine sandy loam 10.8 per cent are the most important in extent among the 46 types, here assigned to 16 series, which are mapped and described.

Soil fertility investigations, [M. M. McCOOL] (*Michigan Sta. Rpt. 1926, pp. 299–305*).—Continuing previous work (E. S. R., 55, p. 808), a fairly definite correlation among the different types of muck as to their lime and fertilizer needs for general crop production and the type of vegetative growth that was native to them was indicated, and the various groups are classified accordingly. A table showing the effect of various fertilizers on the composition of sweet clover tops is given.

Very great differences in the power of soil types to fix phosphorus up to the point of having water-soluble phosphorus in them were noted by C. H. Spurway.

In studies on lime, the coarser materials appeared to be giving the larger and more economical yields over a period of years. Tests of marls applied directly to the soil before seeding to alfalfa with unfavorable results revealed sulfids in sufficient amount to be injurious to seedlings, and a period of weathering is suggested as a remedy.

The relation between the concentration of mineral elements in a culture medium and the absorption and utilization of those elements by plants, F. W. PARKER and W. H. PIERRE (*Soil Sci., 25 (1928), No. 5, pp. 337–343*).—Extending certain of the results of a previously noted investigation (E. S. R., 58, p. 118) in which corn was shown capable of attaining a maximum growth in a culture solution having a concentration of the phosphate radical of but 0.50 part per million, this paper from the Alabama Experiment Station reports an experiment in which corn grown in large volumes of culture solution having phosphate radical concentrations ranging from 0.05 to 0.50 part per million gave indication of being able to make maximum growth at a concentration in the culture solution of but 0.10 part per million of the phosphate radical "if that concentration can be maintained throughout the growing period." A second experiment is reported in which corn and soy beans grown in culture solutions varying in potassium concentration from 0.5 to 25 parts per million showed themselves capable of maximum growth in potassium concentrations of 2.0 parts per million or possibly less. The bearing of these results upon the question of plant nutrition in soils is discussed, with the conclusion that in many soils the displaced soil solution is probably adequate for the potassium nutrition of plants, although root-soil contact is in many cases necessary for the phosphate nutrition.

Fertilizer ratios for Prince George County, A. G. McCall (*Maryland Sta. Bul. 294 (1928), pp. 35–51, figs. 9*).—A series of 21 fertilizer ratios in which each of the nutrients, nitrogen, phosphorus, and potassium, was varied from 0 to 100 per cent in steps of 20 per cent was systematically tested on each of the 4 soils, Leonardtown silt loam, Collington sandy loam, Norfolk sand, and Sassafras loam, with each of the 3 crops, wheat, rye, and soy beans, the results being presented in the form of tables, discussion, and a set of triangular diagrams showing the location of the 6 highest yielding pots of each crop on each soil type. The most favorable ratios for the different soil types are summarized as follows:

Leading fertilizer ratios for several Maryland soil types

Soil type	Crop	Leading fertilizer ratios, NH_3–P_2O_5–K_2O	Fertilizer mixture equivalent	Application per acre
				Pounds
Leonardtown silt loam	Wheat	33–57–10	6–10– 2	560
	Rye	20–47–20	4–10– 4	450
	Soy beans	23–60–17	4–11– 3	537
Collington sandy loam	Wheat	33–53–10	6–10– 2	535
	Rye	23–34–43	5– 8–10	427
	Soy beans	33–47–20	6– 8– 4	524
Norfolk sand	Wheat	20–60–20	4–11– 4	527
	Rye	13–73–13	2–13– 2	555
	Soy beans	37–43–20	7– 8– 4	516
Sassafras loam	Wheat	27–56–17	5–10– 3	534
	Rye	23–43–33	5– 9– 7	464
	Soy beans	20–10–70	6– 3–22	314

Nitric acid from ammonia, C. L. Parsons (*Indus. and Engin. Chem., 19 (1927), No. 7, pp. 789–794, figs. 6*).—The author states that nitric acid can now be produced by the oxidation of ammonia for at least $30 per ton less, fixed plant charges included, than from Chilean nitrate even with the latter obtainable at 2 cts. per pound. It is noted that ammonia nitrogen now costs less than one-half the price of Chilean nitrate-nitrogen.

The effect of potassium salts on the availability of nitrogen in ammonium sulfate, W. B. Mack and D. E. Haley (*Soil Sci., 25 (1928), No. 5, pp. 333–336*).—Data from some plats of fertilizer experiments on the rotation of vegetables, under observation for 10 years at the Pennsylvania Experiment Station, having given indications that potassium chloride additions decreased the availability of ammonium sulfate nitrogen, the experiments reported in the present paper were undertaken to determine the effect of potassium and of chlorine, alone and in combination, upon the nitrification of ammonium sulfate.

The soil for this work was obtained from separating strips between the tiers of plats, these strips having been in sod and without fertilizer for the 10 years of the rotation experiments. Ammonium sulfate, together with constant quantities of potassium in the forms of carbonate, sulfate, nitrate, and chloride, and constant quantities of chlorine in the forms of sodium, calcium, and ammonium chlorides were added to screened 100-gm. samples of this soil in 150-cc. beakers, and the samples were placed under good nitrification conditions. The soil was kept at the original moisture content of 26.8 per cent, and the soils were sampled for nitrate determinations after 3, 5, 7, and 10 weeks.

A consistent inhibition of the nitrification process could not be demonstrated either for the chlorine or for the potassium compounds, the rate of nitrification of aluminum sulfate being, in fact, greater at the end of the test for all ad-

ditions either of potassium or of chlorine compounds. It is noted as of possible significance for future studies of the effect of fertilizers on nitrification that mixing the soil at the end of 7 weeks resulted, on the whole, in increasing the rate of nitrification. All fertilizers were found to increase the nitrification rate as compared with that of the unfertilized check plats, potassium carbonate causing a higher rate of nitrification during this period than did either potassium chloride or potassium sulfate. During the last 3 weeks monocalcium phosphate tended to decrease the nitrification rate for combinations containing sodium nitrate but increased the rate for combinations containing ammonium sulfate.

Effect of lime on the availability of phosphorus in superphosphate (acid phosphate), H. C. HARRIS (*Jour. Amer. Soc. Agron., 20 (1928), No. 4, pp. 381–393*).—This paper reports experiments with the purposes (1) of ascertaining if the mixing of lime with superphosphate decreases the fertilizer effectiveness of the phosphate, and (2) of reëxamining by chemical analysis the question of the reversion of soluble phosphate as a result of such mixing. Following a brief analysis of the literature, description is given of pot experiments in which Alpha barley, Galgalos wheat, Smut Nose corn, and sweet clover were grown on Ontario loam and on Volusia silt loam, the results on the first named soil having been confirmed by the Neubauer method (E. S. R., 53, p. 319). Superphosphate samples, both with and without mixture with lime, were analyzed with the purpose of ascertaining the extent of the resulting reversion. Reversion occurred, "but most of it seemed to take place in the analytical process."

The general conclusion was reached that the mixing of lime with superphosphate before application to the soil is not detrimental to the subsequent yield of most plants but may be detrimental to some, white sweet clover being noted as one of the possible exceptions.

The effect of sulphur on soils and on crop yields, R. R. MCKIBBIN (*Maryland Sta. Bul. 296 (1928), pp. 65–114, figs. 8*).—Following an introduction in which the history of the use of elementary sulfur as a fertilizer is concisely summarized, this bulletin presents an account of field and greenhouse experiments on the effect of sulfur as a fertilizer on several types of soil, including two each from Oregon and Washington, and of chemical studies on the effect of sulfur upon various soils with respect to the availability of radicals essential for plant nutrition, etc. Observations and conclusions recorded in the course of these investigations include the following:

The water-soluble sulfur compounds in the soil were found not to be a measure of the total sulfur content of the soil, some soils low in total sulfur being high in water-soluble sulfur. Soils low in total sulfur readily oxidize elementary sulfur to sulfate. It is considered that sulfur acts rather as a soil amendment than as a fertilizer, assisting in the restoration of normal conditions in alkaline soil as does lime in the case of acid soils. Sulfur oxidation was observed to render the soil phosphorus less rather than more soluble in most soils. Sulfur and superphosphate (acid phosphate) tended to lower the yields of most crops in Maryland soils, but when the sulfur was mixed with pulverized raw rock phosphate most crops grown in Maryland soils were increased in yield. Inoculated sulfur gave about the same results as did untreated elementary sulfur.

It is considered that where crop increases were obtained from sulfur applications in Maryland soils it is to be attributed to the beneficial effect of increased acidity either upon the soil solution or the specific crop grown, rather than to an increase in the water-soluble sulfates, of which last-named con-

stituent there is considered to be an adequate supply for the growth of any crop.

From comparisons with the Washington and Oregon soils, it is concluded that applications of more than 100 lbs. per acre of elementary sulfur should not be made to Maryland soils, but it is believed that in light applications and for specific crops sulfur may in many cases give increased yields. For the correction of overlimed soils it is stated that light sulfur applications will undoubtedly prove valuable, and it is considered that in mixture with raw rock phosphate sulfur will in most cases increase the value of the last-named material.

AGRICULTURAL BOTANY

A textbook of systematic botany, D. B. SWINGLE (*New York and London: McGraw-Hill Book Co., 1928, pp. XIII+254, pl. 1, figs. 62*).—This book, an outgrowth of a course given at the Montana State College, is designed to cover one semester. It is intended that this text will not supplant but rather supplement the manuals used for identifying plants. The first part sets forth and illustrates the principles and rules on which systematic botany is based. The second describes some 60 families of spermatophytes, chosen because of size, economic importance, or peculiar interest. It is expected that considerable time will be given to laboratory and to field work.

[Report of the work in plant physiology of the Michigan Station], R. P. HIBBARD (*Michigan Sta. Rpt. 1926, pp. 253, 254*).—Studies were made of the effect of light, temperature, humidity, etc., under constant conditions on the growth and development of certain plants.

Comparative studies of plants were made under artificial light of definite intensity acting continuously with similar plants under the usual conditions of the greenhouse and field. In water cultures the roots of the continuously lighted plants were found to be about one-half as extensive as those grown in the usual greenhouse conditions. The tops of both groups of plants appeared to be about the same, but dry weight determinations showed that those in continuous light were very much reduced. It is suggested that with 70 per cent of the light intensity of the greenhouse the continuously lighted plants, though of the same vigorous appearance, were not making as much photosynthate and, therefore, could not produce as much root system. When the light was made more intense and sufficient for maximum photosynthesis, temperature was found to be the limiting factor.

In studies on different intensities of light as affected by different types of covering, all types were found to reduce the amount of photosynthate made and modify the type or habit of growth. Thus far investigations of light intensity on the so-called optimum ratio of salts have given no definite results.

The physiology of organic acids in green plants.—III, Rheum hybridum [trans. title], W. RUHLAND and K. WETZEL (*Ztschr. Wiss. Biol., Abt. E, Planta, Arch. Wiss. Bot., 3 (1927), No. 4, pp. 765–769*).—In continuation of accounts previously noted (E. S. R., 58, p. 212), the authors here consider, as regards *R. hybridum*, the assimilation of nitrogen and of oxygen and the relation between the assimilation of each and that of the other leaf petioles.

Influence of nutrient salts, I, II [trans. title], J. KISSER (*Ztschr. Wiss. Biol., Abt. E, Planta, Arch. Wiss. Bot., 3 (1927), No. 4, pp. 562–596, figs. 4*).—Of these two sections (pp. 562–577, 578–596), both dealing with the influence of nutrient salts on water outgo and intake, relative shoot and root mass, and leaf structure, the first is general. The second deals with changes in leaf structure under the influence of nutrient salts.

Mineralization in green and in chlorotic leaves [trans. title], H. Colin and A. Grandsire (*Compt. Rend. Acad. Sci. [Paris], 181 (1925), No. 3, pp. 133–135*).—Dealing with congenital chlorosis (albinism) in material from chestnut and from elm, the authors tabulate organic and mineral percentages, ash, alkalinity, and certain chemical ash constituents (CaO, MgO, K_2O, SO_3, and P_2O_5) as found to occur during spring and summer in green and in chlorotic leaves of these plants.

Calcium oxalate monohydrate and trihydrate in plants [trans. title], A. Frey (*Vrtljschr. Naturf. Gesell. Zürich, 70 (1925), No. 1–2, pp. 1–65, figs. 18*).—Forms, phases, relations, and significance are investigated of these calcium compounds.

Influence of conditions in the medium on the germination of seeds in the absence of calcium [trans. title], R. Cerighelli (*Compt. Rend. Acad. Sci. [Paris], 181 (1925), No. 20, pp. 728–730*).—In related or analogous work of Maquenne and Demoussy (E. S. R., 39, p. 526) or of Maquenne and Cerighelli (E. S. R., 50, pp. 128, 325), some apparent relations of calcium and other minerals to growth have been pointed out. In the present work, employing pea seeds for the study of the influence of sterilization of the culture medium, of immersion of the seeds, and of water vapor, the author concludes that, independently of such conditions (or their absence), pea seeds germinate satisfactorily in the absence of calcium.

Suspension of vitality in seeds [trans. title], P. Becquerel (*Compt. Rend. Acad. Sci. [Paris], 181 (1925), No. 21, pp. 805–807*).—Previous studies (E. S. R., 21, p. 726) have been followed up by similar work, employing the temperature of liquid helium.

Seeds of eight different plants were dried in a vacuum at 40° C. and then submitted in separate lots to simple darkness, to simple exhaustion, and to exhaustion at —269.2°, only 3.8° above absolute 0, for four months. This was followed by the application of germinating conditions, 28°, and it was found that germination had not been lowered. Bearings are suggested, and the observations of Maquenne (E. S. R., 14, p. 577) are recalled.

Movements of sleep and of awakeness [trans. title], C. T. Popesco (*Compt. Rend. Acad. Sci. [Paris], 181 (1925), No. 15, pp. 470–472*).—In June, 1925, the author grafted the perennial, ligneous, and nontwining *Desmodium canadense* on the annual, herbaceous, and twining bean of Soissons. The graft remained much smaller than the control but bloomed and fruited well in the open. Movement and other phenomena in these plants are noted, and reference is made to contrasts with the outcome of the experiments previously noted (E. S. R., 59, p. 324).

It is concluded that *D. canadense* belongs in the category of legumes the leaves of which undergo sleeping movements, although this tendency may be overlooked due to the shortness of the sleep in the night. Grafting exercises a distinct influence over these movements. After a period, more or less prolonged, of opposing influences between graft and stock, an equilibrium becomes established which is not just the same as that of the autonomous plant.

Equilibrium of cellular constituents and oxidation form.—Imbibition and respiratory types in reviviscent plants [trans. title], A. Mayer and L. Plantefol (*Compt. Rend. Acad. Sci. [Paris], 181 (1925), No. 3, pp. 131, 132*).—On account of work apparently related to that previously noted (E. S. R., 54, p. 220; 59, p. 214), the authors have given attention to the respiratory quotient and imbibition, the respiratory quotient of dry mosses, and variations of the respiratory quotient of mosses in relation to time periods.

Formation of antibodies in plants [trans. title], J. R. Sardiña (*Angew. Bot., 8 (1926), No. 5, pp. 289–303*).—To a compact review of literature bearing

upon the subject the author adds an account of his own researches, stating in conclusion that no formation of agglutinin or of precipitin occurs under the conditions employed in such work as was done with Opuntia, *Vicia faba*, potato, tomato, or cucurbit, and that in this respect, therefore, plants show behavior different from that shown by animals and by human beings.

Studies on stomata [trans. title], K. Linsbauer (*Ztschr. Wiss. Biol., Abt. E, Planta, Arch. Wiss. Bot., 3 (1927), No. 4, pp. 527–561, figs. 5*).—A study of stomatal apparatus, relations, and reactions, here detailed, deals with coloration and poisoning, and with resistance to both of these, with viscosity and permeability and their variations, and with electrical conditions in the plasma.

Anatomy and physiology of stomatal apparatus having lignified cells [trans. title], K. Kaufmann (*Ztschr. Wiss. Biol., Abt. E, Planta, Arch. Wiss. Bot., 3 (1927), No. 1, pp. 27–59, figs. 7*).—This detailed account covers a somewhat wide range of plant forms.

The physics of transpiration [trans. title], H. Sierp and A. Seybold (*Ztschr. Wiss. Biol., Abt. E, Planta, Arch. Wiss. Bot., 3 (1927), No. 1, pp. 115–168, figs. 10*).—A detailed account, with discussion of resulting data, is given of the present study of the physical laws applying in plants during transpiration both in wind and in calm.

Development of leaves and the theory of periclinal chimeras [trans. title], W. Schwarz (*Ztschr. Wiss. Biol., Abt. E, Planta, Arch. Wiss. Bot., 3 (1927), No. 4, pp. 499–526, figs. 12*).—A study is presented of structure, development, and relation in leaves of *Plectranthus fruticosus* and *Ligustrum vulgare*.

Reversion of plastids in plants [trans. title], L. Emberger (*Compt. Rend. Acad. Sci. [Paris], 181 (1925), No. 22, pp. 879, 880*).—Observations and hypotheses are outlined.

The chondriome in plants [trans. title], L. Emberger (*Compt. Rend. Acad. Sci. [Paris], 181 (1925), No. 5, pp. 226–228*).—Since 1910 questions involving plastids have included that of chondriomes. The author outlines three phases of opinion, naming prominent adherents of each and presenting his own views.

Studies in the metabolism and physiology of mottled plants [trans. title], W. Schumacher (*Ztschr. Wiss. Biol., Abt. E, Planta, Arch. Wiss. Bot., 3 (1927), No. 4, pp. 762–764*).—Brief argumentative discussion is given of data reported by various authors in recent years.

The potato in the light of physiological studies [trans. title], O. Schlumberger (*Angew. Bot., 8 (1926), No. 4, pp. 262–274*).—This article deals largely with the problem of wound stimulation.

Starch grain size and cell size in potato tubers [trans. title], K. O. Müller and R. Lehmann (*Angew. Bot., 8 (1926), Nos. 5, pp. 314–327, figs. 4; 6, pp. 329–350, figs. 5*).—Starch from the larger potato tubers had larger grains than had that from the smaller tubers. Starch grain size showed increase (to which rule, however, there were exceptions) with age of the plant. This character differs considerably from variety to variety, the differences being referable to factors internal to these plants. Place of growth appears to have no influence on starch grain size.

Energy yield in the development of plant organs and function of oxygen content of the medium [trans. title], E. F. Terroine, R. Bonnet, and A. Hée (*Compt. Rend. Acad. Sci. [Paris], 181 (1925), No. 19, pp. 685–687*).—Submitting, as the results of work with *Sterigmatocystis nigra*, lentil, and black soy bean, data in evident or apparent relation with results of work elsewhere noted as reported by one or more of them (E. S. R., 57, p. 216; 58, p. 524; 59, p. 215), the authors conclude that it is rather in the intimate relations within the organism itself that should be sought the cause for the magnitude of the combustions and not in the exterior conditions.

Drought resistance and soil moisture, H. L. Shantz (*Ecology, 8 (1927), No. 2, pp. 145–157*).—Plants which succeed on a droughty area may escape death owing to a short, rapid growth period, evade disaster by conservation (due to small size, growth or water requirement, or wide spacing), endure drought in a state of dormancy, or resist it by storing an emergency supply. Such plants do not necessarily have any superior ability to grow in dry soil, nor do they, in many instances, show any greater efficiency in the use of water.

Divergent soil reaction preferences of related plants, E. T. Wherry (*Ecology, 8 (1927), No. 2, pp. 197–206*).—In studies on the relation of soil reaction to plant distribution in eastern North America, groups of related plants have been found to show divergence as regards soil-reaction preference. This difference is often accompanied by differences in geographical range, the southern or southeastern species usually preferring the more acid and the northern and western the less acid or the more alkaline soils. The data for 30 of these groups are tabulated, with discussion of relations in individual cases.

Forms of growth in Hypnum triquetrum [trans. title], L. Plantefol (*Compt. Rend. Acad. Sci. [Paris], 181 (1925), No. 23, pp. 929–931*).—Studies on *H. triquetrum* show that the form variations due to differences or changes in conditions have a certain stability in the climate in question.

GENETICS

Chromosome numbers and morphology in Trifolium, H. Wexelsen (*Calif. Univ. Pubs. Agr. Sci., 2 (1928), No. 13, pp. 355–376, figs. 4*).—Cytological studies at the University of California were made in 18 species of Trifolium. The 10 American species studied have the diploid numbers 16, 32, and 48, while no representative was found of the 7 series occurring in European species of Trifolium.

The chromosomes of Trifolium are generally small, although a great variation in size is observed both as to single chromosomes and to total amount of chromatin. In *T. repens*, giganteum, a giant variety, has large chromosomes, and sylvestre, a small variety, has small chromosomes, and the F_1 plants of sylvestre ×giganteum showed chromosomes of intermediate size. Ten species in the genus have 1 pair of satellited chromosomes and 1 species probably 3 such pairs. Species crosses were attempted between 9 species in 18 different combinations, but with completely negative results. It is suggested that the diversity of chromosome complexes in Trifolium is a result of mutational changes in species isolated by intersterility rather than the result of hybridization.

Mendelian inheritance of leaf shape in cotton, R. H. Peebles and T. H. Kearney (*Jour. Heredity, 19 (1928), No. 5, pp. 235–238, figs. 3*).—In crosses between an "okra-leaf" form of Acala cotton and the normal, broad-leafed form of this variety all of the F_1 plants and about half of the F_2 plants were intermediate between the narrow-lobed and the broad-lobed parents in leaf lobation, while the rest of the F_2 population was almost equally divided between the okra-leaf type and the normal Acala type.

Inheritance of rachis internode length and certain other characters in Asplund×Maskin barley [trans. title], K. Vik and A. P. Lunden (*Meld. Norges Landbr. Høiskole, 8 (1928), No. 5, pp. 249–266; Eng. abs., pp. 265, 266*).—Studies in the parental and F_1 to F_3 generations of the above cross produced evidence that the parent sorts differed by two main factor pairs, determining internode length in the rachis. In its short pubescence on the rachilla and glumes Asplund differed from Maskin with the long type of pubescence by one factor pair. No correlation was observed between internode length and type

of pubescence. The type of spike and date of exsertion seemed to be linked to some extent. Asplund had a somewhat greater tillering ability than did Maskin.

[Studies in poultry genetics at the Connecticut Storrs Station] (*Connecticut Storrs Sta. Bul. 149 (1928), pp. 332–334, figs. 2*).—Brief results of the following experiments are reported (E. S. R., 56, p. 817):

The factors involved in the hatching of eggs.—In a general study of chondrodystrophy in chicken embryos it was found that the creeper condition in certain strains was lethal when homozygous, causing the death of genetically pure creeper embryos on the fourth day of incubation.

In experiments dealing with the effect of certain electrolytes on the development of the chicken embryo, it was found that more dilute solutions of certain salts were more poisonous than stronger solutions.

The inheritance of morphological characters in poultry.—A new modifier for the rumpless stock was found which caused an intermediate number of tail vertebrae to appear in genetically pure rumpless birds.

In Silky×Leghorn crosses several linkages have been found which are the first autosomal linkages discovered in domestic fowls.

The inheritance of the blood groups in Bantams and Leghorns has been found in crosses to be determined by one or a few Mendelian genes.

Breed characters of the creeper fowl are controlled by a single Mendelian gene, dominant and apparently lethal in certain strains but not in others.

A genetic study of inbreeding in fowls (White Leghorns).—Crosses of inbred lines and double crosses of crossed inbred lines indicated a remarkable increase in vigor as compared with the control stock.

The behavior of a single gene in development.—Results of forced regeneration of feathers from one and the same follicle in Silver Spangled Hamburgs showed marked differences in the pattern of such feathers from different body regions. The feathers from the feather tracts, which are the first to show spangling during growth, retained a more constant pattern during consecutive regenerations than feathers from tracts showing spangling at a later age.

FIELD CROPS

Symposium on "field experiments" (*Jour. Amer. Soc. Agron., 20 (1928), No. 5, pp. 421–458*).—Papers presented at the meeting of the American Society of Agronomy held in November, 1927, at Chicago included The Type of Problem Adapted to Field Plat Experimentation, by C. F. Noll (pp. 421–425); Planning the Plat Experiment, by H. H. Love (pp. 426–432); The Mechanical Procedure of Field Experimentation, by T. A. Kiesselbach (pp. 433–442); Mathematics in the Service of Agronomy, by J. A. Harris (pp. 443–454); and Application of Plat Results to Agricultural Practise, by E. L. Worthen (pp. 455–458).

Plant-breeding at Canterbury Agricultural College, F. W. Hilgendorf (*New Zeal. Jour. Agr., 36 (1928), No. 3, pp. 156–171, figs. 5*).—A brief account is given of the technique and results of the institution in selection work with wheat, oats, ryegrass, orchard grass, and red clover, and hybridization work with wheat.

[Field crops experiments at the Connecticut Storrs Station] (*Connecticut Storrs Sta. Bul. 149 (1928), pp. 321–325*).—Strains of Green Mountain, Irish Cobbler, and Russet Rural potatoes grown in cheesecloth bags and also in isolated plats for 5 years have kept relatively free from mosaic, leaf roll, and spindle tuber, and their yields in 1926 and the appearance of the vines in 1927 were as good as or better than either new seed from the original grower

or any certified strains from other States. The results indicated that the degenerative or virus diseases are the principal factors in decreasing the vigor and yields of Connecticut potatoes. Plantings from tubers from the isolated plats dug early in the season generally carried less leaf roll, mosaic, etc., than those from mature potatoes, although no appreciable difference in vine growth has been apparent.

Plats receiving potassium alone during 9 years gave as much alfalfa in 1927 as those receiving 2,625 lbs. of superphosphate (acid phosphate) during the 9 years. On manured plats potassium has not increased yields, although superphosphate made a slightly larger crop. As noted in a paper by Brown (E. S. R., 59, p. 224), nitrogenous fertilizers have not been profitable with alfalfa and tend to increase the weeds and grasses therein. Indications were that alfalfa needed a complete mineral treatment, i. e., lime, phosphorus, and potassium, rather than excessive quantities of a single nutrient. On land receiving neither potassium nor sulfur carriers for at least 14 years alfalfa did not respond to applications of sulfur in flowers of sulfur, gypsum, or superphosphate, whereas plats receiving potassium produced the most alfalfa.

Fertilizer tests on pastures grazed by yearling steers showed that without phosphorus no gains may be expected from other treatments. In 1926 superphosphate alone nearly doubled the production, and superphosphate plus limestone or limestone and potassium nearly trebled the pasturage, whereas neither potassium nor limestone alone or together affected yields appreciably. The increase in production on the pastured plats provided keep for twice as many steers per acre as before treatment.

Other activities discussed briefly included tests of nurse crops and planting dates and cutting stages with alfalfa; trials of Hubam annual sweet clover for hay and nurse crops; tests of biennial sweet clover for New England pastures; and tests of the effect of manure, superphosphate, and a complete fertilizer in dairy farm rotations.

[Farm crops work at the Michigan Station], A. J. Patten, J. F. Cox, B. R. Churchill, and G. W. Putnam (*Michigan Sta. Rpt. 1926, pp. 260, 284–290, 313, 314*).—Practices resulting in the highest sugar yields from sugar beets in 1925 were 10-in. plowing, fall plowing, May 15 planting, and thinning earlier than usual. Averages from two or more seasons showed the highest sugar yields to come from seeding 18 lbs. of seed per acre, planting 1 in. deep, using ordinary rather than large or small seed balls, and thinning to 10 in. apart. Indications were that an even stand with plants close enough to reach all parts of the soil with their roots will result in practically the same tonnage and yield of sugar per acre, even though the spacing varies widely. The killing of weeds seemed to be the most important feature in trials of methods of cultivation. The sugar produced per acre decreased as the number of cultivations given or the depth of cultivation increased. Sugar losses were slight in field storage tests with beets and did not appear to be related to the size of roots. Seed treatments for seedling diseases appeared to be without value.

Cultivation tests with field beans showed that the duckfoot sweeps and ordinary methods of cultivation gave good results, and that cultivation up to and through blooming did not seem to injure the plants. With a good seed bed and weeds controlled, two cultivations were as good as more. About 80 lbs. of seed per acre seemed enough for kidney beans, and the first week in June appeared to be about right for seeding Robust and other varieties equally late. Earlier sorts could be seeded as late as June 16 and still make good yields. The 28- and 30-in. rows seemed to be quite satisfactory for beans.

Potato experiments suggested planting early sorts as early in the spring as possible and late potatoes early in June. The latter were best planted at from 3- to 5-in. depths and from 12 to 15 in. apart in 3-ft. rows, whereas early sorts have given good results in from 9- to 12-in. spacings.

Tests on 218 samples of wheat showed the protein content in 1925 to average 17.06 per cent and the ash 1.55 per cent, and flour derived from 113 wheat samples averaged 15.56 and 0.5 per cent, respectively.

The progress of breeding work with corn, wheat, barley, oats, beans, alfalfa, sweet clover, and sugar beets is outlined briefly. Variety tests with oats and red clover, tests of oats-flax combinations, and nursery studies of the susceptibility of wheat and oats varieties to rust are reported from the Upper Peninsula Substation.

[Agronomic investigations in the Virgin Islands, 1927], J. B. THOMPSON and M. S. BAKER (*Virgin Islands Sta. Rpt. 1927, pp. 3, 4, 9–14, figs. 3*).—Experiments with field crops continuing earlier work (E. S. R., 57, p. 326) included trials of seedlings and varieties of sweet potatoes and sugar cane and cultural tests with sugar cane and cotton.

S. C. 12/4, Uba selections 1241, 796, and 797, B. K. 6, Kassoer, and S. C. 22/21 led in acre sucrose production from plant cane, and S. C. 22/31, B. H. 10 (12), and P. O. J. 826 led the ratoons in this respect. On fallowed land cane planted on a level surface gave better and more profitable yields of plant cane than that planted in furrows or either surface or furrow plantings on unfallowed land. This advantage did not appear in the first ratoon crop. Sugar cane with the trash piled in alternate rows outyielded by 5 tons of cane per acre and cost one-half as much to cultivate as unmulched cane. The paper mulch tested for its effect on soil moisture had no value as a mulch after the first year. Crystallina cane made its best plant and ratoon yields where plants were 2 ft. apart in 3-ft. rows. Two-ft. spacing made higher yields than wider distances in all plats, and the weights of cane decreased as the width of middles and the distance between plants were increased.

Crop rotations and soil management for the prairie provinces, E. S. HOPKINS and S. BARNES (*Canada Dept. Agr. Bul. 98, n. ser. (1928), pp. 53, figs. 13*).—A detailed statement is given of the yields and profits obtained from rotation experiments carried on for long periods on the Dominion Experimental Farms in different parts of the prairie provinces, with information regarding the suitability of rotations for different conditions. Grain, mixed farming, and irrigation rotations are discussed, and comment is made on the merits of rotation and their effects, on crop production methods in rotations, the summer fallow, stubble treatment, weed control, soil moisture, soil drifting, and on alkali, burn-out, and gumbo lands.

Forage crops, W. D. ALBRIGHT (*Canada Expt. Farms, Beaverlodge (Alta.) Substa. Rpt. Supt. 1926, pp. 27–56, figs. 2*).—Extensive experiments with forage crops, continuing work noted previously (E. S. R., 54, p. 828), were concerned with nurse crops, combinations of grasses with clover and alfalfa, annual forage crops for hay or silage, intercultivated silage crops, and the dry matter contents of various forage crops.

[Root crops experiments in Canada], F. T. SHUTT (*Canada Expt. Farms, Div. Chem. Rpt. 1926, pp. 46–61*).—Analytical data on sugar beets, mangels, turnips, and carrots continue those recorded previously (E. S. R., 56, p. 433). Canadian grown seed continued to produce sugar beets equal in richness and purity to those from imported seed of the best European varieties.

Green feed crops for poultry, M. E. MCCOLLAM (*Western Washington Sta. Bul. 8–W (1928), pp. 20, figs. 4*).—Cultural and feeding directions are given for

kale, Japanese lettuce, alfalfa, and lawn grasses, all indicated as desirable forage crops for poultry. Thousand-Headed kale, "ketkku hakusai" lettuce, and Grimm and common alfalfa are suggested as desirable varieties, and seed mixtures are outlined for lawns and chicken runs and yards. The insect pests of kale and lettuce and the diseases of kale are discussed briefly.

Dry farming methods in the Deccan, V. A. TAMHANE, N. V. KANITKAR, and G. M. BAPAT (*Bombay Dept. Agr. Bul. 142 (1927), pp. 25, pls. 4*).—Cultural and green manuring tests led the authors to outline methods for growing bajri (pearl millet) as a typical kharif (rainy season) crop and rabi jowar (sorghum) as a typical rabi (late sown) crop.

An index to selection work with awnless brome grass, R. A. DERICK (*Sci. Agr., 8 (1928), No. 9, pp. 556–559, figs. 4*).—Studies on three varieties and six North Dakota selections of brome grass grown at the Brandon, Manitoba, Experimental Farm showed that strong positive correlations existed in awnless brome grass between the number of culms at heading the second year and the yield and between the spread at the base of plant and the yield, but none between the date of heading and the yield. The association of the character for number of fertile culms produced the first year with yield was found inconsistent when several strains were compared. Indications were that the degree of variability as well as the mean of certain characters could be changed by selection.

Red clover strain tests on the outlying experiment farms, J. S. CUTLER, W. E. WEAVER, and J. D. SAYRE (*Ohio Sta. Bimo. Bul., 13 (1928), No. 3, pp. 106–108, fig. 1*).—Strain tests with red clover on the Clermont and Hamilton County Experiment Farms indicated that seed grown in the northern United States, except the Pacific States, and Canadian-grown seed may give the best results, yield well, and withstand Ohio winters. French, Chilean, and north European seed yielded less, were more tender, and recovered slowly after cutting. Tennessee and Pacific coast seed were not winter hardy enough, and Italian seed was unadapted.

Experiments in crossing varieties as a means of improving productiveness in corn, L. H. SMITH and A. M. BRUNSON (*Illinois Sta. Bul. 306 (1928), pp. 373–386*).—The investigations reported were carried on during the period 1912–1916 to obtain further evidence upon the problem of hybrid vigor and upon the effect of crossing the standard corn varieties of Illinois.

With Reid Yellow Dent as the pollen parent on 10 dent varieties, crossing seemed to have produced little effect upon the yields. When sweet corn averaging 16 bu. per acre was crossed with Reid averaging 44.7 bu., the cross yielded only 0.58 bu. less than Reid, whereas crossing pop corn yielding 19.6 bu. with Reid giving 42.7 bu. produced a hybrid averaging 36.9 bu. Intercrosses between strains long selected for high and low ear, high and low oil, and high and low protein made no loss by crossing; on the contrary, the increase in yield of the cross over that of the higher yielding parent was quite substantial in five of seven cases. These results seemed to indicate the possibility of restoring the yielding capacity of varieties or strains which have suffered through inbreeding. When the special strains were crossed with Reid both gains and losses were recorded, but only one case seemed statistically significant. The average yield of the cross was in all cases above the average for the selected strains.

The results appeared to harmonize with theoretical considerations and suggested that the simple crossing of varieties as a practice does not insure a yield increase. On the other hand, the chances in crossing ordinary varieties appeared greater for loss than for gain, especially if the cost of producing crossbred seed is considered.

Fertilizers speed growth and increase yield of corn, R. M. Salter and R. W. Gerdel (*Ohio Sta. Bimo. Bul., 13 (1928), No. 3, pp. 82–92, figs. 6*).—While the length of growing season of a corn variety and soil fertility are important factors in maturity and yield, data obtained in a backward season with a rather late variety indicated that applications of manure with proper fertilizer treatments may also result in significant increases in yield and hasten maturity. The fact that the hill applications of fertilizers seemed to provide best for the needs of the crop early in the season, and manure and broadcast fertilizer applications for the needs in the later growth stages, indicated the value of combining hill applications with manure and broadcast applications. Fertilizer formulas and rates are suggested for several soil types and conditions.

Botany and culture of cotton, L. Wittmack (*Botanik und Kultur der Baumwolle. Berlin: Julius Springer, 1928, pp. X+352, figs. 92*).—The information assembled in this volume deals with the nomenclature and history of cotton, its botanical relationships, species, varieties, and hybrids, the life history, morphology, and anatomy of the plant, breeding and inheritance, and insect pests and diseases. A chapter by S. Fraenkel treats of the chemistry of the cotton plant.

The fruiting habits of the cotton plant, T. S. Buie (*Jour. Amer. Soc. Agron., 20 (1928), No. 3, pp. 193–201*).—Factors involved in the production of fruit in the cotton plant have been studied by the South Carolina Experiment Station (E. S. R., 58, p. 632), with particular reference to environmental factors concerned with earliness.

Flowers blooming early in the season at Clemson College seemed to have a much better chance of developing into open bolls than those appearing later. The peak of flowering was attained during the fifth to sixth week of fruiting under conditions prevailing from 1923 to 1925. It was noted that varieties producing a large proportion of their fruit early in the season bore few flowers late in the season, and vice versa. Plants from early plantings took longer to begin fruiting but produced more flowers early in the season. Closely spaced plants fruited early, although not necessarily bearing more bolls. A greater reproductive activity was stimulated by removing the flowers.

Further studies at the Pee Dee Substation, supplementing those reported by Warner (E. S. R., 57, p. 129) indicated that phosphorus seems to hasten the fruiting of the plant. Nitrogen on the particular soil did not have much effect in stimulating the production of early fruit as compared with cotton on infertile soils. Potassium under the conditions prevailing increased the number of flowers borne before midseason and slightly decreased the percentage of total yield obtained at first picking.

A chemical study of the development of cotton bolls and the rate of formation of gossypol in the cotton seed, W. D. Gallup (*Jour. Agr. Research [U. S.], 36 (1928), No. 5, pp. 471–480*).—Further studies (E. S. R., 56, p. 762; 57, p. 609; 58, p. 865) at the Oklahoma Experiment Station dealt with the apparent relationship existing between the formation of gossypol and of oil during the development of the cotton seed. Analyses showed the physical characteristics and the chemical composition of cotton bolls at maturity stages ranging from 8 to 52 days and of their contents at from 16 to 52 days.

The changes in composition were found to be very rapid from boll formation until opening. Young bolls were high in ash, nitrogen, and carbohydrates and increased in fat and crude fiber as they matured. After the opening stage the bolls increased slightly in crude fiber, although the nearly mature unopen bolls appeared to yield products nearly as high in the several constituents as the

open bolls. The composition of bollies and bolly refuse seemed to depend upon the age of the boll, probably the most important factor, their time of maturity, climatic conditions during growth, and possibly the nutrition of the plant. The presence in the lint of materials other than crude fiber is discussed as having some textile significance.

Oil and gossypol seemed to form concurrently in the cotton seed and during a very short and well defined period of growth. Gossypol appeared to be associated in some way with the formation of oil.

Effect of spacing on yield and size of cotton bolls, H. B. TISDALE (*Jour. Amer. Soc. Agron., 20 (1928), No. 3, pp. 298–301*).—In spacing tests with cotton at the Alabama Experiment Station during 3 years on fertilized and unfertilized land the largest average yields were made in spacings of 24 and 18 in. in the 3.5-ft. row with 2 plants per hill, or 12,445 and 16,592 plants per acre, respectively. Only small differences were noted in the yields from spacings giving 8,296 and 37,335 plants per acre, respectively. The yield differences from all spacings were less in the extremely dry year 1925 than in 1924 and 1926, which were more favorable. Thick spacing, low fertility, and dry weather evidently caused a decrease in boll size.

Cotton in Uele (Belgian Congo) [trans. title], E. DEJONG (*Bul. Agr. Congo Belge, 18 (1927), No. 4, pp. 451–536, figs. 62*).—A detailed report is made of experiments with cotton at the Bambesa Selection Station, including varietal, cultural, fertilizer, green manuring, and rotation tests, and breeding work. Insect pests and diseases and marketing problems are discussed briefly.

Relative resistance of oat varieties to shattering at Moro, Oregon, T. R. STANTON, D. E. STEPHENS, and B. B. BAYLES (*Jour. Amer. Soc. Agron., 20 (1928), No. 3, pp 304, 305*).—Observations in 1923 on 95 sorts of oats under the semiarid conditions of eastern Oregon revealed that lodging in different varieties varied from 1 to 90 per cent and shattering from 1 to 25 per cent. While early varieties as a group lodged and shattered more than midseason varieties, some early sorts, especially Richland, showed a high resistance to both lodging and shattering. Varieties with red kernels, including Kanota, Fulghum, and Burt, shattered more than any other group based on color. The data suggested that on the average lodging may be of more importance than shattering when the harvest of oats is delayed after maturity.

Peanuts in Texas, G. T. MCNESS (*Texas Sta. Bul. 381 (1928), pp. 23, figs. 7*).—The soils and climatic adaptations, varieties, and cultural requirements for peanuts in Texas are described, and information is given on harvesting, stacking, curing, feeding, and marketing the crop.

Varietal trials indicated that the Spanish and Valencia varieties are adapted to all sections of the State and Virginia Bunch and Virginia Runner to the Gulf Coast region. The Macspan peanut, selected by the station from Little Spanish, matures earlier, yields better, and is more uniform, and its kernels apparently contain more oil than the ordinary Spanish peanuts. Yields did not differ much whether the peanuts were planted in the hull or the hulls were broken or cracked. Close spacings, from 3 to 6 in. in the row, gave larger yields of forage and nuts than did wider spacings.

Effects of stimulants in hastening germination of potatoes [trans. title], W. VON VELSEN (*Jour. Landw., 76 (1928), No. 1, pp. 41–61, pls. 2*).—Tubers of the Industry, Up to Date, and Odenwälder Blue varieties were subjected at the University of Göttingen to treatment with different chemicals and with cold, wound stimulation, hot water, and desiccation. The varieties differed in their responses to the various agencies. The physical stimulants were not found effective.

Chemicals, including diastase, hydrocyanic acid, thiourea, ethylene chlorohydrin, and potassium thiocyanate, were most effective; sodium thiocyanate, sodium nitrate, and oxygen were rather variable, whereas fluorescein, ether, alcohol, and hydrogen peroxide were uncertain or ineffective. The three varieties showed typical differences in sprout production. The effective stimulants were similar in producing a large number of sprouts with a high total sprout weight. The course of germination in spring and development in summer showed no difference between treated and untreated tubers.

The light sprout test for determining the trueness of potato varieties [trans. title], K. SNELL (*Mitt. Biol. Reichsanst. Land u. Forstw. No. 34 (1927), pp. 32, pl. 1*).—The nature of the light sprout as to color, form, and pubescence, and the details of the light sprout test are described, and important German potato varieties are listed with reference to the character of their tubers and light sprouts. Twenty-four typical light sprouts are illustrated in color.

Handbook of potato culture, T. REMY and A. W. ULRICH (*Handbuch des Kartoffelbaues. Berlin: Paul Parey, 1928, 2. ed., rev. and enl., pp. [4]+312, figs. 87*).—Largely intended for German conditions, this book describes the status of the industry, the distribution of the crop, and the botanical and morphological characteristics and composition of the plant, discusses varieties and seed in considerable detail, and outlines general and specific cultural, harvesting, and storage methods. Information is included on the determination of starch in the potato and on marketing potatoes. Discussions on potato diseases by Ulrich and on machines and implements for potato culture by K. H. Dencker are appended.

Rice experiments in Sacramento Valley, 1922–1927, C. F. DUNSHEE (*California Sta. Bul. 454 (1928), pp. 14, figs. 4*).—The progress of experiments with rice (E. S. R., 51, p. 638) at Cortena in cooperation with the U. S. Department of Agriculture is reported on for the period 1922–1927.

Cultural tests showed that broadcasting 150 lbs. of seed rice per acre with immediate submergence to from 6 to 8 in. in depth will give satisfactory yields on old land if well-matured seed be planted early on a well-prepared seed bed. Yield increases obtained during 3 years suggested that 150 lbs. of ammonium sulfate per acre could be applied profitably on old land not producing more than 3,000 lbs. of rice per acre. An occasional year or two of fallow is suggested for improving soil conditions, weed control, and possibly some yield increase.

Observations indicated the control of sprangle top and the earlier maturing types of water grass by continuous submergence to a 6- to 8-in. depth, late white water grass by pulling, and cat tail by deep plowing and drying the roots in the spring, supplemented by pulling in July of plants not killed by the plowing. Thick stands of rice reduce the harmful effects of sedge, red stem, arrowhead, and water plantain. A year or two of dry fallow usually controls joint grass, and a thorough spring plowing suppresses spike rush if drying weather follows.

Thermograph records revealed that the minimum water temperature during the growing season always somewhat exceeds the minimum air temperature and suggested that from the viewpoint of warming the soil nothing is to be gained by withdrawing the water for a few days. Duty of water studies showed that with the method of continuous submergence the net duty of water for rice should not exceed 5 acre-ft. per acre on the clay, clay adobe, or adobe soils, whereas on the loam soils it may amount to as much as 8 acre-ft. per acre.

Comparative trials with sugar beets in Czechoslovakia [trans. title], J. SOUČEK (*Ztschr. Zuckerindus. Čechoslovak. Repub., 52 (1928), No. 20, pp. 229–246*).—Twelve strains of domestic and imported sugar beet seed were compared in 1927 in 15 different localities in Czechoslovakia. Selecta-Prag, Strube E, Gebrüder Dippe WI, and Zapotil I gave the highest average yields of

beets per unit area; Mette, Gebrüder Dippe WI, Zapotil I, and Kleinwanzleben Z led in average sucrose content; and Gebrüder Dippe WI, Zapotil I, Selecta-Prag, and Strube E produced the most sugar per hectare.

Moist storage of commercial sugar beets, D. A. PACK (*Facts About Sugar, 23 (1928), No. 16, pp. 378, 379, fig. 1*).—Supplemental to a study (E. S. R., 55, p. 435) indicating that sugar beets under controlled conditions lose more sugar under dry than moist storage, examination of factory data revealed that, in general, the sugar loss of beets increases with the weight loss of beets, although such losses are not always proportional. The sugar loss could be correlated with the weight loss, since the weight loss had been shown previously to be directly proportional to the dryness of storage conditions. Conditions of the crop, harvest, and storage seemed responsible for variations in the loss ratio. Economical methods should evidently be provided to maintain a uniform moisture content in sugar beets during storage.

[Sugar cane in Cuba] (*Mem. Conf. An. Asoc. Téc. Azucareros Cuba, 1 (1927), pp. 11–109, 197–289, figs. 18*).—Papers of agronomic interest presented at the first annual convention of the Association of Cuban Sugar Technologists and reported in Spanish and English include Preparation and Planting of Cane Lands, by F. S. Earle (pp. 11–15, 197–200); Mechanical Cultivation of Sugar Cane, by D. Sturrock (pp. 15–23, 200–204); The Irrigation of Sugar Cane in Cuba, by J. T. Crawley (pp. 23–31, 204–207); Cuban Drainage Problems, by E. L. Anderson (pp. 31–47, 208–220); Experiences with Sugar Cane Varieties in Oriente Province, Cuba, 1923–1927, by R. M. Ramos (pp. 48–66, 220–254); Some Comparative Figures, by F. Barreto (pp. 66–68, 254–256); The Size of the Colonia in Relation to Cane Yields, by J. A. Faris (pp. 68–72, 256–259); Plantation Experimental Stations in Relation to Seed Supply, etc., by D. N. Eaton (pp. 72–80, 259–269); Plan for Buying and Selling Cane on an Analysis Basis, by R. Sánchez Aballi and J. G. Salinas (pp. 81–105, 269–285); and Cane Payment Systems, by C. J. Bourbakis (pp. 106–109, 285–289).

Sugar-cane experiments in the Leeward Islands [1925–26 and 1926–27], A. E. COLLENS ET AL. (*West Indies Imp. Dept. Agr., Leeward Isl. Sugar-Cane Expts., 1925–26—1926–27, pp. [2]+19*).—Tests of sugar cane varieties and seedlings are reported as heretofore (E. S. R., 57, p. 432) for the above years for Antigua and for 1925–26 only for Montserrat.

Experiments with sugar cane conducted by the Department of Agriculture in Mauritius, H. A. TEMPANY (*Mauritius Dept. Agr., Gen. Ser. Bul. 39 (1927), Eng. ed., pp. 84*).—Experiments reported on include variety (E. S. R., 58, p. 636), fertilizer, and cultural trials, and tests on the trashing of cane during growth and on the effect of fire on sugar cane. The sorts D. 109, R. P. 6, P. O. J. 213, and M. 2316 have been outstanding in the average yields shown by a large number of trials. Varieties and seedlings are described briefly, and their distribution in the island is discussed by M. Koenig.

Sunflowers for silage, E. D. HOLDEN and E. J. DELWICHE (*Wis. Agr. Col. Ext. Circ. 220 (1928), pp. 16, figs. 14*).—Practical information is given on the adaptation of the crop and cultural and harvesting methods.

Time of seeding and turning vetch for cotton and corn, M. J. FUNCHESS (*Jour. Amer. Soc. Agron., 20 (1928), No. 3, pp. 294–297*).—Experimental results obtained at the Alabama Experiment Station suggested that monantha vetch, hairy vetch, and Austrian winter peas for green manure should be planted early in the fall, plantings during the latter part of September giving the best results. Vetch turned as early as March 15 produced increases in the yield of cotton or corn about equal to those obtained from 200 to 300 lbs. of sodium nitrate. While turning under April 1 or 15 made an additional increase with

corn, delayed turning reduced the yield of cotton, although the quantity of nitrogen turned under was more than double that in the early turned vetch.

Investigations on winter wheats in Michigan, E. E. Down, H. M. Brown, A. J. Patten, O. B. Winter, and G. H. Coons (*Michigan Sta. Tech. Bul. 88 (1928), pp. 35, figs. 8*).—Comparative yields, agronomic characteristics, smut resistance, chemical analyses, and milling and baking qualities are reported on for 52 varieties and strains of winter wheat grown at the station during 1921, 1922, 1923, and 1924.

Early Windsor and American Banner were outstanding among the awnless white wheats. Poole and Illini Chief were the best of the commercial awnless red sorts in acre yield and loaf volume, although they were outyielded by several selections found in Red Rock. While Red Rock has led the awned red wheats, 8 other varieties appeared to be about equal. Wheats of the Turkey type do not thrive as well under Michigan conditions as in the drier west. Difference in heading dates and maturity within a variety between years exceeded those between any two varieties in a given year. Only Red Winter and Berkeley Rock showed high resistance to stinking smut.

Texture tests tended to place the varieties in the same textural classes each year. No relationship was observed between protein content of wheat and texture of grain, although the protein contents of the grain and flour made therefrom were clearly related. No wheat had a water absorption greater than that of any other wheat each of the four years, and no distinct correlation was observed between loaf volume and water absorption.

A comparison of the types of wheats showed that the awned soft red wheats, as a subgroup, were highest in acre grain yields, percentage of protein in wheat, and loaf volume, and next highest in percentage of protein in flour. It appeared that among the red winter wheats the awned types were higher than the awnless wheats in percentage of protein in wheat and flour and in volume of loaf. The test results demonstrated that the red color of a wheat is no indication of good baking qualities, and that a flour with a high percentage of protein can not be guaranteed to produce a large and light loaf.

The improvement of Indian wheat, A. and G. L. C. Howard (*Agr. Research Inst., Pusa, Bul. 171 (1927), pp. [2]+II+26, pls. 2*).—Investigations at Pusa from 1905 to 1924 on the improvement of Indian wheats by isolation, selection, and hybridization are reviewed, with comments on the status of improved varieties which now are grown on at least 2,500,000 acres in India. A Report on Six Pusa Wheats, 1923 Crop, by A. E. Humphries (pp. 17–22), which describes tests on the milling and baking qualities of Pusa numbers 6, 51, 52, 53, 54, and 56, and a bibliography of 34 titles on wheat in India are included.

Seed testing, J. S. Remington (*London and New York: Isaac Pitman & Sons, 1928, pp. XI+144, figs. 33*).—This practical manual discusses the several phases of seed testing work, including sampling, purity determinations, germination apparatus and tests, flower seed testing, soil trials, reports, dodder tests, and cereal testing. Descriptions of the principal weed seeds found in samples of clover and grass seed are listed according to families and subdivisions.

Weeds, W. Peterson and D. C. Tingey (*Utah Sta. Circ. 71 (1928), pp. 52, figs. 15*).—A popular discussion of the losses caused by weeds, how they spread, and methods for their control.

Trials of weed-killers on garden paths at Craibstone, A. Hill (*Scot. Jour. Agr. 11 (1928), No. 2, pp. 203–209*).—Experiments on the garden paths and drives of the experimental farm of the North of Scotland College of Agriculture, where the infestations were largely grass plants, including some sorrel, showed salt, washing soda, sulfuric acid, sodium arsenate, gas liquor, carbolic

acid, and sheep dip to be ineffective or objectionable. Certain commercial herbicides were effective, although several applications appeared necessary for control. With proper weather copper sulfate powder, 1 lb. per 100 sq. ft., has been most efficient. Iron sulfate controlled moss on walks.

Chemicals destroy lake weeds, J. W. Jareo (*Sci. Amer., 138 (1928), No. 6, pp. 532, 533, figs. 6*).—A popular description of the work of B. P. Domogalla in the control of weeds and algae in Wisconsin lakes by copper sulfate drags and sprays, white arsenic, sodium arsenite, power-driven cutters, and cables.

HORTICULTURE

A physiological study of the influence of various types of paper frost protectors on the growth of plants, R. P. Hibbard (*Michigan Sta. Rpt. 1926, pp 254, 255*).—As previously noted (E. S. R., 55, p. 38), glassine-covered cones proved the most efficient type of plant protector. The California type of glassine cone did not give satisfactory results in the spring of 1926.

Report of the horticulturist, J. B. Thompson (*Virgin Islands Sta. Rpt. 1927, pp. 4–9, fig. 1*).—In an attempt to build up an export trade in vegetables, experimental plantings and trial shipments were again made (E. S. R., 57, p. 335) with eggplants, peppers, and tomatoes. In addition, data were assembled on the cost of production, marketing, and on returns. Carrots and Lima beans gave good results as home garden plants. Comparison of Hawaiian and Guam strains of papaya showed larger size but lower quality in the Hawaiian. A small experimental planting of Cavendish bananas gave good results, commencing to bear at about 10 months and yielding in some cases bunches weighing from 40 to 60 lbs. A companion crop of avocados made excellent growth. Notes are given on the behavior of various introduced species, palms, etc. Over 58,000 plants were grown in the station nurseries for distribution.

Effect of high temperature on character of growth of cabbage, J. C. Miller (*Plant Physiol., 3 (1928), No. 1, pp. 95, 96, fig. 1*).—Full-grown cabbage plants removed from the field to a greenhouse in the early autumn of 1925 and held at relatively high temperature failed to go to seed, although still living in December, 1927. Comparable plants taken from the field at the same time and held in a cool house or subjected to low temperature before being placed in the warm greenhouse blossomed in a normal manner.

Culture and varieties of sweet peppers, R. Magruder (*Ohio Sta. Bimo. Bul., 13 (1928), No. 3, pp. 109–112, figs. 2*).—A brief discussion of cultural requirements and varieties.

The effects of fertilizer on the quality of canned tomatoes, W. B. Mack (*Canning Trade, 50 (1928), No. 34, pp. 16, 18*).—In experiments at the Pennsylvania Experiment Station variations in the nitrogen, phosphoric acid, and potash content of fertilizers failed to produce any significant differences in the quality of canned tomatoes, as measured by color, flavor, solidity, and proportion of solid material to juice. The acidity of the tomatoes from the manure plats (30 tons per acre) was noticeably less on the average than that of the fruit of the fertilizer plats. This decrease in acidity was accompanied by an obvious loss in flavor. No association was found between yield and canning quality, except perhaps on the manured areas.

The relations of scion and rootstock.—I, Tree size in relation to scion and rootstock—(a) the case of young trees, B. T. P. Barker (*Jour. Bath and West and South. Counties Soc. 6. ser., 2 (1927–28), pp. 235–244*).—Utilizing as stock and scion in reciprocal grafts three free rooting apple stocks of

decidedly contrasting vigor, it was found at the Long Ashton Research Station, England, that tree size in the case of grafted or budded trees bears a direct relation to the vigor of growth of the two varieties used, the weaker of the two functioning as a limiting factor. The actual size of the tree was not the same regardless of which of the two varieties was used as stock or scion. The larger tree resulted when the stronger variety was used as the scion. Appropriately selected root stocks exercised a dwarfing influence on tree size, but even the strongest growing exerted but little increasing effect on the vigor of the scion.

Parthenocarpy and self-pollination in fruit [trans. title], V. A. KOLESNIKOV (KOLESNICOV) (*Trudy Salgir. Opytn. Plodovod. Sta.* (*Bul. Salgir Pomol. Expt. Sta.*) *No. 2* (*1927*), *pp. 3–42, figs. 4; Eng. abs., pp. 40–42*).—Fruit studies conducted near Moscow and in the Crimea showed parthenocarpy to be quite common in the pear and relatively rare in the apple. A strong tendency to parthenocarpy was recorded in Flemish Beauty, Beurré Ligel, William Bon-Chrétien (Bartlett), Curé, and Beurré Diel pears. Parthenocarpical and self-pollinated pears were usually seedless, and, in the case of Flemish Beauty, without carpels. Removal of both the stamens and the pistils did not prevent fruit formation. Parthenocarpic pears did not differ in composition or flavor from normal cross-pollinated fruits, but were often later and usually longer or shorter in form. In the apple normally pollinated fruits were usually larger than those obtained by self-pollination or by parthenocarpy. The single seed found in 198 parthenocarpic pears failed to germinate.

Studies with peaches showed most varieties capable of self-pollination. Plums showed but little tendency to self-fruitfulness, and all varieties of sweet cherries and nearly all other cherries were self-sterile.

Chemical composition of American-grown French cider apples and other apples of like character, J. S. CALDWELL (*Jour. Agr. Research* [*U. S.*], *36* (*1928*), *No. 5, pp. 391–406*).—In view of the fact that dessert and culinary apples are largely deficient in acidity and astringency properties useful in the manufacture of ciders and other products, a study was made at the Arlington, Va., Experiment Farm of the composition of French cider apples and other astringent varieties of various origin to determine their usefulness in beverage manufacture.

Comparing the results obtained with the French varieties with those recorded by French investigators, there was found no large or consistent modifications that could be associated with environment. The large group of American, Siberian, and other apples, divided into three classes on the basis of titrable acidity, represent such a wide range in chemical composition that the author suggests the possibility of meeting almost any conceivable manufacturing requirement in this group.

It is emphasized that total astringency is made up of two components, tannins and astringent nontannins, and that determinations of total astringency tell little or nothing as to the relative sweetness and flavor as determined by the taste. The large range in total astringency in the material studied is shown in a minimum of 7.4 and a maximum of 955 mg. per 100 cc. of juice.

Chemical composition of the juices of some American apples, J. S. CALDWELL (*Jour. Agr. Research* [*U. S.*], *36* (*1928*), *No. 5, pp. 407–417*).—Presenting the results of the analyses of the expressed juice of 105 varieties of apples grown at Arlington, Va., and Blacksburg, Va., and studied with a view to determining their possible use as sources of unfermented juice, the author again draws attention (E. S. R., 59, p. 233) to the significant influence of climatic conditions during the period of fruit development and maturity

upon chemical composition. The varieties, although of widely dissimilar origin, displayed a general mass response to climatic conditions. The acid : astringency : sugar ratio obtained by dividing the total astringency and the total sugar content by the titrable acidity is computed for the individual varieties in the belief that such figures materially aid in giving the reader a conception of the actual taste of the juices.

Changes produced in apples by the use of cleaning and oil-coating processes, J. R. Neller (*Jour. Agr. Research [U. S.], 36 (1928), No. 5, pp. 429–436, figs. 2*).—Determination of the respiration rate, as measured by carbon dioxide evolution, of apples treated in various ways to remove the arsenical residue showed that brushing in either the dry or the wet cleaning process tended to increase the respiration rate and to cause a notable increase in the rate of weight loss when the fruit was exposed to marketing temperatures immediately following treatment. However, where brushed fruit was coated with a highly refined mineral oil mixed with paraffin, respiration was slowed down. After four months of storage untreated Winesap and Delicious apples respired about 40 and 46° faster, respectively, than dry brushed, oil coated fruits.

As utilized in this study, the oil film had no significant influence on the eating quality of the fruits, even after 8 months of storage, and tended to reduce the rate of shriveling and softening after removal from storage. Dipping with mild agitation for 10 minutes in a 2 per cent solution of hydrochloric acid had but little effect on the respiration rate or loss in weight of Winesap apples. On the other hand, dipping in 2 per cent sodium hydroxide did increase the respiration and the loss of weight.

Bush fruit production, R. A. Van Meter (*New York: Orange Judd Pub. Co.; London: Kegan Paul, Trench, Trübner & Co., 1928, pp. 123, pls. 11*).—A presentation in practical terms of the essentials of bush fruit production, with particular reference to raspberries and blackberries.

Pruning the raspberry and blackberry, J. S. Shoemaker (*Ohio Sta. Bimo. Bul., 13 (1928), No. 3, pp. 113–118, fig. 1*).—In addition to a general discussion on pruning of bramble fruits the author reports the results of experiments conducted in 1927. Cumberland black raspberry canes, the diameters of which were determined previous to pruning, were treated by cutting back the laterals while dormant to 8, 12, 18, and 24 buds. A direct correlation was noted between the size of the canes and fruit production and shoot growth. The laterals pruned to 8 buds bore fruits of larger size and higher quality than those pruned less or not at all. It was observed that the severer the pruning the greater the percentage of fruit bearing shoots on the main cane and laterals. There was, however, but slight difference between the 8- and the 12-bud laterals. In general pruning reduced total yields and increased the quality and size of berries. It was noted that weak canes should be pruned more severely than strong canes.

In the case of King red raspberries, also measured prior to pruning, cutting back one-fourth of the length caused a reduction in yield and shoot growth, leading to the suggestion that the King and other red raspberries be headed as lightly as is compatible with training, freedom from injury during cultivation, ease in harvesting, etc. As in the black raspberry, there was found a direct relation between diameter of the cane and fruit production and shoot growth. For red raspberries grown in hills from 7 to 9 vigorous canes were found sufficient.

For purple raspberries a pruning length of from about 10 to 14 in. is suggested for laterals. With blackberries the optimum length of the lateral to

be left at pruning was found to vary with varieties and also with the vigor of the cane. Shortening the laterals apparently did not force buds into fruit as it did in the case of the black raspberries.

Strawberry investigations (*Jour. Bath and West and South. Counties Soc., 6 ser., 2 (1927–28), pp. 221–234*).—Observations at the Long Ashton Research Station, England, on the productivity of several strains of the Royal Sovereign strawberry showed one consistently high producing strain, with the others giving a somewhat irregular performance. Four varieties found resistant to root aphids, Aberdeen Standard, Dumbarton Castle, Sturton Cross, and Tardive de Leopold, were used in self- and cross-breeding studies to obtain resistant varieties with good commercial qualities. In manurial tests with Royal Sovereign, stable manure gave much better results than commercial fertilizers. No significant results were obtained from the omission of any of the several elements.

The strawberry in Ontario, E. F. Palmer and W. J. Strong (*Ontario Dept. Agr. Bul. 335 (1928), pp. 24, figs. 12*).—A presentation of useful cultural information.

The banana, R. C. P. Boone (*Le Bananier. Paris: Soc. Éd. Géogr. Marit. et Colon., 1926, pp. [1]+346, figs. 24*).—A general treatise on varieties, culture, harvesting, marketing, industrial uses, etc.

Factors concerned in the growth of Valencia orange, D. D. Waynick (*Calif. Citrogr., 13 (1928), No. 6, p. 200, fig. 1*).—A further contribution to the general study (E. S. R., 57, p. 241).

Among various factors affecting the growth of Valencia oranges moisture content of the soil was found to be exceedingly important. As determined at Riverside by J. G. Surr, of the California Experiment Station, the almost complete absence of nitrates under wheat straw was quite evidently the cause of a material reduction in ultimate size of fruits. That sunlight is also a potent factor in the growth of Valencia oranges was suggested in observations during 1927, a year of adequate moisture but of unusually cloudy weather during the spring. For no other apparent reason, nitrates being present in adequate quantities, the oranges were smaller than anticipated. The green surface of oranges and the green bark of the shoots are believed to function photosynthetically, since oranges on trees defoliated in October averaged only slightly smaller at time of picking than those from normal trees. Insects and desiccating winds also reduce size; for example, a decrease of two packing sizes occurred following a 48-hour Santa Ana wind. By expressing growth rates as a mathematical equation the author hopes to be able to forecast market sizes several months in advance of maturity.

Intra-seasonal cycles of growth, H. S. Reed (*Natl. Acad. Sci. Proc., 14 (1928), No. 3, pp. 221–229, figs. 5*).—Measurements taken upon the growth of 94 shoots of lemon trees growing at Riverside, Calif., showed during the growing season, May 1 to October 23, three distinct growth cycles each about 8 weeks in duration in most of the shoots. Growth was about equal in the first and second cycles but declined in the third. A slight overlapping of the cycles is ascribed to a lack of complete synchronization between individual shoots. A mathematical analysis of the data indicates that growth proceeded like a series of autocatalytic reactions, and leads to the formation of a hypothesis that the successive cycles are due to the periodic activity of a specific growth promoting substance which catalyzed the growth process. The single growth cycle recorded in certain of the shoots is believed to be due to a larger amount of the catalyst in these shoots.

Report on the Lime Experiment Station, Dominica, F. G. Harcourt (*West Indies Imp. Dept. Agr., Dominica Agr. Dept. Rpt. 1926–27, pp. 7–19*).—A

summary of 10 years' records of yields of limes fertilized with different materials showed no treatment to be outstandingly successful, all giving greatly increased yields above the controls. The plat mulched with lemon grass and leaves and shoots of *Gliricidia maculata* was only slightly below the fertilizer plats. With both budded on sour orange roots, common limes greatly outyielded spineless limes. Sour orange proved a disease resistant, strong rooting, and strong growing stock for limes.

Observations on oil palms, T. D. Marsh (*Malayan Agr. Jour., 16 (1928), No. 1, pp. 20–28*).—Substantiating the results of 1925 (E. S. R., 57, p. 341), records taken in 1926 showed an even greater increase for artificial pollination of oil palms. Measurements of height and spread of the palms and the circumference of the trunks revealed no appreciable differences between the pollinated and the nonpollinated trees. From 43 artificially pollinated palms there was harvested a total of 546 bunches containing 5,163 lbs. of fruit, as compared with 407 bunches carrying only 902 lbs. of fruit for the same number of control trees.

Some flowering bulbs, E. M. Straight (*Canada Dept. Agr. Bul. 95, n. ser. (1928), pp. 53, pl. 1, figs. 18*).—This contains general cultural and varietal information, with a chapter on Common Bulb Diseases, by F. L. Drayton (pp. 41–53).

Production of certain iris bulbs, D. Griffiths (*U. S. Dept. Agr. Circ. 25 (1928), pp. 23, pls. 7*).—Pointing out that the Irish genus is divided by the character of the underground parts into four distinctive groups, (1) thick rootstocks, (2) true bulbs, (3) fibrous roots, and (4) cormlike roots, the author discusses the propagation, culture, and handling of the Spanish iris, Dutch iris, *I. filifolia*, *I. tingitana*, and the English iris, all belonging to the second group. Among the points considered in the paper are the comparative importance of the several types, the availability of stocks, environmental and soil requirements, culture, harvesting, storage and handling of bulbs, commercial varieties, and the general utilization as flowers.

Lilies and their culture in North America, W. N. Craig (*Chicago: Florists' Pub. Co., 1928, pp. [6]+146, pls. 35*).—Beginning with a brief discussion of the culture of lilies, information is given on the growth habits and cultural needs of many species commonly grown in North America.

Home flower-growing, E. C. Volz (*New York: Macmillan Co., 1928, pp. XXII+342, figs. 113*).—A comprehensive treatise upon flowering plants—their varieties, culture, and utilization.

The care of ornamental trees, C. F. Greeves-Carpenter (*New York: Macmillan Co., 1928, pp. XI+[2]+70, pls. 6*).—A small handbook of useful information.

FORESTRY

The farm woodlot of southeastern Minnesota: Its composition, volume, growth, value, and future possibilities, E. G. Cheyney and R. M. Brown (*Minnesota Sta. Bul. 241 (1927), pp. 28, figs. 10*).—Stressing the importance of the farm woodlot as the principal source of hardwood timber in the future, the authors present the results of a study of woodlots in southeastern Minnesota. Two contrasting forest types were studied, (1) the oak type, in which oaks predominated, and (2) the mixed hardwood type, in which basswood, maple, and elm were usually the principal species.

In the mixed hardwood type, basswood made up about one-third of the stand by volume and elm and maple in equal amounts the second third. Hard maple was the most abundant species in the young growth. The volume per acre

above 4 in. in diameter, including the cordwood in the tops and branches, was about 3,100 cu. ft. The better woodlots averaged about 5,000 bd. ft. per acre of saw log material. Rate of growth, as estimated upon the several species, showed basswood to be the most rapid grower, with shagbark hickory and hard maple the slowest. It is suggested that ironwood, dogwood, willow, red cedar, boxelder, bitternut hickory, and probably hackberry, butternut, and white oak could be advantageously eliminated from the mixed hardwood type. The favored species are basswood, red oak, bur oak, largetooth aspen, shagbark hickory, Kentucky coffee tree, black cherry, and black walnut.

Comparable data taken in woodlots of the oak type showed red oak to be the most common species, making up 45 per cent of the stands 0.6 in. or more in diameter. The three oaks, red, white, and bur, comprised 63, 19, and 6 per cent of the total cubic volume. Ironwood was the most common species in the young growth, constituting 42 per cent of the trees between 0.6 and 3 in. in diameter. The well stocked woodlots of the oak type were highly comparable in volume to the mixed hardwood stands. Of the three oaks, the red grew most rapidly, being in the larger diameters the most rapid growing species in the oak stands. The authors suggest that aspen, elm, boxelder, cottonwood, ironwood, black ash, hard maple, dogwood, bitternut hickory, and white and bur oaks be eliminated and that red oak, shagback hickory, black cherry, basswood, yellow birch, butternut, and largetooth aspen be encouraged. Hard maple may be retained if desired for sugar production.

Grazing was found to eliminate reproduction and should be prohibited where sustained production is desired. In some woodlots the stand was so thin that the underlying sod was too thick to allow seeding. The economic value of the farm woodlot is discussed.

[**Forestry investigations at the Michigan Station**], A. K. CHITTENDEN (*Michigan Sta. Rpt. 1926, pp. 293, 294, 297, 298*).—Difficulty met in germinating basswood seeds is attributed to both an impervious seed coat and a rudimentary embryo. A trial at the Dunbar Substation of the furrow method of planting showed this to be an effective means of setting out young evergreens.

DISEASES OF PLANTS

[**Report of work in plant pathology of the Michigan station**], R. NELSON (*Michigan Sta. Rpt. 1926, pp. 255–259*).—In an attempt to determine the biological relations of certain of the Fungi Imperfecti, G. H. Coons and M. Carpenter are reported to have obtained immune sera, which were tested against their antigens. Attempts to segregate species of Fusarium on the basis of their use of carbohydrates gave negative results. Sources of nitrogen, toxicity of organic substances other than dyes, etc., are being tested, and the response to phenol is said to have given promise as a means for diagnosis of species.

Continued production of Golden Self-blanching celery seed resistant to yellows is reported. However, the demand for a quick blanching, succulent celery is said to have made it necessary to continue breeding work to meet these requirements.

Cytological studies of mosaic and healthy bean plants are reported to have shown characteristic structures present in the chloroplasts of the subcortical cells of stems and petioles of diseased plants. These bodies are believed to represent a stage in the life history of an organism concerned with the production of mosaic symptoms.

Experiments by J. E. Kotila have shown the possibility of producing virus-free potato seed stocks of several varieties at the Upper Peninsula

Substation, but the efforts at the main station at East Lansing were not so successful.

A study of the factors involved in spore formation of Rhizoctonia of potatoes and alfalfa revealed some of the external factors which influence spore formation in one strain from alfalfa. Preliminary field studies are said to have shown that the bacterial root rot of alfalfa caused by *Aplanobacter insidiosum* occurs in Cass County and probably in adjacent counties as well.

Investigations by Miss Carpenter are said to have shown the outstanding resistance to stinking smut of wheat of the variety Berkeley Rock.

Tests by the author of various chemicals for the control of bacterial diseases borne by gladiolus corms indicate that formaldehyde is as effective as some of the organic mercury compounds, and the cost of treatment was decidedly less. Alcoholic solutions of some of the disinfectants were found to penetrate the dormant corms better than other treatments, and there was no injury to the corms if growth had not begun.

Virus diseases in plants [trans. title], E. Foëx (*Rev. Path. Compar., 25 (1925), No. 272, pp. 241–256; 26 (1926), No. 293, pp. 39–73*).—The first article is chiefly a review of experimentation and opinion, extending as far back as 1857. The second deals with potato degenerating diseases, mainly from a historical and descriptive standpoint.

Some cytological and physiological studies of mosaic diseases and leaf variegations, F. F. Smith (*Ann. Missouri Bot. Gard., 13 (1926), No. 4, pp. 425–484, pls. 4, figs. 4*).—The purpose of this investigation was to determine the frequency of occurrence of the various bodies which have been reported as found in cells of plants affected with mosaic diseases. An account is given of the literature, also of the author's own materials, methods, and results. Confirmations are indicated.

The author's observations, as a whole, are thought to justify the conclusion that the vacuolate and the granular bodies discussed in this paper are associated directly with the causal agency rather than with the chlorosis which results from the presence of the virus in the plant. Probably they are not the causal agency, but are rather the product of a reaction between such agency and the cytoplasm of the cells.

Parasitic and saprophytic life in the genus Phytophthora [trans. title], J. Dufrénoy (*Rev. Gén. Sci., 37 (1926), No. 5, pp. 146–149*).—The Phytophthoras are dealt with briefly and systematically, and a number of references are given.

Notes on some physiological conditions affecting the parasitism of Rhizoctonia solani Kühn, M. Park (*Ceylon Dept. Agr. Yearbook, 1927, pp. 47, 48*).—Attention has been drawn to the occurrence of *R. solani* on *Vigna oligosperma*, which is widely used as a cover crop and green manure on estates, and it is stated that under favorable conditions a number of plants may be attacked. On account of its habits it is difficult to eradicate this soil fungus by fallowing, and experiments are here summarized which were carried out to study some of the physiological relations of parasite to host.

Cottonseed, having been found the most convenient growth medium, was placed in soil inoculated with *R. solani* and kept under observation. The results showed that air humidity plays a part in the infection of cotton seedlings by *R. solani* at least as important as that played by soil moisture, and further experiments with controlled humidity were therefore necessary.

The experiments briefly summarized indicate that, if extremes of soil moisture are excluded, the humidity of the air immediately above the soil plays a more important part in governing the parasitism of *R. solani* than does the average

water content of the soil. In nature, however, except in irrigated soils, the two factors are usually linked together.

Recommendations for the control of *R. solani* involved reduction of the humidity of the air in the plats, including the lessening of shade in the nurseries. Spacing to allow free passage of air should be as wide as is practicable. Humid situations should be ameliorated and soils should be well drained.

"The results of the experiments, however, show that when soil is infected with *R. solani* it is impossible to insure freedom from the disease by altering conditions of humidity and soil moisture in the range in which plants can be grown successfully under field conditions."

Cereal rusts [trans. title], M. Lacoudre (*Jour. Agr. Prat., n. ser., 45 (1926), Nos. 13, pp. 253–255, pl. 1, fig. 1; 22, pp. 434, 435, pl. 1*).—General, annual, and seasonal observations are briefly reported, with discussion, regarding several cereal rusts.

Correlated studies in oats of the inheritance of reaction to stem rust and smuts and of other differential characters, H. K. Hayes, F. Griffee, F. J. Stevenson, and A. P. Lunden (*Jour. Agr. Research [U. S.], 36 (1928), No. 5, pp. 437–457*).—A study was made of the inheritance of reaction of some oat hybrids to stem rust (*Puccinia graminis avenae*) and smuts (*Ustilago avenae* and *U. levis*) in relation to other differential characters of the parents, such as black and nonblack hulls, hairiness of the rachilla of the second kernel of the spikelet, differences in awn development, etc.

The rust-resistant parents were segregates from previous crosses of White Russian with Victory or Minota. The selections used had white glumes, weak awns, few or no hairs on the second kernel of the spikelet, and were susceptible to smut. The smut-immune parent, Black Mesdag, had black glumes, strongly developed awns, many hairs on the rachilla of the second spikelet, and was susceptible to rust.

Black v. white glumes and rust resistance v. susceptibility gave close approximations to 3:1 segregations with black dominant over white and rust resistance dominant over susceptibility. Segregation for number of hairs on the rachilla of the second spikelet agreed with a 3:1 ratio in the F_2 generation of few to many hairs on the spikelet. Segregation for number and strength of awns occurred, and it was found that the classification of the F_2 plants when compared with the F_3 could not be explained on any simple genetic basis. Approximately the same number of F_2 plants were selected at random from the four groups—black, resistant to rust; black, susceptible to rust; white, resistant; and white, susceptible, and their progeny tested in the F_3 to F_5 generations for smut reaction. Some lines appeared highly resistant and produced only a small percentage of infection. The genetic factors for smut reaction could not be determined with accuracy in the studies. Black v. white glumes appeared to be independently inherited from resistance v. susceptibility to rust. A slight tendency was found in all three crosses for a loose linkage between genetic factors for hairs on rachilla and for glume color. No correlation was found between rust reaction and awn development or rust reaction and smut reaction.

From these studies several homozygous lines were obtained, which were resistant to black stem rust, immune from smut, and had weak awns and white glumes.

Some recent developments in vegetable disease control, C. Chupp (*N. J. State Hort. Soc. Proc., 1926, pp. 21–26*).—Areas, means, and experimentation methods are reviewed in connection with several diseases threatening the interests of vegetable growers.

Celery dusting in 1927, J. D. WILSON (*Ohio Sta. Bimo. Bul., 13 (1928), No. 3, pp. 122–124*).—A report is given of comparative tests of a number of freshly mixed dusts containing copper and several commercial dusts for the control of celery blights caused by *Septoria apii* and *Cercospora apii*. No bacterial blight was noted in any field in 1927.

The results indicate that probably any reliable commercial or freshly mixed copper-lime dust will give satisfactory control if proper care is used to obtain an even distribution and if the applications are made at proper time intervals and only when the leaves are moist.

Among the freshly mixed dusts tested part of the lime was replaced by kaolin and infusorial earth, but they were no more efficient for blight control than the standard 20–80 copper-lime formula.

A sclerotial disease of maize (Zea mays L.) due to Rhizoctonia solani Kühn, L. S. BERTUS (*Ceylon Dept. Agr. Yearbook, 1927, pp. 44–46, pl. 1*).—Early in September maize plants three months old in the students' plats of the Farm School, Peradeniya, showed sclerotia, which proved to be those of *R. solani*. Studies on this material are briefly indicated.

Sclerotia of *R. solani* collected from *Vigna* sp. in 1919 germinated in 1925 when placed in a mixture of sterilized damp sand and dadap leaf, showing that these bodies can retain their vitality for at least six years. It is recommended, therefore, that in the case of such aerial infection on maize as the present all diseased plants bearing sclerotia should be carefully removed and burned. The occurrence of *R. solani* on plantain, paddy, and maize, three important food crops, is regarded as important.

Report on the occurrence of angular leaf-spot of cotton (Bacterium malvacearum E. F. S.) in Uganda, J. D. SNOWDEN (*Uganda Dept. Agr. Circ. 17 (1926), pp. 3–12, pl. 1*).—Suspicions regarding the presence of cotton angular leaf spot (*B. malvacearum*) in Uganda and study during 1925 culminated in the isolation of the organism in 1926. This short account deals chiefly with the resulting inoculation experiments, the dissemination of the disease and its effect, distribution, and control measures, the most effective of which is said to be disinfection of the seed in commercial sulfuric acid for 15 minutes with constant stirring, rinsing in running water for 20 minutes, then placing in mercuric chloride 1–1,000 for 15 minutes, and finally drying. This treatment, though it does not lower germinability, is too expensive for general purposes, but it will allow the raiser to produce disease-free seed.

Bacterial halo spot of kudzu caused by Bacterium puerariae Hedges, F. HEDGES (*Jour. Agr. Research [U. S.], 36 (1928), No. 5, pp. 419–428, pls. 2*).—A detailed account is given of a leaf spot of kudzu, the occurrence of which has been previously noted (E. S. R., 59, p. 344). The disease is said to be characterized by a conspicuous spotting of the leaves, the presence of wide yellow halos when the spots are not too close together, and glistening brown streaks on the succulent young runners. The disease is known to occur in Georgia, Florida, and Connecticut. Circumstantial evidence indicates that the disease is introduced into new areas by planting roots from diseased fields. The author claims that the use of cuttings should be avoided, as the succulent young runners are very susceptible to infection. The causal organism, *B. puerariae*, incorrectly given in the earlier publication as *B. pueriae*, is technically described.

A sclerotial disease of groundnut caused by Sclerotium rolfsii Sacc., L. S. BERTUS (*Ceylon Dept. Agr. Yearbook, 1927, pp. 41–43, pl. 1*).—In October, 1925, peanut plants on the students' plats at the Farm School, Peradeniya, were attacked by a sclerotial fungus which was identified as *Rhizoctonia solani*. In the same plat small sclerotia were observed, and these are described. The

fungus producing the smaller sclerotia was identified as *S. rolfsii*. Plants attacked by this fungus only were affected at or above ground level, the leaves and leafstalks being dried up and withered. The fungus, which appeared to spread from one plant to another by contact and also by means of the mycelium developed from sclerotia which had fallen to the ground, was studied.

It is concluded that *S. rolfsii* is on the whole a weak parasite, causing a stem disease of peanuts only under very favorable circumstances. With the possible exception of radish, this fungus is not a root parasite of the plants used in this experiment. Young seedlings of certain plants are susceptible to attack by *S. rolfsii* and later become immune. The fungus causes a stem rot of mature chili and tomato plants, and when buried in the soil as deep as 4 in. may come up to the surface and attack certain plants at the collar. Seeds of certain plants sown in infected soil may give rise to infected seedlings. Humid atmospheric conditions are essential to a vigorous growth of the fungus. The measures recommended for the eradication of the fungus include the burning of diseased plants in place, deep burying of surface portions of the soil, and soaking the surface of the soil with a fungicidal preparation.

The storage rot of sugar beets in the factory [trans. title], V. P. Murav'ev (*Nauch. Zap. Gosud. Éksper. Inst. Sakh. Promysh.* [*Kiev*], *5* (*1927*), *No. 2, pp. 59–65*).—The losses due to fungus rots in sugar beets stored at the factory are discussed, and it is stated that the causes are excess of moisture, temperatures favorable to the development of the fungi, the presence of a favorable substratum, and the occurrence of infecting agents. The excess of moisture is due to poor ventilation, to the access of rain water to the storage pits, and to the water remaining on the surface of the beets at the time of storing. The temperature most favorable for the prevention of fungus rots is from 1 to 3° C. (33.8 to 37.4° F.). A lower temperature causes injury which conditions rotting when the temperature rises. The dead residues adhering to the beets serve as a substratum for rot fungi. The bruises and cuts on beets in the process of preparing them for storage furnish another condition of infection. The presence of *Sclerotinia libertiana* in the pits and of *Botrytis cinerea* in the field contributes largely to the spoilage.

The value of more than one plant to each hill in reducing losses from stem rot, W. H. Martin (*N. J. State Hort. Soc. Proc., 1926, pp. 14–21*).—Results, with discussion, are given of experiments conducted for three years to determine the value of planting more than one sweet potato plant to each hill in order to maintain a stand in fields where the plants are seriously subject to killing by stem rot.

It appears from results obtained in 1925 that where stem rot is severe the setting out of two and three plants to the hill is more likely to result in a stand than is one plant per hill. Where only one plant survived, this yielded as well as in case one only had been set out originally, and where more than one plant remained the yield was greater than where one plant had originally been set out. The results for the year 1926, in which stem rot was not severe, were in accord with those of 1925, and suggest that where stem rot has been present in a field two plants should be set to each hill. Where the disease has been very severe, three plants should result in even better yields.

A cytological study of the leaves and growing points of healthy and mosaic diseased tobacco plants, B. Goldstein (*Bul. Torrey Bot. Club, 53* (*1926*), *No. 8, pp. 499–599, pls. 12, figs. 4*).—Upon the basis of studies made on Connecticut seed leaf tobacco inoculated with a particular strain of mosaic virus, the author has classified and described both macroscopically and cytologically the commonly recognized symptoms of mosaic as a series of six patterns,

each of which is correlated with the particular growth and histogenic stage of development which the leaf had reached when its cells were affected by the virus. He claims to have evidence of another virus or of a modified strain of the virus which produces recognizable differences in the patterns. The distinctness of the patterns and their sequence have been repeatedly determined and confirmed by inoculating successive series of plants similar in age, size, and cultural growth conditions with virus obtained from the same diseased leaf and in a corresponding leaf of the plant. The anatomical structure of a diseased leaf proves to be correlated with the stage of its development when it was entered by the virus. Examples of this are given.

The nuclei of the cells in the dark green area are always smaller than those of healthy cells in leaves of corresponding size. The leaf patterns of many variegated plants resemble those found in mosaic leaves of tobacco.

In the author's view the dark green areas represent regions which have escaped infection during the early stages of the entrance of the virus into the leaf primordium. These areas are able to go through their histogenic development for a time, but soon the toxins of the virus hinder the completion of histogenesis, so far as differentiation is concerned. The cells enlarge continuously, but can so enlarge only by elongating. When cells of the dark green regions divide, they are likewise under pressure from the surrounding light green regions which are enlarging more slowly, so that a bulging upward to form a blistered or puckered region (savoying) results.

"The striated bodies are evidently associated with the mosaic diseased condition of two solanaceous plants, *Nicotiana tabacum* and *Solanum aculeatissimum*, and appear to be reaction products of the cell. I have not as yet been able to determine satisfactorily their chemical constituents, but am inclined to compare them to cystoliths and similar cell inclusions of mixed organic and inorganic make-up."

The relation of humidity and ventilation to the leaf mold disease of tomatoes, A. G. Newhall (*Ohio Sta. Bimo. Bul., 13 (1928), No. 3, pp. 119–122, figs. 2*).—Experiments with copper and sulfur fungicides are said to have given unsatisfactory control of *Cladosporium fulvum* on tomatoes grown in greenhouses. Laboratory studies are reported, which show that at room temperatures a nearly saturated atmosphere is necessary for the germination of spores of the fungus. The best germination occurred at relative humidities of 98 and 99 per cent, and there was no germination at ordinary temperatures when the humidity fell to 96 per cent or lower.

Following these studies an investigation was made of air circulation by forced ventilation on humidity and fungus activity, and ventilation systems were investigated in which the humidity was artificially lowered. In a greenhouse where the air was theoretically changed in from 22 to 32 minutes there was no leaf mold except in one corner, and there it made no progress during a period of 4 months when the ventilating fan was in use.

Silver-leaf disease, V, F. T. Brooks and W. C. Moore (*Jour. Pomol. and Hort. Sci., 5 (1926), No. 2, pp. 61–97, fig. 1*).—Late in 1922 facilities were provided for the continuance of the investigation (E. S. R., 52, p. 846) on fruit tree silver-leaf disease, and certain other relevant investigations and information are mentioned as having become available. Additional observations are recorded, and attention is called to some increase of the disease upon roses, especially ramblers.

It was found that *Stereum purpureum* can generally infect fresh wounds readily throughout the year except during June, July, and August, the cause of noninfection during this period being related probably to the physiological

condition of the host, which corresponds to the formation of a gum barrier beneath the exposed surface. Though *S. purpureum* readily infects woody tissues just after exposure, it appears very difficult for this fungus to infect exposures of a month's standing, and practically impossible for it to infect tissues which have been exposed for three months. Removal of dead or silvered wood and thinning of fruit trees should be done during the early summer. There seems to be no danger of *S. purpureum* following in the wake of an attack on plum trees by *Sclerotinia cinerea*, *Diaporthe perniciosa*, and *Cytospora* spp. The mode of gum formation in response to wounding and to fungal invasion is described, as is also the development of gum barriers. Natural recovery is more common than was formerly supposed, even in susceptible plums, as Victoria and Czar. Recovery is correlated with tree vigor, depending upon the formation of the gum barrier.

The best protective results have been obtained with soft grafting wax and with paints, the formulas for which are given. Gas tar and Stockholm tar are unsatisfactory. No considerable benefit appears likely to follow ringbarking the silvered trees.

Applications of basic slag and kainit gave benefit in some instances. Preventive sanitation is favored.

It has been shown that the fungus during growth secretes some substance which, apart from the living organism, will produce, when injected into healthy trees, some of the symptoms which are associated with the later phases of silver-leaf disease.

Recent investigations on silver-leaf disease, F. T. Brooks (*Jour. Min. Agr. [Gt. Brit.], 32 (1926), No. 12, pp. 1128–1133*).—A fuller account of the results of these investigations is noted above.

Notes on silver-leaf, F. R. Petherbridge (*Jour. Pomol. and Hort. Sci., 5 (1926), No. 2, pp. 141–147, pls. 2*).—This account, dealing with silver-leaf both in plum and in apple trees, shows the relation between the means and methods described as used and the increase or decrease of silver-leaf incidence and injury.

Investigations on chlorosis of fruit trees.—I, The composition of apple leaves in cases of lime-induced chlorosis, T. Wallace and C. E. T. Mann (*Jour. Pomol. and Hort. Sci., 5 (1926), No. 2, pp. 115–123*).—Presenting comparative results of an investigation on the composition of green and chlorotic leaves in typical cases of lime-induced chlorosis of apple, the authors show the nature of the soil conditions conducive to chlorosis. The data show salient differences distinguishing between green and chlorotic leaves. Green leaves show more dry matter, less ash, more calcium, and less potassium and sodium than do chlorotic leaves. The differences in the amounts of magnesium, iron, aluminum, phosphorus, and silica are not so definite.

Apple scab studies in 1925, W. H. Martin (*N. J. State Hort. Soc. Proc., 1925, pp. 71–85, pl. 1*).—Scab, said to be probably the most serious apple disease in New Jersey, is dealt with as regards the summer and winter spores, relation of weather conditions to spore discharge, relation of discharge period to early spray applications, prospects of scab in 1926, and spraying v. dusting for scab control, with a résumé of experience in Michigan, Massachusetts, Virginia, Connecticut, Pennsylvania, West Virginia, New York, and New Jersey.

Observations and experiments on apple scab in East Anglia, F. R. Petherbridge and W. A. R. D. Weston (*Jour. Min. Agr. [Gt. Brit.], 32 (1926), No. 12, pp. 1119–1127*).—It is stated that following Salmon's discovery (E. S. R., 56, p. 849) of the existence in this region of the winter spore stage (perithecia) of the apple scab fungus on the previous season's leaves, the authors examined

a number of dead apple leaves to ascertain whether this mode of overwintering was common.

During the spring of 1925, the winter spore stage (perithecia) was abundant on dead leaves of many apple varieties, certain of these showing heavy infections. Apparently, soil characters influence the severity of attack. Scab varietal incidence is shown for many varieties examined during 1924–1925.

Worcester Pearmain was badly russeted by excess lime in Bordeaux mixture (with or without lead arsenate) in 1923, but not in 1925. Scab on Worcester Pearmain was economically controlled in 1925 by spraying with normal Bordeaux mixture, excess lime Bordeaux mixture, or lime sulfur (with or without lead arsenate). Lime sulfur at 1 per cent sprayed on once only (after blossoming) seriously injured leaves of Lane Prince Albert, but no injury resulted on those trees which had been previously sprayed with lime sulfur 1–40.

The control of apple scald, C. Brooks (*N. J. State Hort. Soc. Proc., 1926, pp. 282–291*).—The cause of scald is the accumulation within the apples of certain odorous substances. The odoriferous factor is made up of several complex compounds, probably two or three of these definitely toxic to the skin of the apple when present in sufficient quantity. The most strongly suspected substances in this respect is acetaldehyde, which can be formed from ethyl alcohol by oxidation and which appears to accumulate in poorly ventilated spaces, probably being given off by apples as they warm up after being brought in from the cold. Types and methods of aeration are outlined, as are also types of wraps and packs. Oiled wrapping paper is given a certain preference over oiled shredded paper, and has now practically supplanted the ordinary wrap for use on boxed apples. Varietal tests show considerable diversity as regards control. Oiled paper has given almost complete control in case of Grimes Golden, York Imperial, Stayman Winesap, Winesap, and Rome Beauty, but has been sometimes less successful in case of Black Twig and western Yellow Newtown.

Complete maturity previous to picking is an important auxiliary factor. Loss incidence is briefly discussed.

Apple disease control studies in 1926, W. H. Martin (*N. J. State Hort. Soc. Proc., 1926, pp. 185–209*).—A summary is given of the results of studies during 1926 on apple scab, blotch, and fruit spot.

As regards scab, temperature proved to be a factor of considerable importance in determining the time of maturity of the winter spores of the fungus. Preliminary studies have indicated that a cool spring will result in earlier maturity than will a warm, dry spring. Rainfall is the most important factor contributing to the discharge of the winter spores, and in the absence of rain no spore discharge occurs. Total rainfall is not so important as the time of the precipitation in relation to the development of the trees. Scab infection occurs most readily during cool, moist weather, but any set of conditions that helps retain moisture is important in determining the amount and severity of infection. The results of studies in both 1925 and 1926 show conclusively the need of making spray applications before rather than after a period of rainfall. Dry mix 8–4–50 at the pink stage gave much less efficient scab control than concentrated lime sulfur at this stage. For subsequent sprays, dry mix gave about as good control as the concentrated lime sulfur and had the advantage of causing no leaf burning. In a comparison of 6–4–50, 8–4–50, and 8–8–50 dry mix, all gave about equally good control. Colloidal sulfur at the rate of 3 lbs. per 100 gal. gave good results, but sulfur dusting from the pink bud stage on gave very poor scab control. Where concentrated lime sulfur was

applied at the pink stage and sulfur dusts later, fairly good scab control resulted, Kolotex giving the best results.

Blotch, though by no means as widespread as scab, caused serious losses in some orchards. In 1926, blotch occurred in all parts of the State, apparently increasing in importance. Studies have been carried on during three years to determine the time of infection and the most efficient control measures. Infection in 1925 and 1926 occurred at about the same time. The 1926 test shows that both the 17-day and 4-week applications are important in blotch control. The control in 1926 following the use of Bordeaux mixture was not so good as in 1925, supposedly because no accessory spray was applied between the regular sprays made 4 and 11 weeks after petal fall. It is thought that where the disease has been severe it is probably advisable to make an extra application 2 weeks after the 4-week spray. Better protection will thus be afforded during the heavy infection period.

Apple fruit spot (*Phoma pomi*) was severe even on fruits bagged early during both 1925 and 1926. It appears that the 17- and possibly the 7-day sprays are both important in the control of fruit spot, and that the later sprays are important. It is doubtful whether dry mix will control fruit spot. It is thought possible, in the absence of definite results, that where fruit spot has been severe in the past and where thorough spraying with dry mix following the New Jersey spray schedule has failed to control the disease, it may be advisable to spray with concentrated lime sulfur, 4 qt. to 50 gal. of water.

The action of Phomopsis californica in producing a stem-end decay of citrus fruits, M. Bahgat (*Hilgardia [California Sta.], 3 (1928), No. 6, pp. 153–181, figs. 6*).—Histological and other studies were made of sound lemon tissues and those attacked by *P. californica*, and the author reports that the vascular bundles, which are the principal channels for the invasion of the fungus, were found to branch into three circles at the button just before entering the fruit. The first circle is said to proceed straight into the core, the second follows the rind and pulp, and the third diverges toward the rind and forms a net of strands. The oil glands, which are found only in the outer layers of the rind, are believed to protect that portion of the fruit against invasion. In a similar way the protection of the pulp is believed to be due to the high acidity of the juice it contains. The albedo and the core, which are free from oil glands and contain the greater part of the vascular bundles, were found to be the most affected portions of the fruit.

The nature of the decay was studied by means of tests for the presence of various enzymes in the mycelium and its products. Positive evidence was obtained of the presence of cytase, pectinase, invertase, maltase, and emulsin, but negative results were obtained in the tests for pectase and inulase. Among the other enzymes found to be very active in the lemon fruit were the proteases and amidase. It is claimed that ammonia was liberated by the action of the amidase on the amides, and it was believed responsible, to some extent at least, for the effect found in the area preceding the spread of the mycelial threads in the fruit. In the diseased fruit the advancing zone which lies between the margin of discoloration and the healthy tissues is considered mainly due to the accumulation of enzymes and their by-products. Lipase was present in the ground mycelium, and it was more active on methyl and ethyl acetates than on lemon-oil emulsion.

Diseases of the coconut palm, A. Sharples (*Malayan Agr. Jour., 14 (1926), Nos. 3, pp. 65–73; 4, pp. 91–95*).—In amplification of portions of the note previously made (E. S. R., 58, p. 152), it may be stated that the second section of this account deals chiefly with obscure symptoms observed in Malaya which have been confused by planters with those of bud rot, and that the intro-

duction to this part gives prominence to Nowell's work in the West Indies on coconut red ring, a part of the account by Nowell (E. S. R., 55, p. 540) being quoted in this connection. Previous statements which have been noted (E. S. R., 40, pp. 155, 751; 41, p. 350; 42, p. 746; 43, p. 551; 46, p. 454; 48, p. 456), have some bearing upon a similar or perhaps related coconut disease which has been attributed eventually to the nematode *Aphelenchus cocophilus*.

The inoculation experiments carried out in the West Indies are held to prove conclusively that the infestation of the coconut palms by nematodes is the primary cause of the symptoms described. "The diseases in Malaya usually confused with bud rot show well marked symptoms in the stems and roots." These are described, with careful distinction as regards characteristics. No nematodes are reported in connection with the Malayan disease, which is supposed to have other causation. To date it has been found in Malaya only on trees over 10 years old. Most of the trees so affected are 20 years or more of age. The disease is found in practically every coconut-growing district throughout Malaya.

Leaf-break disease of coconuts, C. RAGUNATHAN (*Ceylon Dept. Agr. Yearbook, 1927, pp. 25, 26, pl. 1*).—Coconut leaf break is said to have been first recorded from Kurunegala in 1918, observed again in 1920 at Delwita, Kurunegala, Katugastota Estate, and Koodalupotha Estate in Pannella, and recorded in 1927 from Chilaw and Kurunegala. From specimens received from Kurunegala two fungi have been isolated, *Diplodia* sp. (*Botryodiplodia* sp.) and *Pestalozzia palmarum*. Inoculations testing the pathogenicity of these organisms were carried out in two series, the first on the leaf midribs of young palms and the second on plants aged from 9 to 10 years. The successful inoculations of Diplodia and Pestalozzia developed the same characters in the second as in the first experiment, but the successful Diplodia inoculations appeared to progress more quickly.

From the results obtained and the opinions of other workers it appears that Diplodia (Botryodiplodia) is a wound parasite of coconut leaf midrib, though it is not yet known what nature of wounds enables it to enter the midrib. The constant association of Pestalozzia with Diplodia may indicate one of the means of entry.

Remedial measures recommended are limited to cutting away the diseased portions of leaves and burning them without removal.

"Rot of Hevea cortex" in Uganda, J. D. SNOWDEN (*Uganda Dept. Agr. Circ. 17 (1926), pp. 13–22, pl. 1*).—Hevea cortex rot, ordinarily a disease of minor importance in Uganda, has become increasingly prevalent and more serious since tapping was resumed a few years previous to the present account. The disease is described. Careful and frequent investigations in the field have shown that the fungi always present included *Fusarium udum*, *Cephalosporium* sp., and *Cladosporium* sp.

The chief difference between two experiments described was the nature of the wounds, and it is thought that exposure of the wood in tapping allows certain weak parasitic or saprophytic fungi to enter. Comparison is made with Hevea moldy rot in Malaya, where a Sphaeronema found in this connection resembles one lately found to be similarly related in Uganda.

With care in applying Agrisol fortnightly twice at 10 per cent and then at from 2 to 4 per cent every two weeks, the disease should easily be kept under control.

A die-back disease of pines, J. S. L. WALDIE (*Roy. Scot. Arbor. Soc. Trans., 40 (1926), pt. 2, pp. 120–125, pls. 3*).—The Austrian pine (*Pinus austriaca*), formerly showing high resistance against diseases, unfavorable climatic condi-

tions, and poor soils, has recently been attacked by several fungus diseases. One of the most serious is that due to *Brunchorstia destruens*, which also damages extensively such introduced pines as *P. laricio*, *P. cembra*, *P. montana*, and *P. strobus*. This disease of *P. austriaca* is described. Suggestions include the removal of diseased parts, in case of valuable trees, in December before the spores are ripe and spraying with Bordeaux mixture where practicable.

White pine blister rust, W. A. McCubbin (*Penn. Dept. Agr. Bul. 452 (1927), pp. 27, pls. 3, figs. 3*).—An account is given of the American history of white pine blister rust as it is known to have existed here since 1906, or earlier. Up to the end of 1926 white pine blister rust infections in Pennsylvania have been found only in the counties of Susquehanna, Wayne, Lackawanna, Pike, and Monroe.

ECONOMIC ZOOLOGY—ENTOMOLOGY

Wild birds introduced or transplanted in North America, J. C. Phillips (*U. S. Dept. Agr., Tech. Bul. 61 (1928), pp. 64*).—This account deals with exotic species established through accident; unsuccessful acclimatization attempts; types of response to new environment; need for recording results; policies regarding introduction and transplantings; tinamous (*Tinamus robustus* and *Rhynchotus rufescens*); ducks, geese, and swans (Anatidae); rails and gallinules; gallinaceous birds; pigeons and doves; parrots; song birds and other cage birds; and miscellaneous and doubtful species. A subject index is included.

Dakota birds.—I, Song and insectivorous birds of South Dakota, L. G. and N. M. Atherton (*Pierre, S. Dak.: J. Fred Olander Co., 1925, pp. 238, pls. 12, figs. 43*).—This is a popular account which includes a number of colored plates.

A distributional and economic study of the European starling in Ontario, H. F. Lewis (*Univ. Toronto Studies, Biol. Ser., No. 30 (1927), pp. 57, pls. 2, figs. 2*).—The studies here reported, conducted in Ontario, led to the conclusion that in that Province the starling is at the present time very useful since its beneficial activities far outweigh its few injurious ones. It is pointed out, however, that when it becomes present in abundance it is capable of doing serious harm. The identifications of the contents of 87 stomachs of the starling are reported upon in appendix A. A list of 49 references to the literature is given in appendix B.

Summer notes on the north China turtle doves, G. D. Wilder (*China Jour. Sci. & Arts, 4 (1926), No. 1, pp. 32–40, figs. 3*).—These notes relate to the red turtle dove, *Oenopopelia tranquebarica humilis* (Temminck); the collared or Indian ring-necked turtle dove, *Streptopelia decaocto decaocto* (Frivalsky); the south China or spotted-necked turtle dove, *S. chinensis chinensis* (Scopoli); the Chinese or eastern turtle dove, *S. orientalis orientalis* (Latham); and the eastern rock dove, *Columba rupestris rupestris* Pall.

Quantitative results in the prediction of insect abundance on the basis of biotic potential and environmental resistance, R. N. Chapman (*Jour. Econ. Ent., 21 (1928), No. 2, pp. 349–352*).—This is a contribution from the Minnesota Experiment Station.

Crop failure, W. A. Ruffin (*Jour. Econ. Ent., 21 (1928), No. 2, pp. 387–391*).—A discussion of the relation of insects to plant pollination. It is pointed out that the crop failure in Alabama in 1927, with the possible exception of the extreme northern part of the mountain region, where subnormal temperatures and too frequent showers occurred and prevented the normal flight of the field bees, was caused by low rainfall and consequent lack of soil moisture.

[Notes on economic insects] (*Jour. Econ. Ent., 21 (1928), No. 2, pp. 431–437*).—These notes dealing with insects and their control are as follows: An Inexpensive Method of Protecting Household Refrigerators from Ants, by J. C. and M. S. Hamlin (p. 431); Turpentine Oil as an Attractant of the Wheel Bug (*Arilus cristatus* L.), by F. W. Metzger (pp. 431, 432); Notes on *Phlebatrophia mathesoni* MacG. in Maine, by K. A. Salman (p. 432); Why Only Staminate Box-elders Should Be Used for Shade Trees, by W. H. Long (pp. 433, 434); Longevity of the Codling Moth Larva, by E. H. Siegler and L. Brown (p. 434); The Native Home of the Citrophilus Mealybug, by H. S. Smith (pp. 435, 436); Pollen Carriers on Summer Squash, *Cucurbita pepo*, by G. B. Durham (p. 436); Lime and Sodium Fluosilicate, by S. Marcovitch (pp. 436, 437); Sonora Cotton Square Dauber (*Creontiades debilis* Van D.), by A. W. Morrill (p. 437); and European Hen Flea in Connecticut, by W. E. Britton (p. 437).

Twenty-seventh report of the State entomologist of Connecticut, 1927, W. E. Britton (*Connecticut State Sta. Bul. 294 (1928), pp. 189–303, pls. 16, figs. 11*).—In this report (E. S. R., 57, p. 160) a brief account of entomological features of the year under the headings of crops and plants attacked (pp. 198–210) is followed by accounts of the inspection of nurseries in 1927 (pp. 210–221) and inspection of imported nursery stock (pp. 221–223), both by W. E. Britton and M. P. Zappe; inspection of apiaries in 1927 (pp. 223–230); and gipsy moth work in Connecticut, 1927, by J. T. Ashworth and Britton (pp. 231–246).

Then follow Operations for the Control of the European Corn Borer, by Britton and Zappe (pp. 246–256); Further Reports on Spraying and Dusting of Apples, by Zappe and E. M. Stoddard (pp. 256–261); and Cankerworms in New London County, by Zappe (pp. 261, 262). The Oriental Peach Moth in Connecticut (pp. 263–271), Weather Conditions Accompanying the Aphid Outbreak in Connecticut in 1927 (pp. 271–276), and Tests with Insecticides Designed to Do the Work of Nicotine Sulphate (pp. 277, 278) are discussed by P. Garman. An account is then given of The Carrot Rust Fly (*Psila rosae* Fabr.) (pp. 278, 279), and of the European Hen Flea in Connecticut (*Ceratophyllus gallinae* Schrank) (pp. 279, 280), and a Report of Activities to Control the Japanese Beetle in 1927 (pp. 281–288) and a Report of Asiatic Beetle Control and Quarantine Work in 1927 (pp. 288–291), both by Britton and J. P. Johnson. Mosquito Control Work in Connecticut, Season of 1927, is reported upon by R. C. Botsford (pp. 281–296). The report concludes with Miscellaneous Insect Notes (pp. 296–299).

[Work in economic entomology by the Michigan Station], R. H. Pettit (*Michigan Sta. Rpt. 1926, pp. 261–283, figs. 20*).—This report of work for the year 1926 (E. S. R., 55, p. 853; 57, p. 654) deals with the hemlock looper (*Ellopia fiscellaria*) (E. S. R., 55, p. 54), striped cucumber beetle, 12-spotted cucumber beetle, codling moth, June beetles, root maggots, bladder maple gall (*Phyllocoptes quadripes*), blackberry psyllid (*Trioza tripunctata*), cherry fruit fly, army worm of the forest, apple tree tent caterpillar, Gibson's hen flea (*Ceratophyllus gibsoni*), narcissus bulb fly, *Eustillus apicalis*, apple maggot, cutworms, spruce mite (*Paratetranychus ununguis*), and European red mite (*P. pilosus*).

[Entomological memoirs] (*Union So. Africa Dept. Agr., Div. Ent. Mem. 2 (1924), pp. 104, pls. 7, figs. 48; 3 (1925), pp. 67, pls. 3; 5 (1026), pp. 48, pls. 7*).—

These additional memoirs (E. S. R., 51, p. 57) contain the following contributions:

No. 2.—Fruit Flies of Wild Olives, by H. K. Munro (pp. 3–17); South African Psyllids (pp. 19–30) and Report of Orchard Spray Experiments at Elsenburg during the 1922–23 Fruit Season (pp. 31–45), both by F. W. Pettey; and The Thorax and Abdomen of Winged Termites (pp. 47–78) and White Ant Experiments (pp. 79–104), both by C. Fuller.

No. 3.—Experiments with Cutworm Baits: Success with Sodium Fluoride, by L. B. Ripley (pp. 3–20); The Black Sand Mite: *Penthaleus destructor* n. sp., by R. W. E. Tucker (pp. 21–36); and Biological Notes on South African Trypaneidae (Fruit-flies), I, by H. K. Munro (pp. 37–67).

No. 5.—Some South African Mites, Mainly Tetranychidae and Eriophyidae, by R. W. E. Tucker (pp. 3–16); Biological Notes on the South African Trypaneidae (Trypetidae: Fruit-flies), II, by H. K. Munro (pp. 17–40); Two South African Cecidomyid Galls (Diptera), by H. K. Munro, including descriptions of the species by E. P. Felt (pp. 41–43, 46); New African Gall Midges, by E. P. Felt (pp. 44, 45); and A New Pericallimyia, by C. H. Curran (pp. 47, 48).

Report of the imperial entomologist, T. B. Fletcher (*Agr. Research Inst., Pusa, Sci. Rpts., 1926–27, pp. 56–67, pls. 10*).—A few insect pests are considered, particularly those of sugar cane, of which the author gives a revised list of correct names of 18.

Notes on banana insect pests, J. L. Froggatt (*Queensland Agr. Jour., 29 (1928), No. 1, pp. 15–35, figs. 23*).—This is a general account of the insect enemies of banana in Queensland.

Some factors influencing outbreaks of, and the control of, shade tree insects, W. Middleton (*Jour. Econ. Ent., 21 (1928), No. 2, pp. 421–431*).—A contribution from the U. S. D. A. Bureau of Entomology.

Worms in furniture and structural timber, J. Girdwood (*London: Oxford Univ. Press, Humphrey Milford, 1927, pp. [XV]+159, pls. 13, figs. 11*).—The several chapters of this work deal with the furniture beetle (*Anobium punctatum*) and its destruction, experiments with turpentine and paraffin oil, further experiments—positive results, further experiments—incomplete and negative results, insecticidal value of turpentine and paraffin oil, tests of saturation, practical work, extermination processes, experiments with fillers, practical advice, preventive treatment, notes on materials, and wax preparations used in treating wormed wood. The several appendixes deal with timber and decorative work, the destruction of worm and other insect pests in furniture and worked wood in tropical countries, a note on patination, tables, and graphs.

The principal bulb pests in Michigan, E. I. McDaniel (*Michigan Sta. Spec. Bul. 173 (1928), pp. 23, figs. 11*).—This is a practical summary of information on the more important bulb pests of Michigan, including the lesser bulb fly, the narcissus bulb fly, the bulb mite (*Rhizoglyphus hyacinthi*), the bu b nematode (*Tylenchus dipsaci* Kuhn) and the iris borer, and means for their control.

Results of forcing hot water treated narcissus bulbs, C. A. Weigel (*Jour. Econ. Ent., 21 (1928), No. 2, pp. 352, 353*).—This is an abstract of a contribution from the U. S. D. A. Bureau of Entomology.

Studies on toxicity of fluorine compounds, S. Marcovitch (*Tennessee Sta. Bul. 139 (1928), pp. 48, figs. 10*).—Following a brief introduction and a historical account, the subject is dealt with under such headings as properties and reactions of the fluosilicates; commercial availability; nature of poisoning by fluorine compounds, including effects on insects and vertebrates, including man;

relation of calcium to permeability and electrical conductivity, fluorides as enzyme poisons, symptoms of poisoning by fluorides in animals, dose of fluorine compounds fatal to higher animals, continued feeding of small amounts of arsenic and fluorine; attractiveness of fluorine compounds to insects and vertebrates; and plant tolerance of fluosilicates, including character of foliage injury, effect of various carriers on foliage injury, buffer action of sodium fluosilicate, and fluorine as a stimulant for plants. Experimental work is reported (pp. 25–40) on determination of comparative toxic values, methods, manner in which mosquito larvae succumb, species studied, discussion, the rôle of acidity, laboratory experiments with *Anopheles punctipennis*, field tests against the Colorado potato beetle and other insects, and temperature and toxicity of fluosilicates. The work concludes with a 4-page list of the literature cited.

It is concluded that "as the white rat is a standard for pharmacological studies, so the mosquito may be employed for insect toxicology. For insects and lower organisms, sodium fluosilicate is more toxic than sodium arsenite. Since fluorine seems to affect the precipitation of essential calcium from the tissues, the meager calcium content of the lower organisms may account for their susceptibility to fluorine compounds. By the aid of the formula $K=\frac{1}{t}\log\frac{1}{\text{conc}}$, a numerical toxicity value of 34.5 was obtained for sodium fluosilicate, 13.1 for sodium arsenite, 4.8 for sodium arsenate, and 4 for sodium fluoride. On the other hand, to man and the higher animals the arsenicals are at least 9 times more toxic than sodium fluosilicate and 30 times more toxic than sodium fluoride.

"Data as to the consequences of the continued daily administration of minute quantities of arsenic are too fragmentary and conflicting to furnish dependable conclusions. As the basis for an estimate of the effects of small daily doses of arsenic on man, more reliable results may be obtained with the omnivorous rat than with herbivorous animals."

Oil sprays and oil injury, W. E. Britton (*Jour. Econ. Ent., 21 (1928), No. 2, pp. 418–421*).—This account includes a tabulated report of a conference questionnaire on oil injury to deciduous trees.

Combined light and suction-fan trap for insects, W. B. Herms and R. W. Burgess (*Elect. West, 60 (1928), No. 4, pp. 204, 205, figs. 5*).—The results of experiments conducted at the California Experiment Station on the control of night-flying insect pests with a trap employing both an electric light and a small ventilating fan are reported. The results showed a marked decrease of gnats within the building tested as compared with those on either side.

The Porto Rican mole cricket, W. A. Thomas (*U. S. Dept. Agr., Farmers' Bul. 1561 (1928), pp. II+9, figs. 3*).—This is a practical summary of information on the changa, which is a source of injury to truck and other crops in the coastal area of Georgia, South Carolina, and North Carolina.

Bionomics of Smynthurus viridis Linn., the South Australian lucerne flea, F. G. Holdaway (*Aust. Council Sci. and Indus. Research Pamphlet 4 (1927), pp. 23, figs. 9*).—This is a report of studies of the life history and bionomics, with technical descriptions, of the several stages of *S. viridis*, a common European collembolid, together with its natural and artificial control. This pest causes considerable damage to the foliage of many winter fodder plants in South Australia, particularly alfalfa and clover, and also to wheat, oats, and barley when these cereals are just through the ground. A severe attack on alfalfa gives the field a scorched appearance. Control measures include bare fallowing in the rotation, liming, and the keeping of headlands free of vegetation.

Some important discoveries about migratory locusts in other countries and their application in the Philippines, F. Q. Otanes (*Philippine Agr. Rev., 20 (1927), No. 4, pp. 477–485*).—This is a paper read before the Philippine Society of Technical Agriculturists, September 25, 1927.

The banana thrips rust, A. A. Girault (*Queensland Dept. Agr. and Stock, Div. Ent. and Plant Path. Bul. 2 (1925), pp. 54, pl. 1*).—This is a revision of an account noted from another source (E. S. R., 56, p. 459).

The banana thrips (Anaphothrips signipennis Bagnall), J. L. Froggatt (*Queensland Agr. Jour., 27 (1927), No. 3, pp. 186–190, pl. 1, fig. 1*).—This account is based upon the bulletin above noted.

The orange-tree bug (Oncoscelis sulciventris Stål.), A. A. Girault (*Queensland Dept. Agr. and Stock, Div. Ent. and Plant Path. Bul. 1 (1924), pp. 24, figs. 4*).—This is a report of the life history and habits of, and control measures for, an important insect pest of the orange in Queensland.

Erythroneura hartii (Gill.), an occasional leafhopper pest on the apple, L. A. Stearns (*Virginia Sta. Tech Bul. 33 (1928), pp. 15, figs. 6*).—This is an account of incidental studies made from 1918 to 1923 (E. S. R., 59, p. 58).

The increase of *E. hartii* was so rapid during this period that by 1920 it equaled, and in 1921 to 1924 exceeded, *Typhlocyba pomaria* McAtee, *Empoasca fabae* Harr., *Erythroneura obliqua* (Say), and *E. dorsalis* (Gill.), which occurred abundantly in the northern Piedmont and valley sections of Virginia. This small and distinctly marked leafhopper has been recorded but seldom in literature, and never heretofore as of economic importance. Its sudden rise from a position of comparative obscurity to one of predominance in these localized areas was apparently correlated with the coincident scarcity of *Empoasca maligna* Walsh, the apple leafhopper, with a slightly subnormal abundance of *T. pomaria*, and with the activities of *E. fabae* confined more closely to its primary food plant, the potato.

Under the severe conditions of infestation, the feeding of overwintered adults in the spring, and of both adults and nymphs during the summer, causes in the first instance a distortion, a condition produced experimentally, and in the last, a whitening of the leaves resulting in a considerable foliage drop. The excrement deposited by them on the ripening apples creates a spotted, rusty-colored surface highly undesirable in the production of first-grade fruit, and necessitates a thorough wiping prior to packing. The records indicate that the apple is the sole food plant of this species.

Distinctive characteristics and adequate illustrations are included for the determination of the leafhopper species commonly associated on the apple. Descriptions and figures of the life cycle stages of *E. hartii*, and notes on its seasonal life history and activities in northern Virginia, in 1922 and 1923, are presented. Two broods of nymphs were recorded each year, with the insect hibernating in the adult stage. A list of 20 references to the literature is included.

Alfalfa "yellow top" and leafhoppers, A. A. Granovsky (*Jour. Econ. Ent., 21 (1928), No. 2, pp. 261–267*).—This contribution from the Wisconsin Experiment Station deals with the studies noted from another source (E. S. R., 57, p. 656), which have shown the common potato leafhopper, *Empoasca fabae* (Harr.), to be responsible for the symptoms known as alfalfa "yellows" or "yellow top."

Parasites of the sugar cane moth borer, and their introduction into Louisiana, T. E. Holloway (*Planter and Sugar Manfr., 80 (1928), No. 13, pp.*

241, 242).—This is a discussion of the work with parasites of the sugar cane moth borer under way by the U. S. D. A. Bureau of Entomology.

Codling moth hibernation studies, S. C. CHANDLER (*Jour. Econ. Ent., 21 (1928), No. 2, pp. 315–318*).—Examinations of codling moth larvae hibernating on trunks of trees showed 30 per cent of the larvae at or just below the ground line. On the ground between the trees eight times as many larvae were found in artificial situations as in pieces of bark, the only type of natural cover sheltering larvae on the ground. In preliminary tests with emulsions of fish oil soap and of orthodicholorobenzene no penetration of the hibernaculae was effected.

Codling moth control in Georgia apple orchards, C. H. ALDEN and M. S. YEOMANS (*Jour. Econ. Ent., 21 (1928), No. 2, pp. 319–324*).—This is a report of control work conducted in Georgia in 1927 by the Georgia State Board of Entomolgy.

Relative resistance to arsenical poisoning of two codling moth strains, W. S. HOUGH (*Jour. Econ. Ent., 21 (1928), No. 2, pp. 325–329*).—This is a contribution from the Virginia Experiment Station. Larvae from the Grand Valley of Colorado and the Shenandoah Valley of Virginia were reared at Winchester, Va., for the purpose of comparing their ability to enter sprayed fruit. Lead arsenate was used at the rate of 4 lbs. in 100 gal. of water. The Colorado larvae demonstrated a marked superiority over the Virginia larvae in their capacity to enter the sprayed apples. The strains were crossed and the first generation of each cross was found to be less resistant to arsenical poison than the pure strain of Colorado larvae, but more resistant than the Virginia larvae.

Some results of three years' experience seeking better control measures for the codling moth in the Yakima Valley, Wash., W. S. REGAN and A. B. DAVENPORT (*Jour. Econ. Ent., 21 (1928), No. 2, pp. 330–338*).—The addition of oil spray to arsenate of lead was found to be a material aid in codling moth control in work by the authors in the Yakima Valley, Wash. Five different types of oil were tested. The factors of refinement, volatility, oil penetration, emulsification, residue removal, etc., are discussed. Some results of tests and practical orchard experience are given in controlling codling moth on apples and pears with the lead-oil combination and with oil spray alone.

Continued studies of baits for oriental fruit moth, S. W. FROST (*Jour. Econ. Ent., 21 (1928), No. 2, pp. 339–348, fig. 1*).—Further comparisons (E. S. R., 57, p. 455) were made of fermenting sugar baits and sodium arsenite-molasses baits, with further studies to determine why the latter baits give the more satisfactory catches. A summary is given of some factors affecting the catches, and the results of control experiments for 1927 are summarized.

Experimental studies on the infection of the European corn borer by entomogenous fungi [trans. title], S. MÉTALNIKOV and K. TOUMANOFF (*Compt. Rend. Soc. Biol. [Paris], 98 (1928), No. 8, pp. 583, 584*).—In attempted infection of the European corn borer with entomogenous fungi, including *Aspergillus flavus, Botrytis bassiana, Isaria farinosa,* and *Sterigmatocystis nigra, A. flavus* was found to be the most virulent, causing a mortality in the larvae of 100 per cent of the cases. *B. bassiana* and *I. farinosa* were also quite virulent. In numerous experiments both the European corn borer and the wax moth were infected, the results having been similar, although the European corn borer larva is much the more susceptible.

The studies have led to the conclusion that the European corn borer is readily infected by entomogenous fungi, and that such infection may take place from mere contact with the spores.

The lesser corn stalk-borer (Elasmopalpus lignosellus Zeller) injuring sugar cane in Cuba, H. K. PLANK (*Jour. Econ. Ent., 21 (1928), No. 2, pp. 413–417, figs. 3*).—This lepidopteran occurs in northern Camagüey Province, Cuba, in young sugar cane, causing "dead hearts," and in two weed grasses. The author found it to be most injurious in burned fields. The insect is described, and observations of its life history are reported upon.

Barathra configurata Wlk., an armyworm with important potentialities on the northern prairies, K. M. KING (*Jour. Econ. Ent., 21 (1928), No. 2, pp. 279–293, pl. 1, figs. 2*).—This contribution from the Entomological Branch, Department of Agriculture, Canada, deals chiefly with the life history, economic importance, and means of distinguishing the immature stages of this increasingly destructive native pest of flax, sweet clover, alfalfa, sugar beets, cabbage, corn, and other plants.

Developmental history of the narcissus bulb fly at Washington, D. C., B. M. BROADBENT (*Jour. Econ. Ent., 21 (1928), No. 2, pp. 353–357*).—This contribution from the U. S. D. A. Bureau of Entomology is based upon studies made in 1926 and 1927 (E. S. R., 57, p. 456).

Hot water immersion for boxwood leaf miner control, F. F. SMITH, H. J. FISHER, and T. L. GUYTON (*Jour. Econ. Ent., 21 (1928), No. 2, pp. 295–301, fig. 1*).—In experiments with hot water immersion conducted in 1927, spring treatments at exposures fatal to the larvae injured the buds, but the plants recovered fully by midsummer, due to adventitious growths. Later treatments after the spring growths had hardened gave satisfactory kill of the larvae without injury to the plants.

Rat-flea survey of the port of San Juan, Porto Rico.—A preliminary report, O. H. COX, A. L. CARRION, and C. FOX (*Pub. Health Rpts. [U. S.], 43 (1928), No. 11, pp. 611–616, figs. 2*).—These data have been noted from another source (E. S. R., 58, p. 660).

Ecological studies of Kansas scarabaeid larvae (Coleop.), W. P. HAYES and J. W. MCCOLLOCH (*Jour. Econ. Ent., 21 (1928), No. 2, pp. 249–260*).—The studies reported in this contribution from the Kansas Experiment Station relate to 17 species of the genus Phyllophaga. The data given show the percentage of rearing mortality, the seasonal distribution, relative abundance, habitat preferences, food habits, and parasitism by Tiphia wasps.

A preliminary survey of May beetles (Phyllophaga spp.) in Iowa, H. E. JAQUES (*Iowa Acad. Sci. Proc., 33 (1926), pp. 337–339*).—The author lists 29 species of the genus Phyllophaga as occurring in Iowa.

Hibernation studies of Colaspis brunnea (Fab.), J. H. BIGGER (*Jour. Econ. Ent., 21 (1928), No. 2, pp. 268–273*).—The studies here reported upon relate to the grape colaspis, which became a serious corn pest in the central part of Illinois during the years 1924–1926. The studies show that the pest hibernates as a larva below the frost line in the clover fields.

Economic importance of wireworms and false wireworms in Saskatchewan, K. M. KING (*Jour. Econ. Ent., 21 (1928), No. 2, pp. 294, 295*).—This is a summary of a contribution from the division of field crop and garden insects, Entomological Branch, Department of Agriculture, Canada.

Beetles injurious to timber, J. W. MUNRO ([*Gt. Brit.*], *Forestry Comn. Bul. 9 (1928), pp. 29, pls. 6, figs. 20*).—A practical summary of information.

The banana weevil borer (Cosmopolites sordidus Chev.), J. L. FROGGATT (*Queensland Dept. Agr. and Stock, Div. Ent. and Plant Path. Bul. 4 (1926), pp. 40, figs. 13*).—The first part of this bulletin deals with the life history and habits of the banana root borer, the second part with control measures, and the third part with other insects mistaken for it.

The honeybee in relation to alfalfa in California, G. H. VANSELL (*Jour. Econ. Ent., 21 (1928), No. 2, pp. 411–413*).—A brief discussion of the subject.

Seasonal brood-rearing activity of the Cyprian honeybee, W. J. NOLAN (*Jour. Econ. Ent., 21 (1928), No. 2, pp. 392–403, fig. 1*).—In these investigations, conducted by the U. S. D. A. Bureau of Entomology, the author found the seasonal brood-rearing activity of a colony of the Cyprian honeybees to be strikingly similar to that typical of colonies of Italian honeybees in the same apiary.

A septicemic condition of adult bees, C. E. BURNSIDE (*Jour. Econ. Ent., 21 (1928), No. 2, pp. 379–386, pls. 2*).—A hitherto unrecognized organism, *Bacillus apisepticus*, is shown by the author in this contribution from the U. S. D. A. Bureau of Entomology to be the cause of a fatal septicemic condition of adult bees. Experimental results obtained thus far are believed to indicate that the presence of external moisture aids in the transmission of the disease.

Malpighamoeba (Prell) in the adult honeybee found in the United States, J. W. BULGER (*Jour. Econ. Ent., 21 (1928), No. 2, pp. 376–379, pl. 1*).—The author reports that an organism causing the so-called amoeba disease in the adult honeybee was found early in February, 1927, in two colonies of bees in the apiary of the Office of Bee Culture Investigations of the U. S. D. A. Bureau of Entomology at Washington, D. C. So far as the author knows this is the first report of the occurrence of this disease of the honeybee in the United States. The disease is not thought to be of very great economic importance. The name *Vahlkampfia* (*Malpighamoeba*) *mellifica* n. sp. is given to the organism.

Area clean up of foulbrood, F. E. MILLEN (*Jour. Econ. Ent., 21 (1928), No. 2, pp. 371–375*).—This account is based upon work in the Province of Ontario.

The occurrence and characteristics of certain yeasts found in fermented honey, G. E. MARVIN (*Jour. Econ. Ent., 21 (1928), No. 2, pp. 363–370, pls. 4*).—This is an account of studies at the Wisconsin Experiment Station, reference to which has been noted from another source (E. S. R., 59, p. 55).

The pathological changes in honeybees infested with the Isle of Wight disease, E. J. ANDERSON (*Jour. Econ. Ent., 21 (1928), No. 2, pp. 404–407, figs. 3*).—In studies based upon material received from Switzerland, it was found that the mouth parts of the mite were sufficiently long to extend a relatively long distance through the tracheae and injure the surrounding muscle and nerve tissues. It would appear that paralysis could occur in the bee as a result of injury to these tissues, inflicted while feeding.

A contribution to a list of the aculeate Hymenoptera (excepting ants) of Hongkong, C. DOVER (*China Jour. Sci. & Arts, 4 (1926), No. 5, pp. 233–235*).—This is a list of 73 forms.

Utilization of Trichogramma minutum for control of the sugarcane borer, W. E. HINDS and H. SPENCER (*Jour. Econ. Ent., 21 (1928), No. 2, pp. 273–278, pl. 1*).—This is a report of studies at the Louisiana Experiment Stations on the value of *T. minutum* for control of the sugar cane borer. A method for laboratory production and increase has been devised, and in 1927 a small-scale colonization experiment was apparently successful. Details of rearing technique and plans for 1928 work on a larger scale are discussed.

The influence of small mammals and other factors upon the larch sawfly survival, S. A. GRAHAM (*Jour. Econ. Ent., 21 (1928), No. 2, pp. 301–310*).—This paper presents the results of a series of quantitative studies and experiments concerning the factors that influence the mortality of the larch

sawfly (*Lygaeonematus erichsonii*) in the cocoon stage. Facts are presented to show that the physical conditions that exist in the sphagnum moss in tamarack swamps are much more favorable for hibernation of the sawflies than are the conditions that are to be found under tamarack on high ground. Of the biotic factors that operate to reduce the numbers of the sawfly in the cocoon stage, small mammals, particularly mice, play a much more important rôle than do the insect parasites and fungus diseases.

Australian ticks, E. W. Ferguson (*Aust. Zool., 4 (1925), pt. 1, pp. 24–35*).—This account includes a list of the species with their hosts and distribution.

The European red mite, Paratetranychus pilosus, J. S. Houser (*Jour. Econ. Ent., 21 (1928), No. 2, pp. 311, 312*).—The author reports the early seasonal development of red mite as profuse on lime-sulfur-sprayed plats and meager on oil-sprayed plats. By the end of the season the conditions were reversed, having been brought about in large measure through the biological control effected by a lady beetle, *Stethorus punctum* Lec.

Observations on European red mite (Paratetranychus pilosus C. & F.), J. G. Sanders (*Jour. Econ. Ent., 21 (1928), No. 2, pp. 313–315*).—Attention is called to the fact that *P. pilosus* is becoming a decided factor in the alteration of standard spray practices in apple, peach, plum, prune, and cherry orchards.

Observations on the habits and control of the garden centipede, Scutigerella immaculata Newport, a pest in greenhouses, G. A. Filinger (*Jour. Econ. Ent., 21 (1928), No. 2, pp. 357–360*).—This is a contribution from the Ohio Experiment Station, in which it is pointed out that the garden centipede (*S. immaculata*) is becoming a serious pest in greenhouses. This paper discusses some of the habits of this pest, and deals with some of the control measures which have been tried and found to be of value.

ANIMAL PRODUCTION

General animal breeding, I, C. Kronacher (*Allgemeine Tierzucht. Berlin: Paul Parey, 1928, 3. ed., rev., pt. 1, pp. XXVII+499, figs. [369]*).—This is the third edition of the first volume of this work, the fourth volume of which has been previously noted (E. S. R., 57, p. 660). Part 1 deals with the national agricultural situation and the significance of animal breeding and raising, as well as the problems of the general knowledge of animal breeding. Part 2 is a discussion of the place of domestic animals in the zoological system, how they were obtained, their origin, and the prehistoric and historic development.

Experimental embryology, T. H. Morgan (*New York: Columbia Univ. Press, 1927, pp. XI+766, pl. 1, figs. 268*).—A very comprehensive treatise dealing principally with the so-called formative changes in the egg and with their initiation.

Comparison of the productive values of hays from meadows on mineral and peat soils [trans. title], I. Poijärvi ([*Finland*] *Valtion Maatalouskoetoiminnan Julkaisuja No. 13 (1927), pp. 64, figs. 3; Eng. abs., pp. 54–57*).—Hays, grown on peat soil and on mineral soil, of the same botanical composition, cut at the same stage of growth under similar weather conditions, and with other factors as nearly uniform as possible, were compared to determine their relative nutritive value in tests in Finland. The usual chemical and ash determinations were made upon the hays, and in addition digestion trials with sheep and milk production trials with cows were conducted.

The hay from the peat soil may be equal to hay from mineral soils provided the cultivation, drainage, and fertility of the peat soil are good, but in some cases the peat soil hay was as much as 8 per cent less efficient in digestibility and productive value than hay from mineral soil. The poorer

quality peat soil hay contained large amounts of crude fiber, and the ash content was small and not suitable for efficient digestion. The addition of wood ashes or a mixture of phosphate and chalk so increased the productive value of low quality peat soil hay that it equaled that of mineral soil hay, indicating that the ash content was the limiting factor in the low quality hay.

Classing the clip: A handbook on wool-classing, C. E. COWLEY (*Sydney: Angus & Robertson, 1928, pp. [6]+186, pls. 9, figs. 7*).—A treatise designed to add supplementary knowledge to practical experience in the preparation of the wool clip of Australia for market. A brief outline of the procedure following its disposal, together with a description of shearing sheds and drafting yards, is also given.

[Experiments with swine at the Michigan Station], G. A. BROWN (*Michigan Sta. Rpt. 1926, pp. 223–227*).—Two experiments are noted.

Forage crops for hogs.—In continuing this comparison of forage crops for hogs (E. S. R., 55, p. 62), 3 lots of 15 pigs each averaging approximately 35 lbs. and 3 lots of 10 pigs each averaging approximately 50 lbs. were fed to an average final weight of about 200 lbs. on alfalfa and rape pasture, respectively. In the alfalfa series lot 1 received shelled corn and a protein supplement self-fed, lot 2 was hand fed approximately three-fourths as much shelled corn and protein supplement as lot 1, and lot 3 received ground barley and ground oats self-fed. In the rape series lot 4 received shelled corn and protein supplement, lot 5 ground barley and protein supplement, and lot 6 ground barley and ground oats, all self-fed. The protein supplement consisted of equal parts of tankage and linseed meal, and each group had free access to a mineral mixture of 45 parts steamed bone meal, 20 parts ground limestone, and 30 parts salt. All lots had sufficient pasture, and in addition lots 1, 2, and 3 yielded 3,110, 2,765, and 1,000 lbs. of hay, respectively.

The average daily gains in the respective lots were 1.22, 1.02, 1.19, 1.43, 1.36, and 1.34, lbs. Lot 4, fed a ration similar to lot 1 except for pasture, proved more economical in feed required per 100 lbs. of gain, and the same was true in comparing lots 6 and 3. Lot 2, while making small daily gains, was the most economical lot in feed requirements, and while the alfalfa was pastured heavily the stand was apparently not affected. Shelled corn was more efficient than ground barley when fed with a protein supplement on rape pasture.

Cull beans for fattening pigs.—Five lots of 8 pigs each weighing approximately 107 lbs. per head were fed to a final weight of approximately 205 lbs. The rations in the various lots were as follows: Lot 1 ground corn and tankage self-fed, lot 2 cull beans and ground corn hand fed in amounts to give approximately the same nutritive ratio as in lot 1, lot 3 cull beans and ear corn as in lot 2, lot 4 equal parts cull beans and ground corn hand fed, and lot 5 2 parts cull beans and 1 part ground corn hand fed. The cull beans were cooked until fairly soft. Each lot had access to a mineral mixture (as above) and alfalfa hay in racks.

The days required to reach the final weight were 61, 75, 85, 88, and 88 in the respective lots. The average daily gains in the respective lots were 1.6, 1.26, 1.17, 1.13, and 1.11 lbs. The cost of producing 100 lbs. of gain was less in all the bean lots, except lot 3, than in lot 1. The pigs in lot 3 did not eat the beans well during the latter part of the test and had the highest feed requirement per 100 lbs. of gain of any of the lots.

Hog marking (*Canada Dept. Agr. Pamphlet 88, n. ser. (1927), pp. 6, figs. 3*).—A method and system of marking hogs for identification during shipping are described.

Horse breeding, M. W. HARPER (*N. Y. Agr. Col. (Cornell) Ext. Bul. 165 (1928), pp. 34, figs. 14*).—This revision of an earlier publication (E. S. R., 31, p. 394) discusses the problems of selecting breeding animals, the care and management of mare and foal, training the colt, and fitting horses for sale.

The Thoroughbred race-horse: Its breeding and early management, J. E. PLATT (*London: Sports & Sportsmen, Ltd., 1927, pp. 110, pl. 1*).—An interesting and instructive treatise designed especially for the breeder starting in the business of raising Thoroughbreds for the yearling sales. The planning of the farm, the selection of brood mares and their management, and the value of certain strains of breeding are discussed.

Brooding and feeding chicks, B. ALDER (*Utah Sta. Circ. 72 (1928), pp. 16, figs. 2*).—This is a revision of Circular 50 (E. S. R., 51, p. 473).

A study of various methods of preventing rickets in chicks, G. T. KLEIN (*Poultry Sci., 7 (1927), No. 1, pp. 31–40, figs. 4*).—Two experiments of eight weeks each were conducted at the Kansas Experiment Station to determine whether rickets in chicks could be prevented by exposure in early spring to direct sunlight through an open window, whether cottonseed oil exposed to irradiation from a quartz mercury lamp would contain sufficient antirachitic vitamin to protect the chicks, and whether a mercury arc glass tube "Worklamp" would give enough ultra-violet light to prevent rickets. Four lots of chicks in each experiment were fed a basal ration known to give normal growth when supplemented with the antirachitic factor. One lot in each of the tests received in addition to the basal ration 2 per cent of irradiated cottonseed oil and light through window glass and another lot light from the Worklamp which burned an average of 8 hours and 15 minutes per day in the first test and 9 hours and 30 minutes in the second test. Other lots in the two experiments received the following additions to the basal ration: Light through window glass, 15 minutes daily exposure to light from a mercury arc in quartz tube, direct sunlight through open window, and 0.5 per cent of cod-liver oil with light through window glass.

It was found that in the amounts fed irradiated cottonseed oil had little if any effect in preventing rickets, and the mortality of the lot was high. Sunlight through window glass had the same effect. Long exposure to the light of the mercury arc glass tube lamp which had no wave lengths shorter than 300μ prevented rickets. The bones of chicks in all other lots were normal.

Weak bones in crate fed poultry, F. E. MUSSEHL and S. J. MARSDEN (*Poultry Sci., 7 (1927), No. 1, pp. 41–45, figs. 4*).—Vigorous Rhode Island Red, Orpington, and Plymouth Rock cockerels were divided into 4 lots of 40 birds each and fed in a basement in steel feeding batteries at the Nebraska Experiment Station. The basal ration fed to the check lot consisted of 60 parts of yellow corn meal and 40 parts of white shorts, moistened with fresh buttermilk and fed three times daily for 29 days. To the basal ration was added in a second lot 3 lbs. of an ash mixture consisting of 3 parts of raw bone meal and 1 part each of ground limestone and common salt to each 100 lbs. of dry feed; in lot 3 was added 3 lbs. of corn oil and 3 lbs. of ash mixture to each 100 lbs. of dry feed; and in lot 4 3 lbs. of corn oil irradiated with ultra-violet light at a distance of 12 in. for 30 minutes and 3 lbs. of ash mixture to each 100 lbs. of dry feed. The breaking strengths of the femur and humerus bones of 4 typical birds in each lot were determined and X-ray photographs taken.

The bone resistance in pounds of the humerus was 42, 43, 46, and 43 in the respective lots, and of the femur 54, 47, 53, and 54, respectively. No marked deterioration in bone structure was noted after 29 days of feeding, and the addition of the ash mixture and irradiated corn oil, while not harmful, was

without any apparent effect. The authors conclude that bone weakness in crate-fed poultry is due to poor feeding and improper methods of management before birds are placed in the crates.

The vitamin A and vitamin D content of cod liver meal, E. M. CRUICKSHANK, E. B. HART, and J. G. HALPIN (*Poultry Sci., 7 (1927), No. 1, pp. 9–16, fig. 1*).—Cod-liver meal containing 45 per cent of oil and 43 per cent of protein was tested for its vitamins A and D potency at the Wisconsin Experiment Station, using day-old checks for the determination. In testing the vitamin D content 9 groups of chicks were fed for six weeks on a basal ration of 97 parts of yellow corn, 2 parts of calcium carbonate, 1 part of salt, and skimmed milk ad libitum. To the basal ration was added in the various groups ultra-violet light, cod-liver oil, and cod-liver meal in amounts varying from 1 to 10 per cent. In testing the vitamin A content 10 groups of chicks were fed a basal ration of 92 parts of white corn, 5 parts of yeast, 2 parts of calcium carbonate, 1 part of salt, and skim milk ad libitum. To the basal ration in the various groups was added ultra-violet light, cod-liver oil, and cod-liver meal in amounts varying from 1 to 10 per cent and cod-liver meal and ultra-violet light in combination.

The chicks in the first phase of the experiment were killed for post-mortem examination. The tibia was dissected out and soaked in formalin and a longitudinal section from the proximal end treated with 1.5 per cent silver nitrate and exposed to light. Ash analyses were also made of the bones. In the group receiving the basal ration the ash content of the tibia varied from 33 to 37 per cent, while in all other groups the ash content ranged from 46 to 52 per cent. The silver nitrate test showed good calcification in all groups save the check, where there was a wide uncalcified area of proliferating cartilage.

It was found that even 10 per cent of the cod-liver meal used in the experiment did not furnish sufficient vitamin A to protect against rickets, although chicks receiving this amount survived longer and did not show pathological symptoms in such a marked degree as those receiving less meal. It is concluded that the cod-liver meal used contains sufficient vitamin D to promote good calcification even when fed at a level of 1 per cent, but not enough vitamin A to protect birds from vitamin A deficiency even when fed at a 10 per cent level.

The Crumazone method of intensive poultry culture for the commercial farm, J. H. CRUM (*New York: Walton Book Co., 1928, pp. VI+313, pls. 15, figs. 22*).—This is a practical treatise outlining a method developed by the author and known as the Crumazone method for the intensive raising of poultry on small farms.

Practical poultry-farming, L. M. HURD (*New York: Macmillan Co., 1928, pp. XXIII+405, figs. 149*).—A practical guidebook for both the large and small poultry producers, giving the practices and methods based on scientific principles that are commonly used by successful poultry keepers.

Report of committee on dressed poultry standards, C. HENDERSON ET AL. (*Ottawa: Govt., 1928, pp. 15*).—The classes, subclasses, and grades of dressed poultry which have been devised by a committee representing dealers in most of the Provinces of Canada are described in this publication.

A manual of management for duck keepers, H. F. CARTER (*Fair Oak, Hants, Eng.: Utility Duck Club, [1928], pp. 12–55, figs. 7*).—A handbook based on the practices common to successful duck keepers, dealing with the choice of breeds, purchase of livestock, selection and storage of eggs for hatching, hatching, management and feeding, housing, marketing, and keeping of records.

DAIRY FARMING—DAIRYING

[Experiments with dairy cattle at the Michigan Station], O. E. Reed (*Michigan Sta. Rpt. 1926, pp. 229–232*).—The results of three experiments are noted.

[*Feeding value of different mineral feeds.*]—Continuing this study (E. S. R., 55, p. 571) it was found that at 30 months of age the check alfalfa-fed heifers and those receiving bone flour as a supplement to a ration low in lime were practically the same in body development. Both of these groups were better grown than heifers receiving timothy with no mineral supplement. Adding equal parts of raw rock phosphate and limestone rock or a complex mineral mixture did not reproduce the growth that was made in the check lots. Heifers receiving timothy hay and turned on pasture during pasture season did not show the same development as those receiving timothy alone, due to the shortage of pasture. Heifers fed raw rock phosphate and the complex mineral mixture were inferior to the other groups in milk production, in reproduction, and in general health and appearance, and those fed calcium carbonate were inferior in the last two respects.

The effect of a ration deficient in lime on calves.—Four heifer calves were fed timothy hay at the rate of 1 lb. per head per day. A basal ration low in lime was fed to 2 calves, and the other 2 received calcium carbonate in addition to the basal ration. In weight and body measurements all animals developed normally. One heifer in each group became blind, and 1 in each never came in heat. The bred heifers in each lot aborted, due to *Clostridium coli* infection. One heifer in the group receiving lime had numerous convulsions, and replacing the calcium carbonate with calcium lactate for one month had no effect in stopping the convulsions. It was believed that if the heifers had received 5 lbs. instead of 1 lb. of timothy hay they would have been normal since the calcium requirements for growth were adequately furnished in the low lime ration.

Feeding concentrates alone to ruminants.—Continuing this study (E. S. R., 55, p. 67), it was found that the addition of mineral supplements carrying both lime and phosphorus and also calcium carbonate to a concentrated ration acted as a temporary cure to the disease caused by such a ration, but cod-liver oil had little if any curative properties. Tricalcium phosphate, special steamed bone meal, superphosphate (acid phosphate), raw rock phosphate, and magnesium phosphate were of temporary benefit only. Adding 50 cc. of neutral oil daily to the ration to hasten the movement of food through the digestive tract was without effect, but a similar amount of raw linseed oil gave good results. Balance experiments showed that animals retain ample calcium and phosphorus from concentrated rations, and in some cases X-ray photographs showed abnormally heavy deposits of minerals at the growing end of the ribs. This indicated that the tetany occurring in calves is not associated with rickets.

High protein grains as a supplement to pasture for dairy cows, C. C. Hayden and A. E. Perkins (*Ohio Sta. Bimo. Bul., 13 (1928), No. 3, pp. 99–102*).—Three groups of six cows each were fed during a 4-months pasture season on high and low protein grain mixtures. The low-protein mixture was composed of 2 parts of corn and 1 part each of oats and wheat bran. The high-protein mixture was the same with the addition of 1 part each of linseed oil meal and 40 per cent gluten meal. The first ration carried 9.3 per cent digestible protein and the second ration 16.8 per cent. Lot 1 was continued through the summer on the first ration. Lot 2 received the low-protein mixture in June and August and the high-protein ration in July and September. Lot 3 received the respective mixtures in the reverse order to lot 2. In late July when the pasture began to fail silage was fed to all groups.

Lots 2 and 3 gained slightly in weight during the season and lot 1 lost slightly. The coefficient of persistency of production, in which each month's production is expressed as a percentage of the production during the previous month, showed that the coefficient of lots 2 and 3 during the periods on the low-protein ration was 0.873 following the month on the high-protein ration. The coefficient of lots 2 and 3 during the month on the high-protein ration was 0.904 following the low-protein ration. The coefficient for lot 1 throughout the pasture season was 0.919. Since the differences in lots 2 and 3 were within the limits of experimental error, the authors believe that the low-protein ration is the more economical, due to its lower cost and the failure of the high-protein ration to increase production.

The importance of properly balanced rations in trials to determine digestibility as shown in experiments with dried apple pomace, C. W. Holdaway, W. B. Ellett, J. F. Eheart, and M. P. Miller (*Virginia Sta. Tech. Bul. 32 (1927), pp. 18*).—In determinuing the value of dried apple pomace for milk production, three experiments were conducted to ascertain the digestibility of the nutrients of this feed. In two of the tests four cows and in one test two cows were used. In the second and third tests the ratio of protein to energy was varied to eliminate the depressing effects found in the first test. The basal ration consisted of a grain mixture and corn silage, and the apple pomace was added to the entire basal ration. In the first and second trials allowance was made for the protein in the apple pomace while in the third trial no allowance was made for this nutrient. The cows were fed the basal ration for some time to accustom them to the feed, after which digestion trials of 5 days' duration were conducted with rations containing apple pomace and with the basal ration alone.

Apple pomace, which has a low protein and a high energy content, widened the protein-energy ratio of the basal ration, causing a depression of the protein digestion for the whole ration. In the first trial the results showed a negative digestibility for the protein of the pomace. In the second trial a special corn gluten feed replaced the corn meal in the basal ration, balancing the lack of protein in the apple pomace. With this correction, two of the cows apparently digested 22 per cent of the protein of the pomace, while the other two cows gave negative results. In the third trial, in which no allowance was made for the protein of the pomace, the two cows showed an average digestibility of the pomace protein of 37 per cent. Under balanced conditions, the digestibility coefficients of dried apple pomace were found to be as follows: Dry matter 67 per cent, crude protein 37 per cent, ether extract 32 per cent, crude fiber 54 per cent, and nitrogen-free extract 80 per cent.

In these trials the quantity of protein involved in the variation due to the depressing effect amounted to 130 per cent of the total protein contained in the apple pomace. The size of error made it impossible to obtain positive coefficients for the protein of the apple pomace.

The energy basis of measuring milk yield in dairy cows, W. L. Gaines (*Illinois Sta. Bul. 308 (1928), pp. 401–438, figs. 9*).—In previous work (E. S. R., 50, p. 75) it was suggested that energy yield is a better measure of milk yield than either the milk or fat, and this work is intended to bring the evidence up to date, basing conclusions largely on prior pertinent literature.

Accumulated evidence substantiates the accuracy of the F C M (fat-corrected milk) formula given, but indicates that the energy value of 1 lb. of 4 per cent milk is about 340 Calories. The corresponding calorie formula becomes $E=51M(2⅔+f)$, in which E is energy in Calories, M milk in pounds, and f fat percentage. The correlation between fat percentage and milk yield has been found to be $r=$ —0.2 to —0.4, while between fat percentage and energy yield it is $r=0$. Thus. when energy is used to measure yield it eliminates the variations

due to the composition of the milk. In nutritional work the energy value of the milk gives a very comprehensive expression of yield. Measuring milk yield on an energy basis permits its being translated directly in terms of power: 1 lb. of F C M per day=0.022 h. p.

The results of crossbreeding experiments in an attempt to segregate a high-milk, high-fat percentage strain in the F_2 have not promised improvement in the measure of milk yield. Fat percentage is a good index of the composition of the milk and of its energy content, but it may be regarded as a secondary measure of yield, showing the direction in which the work is done.

The author concluded that from a biological standpoint the essential measures of performance of the cow at the pail are the energy yield and fat percentage.

Getting the most from the dairy herd by right feeding, P. E. McNall and D. R. Mitchell (*Wisconsin Sta. Bul. 397 (1928), pp. 19, figs. 6*).—A popular bulletin pointing out the facts to be considered in feeding dairy cattle in order to make the most profit from the herd.

[Experiments in dairying at the Connecticut Storrs Station] (*Connecticut Storrs Sta. Bul. 149 (1928), pp. 329–331*).—Two experiments are noted.

Testing ice cream for fat.—The fat percentage of 26 samples of vanilla ice cream tested by the ethyl alcohol plus sulfuric acid method varied an average of 0.486 per cent from the Roese-Gottlieb method. Nine samples of chocolate ice cream tested by the first method showed an average variation of 0.733 per cent from the second method, and five samples of fruit and nut ice cream had an average variation of 0.569 per cent. These results agree with work previously noted (E. S. R., 53, p. 808).

Effects of freezing on milk.—Samples of raw and pasteurized skim milk were stored at temperatures of 0 and 25° F., each lot being sampled at 1-month intervals. Storage for 6 months at 0° did not change the appearance from normal, although a flavor resembling pasteboard developed. After 2 months' storage at 25° there was a precipitation of large amounts of protein, which progressively increased in amount to 6 months. Storage at 0° caused little precipitation even at 6 months. Pasteurization slightly decreased the protein precipitation. Storage at 0° did not change appreciably the viscosity of either the raw or pasteurized milk, but at 25° there was a marked increase in both kinds of milk. The titrable acidity of the raw skim milk before storage was 0.171 per cent, and after 6 months' storage at 0° 0.163 per cent, and at 25°, 0.114 per cent. The acidity of the fresh pasteurized milk was 0.169 per cent, after 6 months' storage at 0° 0.159 per cent, and at 25° 0.126 per cent.

Proteolytic study of the action of specific organisms and groups of organisms in butter made from graded cream, G. Spitzer, E. H. Parfitt, V. C. Manhard, and W. F. Epple (*Indiana Sta. Bul. 319 (1927), pp. 36, fig. 1*).—The results of three series of investigations on the cause of depreciation of butter during storage and the relationship of the predominating factors influencing the flavor and general quality of storage butter are reported. The first series dealt with the effect of inoculating pasteurized graded cream with acidifiers and proteolytic types of bacteria, the second with the commercial butters made by Indiana creameries and obtainable on the Indiana markets, and the third with the storage butter exhibited at the National Dairy Show, 1926.

In part 1, cream graded No. 1 was inoculated with the following organisms: *Bacterium mycoides, B. liquefaciens, B. subtilis, B. mesentericus, B. amylobacter, B. butyricus, B. ichthyosmius,* and *B. proteus vulgaris.* The acid content of the cream varied from 0.09 to 0.36 per cent and the fat content from 33 to 45 per cent. The cream was pasteurized at temperatures of 148 to 155° F., held for 20 minutes, cooled to 80°, and divided into three equal portions. One portion was used as a check and each of the other two were inoculated with 1,000

cc. of a 24-hour broth culture of a specific organism. The portions were then held at room temperatures for a consistent period, cooled to 55°, and churned. One-half of the butter from each portion was salted and 5 1-lb. samples taken from each of the different butters for examination when fresh and at intervals of 30, 60, 90, and 180 days. In the interim, the butter was held at 32 to 39°.

In part 2, 241 1-lb. cartons of butter were purchased and scored, and those samples scoring 90 points or better were selected for the study of proteolytic decomposition during a storage period of 180 days at temperatures of 32 to 50°. Butters on entering storage in June were analyzed for microorganisms and again on leaving storage after 90 days in part 3.

There was a distinct difference in protein hydrolysis of storage butters, especially when active proteolytic types of organisms were used as in part 1. There was a marked increase in protein hydrolysis with all the organisms used except *B. butyricus*, which caused only a slight increase. Salting of the butter while retarding the growth of microoraganisms did not retard the proteolytic types sufficiently to prevent protein hydrolysis. The results in parts 2 and 3 show that the pH value of butter on entering storage is one of the most important factors in controlling the keeping qualities. Butters entering storage with a pH value of from 5 to 6 lost one point in scoring at the end of 90 days, while those having a value of from 6 to 7 and 7+ lost 2.3 and 1.8 points, respectively. The peptinase and tryptase types of proteolytic enzymes have an optimum activity at pH 1.5 to 4 and 6 to 9, respectively.

From these data the authors conclude that butter going into storage should have a pH of from 5 to 6 in order to secure the maximum keeping qualities.

Gelatinated buttermilk, C. Bates and L. M. Tolman (*Milk Dealer, 17 (1928), No. 6, pp. 46, 47, figs. 2*).—In a series of tests the authors have determined that buttermilk containing 0.25 per cent of high testing gelatin will not whey off for a considerably longer period than plain cultured buttermilk. Gelatin caused no change in the percentage of acid development in cultured buttermilk. Disinterested observers found a difference in the flavor of cultured and gelatinated buttermilk, but preferred the gelatinated to the plain cultured buttermilk.

The movement of substances through cheese and the theory of salting down cheese [trans. title], M. Egunov (*Visti Odcsk. Silsk. Gosp. Inst. (Mitt. Landw. Inst. Odessa), No. 1, (1925–26), pp. 90–93, pl. 1*).—Copper sulfate and silver nitrate were used as indicators for testing the diffusion of solutions through various kinds of cheeses at the Odessa Agricultural Institute, Ukraine. The silver solution was added to a cheese which had been in contact with a salt solution for 4 days in the dark, and the cheese was then exposed to the sun. The formula $h=a\sqrt{t}$, in which a is a constant, h the height of diffused solution, and t the time, was used in calculating the results. In an Edam cheese 15 cm. in diameter the salt penetrated 5.5 cm. in 10 days.

Leicester cheese, J. Long (*Milk Indus., 8 (1928), No. 10, pp. 85–87*).—The author gives detailed directions for the manufacture of Leicester cheese.

Quality and overrun in ice cream, O. E. Reed (*Michigan Sta. Rpt. 1926, p. 233*).—A direct relationship was found to exist between the jelly strength of the gelatin used in an ice cream mix and the standing up properties of the resulting ice cream. Very little relationship existed between the viscosity of the mix and the standing up properties of the ice cream.

VETERINARY MEDICINE

[Investigations in animal pathology and bacteriology at the Michigan Station] (*Michigan Sta. Rpt. 1926, pp. 234, 235, 240–244*).—The station pathologist, E. T. Hallman, reports upon several phases of the project on diseases of

the reproductive organs of cattle, including the finding by himself and L. B. Sholl of nine cases of fetel pneumonia out of 16 aborted fetuses 6 months old and older.

Reference is made to work under way by I. F. Huddleson on the abortion problem, including routine examinations such as the testing of blood samples of cows for the abortion disease received from all sections of the State, and the bacteriological examination of fetal membranes and aborted fetuses. During the year 1926, 2,776 blood samples were received and tested for abortion disease, of which 29 per cent were positive in a dilution of 1 to 50 or higher. It is said that the number of positive reactions was about 15 per cent less than the number of positive reactions of the preceding fiscal year.

A report is given by E. P. Johnson on investigations and other work of the year on avian pathology, including a table of autopsies on 1,876 specimens submitted for examination. In the course of study of the etiology of roup, an organism resembling the fowl cholera organism (*Pasteurella avicida*) culturally and morphologically, but very different in its pathogenicity, was found very consistently in the early stages of roup.

Work on the effect of quinine sulfate on coccidiosis in chicks was conducted with encouraging results, though insufficient to permit of definite conclusions.

Some 13,449 samples were given the agglutination test for bacillary white diarrhea, of which 2,264 were positive, 9,361 negative, 1,264 cloudy, and 560 unfit for examination.

Proceedings of the Ohio State Veterinary Medical Association, 1925, [1926, and 1927], edited and compiled by W. Hobbs (*Ohio Vet. Med. Assoc. Proc., 1925, pp. 136; 1926, pp. 118; 1927, pp. 117*).—The papers presented at the annual meeting of this association in 1925 are as follows: Stomach Worms of Sheep and Their Control, by D. S. Bell (pp. 80–84); The Tuberculous Cow, by A. J. DeFosset (pp. 85–90); Prevention of Diseases of Newborn Calves, by D. H. Udall (pp. 90–102); The Effect of Carban Tetrachloride on Puppies, by A. S. Schlingman (pp. 103–107); Some Thoughts on the Veterinary Profession, by L. A. Merillat (pp. 107–113); The Practicing Veterinarian and Tuberculosis Eradication, by F. A. Zimmer (pp. 113–118); Internal Parasites of Poultry, by R. E. Rebrassier (pp. 118–123); Poisoning of Cattle by Sweet Clover Hay, by A. Broerman (pp. 124–127); and The Pathology and Treatment of Sterility in Cattle, by W. L. Boyd (pp. 128–136).

Those presented in 1926 are as follows: Tuberculosis Eradication from a Practitioner's Viewpoint, by F. L. Carr (pp. 69–75); Periodic Ophthalmia, by S. L. Saylor (pp. 76, 77); Technique of the Intradermic and Ophthalmic Tuberculin Tests, by A. J. DeFosset (pp. 77–83); Observations on General Practice, by W. R. Lukens (pp. 83–86); The Effect of Housing and Feeding on the Health of Fowls, by A. Broerman (pp. 87–92); Sheep Practice in Ohio, by P. T. Engard (pp. 92–99); Small Animal Practice, by J. F. Planz (pp. 99–105); Technique of the Serum and Virus Treatment for the Prevention of Hog Cholera, by E. W. Porter (pp. 105–109); Frights' Disease or Running Fits in Dogs, by J. C. Flynn (pp. 110–115); and Demonstration of the Technique of the Tuberculin Tests, by W. H. McKenzie (pp. 116–118).

The papers presented at the meeting in 1927 are as follows: Experimental Rickets in Swine, by B. H. Edgington (pp. 89–94); Some Observations on the Differential Diagnosis of Foot and Mouth Disease, by L. P. Beechy (pp. 95–100); Influenza of Swine, by A. Broerman (pp. 100–104); Rabies as It Confronts the General Practitioner, by J. F. Planz (pp. 104–106); The Hog Cholera Situation in Nineteen Hundred and Twenty-six, by A. J. DeFosset (pp. 107–112); and Professional Ethics, by H. P. Hoskins (pp. 113–117).

Annual report of the Department of Veterinary Science and Animal Husbandry for the year ending 31st December, 1926, F. J. McCall (*Tan-*

ganyika Ter. Dept. Vet. Sci. and Anim. Husb. Ann. Rpt. 1926, pp. 68, pls. 13).—The first part of this sixth annual report consists largely of a discussion of the occurrence of and work with livestock diseases, including rinderpest, tsetse fly and trypanosomiasis, contagious bovine pleuropneumonia, East Coast fever, anthrax, blackleg, epizootic gastroenteritis in cattle due to coccidiosis, and other infectious and parasitic diseases. Part 2 (pp. 37–49) consists of the Fifth Annual Report of the Veterinary Pathologist, Mpwapwa, with accounts of antirinderpest serum production; diagnosis and advice; research on rinderpest; research on trypanosomiases; observations on sheep diseases, goat diseases, anthrax, and cutaneous streptothricosis; and practical immunization. Part 3 (pp. 51–68) is devoted to animal husbandry work.

Report of chief veterinary surgeon for the year ended 30th June, 1927 (*N. S. Wales Dept. Agr., Rpt. Chief Vet. Surg. 1927, pp. 6*).—In this report brief reference is made to investigational work under way with diseases of livestock. A brief account is given of educational work and a more extended report on disease control and quarantine.

Astragalus campestris and other stock poisoning plants of British Columbia, E. A. Bruce (*Canada Dept. Agr. Bul. 88 (1927), pp. 44, figs. 25*).—This is a summary of information on the more important stock-poisoning plants of British Columbia.

The vaccino-aphtha complexes, M. Belin (*Les Complexes Vaccino-aphteux. Paris: Vigot Bros., 1927, pp. 112, figs. 3*).—This is an account of studies of two ultravirus dermatotropes, namely, of vaccinia and foot-and-mouth disease, and their utilization in vaccination against the latter disease.

Foot-and-mouth disease, I, II [trans. title], S. N. Vendel (*Ugeskr. Laeger, 88 (1926), Nos. 34, pp. 778–780; 35, pp. 789–791, pl. 1; abs. in Jour. Amer. Med. Assoc., 87 (1926), No. 19, p. 1600*).—This account calls attention to the success obtained in treating some 100 cows suffering with foot-and-mouth disease by means of the intravenous injection of a large amount of pure iodine in a physiological salt solution or an isotonic solution of dextrose. Treatment in the early stage, before bacterial invasion, appeared to be effective.

Experimental investigations of the possibility of transmission of foot-and-mouth disease by flies [trans. title], G. Kunike (*Centbl. Bakt. [etc.], 1. Abt., Orig., 102 (1927), No. 1–3, pp. 68–81*).—The author concludes that flies serve only as occasional transmitters of the foot-and-mouth disease virus. The virus will remain virulent upon the body of the fly up to 48 hours, in the intestinal canal up to 18 hours, and in the proboscis an even shorter period.

Malta fever: A problem for State and municipal laboratories, A. V. Hardy (*Pub. Health Rpts. [U. S.], 43 (1928), No. 9, pp. 503–511*).—The importance of examinations for undulant fever is emphasized by the fact that during a 3-months period at the Iowa State Hygienic Laboratories 46 positive reactions to typhoid were reported from 41 cases, while the number of agglutinations for undulant fever was 56 from 31 cases. The figures are considered to indicate that, in Iowa at least, undulant fever presents a health problem comparable to that of typhoid.

Experimental investigation of the classification of paratyphoid organisms, F. Höss (*Experimentelle Untersuchungen zur Systematik der Paratyphus-Bazillen-Arten. Inaug. Diss., Univ. Frankfurt a. M., 1927, pp. 84*).—This discussion is presented in connection with a list of 83 references to the literature.

The control of rabies by prophylactic vaccination, A. Eichhorn (*Jour. Amer. Vet. Med. Assoc., 72 (1928), No. 7, pp. 1023–1035*).—The author concludes that the effectiveness of the prophylactic vaccination of dogs has been proved not only in laboratory experiments but also in practice. Phenolized vaccine

prepared from an immunizing fixed virus has proved very effective. It is pointed out that a standard method of production of such vaccine should be adopted.

Zoological contributions to the surra problem.—XIV, The hymenopterous parasites of tabanid eggs in Java [trans. title], O. Nieschulz (*Centbl. Bakt.* [*etc.*], *2, Abt., 72 (1927), No. 15–24, pp. 399–410, pl. 1, fig. 1; abs. in Rev. Appl. Ent., 16 (1928), Ser. B, No. 3, pp. 44, 45*).—This is a contribution from the Government veterinary laboratory at Buitenzorg.

Two unidentified proctotrypid egg parasites of tabanids, belonging to the genus *Phanurus*, occur in Java and Sumatra. In the laboratory they attacked the egg masses of *Tabanus rubidus* Wied. and T. *striatus* F., either freshly laid or from 1 to 4 days old. In February and March, 1926, 60 per cent of 1,216 egg masses found on rice stalks were parasitized, while from the end of March until the beginning of May 41 per cent of 65 masses were parasitized.

Experimental vaccination against tuberculosis infection by the BCG of avian origin [trans. title], Harnach (*Rev. Gén. Méd. Vét., 37 (1928), No. 435, pp. 129–147*).—The author finds that the BCG vaccine of avian origin gives satisfactory results against massive infection by the digestive tract, the usual place of entry. A list is given of 23 references to the literature.

Ruffed grouse are susceptible to tularemia, R. G. Green and E. M. Wade (*Soc. Expt. Biol. and Med. Proc., 25 (1928), No. 7, pp. 515–517; abs. in Jour. Amer. Med. Assoc., 90 (1928), No. 21, p. 1715*).—This is a contribution from the department of bacteriology and immunology of the University of Minnesota and the Minnesota State Board of Health.

It is pointed out that the diminution in the number of wild rabbits and ruffed grouse has occurred simultaneously in Minnesota during the last 4 years, and that human cases of tularemia have occurred in the State during the same period. The occurrence of specific agglutinins in the blood of many of the wild rabbits still remaining has been indicated by studies conducted in Hubbard County. This finding points to tularemia as the cause of the disappearance of the rabbit.

A study of the susceptibility of the ruffed grouse to tularemia was undertaken, Parker and Spencer (E. S. R., 58, p. 451) having demonstrated that the rabbit tick (*Haemaphysalis leporis-palustris*) is an important carrier of the disease and pointed out that this tick is found on both rabbits and game birds, and is, therefore, a possible natural carrier between rabbits and grouse. In their work Parker and Spencer had produced an infection in the blue grouse, but the authors' transmission experiments were conducted with ruffed grouse (*Bonasa umbellus*) trapped wild in Hubbard County. The strain of *Bacterium tularense* used by the authors for inoculation was obtained from a human case of tularemia, originating in the county from the bite of a deer fly, and passed through a guinea pig. The results obtained from the inoculation of three grouse are described, the birds having succumbed to the infection on the third, ninth, and sixth day, respectively.

The results show the ruffed grouse to succumb to an experimental infection of *B. tularense* with the same regularity as the guinea pig and the rabbits. While guinea pigs and rabbits usually develop macroscopic lesions by the fourth day, these are lacking in the ruffed grouse, none having been visible even as late as the sixth and ninth days. That the organism produces a true septicemia is indicated by its wide distribution in the body and its isolation from normal appearing tissues, such as the lung. The results indicate that it occurs in grouse as a natural disease. As is pointed out, its presence may easily be overlooked at necropsy by the absence of gross lesions of the disease.

The clinical diagnosis of genital disease of the cow, W. W. WILLIAMS (*Jour. Amer. Vet. Med. Assoc., 73 (1928), No. 1, pp. 62–78*).—A paper presented before the American Veterinary Medical Association in September, 1927.

The prevention of sterility in the cow [trans. title], F. C. VAN DER KAAY (*Tijdschr. Diergeneesk., 55 (1928), No. 9, pp. 445–451; Ger., Eng., Fr. abs., p. 451*).—The author has found the inoculation of all cows after calving and of all yearling heifers with a virulent culture of *Bacterium abortum* to be the best treatment for infectious abortion. The use of Lugol-solution is also referred to.

[Infectious abortion studies at the Connecticut Storrs Station] (*Connecticut Storrs Sta. Bul. 149 (1928), pp. 319–321, 327, 328*).—In reporting upon the establishment and maintenance of abortion-free herds by periodic blood testing and segregation, it is stated that at present there are approximately 20 herds on test, 13 of which have been clean for several months, and it is expected that from 3 more the infection will be eradicated very shortly. In some of the herds there has been no evidence of the infection for more than a year, and very few breeding troubles have been experienced.

In work for the refinement of the agglutination test it has been found that by using a buffered solution for the preparation of antigen the incubation period can be cut down from 48 to 12 hours. In this method the temperature was raised from 37 to 55° C.

A large collection has been made of strains of *Bacterium abortus* of porcine, bovine, and human origin and *B. melitensis* of human and caprine origin. Ten strains of each are said to have been grown in peptone broth under aerophilic and dioxide atmospheres, and complete nitrogen determinations were made upon the resulting cultures. The results have shown that true bovine strains are sharply marked off from the rest of the *B. abortus* and *B. melitensis* strains, being especially marked in glucose broth cultures where the amounts of free ammonia and amino nitrogen differ radically.

"By using Benedict and Somogyi methods for glucose determination, the porcine and human strains of *B. abortus* and the caprine and human strains of *B. melitensis* utilized from 5 to 10 per cent of the carbohydrate. The bovine strains of *B. abortus* do not break down the carbohydrate and use it for metabolic purposes. These results are also proved by the difference in hydrogen-ion concentration. During these studies it has been demonstrated that 10 per cent carbon dioxide enhances very markedly the growth of the bovine strains of *B. abortus*. On the other hand, this amount of carbon dioxide shows inhibitory properties to the porcine and human strains of abortus and to all strains of *B. melitensis*. Cross agglutination studies have shown that this method can not be used for the differentiation of the various members of the *B. melitensis* group. At present there have been found several inagglutinable strains which may be R types of the organism."

Agglutination tests made of 10,000 samples of human sera received by the State department of health for Wassermann tests, using *B. abortus* as the antigen, indicated that the infection of man with the bovine type is relatively rare, as is shown in the account previously noted (E. S. R., 58, p. 875).

In a study of infectious abortion in cattle in the college herd, it was found that "the gross milk yield of the nonreacting herd, which for a time during 1925 was below normal because the usual numbers had been somewhat depleted, soon fully recovered, and since that time the yield has been much above that of any other period in its history. The reacting herd is now kept merely for observation. Since January 1, 1925, there have been 106 calvings in the clean herd, only 4, or 3.8 per cent, of which have been premature. In the same time in the reacting herd 8 of the 24 calvings, or 33.3 per cent, have been premature."

The physiology of milk fever, II, P. A. Fish (*Jour. Amer. Vet. Med. Assoc., 73 (1928), No. 1, pp. 10–37, figs. 3*).—This account is in continuation of that previously noted (E. S. R., 57, p. 874). The 44 cases of milk fever examined by the author in the laboratory failed to show a true hypoglycemia, but rather an increased amount of blood sugar, agreeing in this respect with the recent results of some other investigators. The average of 75 tests for blood glucose of 51.75 mg. per 100 cc. of blood, established by Hayden (E. S. R., 56, p. 477), is considered to be none too low. Later tests on cows, for a period of 10 monthly intervals, indicate a still lower average of 45.5 mg. per 100 cc. (48 tests.) A range of 40 to 60 mg. is apparently a safe one for the average normal cow. It is considered that Hayden's averages for other blood constituents (total nonprotein nitrogen, urea, creatinine, uric acids, and chlorides) may serve as standards for comparison with pathological conditions. No important difference in the amount of the blood-sugar content in dry cows and those in milk was observed in the experiments.

The fermentation test applied to the blood of milk fever patients demonstrated, with only one exception, that the hyperglycemia at the onset of the disease is due to glucose, and that lactose generally did not appear in the blood until after inflation of the udder. Following inflation, the moderate increase in glucose in the blood possibly is due to its nonconversion into lactose in the mammary gland. The experimental injection of 3.5 to 4 liters of normal saline solution into a normal cow, aside from its effects on the circulation, produced a stimulating effect upon the kidneys and intestines and quite markedly increased the glucose content of the blood. The experiments of one investigator are said to afford evidence that inflation of the udder increases the blood pressure.

On the etiology and treatment of bovine osseous cachexia, L. M. E. Baillon (*Sur l'Étiologie et le Traitement de la Cachexie Osseuse Bovine. Thesis, Écol. Natl. Vét. Alfort; Paris: Vigot Bros., 1927, pp. 63*).—The first part of this work (pp. 11–16) deals with the nature of the disease, and part 2 (pp. 17-29) with its etiology. Part 3 (pp. 30–35) reports upon treatment, and part 4 (pp. 36–56) upon clinical observations.

A possible cure for Johne's disease, W. W. Williams (*Jour. Amer. Vet. Med. Assoc., 72 (1928), No. 7, pp. 1070–1072*).—The author records two cases of Johne's disease in which chaulmoogra oil was administered in graded doses, starting with 1 cc. daily and increasing gradually up to 5 cc. and continued for a month. A stoppage of the scouring resulted within a few days and recovery in a few months.

Results obtained by the use of johnin in cattle, H. W. Turner (*Jour. Amer. Vet. Med. Assoc., 72 (1928), No. 7, pp. 1061–1069*).—The author's work indicates that the presence of Johne's disease can be detected by the use of johnin before a diagnosis can be made from laboratory examinations of rectal scrapings, or before visible lesions can be found.

Johnin as a diagnostic agent in paratuberculosis, H. K. Wright (*Jour. Amer. Vet. Med. Assoc., 72 (1928), No. 7, pp. 1036–1060*).—The author outlines a method of preparing johnin differing from previously described methods in that the product is obtained from cultures grown in a synthetic protein-free culture medium, thereby eliminating the possibility of nonspecific reactions due to foreign proteins. The entire preparation is completed without exposure to heat, and the johnin contains the products of growth elaborated by Johne's bacillus and also the substances extracted from the organisms. Johnin prepared in this manner, when tested on cattle in known-infected herds has proved capable of producing marked febrile reactions in infected animals. It has been found to be without appreciable effect on normal mature cattle in doses of 5 cc. The tests conducted with johnin prepared from the Hastings

strain, identified as strain 1545, have demonstrated the specificity of this strain. It is stated that the testing of cattle with johnin prepared in the manner described will materially assist in the practical control of the disease by enabling the detection of infected animals before the development of physical symptoms.

On the course of the invasion of Fasciola hepatica in distomatosis of cattle and sheep [trans. title], G. Bugge (*Berlin. Tierärztl. Wchnschr., 44 (1928), No. 12, pp. 189–195, pl. 1*).—The first part of this account, consisting of a review of the literature on the course of the infestation by the causative parasite of liver rot, is followed by a report of studies conducted by the author. A plate with photographic reproductions of 14 separate sections of the invaded tissues and a list of 29 references to the literature are included.

A normal sheep urinalysis, D. J. Healy, J. F. Bullard, and H. D. Spears (*Jour. Amer. Vet. Med. Assoc., 73 (1928), No. 1, pp. 87–91*).—This is a contribution from the Kentucky Experiment Station.

Control of stomach worms in sheep, D. S. Bell and B. L. Warwick (*Ohio Sta. Bimo. Bul., 13 (1928), No. 3, pp. 92–98, figs. 5*).—This is a summary of information on practical means for the prevention of injury and loss.

Liver fluke and stomach worm of sheep, S. B. Freeborn (*Calif. Agr. Col. Ext. Circ. 17 (1928), pp. 14, figs. 2*).—This is a brief practical summary of information.

A contribution to the knowledge of the strongylid lungworms of sheep and goats [trans. title], S. Hueber (*Centbl. Bakt. [etc.], 1. Abt., Orig., 105 (1928), No. 4–5, pp. 216–250, figs. 6*).—The first part of this account is devoted to zoological descriptions of the strongylid lungworms, particularly *Strongylus filaria, S. rufescens,* and *S. capillaris.* This is followed by a report of studies of the eggs and larvae. A list of 39 references to the literature is included.

Hog cholera in the young pig, J. W. Benner (*Jour. Amer. Vet. Med. Assoc., 73 (1928), No. 1, pp. 39–51*).—The author's experiences in the Middle West and East, as well as the experiences of others, have led to the conclusion that simultaneous treatment confers a solid and lasting immunity to pigs weighing 15 lbs. or more, and that this can be done without harmful effects when a potent virus is used with ample doses of potent serum. A discussion entered into by M. Dorset, I. K. Atherton, and R. R. Birch follows (pp. 51–54).

Hog cholera control and the veterinarian, M. Dorset (*Jour. Amer. Vet. Med. Assoc., 73 (1928), No. 1, pp. 55–61*).—This is a discussion of the method of attacking the disease-producing microorganisms, methods of increasing the resistance of the host, and the control program.

Studies on infectious enteritis in swine.—II, The pathogenesis of infectious enteritis, H. E. Biester, C. Murray, S. H. McNutt, and P. Purwin (*Jour. Amer. Vet. Med. Assoc., 72 (1928), No. 7, pp. 1003–1022, pls. 4*).—This second contribution by the authors (E. S. R., 58, p. 176) follows and describes the process of diphtheritic membrane formation from its inception after the introduction of the primary causative factor (*Salmonella suipestifer*).

"The first step in this process consisted of the accumulation of an inflammatory exudate upon the surface of the mucosa. This process was followed by necrobiosis involving both the exudate and mucosal tissue. The mucosal necrosis was progressive and advanced towards the submucosa. Mucin and fibrin played a definite part in the formation of the croupous and diphtheritic membranes. Definite croupous membrane formation as found in the early stages of acute field cases was noted 56 hours after feeding broth culture of *S. suipestifer.* Sixty-four hours after experimental feeding, caseated membrane formation of a diffuse and more advanced character was found.

"Observation of the developments leading up to the final intestinal lesions with reference to the alignment of the primary and secondary etiological

factors confirms and checks our original interpretations of such lesions and the relations of the organisms involved. The deep invasion and establishment of the secondary factor (*Actinomyces necrophorus*) is directly related to the formation and presence of a caseated membrane which creates an anaerobic environment. Acute inflammatory lesions with necrosis and other retrograde processes developed in the stomach and small intestine, but the process had not advanced to a permanent caseated membrane formation up to the twelfth day. In this organ the intensity of the reaction seemed to have subsided somewhat in the last two subjects of the series.

"All parts of the gastrointestinal tract were exposed to the cultures fed in probably less than 24 hours, based upon our results with test feeds. *S. suipestifer* was present in the mesenteric lymph nodes of the small intestine prior to 32 hours after feeding. The action of *S. suipestifer* was greatly intensified when introduced in subnormal subjects affected with ascariasis, but free from necrotic enteritis manifestations at the time of feeding. The lesions developed more rapidly and were of a much more advanced character as compared with the normal subjects of the same duration after being fed a culture of the primary causative organism."

A contribution to the study of equine influenza, H. Bonhomme (*Contribution à l'Étude de la Fièvre Typhoïde du Cheval. Paris: Libr. le François, 1926, pp. 72*).—A summary of information in connection with a bibliography of 14 pages.

The treatment of periodic ophthalmia with mercuric iodid, R. A. Kelser (*Jour. Amer. Vet. Med. Assoc., 73 (1928), No. 1, pp. 93, 94*).—The author reports upon a case of this disease in a native Philippine pony weighing 450 lbs. which was treated with three intravenous injections at 48-hour intervals with 0.30 gm. of mercuric iodide suspended in 30 cc. of distilled water. Forty-eight hours after the first injection of mercuric iodide the pony showed marked improvement, which progressed with the two subsequent injections, a complete and rapid recovery following.

Experimental black tongue of dogs and its relation to pellagra, J. Goldberger and G. A. Wheeler (*Pub. Health Rpts. [U. S.], 43 (1928), No. 4, pp. 172–217*).—A description is given of the experimental disease, summarizing observations extending over a period of five years. The experimental condition produced clinically and post-mortem is indistinguishable from the spontaneous disease of dogs known as black tongue or Stuttgart dog epizootic, and it is concluded that they are identical.

Avian variola (diphtheria, epithelioma contagiosum): Vaccination of the Gallinaceae [trans. title], J. Basset (*Rev. Vét. [Toulouse], 80 (1928), Apr., pp. 189–203, figs. 2*).—The author finds that the fowl, guinea, turkey, and pheasant can be protected against fowl pox by the use of a fixed virus or vaccine obtained from cultures from the fowl (E. S. R., 52, p. 284). Immunity is established 20 days after vaccination and lasts for about one year.

Bacillary white diarrhoea (B. W. D.): B. pullorum isolated from sparrows, T. Dalling, J. H. Mason, and W. S. Gordon (*Vet. Rec., 8 (1928), No. 17, p. 329*).—The authors record the isolation of *Bacterium pullorum* from three sparrows collected in chicken runs in which chicks were infected with bacillary white diarrhea. Broth cultures of the organism obtained from the livers of these sparrows were fed to two day-old chicks, which developed a typical form of the disease, and *B. pullorum* was isolated from their livers.

The authors report that during the present hatching season they have been in touch with many poultry farmers on whose behalf they have examined many hundreds of young chicks, and have isolated *B. pullorum* from 71.6 per cent.

Investigations of bacillary white diarrhea and fowl typhoid [trans. title], R. MANNINGER (*Ztschr. Infektionskrank. u. Hyg. Haustiere, 32 (1928), No. 4, pp. 265–303*).—The subject is discussed in connection with a list of 75 references to the literature. The author was led to conclude that *Bacterium pullorum* and the fowl typhoid organism are identical and belong to a single species, *B. gallinarum* Klein, bacillary white diarrhea and fowl typhoid being two forms of an etiologically similar disease.

[Work in avian parasitology at the Michigan Station], W. L. CHANDLER (*Michigan Sta. Rpt. 1926, pp. 250–252*).—Investigations were conducted with a view to discovering the distribution of the newly recognized prosthogonimiasis due to *Prosthogonimus* sp., which is parasitic in the oviduct of the fowl (E. S. R., 55, p. 778).

Brief reports are given of studies conducted with a view to the standardization of the size and strength of dose and method of administration of an iodine vermicide for the treatment of intestinal worm infestations in poultry and the standardization of methods of manufacture of this vermicide; standardization of the strength and volume of an iodine suspensoid for use in the disinfection of poultry houses and runways against roundworm eggs and larvae, and brooder houses against coccidia cysts (E. S. R., 57, p. 179); beneficial or detrimental effect on the birds in the absence of worms; and problem of making the vermicide and suspensoid available on the market.

An epidemiological study of blackhead in turkeys, L. F. RETTGER and W. F. KIRKPATRICK (*Connecticut Storrs Sta. Bul. 148 (1927), pp. 285–313, figs. 4*).—This report is based upon investigations commenced in the spring of 1915 and since conducted each year during the breeding and rearing season.

The work at the station is said to have shown that turkeys can be reared in successive years without serious losses from blackhead by the use of the rotation system. "This saving from blackhead may be due to a break in the cycle of development of a protozoal organism which may be the cause of this disease, or, what is more probable, to a partial cleansing of the ground during the intervals of rest, and restoration of grass and clover to the yards, and hence an ample supply of this growing green food. Whether the same results may be obtained by the use of only two rotation yards and a system of biweekly rotation, instead of weekly, has not been determined. Such a modification would be in the direction of added simplicity, but numerous experiments are necessary before it can be adopted without material risk.

"There can be little doubt that chickens and other barnyard fowl transmit blackhead disease, and that ground that has been and is occupied by them constitutes an immediate source of infection."

AGRICULTURAL ENGINEERING

Forest and stream-flow experiment at Wagon Wheel Gap, Colo., C. G. BATES and A. J. HENRY (*U. S. Mo. Weather Rev., Sup. 30 (1928), pp. IV+79, pls. 2, figs. 42*).—This is the final report of this experiment (E. S. R., 46, p. 779).

The data indicate that the ability of any vegetative cover to assist absorption, thereby reducing surface run-off and erosion under nearly all conditions, and the ability of a forest cover to retard snow melting can not be seriously questioned. On the other hand, a locality having soil or climatic conditions which are not conducive to extremes of run-off does not need a protecting influence in the same degree as a region or watershed whose streams are not permanent and whose freshets may be strong and destructive. From the evidence presented it is estimated that in a locality where the normal ratio of high to low stages is more than 25 to 1 with a moderate protective cover, the probabilities

are strong that the low stages would be made still lower by removing that protection.

Irrigation [trans. title], P. HIRTH (*Tropenpflanzer, Beiheft, 25 (1928), No. 1, pp. [4]+156, pl. 1*).—This monograph presents a description of irrigation methods and systems, and gives the basis for a geography of irrigation. It contains a list of 244 references to work bearing on the subject from different parts of the world.

Irrigation of orchards by contour furrows, M. R. HUBERTY and J. B. BROWN (*Calif. Agr. Col. Ext. Circ. 16 (1928), pp. 16, figs. 14*).—Practical information on the subject is presented.

Does tile drainage pay? A. G. MCCALL (*Maryland Sta. Bul. 295 (1928), pp. 53–63, fig. 1*).—Data are presented on the effect of drainage on the yields of different crops in Maryland and on the average value of the crops of the rotation. They indicate that the yields of hay and tobacco have been increased decidedly by underdrainage, but that for wheat and corn the results are very irregular, with no significant increases for the drained over the undrained soils. Corn on check plats and on those receiving phosphorus alone and phosphorus-nitrate mixtures showed the beneficial effect of tile drains, but no benefits were apparent on plats receiving complete fertilizer and manure treatments. The value of the increase due to tile drainage was considerably greater on limed than on unlimed soils.

The results are taken to indicate that tile drainage on Leonardtown silt loam soil is a good investment even though the cost of installation of the drainage system is as much as $100 per acre. It was found that excellent drainage may be secured in these soils by spacing the lines of tile 80 ft. apart. Depths of from 3 to 3.5 ft. were found to give the best results for ordinary conditions, and it was found necessary that the tile be laid on a true, straight grade.

Terracing in Oklahoma, G. E. MARTIN (*Okla. Agr. Col. Ext. Circ. 218, rev. (1928), pp. 23, figs. 14*).—This circular points out the benefits of terracing to landowners and operators, and describes a method of terracing whereby it is thought these benefits may be secured.

Bearing capacity of soil, C. TERZAGHI (*Engin. News-Rec., 100 (1928), No. 16, pp. 629, 630*).—In a contribution from the Massachusetts Institute of Technology a restatement is given of the basis for rules as to bearing capacity of cohesionless and cohesive materials.

Public Roads, [May, 1928] (*U. S. Dept. Agr., Public Roads, 9 (1928), No. 3, pp. 49–72, figs. 24*).—This number of this periodical contains data on gasoline taxes during 1927 for the different States and the District of Columbia, together with the following articles: Report on Connecticut Avenue Experimental Road (pp. 49–69); and A Cantilever Testing Apparatus for Mortar Beams, by D. O. Woolf (pp. 70, 71).

Poisson's ratio and the modulus of elasticity of sand-lime brick (*Jour. Franklin Inst., 205 (1928), No. 2, pp. 251, 252*).—In tests of sand-lime brick by the U. S. Bureau of Standards for stress-strain relationships, the value of Poisson's ratio, or the ratio of transverse to longitudinal strain, was found to be one-seventh throughout the range of loading. With the bricks tested on edge the secant modulus of elasticity varied from an average value of about 1,700,000 lbs. per square inch at no load to about 1,600,000 lbs. at a stress of 1,000 lbs. per square inch. The modulus of elasticity in compression was about equal to the modulus in tension.

Strength of interlocking-rib tile walls, A. H. STANG, D. E. PARSONS, and A. B. MCDANIEL (*U. S. Dept. Com., Bur. Standards Technol. Paper 366 (1928), pp. 389–408, figs. 10*).—Tests of eight walls, 12 in. thick, 6 ft. long, and 9 ft. high, built of tile having interlocking ribs, are reported. Four walls were

tested in compression, three under transverse loading, and one was subjected to a transverse load before being tested in compression. Lime, cement-lime, cement, and no mortars were used in the horizontal joints. The wall with cement-lime mortar beds sustained a maximum transverse load about 2.5 times that taken by the wall with lime mortar beds and higher than any other tile wall so far tested at the bureau. Similarly, the compressive strength of the cement-lime mortar bedded wall was about 2.5 times that of the wall with lime mortar beds.

The walls built of interlocking-rib tiles with staggered horizontal joints gave results in the transverse tests indicating that the resistance of the walls to side pressures was affected by the condition and nature of the cementing material used in the walls. The compressive strength of these walls seemed to be directly dependent upon the workmanship and the mortar used in the horizontal joints. The results are taken to indicate that walls built of interlocking-rib hollow tile have considerably higher transverse strength and at least as high compressive strength as similar walls built of tile of the usual design.

The industrial and artistic technology of paint and varnish, A. H. SABIN (*New York: John Wiley & Sons; London: Chapman & Hall, 1927, 3. ed., rev., pp. XI+459, pls. 9, figs. 10*).—This is the third revised edition of this book, containing chapters on early history, varnish—origin of the name, linseed oil, linoleum, manufacture of varnish, tung oil, japans and driers, rosin, spirit varnishes, pyroxylin varnishes, oil paints and paints in japan, varnish or enamel paints, Chinese and Japanese lacquers, protection of metals against corrosion, water-pipe coating, ship's bottom paints, ship and boat painting, carriage painting, house painting, and furniture varnishing.

The use of dynamite for ditch blasting, A. J. MCADAMS (*Missouri Agr. Col. Ext. Circ. 190 (1927), pp. 20, figs. 24*).—Practical information on the use of dynamite for ditch blasting is presented, together with a table of suggested loads, spacings, and depths for ditches of various sizes and conditions.

An observed case of "spontaneous" ignition in stable manure, L. H. JAMES, G. L. BIDWELL, and R. S. MCKINNEY (*Jour. Agr. Research [U. S.], 36 (1928), No. 5, pp. 481–485, figs. 4*).—In a contribution from the U. S. Department of Agriculture, it is reported that a pile of heating stable manure was observed to ignite spontaneously. When exposed to the air charred straw glowed to a fiery red. Oxygen aeration of a small section of heating material produced a rapid increase in temperature of 26.5° C. (80° F.) in 30 minutes.

Present tendencies in motor-fuel quality, G. G. BROWN (*S. A. E. [Soc. Automotive Engin.] Jour., 22 (1928), No. 5, pp. 559–564*).—In a contribution from the University of Michigan it is pointed out that the present tendency in fuel refinement is away from such misleading values as color and gravity. Ease of starting and good acceleration, particularly of a cold engine, demand high partial volatility even more than antiknock value, while the development of maximum power and a high fuel efficiency in modern engines supplying a large amount of heat to the mixture demand a relatively high end point in the distillation tests.

It is shown that there is no economic advantage in buying antiknock fuels at a 3-ct. premium, which now corresponds to about 15 or 16 per cent of the selling price, if an engine having a compression ratio of 5.5 to 1 can be operated satisfactorily on ordinary gasoline.

Electricity consumption on the farm, F. D. PAINE (*Elect. World, 91 (1928), No. 16, p. 821*).—Records of the consumption of electricity on the rural electrification project of the Iowa Experiment Station are briefly presented, indicating that the actual use of electricity for 1 year was 1,548 kw. hours.

Plowing with electricity in Italy (*Elect. West, 60 (1928), No. 4, pp. 206, 207, figs. 3*).—A brief report is given of work in Italy with electric plowing,

using stationary engines and cable outfits. It is pointed out that, with electric costs comparable to those in California, land is plowed, sowed, and harrowed in Italy cheaper with electricity than in the Western States with tractors.

The plough, B. A. KEEN (*Sci. Prog. [London], 22 (1928), No. 88, pp. 641–650, figs. 4*).—In a contribution from the Rothamsted Experimental Station the historical development of the plow is traced.

Traction dynamometer for ploughing (*Engineering [London], 125 (1928), No. 3251, pp. 538, 539, figs. 12*).—A traction dynamometer for obtaining a continuous record of the drawbar pull exerted by a tractor drawing a plow is described and illustrated, which was developed at the Rothamsted Experimental Station.

Report of the committee on fertilizer distributing machinery of the American Society of Agronomy (*Jour. Amer. Soc. Agron., 20 (1928), No. 3, pp. 302–304*).—This report outlines the basis for a study, the purpose of which is to lay down specifications for fertilizer distributing machinery.

Shall I buy a combine? L. A. REYNOLDSON, J. H. MARTIN, and W. R. HUMPHRIES (*U. S. Dept. Agr., Farmers' Bul. 1565 (1928), pp. II+18, figs. 6*).—Data obtained cooperatively by the Bureaus of Agricultural Economics, Plant Industry, and Public Roads and the Kansas, Montana, Nebraska, Oklahoma, Texas, Illinois, Indiana, Pennsylvania, South Dakota, and Virginia Experiment Stations are briefly presented and discussed in their practical aspects.

It is pointed out that small grains, soy beans, clovers, grain sorghums, and other crops have been harvested and threshed successfully with combines. The advantages of the combine in comparison with other methods of harvesting and threshing are enumerated as the saving of labor, the elimination of transient labor, the early clearing of fields for tillage operations, the distribution of the straw on the land, and the getting of the grain to the market earlier. The disadvantages are the large investment required, the large amount of power consumed, the greater risk from damp grain, the greater risk to crops from storms, and the difficulty of saving the straw for feed and bedding.

It is stated that a combine should not be purchased for harvesting less than from 100 to 150 acres annually, as for smaller acreages other methods will usually be more economical.

Coefficients of heat transfer as measured under natural weather conditions, F. C. HOUGHTEN and C. G. F. ZOBEL (*Jour. Amer. Soc. Heating and Ventilating Engin., 34 (1928), No. 5, pp. 403–420, figs. 18*).—Studies are reported from which data are presented giving the various coefficients of heat transfer found, and the conditions for which they apply, for 44 sections of building construction of 19 different types.

The conductances found by measurement for three walls containing hollow tile are higher than the coefficients computed from accepted values for conductivity, indicating that such accepted values do not apply to the tile tested. The coefficients found by measurement for concrete are higher than those usually accepted. This is considered due to the fact that the sample tested had not aged sufficiently.

Some aspects are brought out of heat loss for small wall sections between heavy partitions and windows, of errors in computing heat loss by assuming maximum rates of heat flow due to maximum temperature differences as applying during the whole day, of changing temperature and mean temperature of the wall, and for the comparison of conductance values derived by computation with those found by actual measurement.

Handbook of mechanical refrigeration, H. J. MACINTIRE (*New York: John Wiley & Sons; London: Chapman & Hall, 1928, pp. VII+724, pls. 22, figs. 376*).—This is a handbook of information on the subject, covering both design and

operation of refrigerating systems. It contains chapters on the compressor, the absorption refrigerating machine, fittings and condensers, the automatic refrigerating machine, heat transfer, refrigerants, brine and brine systems, the water supply, erection and operation, the testing of refrigerating plants, piping, ice making, cold storage, the cooling and conditioning of air, miscellaneous applications of refrigeration, hotel and apartment refrigeration, refrigeration in the chemical industry, safety devices and fire protection, costs of refrigerating machinery and equipment, specifications, electric motors, and steam and oil engines.

The compression refrigerating machine, G. T. VOORHEES (*Chicago: Nickerson & Collins Co., 1927, pp. XVI+607, pls.* [*69*], *figs.* [*166*]).—This book contains an analysis of many of the practical and theoretical features involved in the action of the compression refrigerating machine, including its thermodynamics and indicator diagram, and presents a study of ice making and its application A large amount of graphic data on refrigeration is appended.

Refrigerating machinery in the dairy industry, A. FISCHER (*Die Kälte-Maschine in der Milchwirtschaft. Hildesheim: Molkerei-Zeitung, 1927, pp. VI+223, figs. 129*).—This is a handbook of information relating to the construction, operation, and maintenance of dairy refrigerating machinery from the German viewpoint.

Electric dairy cold storage, W. T. ACKERMAN (*New Hampshire Sta. Bul. 233* (*1928*), *pp. 35, figs. 14*).—The results of studies made of electric dairy cold storage on three retail dairy farms in New Hampshire are reported. The storage rooms varied in size from 170 to 206.7 cu. ft., and were operated under a variety of conditions with similar equipment of the dry-room type.

The cash expense for operating refrigeration was in general less for ice, but in one case was in favor of the electric method. The total operating cost for the year, including labor, interest, and depreciation, averaged $118.33 for the electric method and $236.56 for the ice method. The storage rooms were designed to carry an average load of 300 qt. of bottled milk per day, but up to 240 qt. were stored satisfactorily and under extreme temperature conditions. The average total cost per cubic foot of total contents was $1.18 for the ice method and 62 cts. for the electric method.

Dairy stable ventilation, F. L. FAIRBANKS (*Jour. Amer. Soc. Heating and Ventilating Engin., 34* (*1928*), *No. 2, pp. 125–136, figs. 9*).—In a contribution from the New York Cornell Experiment Station the results of experiments in dairy stable ventilation and in measuring and indicating the movement of air in dairy stables are reported. The results indicate that the essential factors in dairy stable ventilation are a heat reservoir maintained in the stable by means of floor outtakes, the stimulation of convection currents, positive action of convection currents, the avoidance of drafts, complete mixing of fresh air and stable air, and a supply of from 50 to 60 cu. ft. of air per minute per head of stock.

RURAL ECONOMICS AND SOCIOLOGY

[Papers presented at the eighteenth annual meeting of the American Farm Economic Association] (*Jour. Farm Econ., 10* (*1928*), *No. 2, pp. 137–255, figs. 2*).—Included are the following papers presented at the meeting in Washington, D. C., December, 1927, previously referred to (E. S. R., 58, p. 301): The Status of American Research Work in Agricultural Land Economics, by L. C. Gray (pp. 137–150); Research in Farm Taxation, by E. Englund, with discussion by F. P. Weaver (pp. 151–161); How the Agricultural College Student should be Introduced to the Subject of Agricultural Economics, by G. F. Warren (pp. 162–168); Preparatory Courses for Agricultural Economics, by A. E. Cance (pp. 169–174); Basic Groups in Agricultural Economics, by C. L. Holmes (pp.

175–184); Quality Factors Influencing Vegetable Prices, by F. V. Waugh (pp. 185–196); The Effect of the Corn Borer on Farm Organization in the Corn Belt, by C. R. Arnold (pp. 197–210); Effect of Large-Scale Production on Cotton Growing in Texas, by L. P. Gabbard, with discussion by J. D. Pope (pp. 211–224); The Effect of Improved Machinery and Production Methods on the Organization of Farms in the Hard Winter Wheat Belt, by W. E. Grimes (pp. 225–231); Problems in Crop and Livestock Estimating, by W. F. Callander (pp. 232–246); and An International Organization of National Farm Associations, by A. Hobson (pp. 247–255).

The World Economic Conference, Geneva, May, 1927.—Final Report (*Geneva: League of Nations, 1927, pp. 76*).—The preparation and composition of the conference held at Geneva in May, 1927; the general survey and summary of the work of the conference by G. Theunis, president; and the report of the conference on the general situation, commerce, industry, and agriculture, and the general resolutions are presented.

Appendixes include the agenda of and the documents submitted to the conference, and lists of the officers, commissions, and members of the conference.

[Investigations in agricultural economics at the Connecticut Storrs Station, 1926–27] (*Connecticut Storrs Sta. Bul. 149 (1928), pp. 325, 326*).—The average cost of producing a pound of tobacco in the towns of East Windsor and Ellington in 1925 was 23 cts., exclusive of rent for land. The units of work of productive labor per man employed varied from 100 to 350 on the different farms. Approximately 50 per cent of the farmers got from 175 to 275 units per man, 25 per cent below 175 units, and 25 per cent above 275 units.

[Rural economics investigations at the Ohio Station] (*Ohio Sta. Bimo. Bul., 13 (1928), No. 3, pp. 125–128, figs. 2*).—Results of investigations in rural economics are reported as follows:

Horses on Ohio farms, J. I. Falconer (p. 125).—Tables are given showing by years the number of horses on Ohio farms, 1910–1928, and colts foaled in the east North Central States and the United States, 1919–1927, and a chart showing the value per head of horses on Ohio farms, 1910–1928.

Shipments of Ohio potatoes, C. W. Hauck (p. 126).—A table is given showing by months, 1919–1927, carlot shipments of potatoes from Ohio points. An average of approximately 69 per cent of the shipments was made in September, October, and November.

Poultry and egg prices, J. I. Falconer (p. 127).—A chart is given showing for 1910–1927 an index of prices of chickens, eggs, and all commodities.

Index number and production, wages, and prices, J. I. Falconer (p. 128).—A table previously noted (E. S. R., 59, p. 180) is brought down through February, 1928.

International yearbook of agricultural legislation (*Internatl. Inst. Agr. [Rome], Internatl. Yearbook Agr. Leg., 16 (1926), pp. XXVI+778*).—This volume continues the series previously noted (E. S. R., 56, p. 485). In addition to the data previously contained, a list is given of the laws, decrees, and regulations with their respective sources according to chronological order by countries.

Federal aid, A. F. Macdonald (*New York: Thomas Y. Crowell Co., 1928, pp. XII+285, fig. 1*).—This book presents the results of a field study during 1926 under a research fellowship of the Social Science Research Council for "a comprehensive field study of the grants made by the Federal Government to the States." The American subsidy system, the evolution and future of Federal aid, and the aid for forest fire prevention, agricultural extension work, highways, the National Guard, vocational education, vocational rehabilitation, and hygiene of maternity and infancy are discussed.

Use of credit facilities by farming organizations, G. M. GILLETT ET AL. (*Jour. Min. Agr.* [*Gt. Brit.*], *35* (*1028*), *No. 1, pp. 23–29*).—This is the report of the Advisory Committee on Cooperation and Credit of the Ministry of Agriculture on the reasons why the existing credit facilities provided by the British Government are not more largely used. Reservations of certain members of the committee to the report are also included, and an appendix gives the terms and conditions under which loans may be made.

Regional views on agricultural problems (*Washington: Chamber Com. U. S., Agr. Serv., 1928, pp.* [*4*]+*20*).—This mimeographed report presents in condensed form the views developed at 10 regional agricultural conferences of agricultural and other industrial representatives, held by the Agricultural Service of the Chamber of Commerce of the United States between April 9, 1925, and January 6, 1927. The subjects considered are credit, crop and livestock improvement, diversification, demand factors in production, farm cost accounting, grazing, labor, legislation, marketing, marketing credit, production costs, reclamation, agricultural surplus, tariff, taxation, the cotton situation, transportation, and water supply for irrigation.

Full reports of the several conference discussions have also been issued.

Farm costs and practices in the production of Walworth County crops and livestock, P. E. MCNALL and L. S. ELLIS (*Wisconsin Sta. Research Bul. 83* (*1928*), *pp. 103, figs. 9*).—This bulletin embodies the results of a study made of records kept on 24 farms in 1922, 22 farms in 1923, and 20 farms in 1924 in Walworth County, a county in which from two-thirds to four-fifths of the farm income is derived from dairying. Tables are given and discussed, showing for each farm in 1923 and the average for all farms each year (1) for corn, corn silage, oats, barley, alfalfa, mixed hay, and canning peas, the costs of production by items and the man labor and horse work requirements by operations and (2) the cost per year for different items and feed requirements for a dairy cow, a heifer, a calf, a bull, and a horse, the costs and feed requirements per 100 lbs. of pork produced, and the costs per 100 head of poultry.

Other tables show the standard requirements—equipment, man labor, and horse work—for different crops and the feed and labor standards for different kinds of livestock, and the relation of butterfat production per cow to costs per pound and to feed requirements. The reasons for the variation in costs of production of crops, livestock, and livestock products on different farms are discussed.

Forecasting the volume and value of the cotton crop, B. B. SMITH (*Jour. Amer. Statis. Assoc., 22* (*1927*), *No. 160, pp. 442–459, figs. 8*).—A method is presented for forecasting during March, or thereabouts, the average price during the December and January following of the March futures of the next year.

Based upon data covering the period 1903–1926, a multiple curvilinear correlation analysis was made, using the logarithm of the price of cotton during December as the dependent variable and the following six independent variables: (1) The last two digits of the calendar year, (2) the logarithm of the size of the crop in millions of bales, (3) the logarithm of the available supply of cotton in millions of bales in the United States at the end of the preceding February, (4) the logarithm of the price in December (and January) a year preceding the given December, (5) the logarithm of the Bureau of Labor Statistics Index of All Commodity Prices at Wholesale in December (and January) a year preceding the given December, and (6) the logarithm of the forecast of the average percentage of furnaces in blast for the year beginning the March preceding the given December. A correlation index of 0.965 was obtained. Curves showing the net relation of cotton prices to the six factors are included. These show that (1) the trend of cotton prices is to increase about 5.5 per cent per year, (2) the price changes in an inverse direction approxi-

mately 1.6 times as fast as the crop, (3) a much greater proportional change in supply than in the crop is required to cause a given change in price, (4) there is a tendency for prices to remain high the year following a year of high prices, and (5) industrial activity and cotton prices move together.

A correlation for the period 1902–1926 of the percentage increase or decrease in the United States acreage of cotton harvested in one calendar year from the preceding year was made, using the following independent variables: (1) The last two digits of the calendar year of harvest, (2) the price of cotton in the preceding December divided by the corresponding Bureau of Labor Statistics Index of Farm Products, (3) the price of cotton in December in the calendar year two years preceding the given year divided by the corresponding Bureau of Labor Statistics Index of Farm Products, and (4) the percentage increase or decrease that took place in the acreage harvested the preceding year. These gave a multiple correlation index of 0.95.

For the period 1919–1926, except the year 1926, the yields per acre of cotton were found to agree closely with the winter weather index numbers constructed by summing, averaging, and weighting the November-March daily temperatures at three weather stations in the northwest belt and three in the eastern belt.

In forecasting at the average percentage of furnaces in blast the following factors were considered: (1) The last two digits of the calendar year, (2) short-time interest rates as a percentage of bond yields, (3) the 2-year moving weighted average of percentage changes in short-time interest rates, (4) the 2-year moving weighted average of percentage changes in wholesale prices, and (5) the average percentage of furnaces in blast for 12 months ending with the month of computation. Charts are included showing the findings.

Survey of the wheat situation, August to November, 1927, M. K. Bennett et al. (*Wheat Studies, Food Research Inst.* [*Stanford Univ.*], *4* (*1928*), *No. 3, pp. [1]+103–134, figs. 6*).—This continuation of the surveys previously noted (E. S. R., 58, p. 81) includes a study of crop developments, marketing and stocks, international trade, wheat price movements, and the international position and outlook.

Statistics of American wheat milling and flour disposition since 1879, H. Working (*Wheat Studies, Food Research Inst.* [*Stanford Univ.*], *4* (*1927*), *No. 2, pp. [1]+63–102, figs. 12*).—The principal results of the study are presented in tables and charts showing the approximate flour output of the mills of the United States for each crop year since 1879–80, the quantities of wheat ground and mill feed produced, the domestic consumption of flour, revised estimates of the monthly flour output of the mills of the United States since May, 1923, and estimates showing, in terms of deviations from a 4-year average, the approximate total stocks of flour in the United States on the first of each month since May 1, 1923.

The methods of making the estimates of annual flour production, wheat ground, mill feed produced, monthly flour production since May, 1923, and changes in flour stocks are described.

Incidental conclusions arrived at were as follows: (1) The per capita consumption of flour in the United States declined about 11 per cent from 1904 to 1917, and about 10 per cent during the last 6 months of 1917, since which time it has been practically constant at about 0.9 bbl. (2) The total quantity of wheat milled varied more from year to year than the total flour output, due to variations in the amount of wheat required per barrel of flour. (3) The existing compilations of reports of flour stocks give no significant indication of the amount, time, or direction of the changes in total stocks. The changes in total stocks are so large as to affect appreciably the calculations of flour consumption, and the varying attitude of handlers and users of flour is a major cause of variations in milling activity.

The world wheat situation, 1926–27: A review of the crop year, M. K. BENNETT ET AL. (*Wheat Studies, Food Research Inst. [Stanford Univ.], 4 (1927), No. 1, pp. [1]+62, figs. 8*).—This is the fourth of the series previously noted (E. S. R., 56, p. 486) and reviews for the crop year 1926–27 the supply position, international trade, stocks and carryovers, wheat price movements, and milling and consumption. Appendix tables contain relevant statistical data.

Report on the grain trade of Canada . . . 1926, W. DOUGAN and E. A. URSELL (*Canada Bur. Statis., Rpt. Grain Trade Canada, 1926, pp. 201, figs. 5*).—This report continues the series previously noted (E. S. R., 56, p. 387).

Economic aspects of the pear industry, S. W. SHEAR (*California Sta. Bul. 452 (1928), pp. 107, figs. 28*).—This bulletin assembles and analyzes the available data on the pear industry. Data are given as to the chief producing sections of the United States, the geographical distribution of the chief varieties, California pear-producing districts, and the prices, purchasing power, and exports of fresh, canned, and dried pears. The trend of and the outlook for production of fresh and canning pears in the chief sections, the markets, monthly and weekly shipments, competition of other fruits, relations of supply to price, and the probable future of the industry are discussed.

Almonds, H. R. WELLMAN and E. W. BRAUN (*California Sta. Bul. 453 (1928), pp. 34, figs. 14*).—Tables and charts are given showing for the State and its counties the bearing acreage, 1921–1927 (also for the State, 1914–1927), and the nonbearing acreage, 1927; for the State the acreage planted by years, 1921–1926, the probable bearing acreage by years, 1928–1930, the production, 1914–1927, and the acreage of principal varieties; the prices and purchasing value, 1910–1927, of California almonds; the United States consumption and imports of almonds; and the production of almonds in foreign countries.

The average yield of almonds for the State as a whole was found to be unprofitably low, and widespread planting does not appear to be justified.

Report of the departmental committee on the transit, prices, and marketing of agricultural produce, J. M. MARK ET AL. (*Belfast: North. Ireland Min. Agr., 1927, pp. 20*).—This is a report of the departmental committee of the Ministry of Agriculture of Northern Ireland, appointed to inquire into and make recommendations regarding the cost of transit of farm produce, the causes of the difference in prices obtained by producers and the prices charged to consumers, and the methods of marketing agricultural produce.

[Improvement of marketing of agricultural produce] (*Jour. Min. Agr. [Gt. Brit.], 34 (1928), No. 12, pp. 1131–1143*).—The text is given of the report adopted October 20, 1927, by the Council of Agriculture for England covering marketing in general; the marketing of cattle, sheep, and meat, pig and pig products, cereals, liquid milk, cheese and butter, eggs and poultry, wool, fruit, and potatoes; transportation; and agricultural cooperation.

An analysis of the cabbage market with respect to New Mexico conditions, A. L. WALKER (*New Mexico Sta. Bul. 167 (1928), pp. 24, figs. 15*).—This bulletin gives a brief analysis of the demands and prices in the principal markets of importance to New Mexico and of the competition New Mexico cabbage growers must meet. Information is also included as to freight rates on cabbages from New Mexico and competing areas to important markets, and the intentions to plant and the outlook for cabbage production in 1928 in different sections of the United States.

Factors affecting returns from potatoes in Massachusetts, R. L. MIGHELL (*Massachusetts Sta. Bul. 240 (1928), pp. 69–95, figs. 11*).—This bulletin reports the results of a study of the records for the year 1926, obtained by personal visits to 54 farms in 4 areas in Massachusetts. The acreage, maximum and minimum acreage in potatoes, yields per acre, total hours of labor per acre, and hours of labor for different operations are reported for each section, and

the acreage in potatoes, yields per acre, and amounts of seed, fertilizer, manure, and spraying and dusting materials are given for the individual farms. Estimated annual costs of special potato machinery per machine and per acre, based on data secured from 69 farmers, and the differences in labor requirements on farms using hand and machine methods, based on data for 1924–1925 from 120 farms, are also included. Suggestions for reducing costs of production and increasing returns are given.

Crops and Markets, [May, 1928] (*U. S. Dept. Agr., Crops and Markets, 5 (1928), No. 5, pp. 153–184, figs. 2*).—Tables, graphs, notes, reports, and summaries of the usual types are included.

[Yearbook statistics of crops, livestock production, trade, and meteorology] (*U. S. Dept. Agr. Yearbook 1927, pp. 735–1212*).—Current statistics and summaries as noted for the previous year (E. S. R., 57, p. 686) are given.

Report on the functions and work of the Imperial Economic Committee, H. J. Mackinder et al ([*Gt. Brit.*] *Imp. Econ. Com. Rpts., 8 (1928), pp. 22*).—The origin and purpose of the committee and its relation with the Empire Marketing Board are described, and the work it has accomplished is illustrated.

The Irish Free State: An economic survey, H. D. Butler et al. (*U. S. Dept. Com., Bur. Foreign and Dom. Com., Trade Prom. Ser. 62 (1928), pp. VI+86, figs. 8*).—This is an economic and industrial survey, and the section on agriculture (pp. 10–29) includes data regarding acreage and size of holdings; area plowed, in hay and grass, and other land in different sized agricultural holdings; acreage and yield of different crops; different kinds of livestock and livestock products; agricultural credit; and agricultural cooperation.

A farmer's fifty years in Lauderdale, R. S. Gibb (*Edinburgh: Oliver & Boyd, 1927, pp. XI+286, pls. 4, figs. 3*).—This is the author's recollection, written in popular style, of nearly 50 years of farming life in the Borders of Scotland.

The industrial revolution and the home, E. Schmiedeler (*Diss., Catholic Univ. Amer., Washington, D. C., 1927, pp. XII+161*).—This is a dissertation submitted to the faculty of the Catholic University of America in partial fulfillment of the requirements for the degree of doctor of philosophy. It is based chiefly upon answers from 150 families to a questionnaire covering general family relations and home life; religious, educational, industrial, financial, environmental, and recreational phases of family life; and sanitation and health. The subject is considered in chapters dealing with the family and its workers, leisure time, the house, the social organism, and religious influence.

A bibliography and a copy of the questionnaire are included.

Movement of open country population in two townships of northwestern Ohio, C. E. Lively and P. G. Beck (*Ohio State Univ., Dept. Rural Econ., Rural Sociol. Mimeogr. 3 (1928), pp. 41, figs. 5*).—This is a progress report on a study of population movement in unincorporated territory to determine its quantitative and qualitative aspects, and covers work done during the fall and winter of 1926–27 in a township each in Union and Van Wert Counties, Ohio. Of the 473 families in the area, 465 were interviewed, of which approximately 84 per cent were farm operaotrs and 7 per cent farm laborers.

Tables are included showing the population changes, composition and characteristics of the population, and the geographic and occupational distribution of the children. The open country population of both areas has been recruited largely from the same or nearby townships, chiefly from families of farm owners. About 60 per cent of the male and 50 per cent of the female heads of families were living in the same township that they did at the time of their marriage. The birth rate exceeded the death rate in both counties, but due largely to migration of children the population of the Union area is of the stationary type and that of the Van Wert area of the regressive type. In 87

families in the Van Wert area in which the wife was more than 45 years of age and the husband still living, the average number of children per mother was 5.1, as compared with 7.2 and 7.7 in the maternal and paternal families.

A critical study of periodical reading in farm homes in five selected localities in Oklahoma, G. Fernandes (*Oklahoma Sta. Bul. 176 (1928), pp. 16*).—An analysis was made of data obtained by interviews regarding the periodical reading matter in 523 farm homes in selected localities in 5 counties in different sections of the State. Fifty-four families were without periodicals of any kind. In the remaining 469 families 514 newspapers, 929 farm papers, 365 periodicals of a general nature, and 37 religious papers were found. Of these families 7.2 per cent took only newspapers and 14.5 per cent only farm papers. The average total expenditure per family per year for periodicals was $6.14, divided as follows: Newspapers $4.42, farm papers 87.5 cts., general periodicals 71 cts., and religious papers 8 cts.

Requisites to rural social organization, W. A. Terpenning (*Amer. Jour. Sociol., 33 (1928), No. 5, pp. 737–753*).—Rural communities, as compared with urban, are found deficient in an awareness of needs for social organization. A study of two rural counties shows the inadequacy with which their rural social needs are being met. A tentative program for rural social organization is suggested.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

Report of the departmental committee on the re-assessment of annual grants to institutions providing higher agricultural (including veterinary) education in England and Wales, Bledisloe, F. N. Blundell, and A. D. Hall (*London: Min. Agr. and Fisheries, 1927, pp. 35*).—This is the report of the departmental committee of the Ministry of Agriculture and Fisheries, appointed in 1926 to consider and report on what annual grants for the five years beginning October 1, 1926, should be made to institutions in England and Wales for the maintenance of higher agricultural education, including veterinary medicine. The reasons for the several recommendations are given, together with a table showing the grants recommended for each of the 17 institutions.

State school funds and their apportionment, III, F. H. Swift (*Amer. School Bd. Jour., 76 (1928), No. 6, pp. 41–43, 138*).—This article, which discusses the plan used in Oklahoma, is the third of the series previously noted (E. S. R., 59, p. 186).

Farm-management extension, 1914–1924, H. M. Dixon (*U. S. Dept. Agr. Circ. 30 (1928), pp. 35, figs. 10*).—A brief history is given of farm management extension work and the changes in procedure, development in program, formulation, and other phases of the work, and the results obtained are discussed.

The number of States conducting work and the number of counties reached increased from 6 and 27 in 1914 to 31 and 856 in 1924.

Marketing farm animals, C. S. Plumb (*Boston: Ginn & Co., 1927, pp. VII+366, pl. 1, figs. 145*).—This book covers the field of marketing farm livestock and is prepared especially for agricultural students and handlers of stock.

Learning exercises in food and nutrition, A. B. Robinson and F. M. King (*Boston and London: D. C. Heath & Co., 1928, pp. VII+164, fig. 1*).—This is a textbook on food and nutrition for senior high schools, but so planned that it can be adapted to junior high schools. The assignments are presented in three groups so planned as to represent the requirements of pupils of different ability

and experience, or with different opportunities, initiative, or interest. The appendix includes tables, score cards, and recipes.

Forest fire prevention handbook for the schools of Oregon (*U. S. Dept. Agr., Misc. Pub. 20 (1928), pp. II+30, figs. 25*).—This circular, based on Miscellaneous Circular 79 (E. S. R., 57, p. 290) and prepared by the Forest Service in cooperation with the State forester and the superintendent of public instruction of Oregon, contains a lesson each on the forests of the State, the forest organizations of the State, causes of fires, effects of fires, fire prevention, and how fires are detected and fought.

FOODS—HUMAN NUTRITION

Fruit juices and fruit juice beverages, J. H. Irish (*California Sta. Circ. 313 (1928), pp. 64, figs. 30*).—This circular, which is essentially a revision of Circular 220 (E. S. R., 43, p. 717) and Bulletin 359 (E. S. R., 49, p. 412), contains practical directions for the preparation of fruit juices and fruit juice beverages. Descriptions are given, with illustrations, of the general equipment required for fruit juice preparation and special directions for the manufacture of grape, unfermented apple, loganberry, pomegranate, and citrus fruit juices, various sirups, concentrates, and carbonated beverages.

Heat penetration in the pasteurizing of syrups and concentrates in glass containers, J. H. Irish, M. A. Joslyn, and J. W. Parcell (*Hilgardia [California Sta.], 3 (1928), No. 7, pp. 183–206, figs. 14*).—This is the complete report of an investigation which has been noted from another source (E. S. R., 59, p. 91).

A bacteriological study of salad dressings, F. M. Bachmann (*Wis. Acad. Sci., Arts, and Letters, Trans., 23 (1927), pp. 529–537*).—A bacteriological examination is reported of 15 brands of mayonnaise, 12 of other salad dressings, 6 of olive mayonnaise, and 6 of olive relish. With the exception of a few samples of homemade mayonnaise only commercial products were studied, and the condition of all of the samples was good when the cans were opened.

Of the entire number of cans, only 4 were found to contain anaerobes and these were nontoxic. The number of aerobic organisms varied from 0 to 17,400 per cubic centimeter. The largest percentage of sterile cans was found among the salad dressings other than mayonnaise. These contained a starch paste, and it is thought that the heat used in preparing the paste and the acidity of the product were the chief factors contributing to sterility. The most probable source of contamination is considered to be the egg yolks. From 12 cans, spore-forming rods with morphological and cultural characteristics similar to *Bacillus subtilis* and *B. mesentericus* were isolated. *Escherichia coli* when introduced in broth cultures into the various foods disappeared rapidly. *B. subtilis* remained viable for a longer period of time.

Notes on basal metabolism.—XI, Basal metabolism standards, W. H. Stoner (*Jour. Lab. and Clin. Med., 13 (1927), No. 3, pp. 265–269*).—Continuing the series of notes on basal metabolism (E. S. R., 58, p. 591), the author discusses the chief features and relative accuracy of the Aub and DuBois, Harris and Benedict, and Dreyer standards for basal metabolism, and the points which should be considered in the choice of standards. In his opinion the Dreyer values are the simplest to apply. It is noted, however, that in the present widespread use of basal metabolism determinations in following the course of treatment rather than for diagnosis the choice of standards becomes of less significance if the same standard is used in successive estimations.

Mineral metabolism on a high mineral diet, A. T. Shohl, A. M. Wakeman, and E. Y. Shorr (*Amer. Jour. Diseases Children, 35 (1928), No. 4, pp. 576–579*).—A mineral balance experiment is reported in which an infant was fed

in one period skimmed cow's milk plus cane sugar, with the addition of salts to make the concentration of each mineral element approximately double that of cow's milk, and in another period the same food without salt additions. The methods employed were the same as reported by Shohl and Sato (E. S. R., 51, p. 63).

The data reported show that more of each of the mineral elements was retained on the diet furnishing the larger amount of salts, but that the excess of base over acid and the composition of the retained material did not differ essentially from normal. The amounts of each element excreted in the urine and feces were in fairly constant proportion to the intake. The question is raised as to whether salt metabolism may not be a limiting factor in growth, and whether growth may be improved by furnishing a more liberal supply of mineral elements in the food.

The influence of feeding on certain acids in the feces of infants.—I, A comparison of the effects of breast milk and modified cow's milk on the excretion of volatile acids, J. R. Gerstley, C. C. Wang, R. E. Boyden, and A. A. Wood (*Amer. Jour. Diseases Children, 35 (1928), No. 4, pp. 580–589, figs. 5*).—This is part of a general investigation of the hypothesis advanced by H. Finkelstein that cow's milk, while harmless in itself, forms a medium unfavorable for the digestion and metabolism. The general plan was to conduct metabolism experiments once or twice a week on the same infants from birth until 6 months of age, during which time the feedings alternated from breast milk to modifications of cow's milk appropriate to the age of the subject.

As judged by the results obtained on four subjects who went through the entire period of 6 months without interruption, the volatile acid output and the total titratable acidity were relatively constant during the breast milk periods, but extremely variable in the periods in which cow's milk modifications were used. The acidity of the stools was often much higher during the cow's milk period, but frequently lower. Propionic acid was identified in the stools during the cow's milk periods, but rarely ever during the breast milk periods. The average weight of the stools was much higher during the cow's milk than the breast milk periods.

There appeared to be no definite relationship between the quantity of acids excreted and the age of the child or the variations in the weight curves. In almost every case placing the child on the metabolism frame caused diarrhea.

A new dietary deficiency with highly purified diets.—III, The beneficial effect of fat in the diet, H. M. Evans and G. O. Burr (*Soc. Expt. Biol. and Med. Proc., 25 (1928), No. 5, pp. 390–397*).—Continuing the series previously noted (E. S. R., 58, p. 791), the authors have made a further study of the effect of the addition of fats to the basal pure diet previously described (E. S. R., 57, p. 791).

In addition to lard, three other fats, butter, coconut oil, and corn oil, when added to the extent of 20 per cent of the sugar-casein diet, all significantly improved growth and ovulation during the first 90 days, the improvement being practically identical with that secured by the addition of lettuce. Lard was slightly superior to the other fats tested and was satisfactory for ovulation in amounts of 5 and 10 per cent, although the growth of the rats receiving the lower levels was not as good. Butter proved superior to lard for lactation. The activity appears to reside in the fatty acid fraction of the lard rather than the unsaponifiable fraction.

The fundamental food requirements for the growth of the rat, III, IV, C. Kennedy and L. S. Palmer (*Jour. Biol. Chem., 76 (1928), No. 3, pp. 591–622, figs. 20*).—Continuing the series previously noted (E. S. R., 58, p. 592), two papers are presented.

III. *Yeast and yeast fractions as a supplement to synthetic rations* (pp. 591–606).—The authors have tested the value of starch-free dry yeast and of various preparations from this yeast as sources of vitamin B in a ration supposedly adequate except for this vitamin and of the same materials as supplements to the purified and supposedly complete ration which had previously been shown to be inadequate for satisfactory growth.

As a source of vitamin B, 0.6 gm. daily of the yeast proved adequate for growth and reproduction, but not for successful lactation. A preparation from this yeast corresponding to the Osborne-Wakeman fraction 2 (E. S. R., 42, p. 314) proved unsatisfactory even when fed in amounts as large as the equivalent of 1 gm. of yeast daily. No better results were secured with Harris yeast vitamin powder, supposedly prepared by the Osborne-Wakeman method, when fed to the extent of 240 mg. daily. Better growth was secured with 320 mg. daily.

In the second series of experiments, the addition of 0.2 gm. of the starch-free dry yeast greatly improved the rate of growth on the supposedly complete ration and made reproduction possible, although the young were not reared. When the yeast was increased to 0.5 gm. daily, there was still further improvement and 3 young were reared. The residue from the yeast after prolonged extraction with hot 85 to 90 per cent alcohol gave as good results as the original yeast. The residue obtained after extracting the yeast in a Lloyd extractor with hot alcohol, followed by hot ether, gave good results when fed in amounts equivalent to 0.6 gm. of whole yeast. Vegex, an extract of autolyzed yeast, had only a slight stimulating effect. Yeast autoclaved for 2½ hours at 15 lbs. pressure gave fairly good growth when fed in 0.2-gm. daily amounts, and somewhat better growth in amounts of 0.4 gm. Bios prepared according to the method of Eddy, Kerr, and Williams (E. S. R., 53, p. 204) did not promote growth.

The authors conclude that "yeast contains some factor other than vitamin B or the antineuritic factor, and that this factor is necessary for satisfactory growth. The evidence so far collected indicates that the factor is in some respects similar to, but not identical with, the yeast growth factor of Smith and Hendrick [E. S. R., 55, p. 891] and the P–P factor of Goldberger and associates [E. S. R., 55, p. 890]."

IV. *Coprophagy as a factor in the nutrition of the rat* (pp. 607–622).—This paper gives a résumé of the authors' experience in studying the effect of coprophagy in rat nutrition studies with synthetic diets. It was first demonstrated that the supposedly complete ration which had proved unsatisfactory could be made fairly satisfactory for growth by allowing the animals to eat their own feces or the feces of stock rats. The factor in the feces responsible for the growth stimulation was soluble in alcohol, insoluble in ether, and was not affected by heating for ½ hour at 15 lbs. pressure, but was considerably injured by heating under the same conditions for 2 hours. Commercial casein purified merely by leaching with acidulated water contained the same factor as the feces, while highly purified casein did not.

Dietary requirements for reproduction.—XII, The inefficiency of the lactating mother (Mus norvegicus albinus) to secrete vitamin B in the milk and the relation of such phenomenon to infant mortality, B. Sure (*Science, 66 (1927), No. 1707, pp. 265, 266*).—This continuation of the series of papers previously noted (E. S. R., 57, p. 896) is a preliminary report on a phase of the subject which has also been noted in the first of a series of papers on the vitamin requirements of nursing young (E. S. R., 58, p. 195).

Dietary requirements for fertility and lactation, XIII–XV, B. Sure (*Jour. Biol. Chem., 76 (1928), No. 3, pp. 659–700*).—In continuation of the series of studies noted above, three papers are presented.

XIII. *Storage of fat-soluble vitamins for lactation, with some observations on the cod liver oil requirements of nursing young* (pp. 659–671).—In this study, in which the author had the technical assistance of H. M. Boggs and D. J. Walker, an attempt was made through greater depletion of the store of fat-soluble vitamins in the bodies of female rats to determine whether or not a specific fat-soluble vitamin other than vitamins A and D is required for lactation.

It was found that females transferred from Stock Colony 1, which received a cereal ration containing 1 per cent of cod-liver oil, had sufficient fat-soluble vitamins in reserve to carry them through the lactation period. This proved to be true also for first generation rats of Stock Colony 2, which had received the Sherman ⅔ whole wheat-⅓ whole milk powder ration. In second generation rats on the second diet, the reserves of vitamin A were so low that on the experimental diet free from fat-soluble vitamins the young developed ophthalmia in from 4 to 14 days. The mothers, however, lost very little weight.

On administering cod-liver oil by capillary pipette to nursing young which had begun to show the effects of vitamin deficiency, there was prompt response in renewed growth. In some cases a single administration of the oil was sufficient to carry the young through the rest of the lactation period. In other cases the dosage had to be repeated. The minimum effective dosage reported was a single small drop of the oil equivalent to 12 mg. per animal, or a total of 72 mg. for the entire litter of 6. In two other cases reported, 37 and 54 mg. of the oil per animal were required for the entire lactation period. These very small amounts are thought to suggest that in the administration of cod-liver oil to young infants, amounts considerably in excess of the requirement are often given.

From the success obtained with the cod-liver oil, the author is now inclined to the belief that there is no "basis for postulating the existence of a specific fat-soluble galactagogic vitamin essential for rearing of the young other than vitamins A and D."

XIV. *A quantitative biological method for the study of vitamin B requirements for lactation* (pp. 673–683).—The author, with the technical assistance of H. M. Boggs and D. J. Walker and the cooperation of E. H. Stuart, has developed a quantitative method for determining the vitamin B requirements for lactation, and with this method has tested the value of various yeast preparations as sources of vitamin B. The method is essentially as follows:

Female rats are transferred immediately after the birth of the litter, which is reduced to 6, from the colony Stock Diet 1 to a vitamin B-deficient diet consisting of casein (purified) 20, agar 2, McCollum's salt mixture (185) 4, butterfat 10, and dextrin 64 parts. On this diet the mothers lose weight and the young grow from 1 to 2 weeks. When the young cease to grow, yeast is administered to the mother. Daily weighings are made of the mother and the litter, and the amount of yeast is increased until there is satisfactory response in growth and weaning record.

Of Harris yeast (concentrated extract), 1,500 mg. daily was required for lactation as compared with 500 for successful growth. Brewers' Yeast-Harris (Medicinal) was much less effective, showing an efficiency index of only 50 per cent in terms of the concentrated extract. Schlitz brewers' yeast, a dehydrated product prepared 7 years ago by drying fresh brewers' yeast at a temperature of 100° C., showed a lactation efficiency of 75 per cent. A concentrate prepared by adsorption of bakers' yeast on fuller's earth, followed by extraction with sodium hydroxide and neutralization with sulfuric acid proved to be three times as potent as the Harris yeast used as the standard.

XV. *The inefficiency of the lactating mother (Mus norvegicus albinus) in secreting vitamin B in the milk, and the relation of this phenomenon to infant*

mortality (detailed report) (pp. 685–700).—This is the detailed report of a study in which the author has had the technical assistance of D. J. Walker and the cooperation of E. H. Stuart and which has been noted above from a preliminary report constituting the twelfth paper of the series.

Dietary requirements for fertility and lactation.—XVI, Potency of "Vitavose" versus dehydrated yeast in vitamin B, B. Sure (*Soc. Expt. Biol. and Med. Proc., 25 (1928), No. 7, pp. 603–605*).—Using the method described above, the author has found Vitavose to be ineffectual as a source of vitamin B for lactation when fed in amounts as large as 2,500 mg. daily.

The nutritive value of maize and its various preparations on Java, B. C. P. Jansen and W. F. Donath (*Meded. Dienst Volksgezondh. Nederland. Indië, 17 (1928), No. 1, pp. 92–119, pls. 8, figs. 6*).—Several varieties of corn grown in Java and meal prepared from corn in different ways were examined for their value as sources of protein, of antineuritic vitamin, and of vitamin A by methods described in previous studies (E. S. R., 51, p. 370; 52, p. 64).

The chemical composition and the content of antineuritic vitamin of the different varieties tested did not vary markedly, but the yellow varieties contained much more vitamin A than the white variety. The nutritive value of the different preparations varied to a marked extent. Meal prepared by the more primitive method of grinding the whole grain by hand without soaking gave the best results.

The amount of vitamin-A in different varieties of batata, B. C. P. Jansen and W. F. Donath (*Meded. Dienst Volksgezondh. Nederland, Indië, 17 (1928), No. 1, pp. 120–125, pls. 3*).—Four varieties of sweet potatoes grown in Java were tested for their content of vitamin A after having been dried at from 50 to 60° C. and pulverized in a mortar. The method employed was the same as described in the previous study (E. S. R., 52, p. 64). The potatoes tested included white, yellow, orange red, and slightly purple varieties. The white variety contained no appreciable vitamin A, the yellow and orange red varieties were rich in this vitamin, and the purple contained a little but not nearly as much as the yellow.

The amount of vitamin-A in Indian fruits, B. C. P. Jansen and W. F. Donath (*Meded. Dienst Volksgezondh. Nederland. Indië, 17 (1928), No. 1, pp. 126–137*).—To the list of fruits previously tested for vitamin A (E. S. R., 52, p. 64), several others have been added. In the summary of results obtained, the figure 0 denotes that the amount of vitamin A in the fruit tested is so small that the addition of a normal quantity of the fruit to the diet does not improve its quality with respect to this vitamin; a + sign denotes that sufficient vitamin A for curative tests and the resumption of growth is furnished by 1 or 2 gm. daily added to the basal diet; and ++ sign denotes that 0.5 gm. or less suffices. The fruits tested and their values according to this scheme are as follows:

Mangosteen (*Garcinia mangostona*) 0, rambotan (*Nephelium lappaccum*) 0, *Lansium domesticum* 0, breadfruit (*Artocarpus integrifolia*) ++, pineapple (*Ananas sativus*) 0, custard apple (*Anona muricata*) 0, Malay apple (*Eugenia malaccensis*) 0, cashew apple (*Anacardium occidentale*) +, grapefruit (*Citrus decumana*) ++, *C. nobilis* +, *C. aurantium* +, lime (*C. medica*) 0, white durian (*Durio zibethinus*) 0, yellow durian (*D. kutejensis*) +, ripe and unripe mango (*Mangifera indica*) +, and *M. foetida* +.

Urolithiasis and deficiency in vitamin A (*Jour. Amer. Med. Assoc., 90 (1928), No. 16, p. 1294*).—An editorial discussion of a previously noted paper by Van Leersum (E. S. R., 58, p. 493), with the question as to the possibility of such a condition arising in the human organism.

The "assay of a so-called cod-liver oil extract" for vitamin-A content and calcifying properties compared to cod-liver oil, H. E. Munsell and

H. Black (*Jour. Amer. Pharm. Assoc., 17 (1928), No. 2, pp. 139–144, fig. 1*).—A commercial product described as an alcohol-soluble extract of cod-liver oil has been compared, weight for weight, with a good grade of cod-liver oil for its content of vitamins A and D. The vitamin A tests were conducted by the method of Sherman and Munsell (E. S. R., 54, p. 89), with the exception that the dried brewery yeast of the basal diet was increased to 10 per cent and the starch reduced to 65 per cent. Although the basal diet contained little or no vitamin D, the fact that a control group showed no increase in growth on irradiation is thought to indicate that the results were not vitiated by lack of D. Amounts of the extract as large as 100 mg. daily failed to afford any protection, while 1 mg. daily of the cod-liver oil furnished complete protection.

In the vitamin D experiments the basal ration of Steenbock and Black (E. S. R., 52, p. 862) and the line test of McCollum et al. were used. After 21 days on the basal ration the cod-liver oil and the extract were administered in comparable amounts, and after definite periods of time one animal from each group was killed for application of the line test. A control from each litter was always continued on the basal diet until the last pair receiving the cod-liver oil and the extract had been killed. In all, over 250 rats were used, with varying amounts of the oil from 0.05 to 2 per cent, and of the extract from 0.05 to 4 per cent, over test periods of 5, 7, 9, 11, and 13 days. The extract showed no greater calcifying properties, gram for gram, than the oil in any of the tests.

Vitamin B (*Nature [London], 121 (1928), No. 3048, Sup., pp. 516–518*).—A review of recent literature on the physiological properties of vitamin B and on its differentiation into two separate vitamins.

Is the pigeon test suitable for the detection of vitamin B in fresh and preserved green feeding stuffs [trans. title]? A. Scheunert and M. Schieblich (*Ztschr. Tierzüchtung u. Züchtungsbiol., 8 (1927), No. 2, pp. 315–320, fig. 1*).—On the basis of negative results in pigeon feeding tests with considerable amounts of green feed and silage as the sole source of vitamin B in contrast with good results reported in rat tests, the authors conclude that pigeons are not suitable experimental animals for the detection of vitamin B in green feeds.

The relation of deficiency of vitamin B to atony of the stomach, M. J. Rowlands and E. Browning (*Lancet [London], 1928, I, No. 4, p. 180, figs. 4*).—Radiograms are given of two rats on a normal diet and two on a diet deficient in vitamin B, the photographs being taken 3½ hours after a meal of barium carbonate made into pills with bread crumbs, milk, and sugar. The photographs show a distension of the cardiac but not the pyloric regions of the stomach and a marked prolapse of the viscera. It is thought that similar conditions of distension and prolapse observed in patients may be due to a deficiency of vitamin B in the modern diet. It is noted incidentally that the detoxicated embryo of cereals has been found to be much more powerful in its antineuritic action than yeast.

Lowering of resistance following lack of vitamin D [trans. title], W. Eichholz and H. Kreitmair (*München. Med. Wchnschr., 75 (1928), No. 2, pp. 79–81*).—A comparison is reported of the resistance to spontaneous infection in full-grown rats and to artificial pneumococcus infection in full-grown mice on a rachitic diet and on the same diet supplemented with Vigantol, a commercial preparation of irradiated ergosterol.

In all cases the mortality was higher on the vitamin D-free diet. The authors conclude that lack of vitamin D tends to lower natural immunity and that the action of the vitamin is nonspecific. The fact that the animals were full-grown is thought to indicate the importance of vitamin D in the diet of adults as well as growing children.

Contributions to the history of the recognition of beriberi as an avitaminosis [trans. title], G. GRIJNS (*Fortschr. Naturw. Forsch., n. ser., No. 1 (1927), pp. [4]+32*).—A review in German of the early investigations, many of which were originally reported in Dutch journals, leading to the establishment of the vitamin hypothesis with particular reference to polyneuritis and beriberi. The review covers the period 1887 to 1911.

A note on the treatment of primary or essential marasmus by Ostelin, K. MCFADYEAN (*Lancet [London], 1928, I, No. 4, pp. 181, 182, figs. 2*).—Case reports are given showing a remarkable growth response following the administration of Ostelin, a proprietary preparation of the unsaponifiable fraction of cod-liver oil, to two infants suffering from severe primary marasmus but with no signs of rickets and with no previous response to sun treatment or the enrichment of the diets with vitamins A, B, and C.

The infrequency of severe rickets in New Orleans and vicinity: An attempt to correlate some of the responsible factors, C. T. WILLIAMS (*Amer. Jour. Diseases Children, 35 (1928), No. 4, pp. 590–606, figs. 3*).—This discussion is based on observations conducted on 100 children from 1 month to 11 years of age selected at random on admission to the outpatient service of Touro Infirmary, New Orleans. Of these, 26 were found to have active or partially healed rickets on admission and were given treatment with cod-liver oil or regulation of diet and sun baths. Monthly determinations of the inorganic phosphorus in the blood of all the subjects and calcium determinations on admission gave an opportunity to study seasonal variations and the correlation between rickets and mineral metabolism. The phosphorous determinations were incomplete for the winter and fall months, but fairly complete for February, March, April, and May. These showed a definite seasonal variation, the averages for the four months being 4.77, 5.19, 5.38, and 5.62 mg. per 100 cc. of serum, respectively. The general level of phosphorus was higher than that reported by Hess and Lundagen for children in New York City (E. S. R., 49, p. 58). The phosphorus content of the blood of the rachitic children was always low, while the calcium levels were in most cases within normal limits.

Possible factors concerned with the comparatively mild type of rickets occurring in New Orleans are discussed, with the conclusion that the geographic location of the city is the most important factor, with good exposure to the sun in the tenement houses, the low type of buildings, playground facilities, the type of clothing, and the character of the diet serving as minor factors in the prevention of a severe type of the disease.

Rickets in dogs.—Metabolism of calcium and phosphorus, A. T. SHOHL and H. B. BENNETT (*Jour. Biol. Chem., 76 (1928), No. 3, pp. 633–642, figs. 2*).—Data are reported on the growth, content of inorganic phosphorus and calcium in the blood serum, weight of the dried feces, and the calcium and phosphorus metabolism of 4 dogs from the same litter during a period of about 10 weeks in which they were fed a rickets-producing diet of 10 gm. of dried skim milk powder, 40 gm. of Quick Quaker Oats cooked 5 minutes, 5 cc. of linseed oil, or cod-liver oil in the case of the 1 dog serving as control, and 1 gm. of sodium chloride. The dogs had been removed from the mother when a week old and fed cow's milk with 5 cc. of cod-liver oil daily until they were placed on the rachitic diet when 7 weeks of age, the experiment proper beginning a week later.

By all diagnostic standards, marked rickets developed in 2 of the 3 dogs which received no cod-liver oil. The third dog, which was the most active and grew the least, showed only slight rickets, and the control was practically normal. The blood examinations, which were obtained in the third period only, gave normal figures for the 2 dogs showing only slight or no signs of

rickets and typical pictures of low calcium rickets for the other 2. The metabolism figures showed that calcium was present in the urine but in negligible amounts. The phosphorus content of the urine was not very different in the control than in the other animals and averaged 35 per cent of the total phosphorus excreted. The balance of calcium was positive for all the dogs in all the periods, but was diminished in the 2 dogs suffering from rickets. One of these showed a negative balance for phosphorus in the third period. The ratio of calcium to phosphorus was higher in both of the dogs with rickets than in the other 2.

In discussing these results, the authors emphasize the significance of the derangement of phosphorus metabolism as compared with calcium. In their opinion the more important defect in rickets lies in the inadequate retention of phosphorus rather than of calcium.

A quantitative study of the photochemical activation of sterols in the cure of rickets, R. J. Fosbinder, F. Daniels, and H. Steenbock (*Jour. Amer. Chem. Soc., 50 (1928), No. 3, pp. 923–927*).—To determine quantitatively the amount of energy necessary to secure a demonstrable deposition of calcium in the bones of a rachitic rat, highly purified cholesterol was exposed for definite periods to monochromatic radiations from a quartz mercury vapor lamp and then fed as a curative measure to rats rendered rachitic on the Steenbock-Black diet, using the line test method of McCollum et al. Data are given on the influence of the quantity in radiation of 265 $\mu\mu$ wave length on antirachitic action, and from these data it has been calculated on the basis of the Einstein photochemical relation that 2×10^{-8} gm. of vitamin D (about 20 billionths of a gram) is sufficient to give a detectable deposition of calcium.

"The calculation just given indicates that a quantity of vitamin D so small as to defy any chemical test is sufficient to initiate a cure of rickets. It is difficult then to draw definite conclusions concerning the antirachitic properties of irradiated material from the gross chemical or physical properties."

The physiologic potency of activated sterols (*Jour. Amer. Med. Assoc., 90 (1928), No. 16, p. 1295*).—An editorial discussion, based chiefly on the foregoing paper, emphasizing the fact that the calculated amounts of vitamin D for activity are smaller than the amounts of drugs like epinephrine that can be detected by the most delicate physiologic tests.

Spectral characteristics of light sources and window materials used in therapy, W. W. Coblentz (*Illum. Engin. Soc. Trans., 23 (1928), No. 3, pp. 247–301, figs. 13*).—In this paper, presented at the 1927 convention of the Illuminating Engineering Society, Chicago, Ill., the author summarizes data, chiefly from his published and unpublished investigations at the Bureau of Standards, U. S. Department of Commerce, on radiometric measurements of various light sources and on the transmissibility of effective ultra-violet rays through special glass and fabrics and the tentative unit dosage for therapeutic purposes.

In his opinion the installation of special glass in private homes is an unwarranted expense. "It is to be hoped that the time will come when (municipal) light baths from artificial sources will be available, instead of trying to gain an uncertain amount of ultra-violet solar radiation through windows, especially in private houses and offices where only a small part of the building consists of windows. As already stated, for solariums and especially-built sunparlors in hospitals, where the nude or partially nude body can be exposed to solar radiation, these new glasses will be of great benefit."

A report of the discussion following the paper is included.

The treatment of pernicious anaemia with liver and liver extracts, S. Davidson, J. G. McCrie, and G. L. Gulland (*Lancet [London], 1928, I,*

No. 17, pp. 847–852, figs. 3).—This report of a large number of cases of pernicious anemia successfully treated with liver or various liver extracts emphasizes the importance of giving sufficient quantities of liver and the equal effectiveness of liver extract. In the authors' opinion, the choice of liver itself or liver extract is immaterial.

TEXTILES AND CLOTHING

Practical textile microscopy, E. R. Schwarz (*Amer. Dyestuff Rptr., Sample Swatch Quart., 1928, Apr., pp. 261–266, figs. 7*).—Practical information on the use, technique, and possibilities of microscopy in textile investigation.

The relation between atmospheric humidity and the breaking strengths and extensibilities of textile fabrics before and after weathering, A. J. Turner (*Jour. Textile Inst., 19 (1928), No. 4, pp. T101–T168, figs. 11*).—Extensive tests were made on flax and cotton fabrics, some of which were doped, ramie and jute fabrics, and several other materials at 30, 50, 70, and 90 per cent relative humidity and wet, in both warp and weft directions. After testing, certain of the fabrics were also weathered for from 30 to 90 days. The expression "humidity-strength coefficient" introduced denotes the percentage of increase of strength resulting from an increase of relative humidity of 1 per cent, the increase being expressed in terms of the strength at 70 per cent relative humidity.

Humidity-strength coefficients, applying roughly to fabrics weighing 4 oz per square yard or less and not chemically treated nor exposed to sunlight, were for cotton 0.2, flax 0.4, ramie 0.4, jute 0.1, and silk —0.6. The value for the weft of cotton fabrics is less than that for the warp. For flax fabrics at low humidities the coefficient is much less in value and at high humidities decidedly exceeds that stated, both for warp and weft directions. For silk the value given applies only between 50 and 90 per cent relative humidity.

The coefficient for heavy fabrics decidedly exceeded that of light weight fabrics from the same fiber, this difference seeming to depend on fabric structure and its magnitude upon the dimensions of the specimens used. Various physical differences between yarns and fabrics from any one fiber, e. g., in counts and twists of yarns and calendering of the fabric, appeared to affect the coefficient value only slightly. Chemical treatments could make profound changes in the values; for example, mercerization caused decided reductions in the coefficients of cotton fabrics. The effect of doping a fabric depends largely upon its extensibility. When the extensibility is below a certain limit the effect on strength is considerable, but quite small if it exceeds this limit.

The coefficients of all classes of fabrics were greatly changed by weathering. Fabrics which unweathered have positive coefficients tended increasingly to possess negative coefficients as weathering was extended. In those fabrics with a negative coefficient in the unweathered state the coefficient becomes still more markedly negative as weathering proceeds. It is concluded that weathering experiments carried on without due regard to these humidity effects in testing can not be considered entirely satisfactory. The extensibility of a fabric increased with the humidity. When fabrics are weathered they become water-shrunk almost immediately, and so initially the extensibility increases. However, as a consequence of further weathering, the extensibility becomes less as the humidity increases.

An examination of the conditions operating in the ordinary breaking test for textile fabrics showed that in such a test there must usually be an inequality of stress distribution as between the different threads under test in any given test specimen. The consequences of known properties of the individual textile

fibers upon their behavior in their aggregations as yarns and fabrics are traced, particularly in connection with the effect of humidity on these properties.

Strength of oiled cotton cloth, A. H. Gill and W. D. McJennett (*Textile World, 73 (1928), No. 17, pp. 43, 45*).—In experiments at the Massachusetts Institute of Technology cotton strips were oiled with raw and boiled American and Calcutta linseed oils with and without 1.5 per cent of Japan drier. One set of samples had been prepared in 1894 and another in June, 1927. The strength test results showed showed that at first the oil acts as a glue, making the cloth stronger, whereas the samples usually showed a loss, due to oxidation, after the first gain. Those samples which after oiling were dried in a hot closet seemed to show a somewhat greater gain in strength than those dried in the open air, while the hot-dried ones showed almost twice as large a loss during the second week. When dried at 60° C. (140° F.) the oils with the drier seemed to gain less in strength than those without, while the subsequent loss was the same. In samples dried in the open air, oil without drier gave a greater gain in strength with only a slightly larger subsequent loss. With either drying method there was little difference between the same oil with and without drier, except in the case of boiled Calcutta oil.

When gray cloth unoiled was broken the load increased steadily up to the point of breaking, and the sample broke a few threads scattering over the specimen. After oiling the load increased steadily until a maximum was reached, remaining constant for several seconds without the sample showing any change. Then the sample broke suddenly, generally in a nearly straight line across the sample.

The identification of fungi causing mildew in cotton goods: The genus Aspergillus, G. Smith (*Jour. Textile Inst., 19 (1928), No. 3, pp. T92–T100, pls. 4*).—The general morphology of the Aspergilli is described, with special reference to growth on cotton, and laboratory methods are outlined. The fungi described includes one group embracing all Aspergillus species which have been identified as the causal agents in actual cases of mildew damage of yarns and cloths, and a second group comprising several species found to occur commonly as spore infections of commercial yarns but not so far found growing on cotton goods.

Effectiveness of materials used for waterproofing canvas and their influence on the fabric, T. D. Jarrell and H. P. Holman (*Textile World, 73 (1928), No. 20, pp. 41, 43*).—A review of results of investigations by the U. S. D. A. Bureau of Chemistry and Soils gives information on the need for waterproofing canvas, the way waterproofing affects durability, the cheapest and best waterproofing materials, objections to paraffin, application of bituminous materials, treatments for paulins, lightweight tent fabrics, and awning materials, and on the testing of treated canvas for water resistance.

Advantages of controlling hydrogen-ion concentration in wet processes of wool manufacturing, C. E. Mullin (*Textile World, 73 (1928), Nos. 17, pp. 45–49; 20, pp. 32–34*).—This article points out some of the processes in the wool industry, wherein pH control has been applied successfully, and indicates other possible applications.

Hospital and institutional cotton textiles (*U. S. Dept. Com., Simplified Pract. Recom. No. 74 (1928), pp. VIII+12, fig. 1*).—Sizes are recommended for textiles for adult beds, cribs, and bassinets, bureau scarfs, and towels.

Cotton sewing thread and cottons for handwork (*U. S. Tariff Comn., Tariff Inform. Surveys [Pub.] I–2 (1927), pp. X+72, pls. 4*).—Information is given on the construction, twist, finishes, sizes, numbering, colors, and yardage of, and demand for, cotton sewing thread; on darning, mending, crochet, and embroidery cottons; and on domestic and foreign production and commercial movement, prices, and tariff considerations.

Dyes and dyeing, C. E. Pellew (*New York: Robert M. McBride & Co., 1928, rev. ed., pp. 362, pls. 22, figs. 2*).—"This book is intended for the use of craftsmen and others who are trying to dye and stain textiles by hand and on a small scale, rather than for professional dyers or dyeing chemists who are interested in factory dyeing, conducted on a large scale." Practical information on the various types of dyes and their application to the different textiles is given, and chapters are also devoted to the dyeing of baskets, straw hats and their component materials; feathers; and leather; tied and dyed work; stencils and stenciling; and batik or wax resist.

MISCELLANEOUS

Yearbook of Agriculture, 1927, W. M. Jardine et al. (*U. S. Dept. Agr. Yearbook 1927, pp. XXII+1234, figs. 294*).—This contains the report of the Secretary of Agriculture, a financial statement as to the Department's expenditures and income for the fiscal year ended June 30, 1927, over 300 brief articles arranged alphabetically by subjects and discussing recent developments under the general title of What's New in Agriculture, miscellaneous lists, and the usual statistics noted on page 486.

Report of the director [of Connecticut Storrs Station], 1927, W. L. Slate (*Connecticut Storrs Sta. Bul. 149 (1928), pp. 317–340, figs. 5*).—This contains the organization list, a report of the director, and a financial statement for the fiscal year ended June 30, 1927. The experimental work reported is for the most part abstracted elsewhere in this issue.

The Fortieth Annual Report of the Maryland Agricultural Experiment Station, [1927], H. J. Patterson (*Maryland Sta. Rpt. 1927, p. XXX+199, figs. 42*).—This contains the organization list, a report by the director on the work and publications of the station, a financial statement for the fiscal year ended June 30, 1927, reprints of Buls. 283–290, all of which have been previously noted, and a list and subject index of all bulletins and reports thus far issued.

[Thirty-ninth Annual Report of the Michigan Station, 1926], R. S. Shaw et al. (*Michigan Sta. Rpt. 1926, pp. 219–317, figs. 20*).—This report, supplementing that of the director previously noted (E. S. R., 57, p. 697), contains a financial statement for the year ended June 30, 1926, and reports of the director and heads of departments on the work of the station during the year, the experimental features of which are for the most part abstracted elsewhere in this issue.

Report of the Virgin Islands Agricultural Experiment Station, 1927, J. B. Thompson et al. (*Virgin Islands Sta. Rpt. 1927, pp. [2]+17, figs. 7*).—This includes the organization list, reports by the director, the horticulturist, and the agronomist as to the work of the station for the fiscal year ended June 30, 1927, and a special report on work on St. Thomas and St. John, by W. M. Perry. The experimental work reported is for the most part abstracted elsewhere in this issue, as are also meteorological observations.

The Bimonthly Bulletin, Ohio Agricultural Experiment Station, [May–June, 1928] (*Ohio Sta. Bimo. Bul., 13 (1928), No. 3, pp. 81–128, figs. 21*).—This number contains, in addition to several articles abstracted elsewhere in this issue, the following: Gold Medal Cows in the Station Dairy Herd, by C. C. Hayden (pp. 103–105); Field Days at the Experiment Station (p. 112); and Why Let Lice and Mites Take Poultry? (p. 124).

NOTES

Delaware University and Station.—C. R. Runk, associate professor of agronomy and associate agronomist, has resigned, effective July 31, to engage in commercial work and has been succeeded by Dr. H. C. Harris as assistant in agronomy and soils. O. A. Pope, instructor in agronomy and assistant agronomist, has resigned to accept a scholarship at the Iowa College. Dr. C. L. Benner, professor of agricultural economics and agricultural economist, has been given a year's leave of absence to engage in commercial work. R. O. Bausman, formerly county agent, has been appointed assistant economist in the station. G. L. Schuster, chief in agronomy, has returned from a year's leave of absence at Cornell University.

Iowa College and Station.—*Science* notes that Dr. C. H. Richardson, entomologist in the U. S. D. A. Bureau of Entomology, has been appointed associate professor of entomology and assistant chief of the entomological section of the station. Perkins Coville, instructor in forestry, has been appointed associate silviculturist in the Office of Forest Experiment Stations of the U. S. D. A. Forest Service.

Mississippi Station.—Following an appropriation by the last legislature of $15,000 per annum for special pecan investigations and other work in Adams County, an appropriation of $25,000 has been made by the county to purchase land and equipment for a permanent substation. The site has not yet been definitely decided upon.

New Hampshire College and Station.—T. B. Charles, associate professor of poultry husbandry and associate poultry husbandman in the Pennsylvania College and Station, has been appointed head of the poultry work vice A. W. Richardson, resigned to take up commercial work.

New Mexico College and Station.—The station has recently bought a tract of 12.72 acres of land adjacent to the present horticultural farm.

C. N. Moore has been elected president of the board of regents to succeed Mark B. Thompson, resigned. H. M. Gardner has been appointed dean of agriculture and professor of agricultural education, effective September 1, vice C. D. Bohannan, whose resignation has been previously noted.

Cornell University and Station.—New courses in the New York State College of Agriculture are to be added in sales management, practical livestock management, advanced poultry marketing, psychology of learning, training voluntary leaders of juvenile groups, and a general seminar in rural education.

During the past year 2,997 persons were registered and 10,748 reports were received in the free correspondence courses offered in 28 subjects by the College of Agriculture. Of these junior farm mechanics was first with 3,851 reports, poultry flock management second with 1,437, and junior woodworking third with 1,172. Following these came the course in chick rearing with 795 reports, gas engines with 629, and the first course in farm management with 345. Other courses in which students were enrolled were agricultural prices, beekeeping, soil management, cooperative marketing, dairy herd improvement, three other courses in farm management, farm mechanics, feeding and management of dairy cows, market gardening, home gardening, marketing poultry products, muck crops, orchard fruits, pork production, poultry breeding and

incubation, sheep and wool production, rearing calves and heifers, small fruits, truck crops, and vegetable forcing.

The retirement as professor emeritus after 40 years' service is noted of Henry H. Wing, professor of animal husbandry and head of the department. Professor Wing was graduated from the university in 1881 and, after short periods of service as assistant in the newly established New York State Experiment Station from 1882 to 1884 and instructor in agriculture and farm superintendent at the University of Nebraska from 1884 to 1888, returned to it in 1888 as deputy director and secretary of the station upon its reorganization under the Hatch Act. He was subsequently continuously associated with the upbuilding of the animal husbandry work, which for many years included that in dairying, and has been actively concerned with the great development which has taken place in both these fields.

Effective June 30, the resignations are noted of H. W. Schneck, assistant professor of vegetable gardening, and F. Beatrice Hunter, professor, Dr. Helen Bull, acting professor, and Dr. Edith H. Nason and Charlotte E. Weiss, assistant professors, in home economics.

Rhode Island Station.—R. Berniece Neil has been appointed assistant research worker in home economics and began work July 1.

Texas Station.—W. S. Hotchkiss, superintendent of Substation No. 2 at Troup since 1903, died July 14 at the age of 54 years. He had previously been connected with the horticultural work of the Michigan Station and the University of Illinois. Under his management the work of the Troup Substation was brought to a high degree of efficiency, and he contributed largely to the development which has taken place in east Texas along horticultural lines.

Dr. Walter F. Ezekiel has been appointed plant pathologist in the cotton root rot project of the station vice Dr. L. J. Pessin.

Utah Station.—The administrative offices of the station have been moved from the old building occupied since 1889 to a suite on the main floor of the main building of the college, and conveniently located as regards the station library. The building formerly occupied by the station has been given over entirely to the extension service.

Wyoming University and Station.—A proved sire has been added to the dairy herd at the experiment farm in Lincoln County, and a number of heifers and cows have been purchased. Since this station is located in a section which is especially adapted to cheese making, the station will foster this industry and hopes to improve the general dairying conditions of the western part of the State.

The dairyman's cottage on the Archer Cooperative Experiment Farm is being remodeled.

James S. Wiant has been appointed instructor in agronomy and assistant agronomist in plant pathology, vice O. T. Bonnett resigned, beginning July 1. Leo J. Paschal has been appointed assistant animal husbandman, beginning on the same date. Donald R. Sabin, superintendent of the Campbell County Experiment Farm, has been appointed crops and soils specialist vice Roy O. Westley, resigned to become county agent of Albany County, and has been succeeded by Clarence Best.

The Fourth Pacific Science Congress.—This congress is to be held at Batavia May 16–25, 1929. Dr. O. de Vries, director of the Rubber Experiment Station at Buitenzorg, has been appointed president of the congress, succeeding Dr. A. A. L. Rutgers, director of the Department of Agriculture, Industry, and Commerce of the Dutch East Indies, who has resigned to accept an appointment as governor of Surinam.

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EXPERIMENT STATION RECORD

VOL. 59 OCTOBER ABSTRACT NUMBER NO. 6

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

Studies of chaulmoogra-group oils.—II, With special reference to refining and the isolation of hydnocarpic acid, G. A. PERKINS, A. O. CRUZ, and M. O. REYES (*Indus. and Engin. Chem., 19 (1927), No. 8, pp. 939–942*).—This is a contribution from the chemical section of the Philippine Health Service and deals with the sources and methods of preparation of hydnocarpic acid and its esters, valuable in the treatment of leprosy. The more significant findings are summarized as follows:

"*Hydnocarpus wightiana* oil is more economical than chaulmoogra, because obtainable in better quality. *H. wightiana* oil is also more suitable for the preparation of hydnocarpic acid. By fractionation of the ethyl esters from this oil nearly pure ethyl hydnocarpate can be obtained, whereas the corresponding fraction from chaulmoogra ethyl esters is contaminated with ethyl palmitate. Hydnocarpic acid was obtained in considerably better yields and purer condition than previously reported."

A previous paper in this series has been noted (E. S. R., 51, p. 313).

Effect of pH on adsorption by carbons, S. M. HAUGE and J. J. WILLAMAN (*Indus. and Engin. Chem., 19 (1927), No. 8, pp. 943–953, figs. 11*).—In this contribution from the Minnesota Experiment Station report is made of a quantitative study of the adsorption both of electronegatively and of electropositively charged substances and also of amphoteric electrolytes (proteins) and of nonelectrolytes. The electrophoretic behavior of the substances of which the adsorption was investigated was also ascertained, together with the apparent isoelectric point of the various charcoals.

In the cases of the electronegatively charged colloids, caramel and benzoazurin, adsorption increased with increase in the acidity of the solution, while electropositive substances (methylene blue) were increasingly adsorbed with increasing alkalinity. The adsorption of amphoteric electrolytes (protein) was found to show a maximum at the isoelectric point of the substance, with decided minima under extreme conditions either of acidity or of alkalinity. The adsorption of the nonelectrolyte dextrose was not found to be influenced by the pH value of the solution from which adsorption took place.

"In the application of carbons to specific requirements as encountered in industries, three factors should be considered—the electrical properties of the substances to be adsorbed, the electrical properties of the available carbons, and the permissible pH of the solutions used. Information concerning these properties should act as a guide in the choice of the carbon best adapted to the specific need, as well as the optimum conditions for the adsorption efficiency."

Conditions of flow into the vertical capillary tube of the Saybolt thermoviscometer, W. H. Herschel (*Indus. and Engin. Chem., 19 (1927), No. 7, pp. 837–840, figs. 3*).—The equations of flow applicable to the instrument in question are briefly reviewed, and the conclusion is stated that, although it has been assumed in previous work that the drainage error and "end effects" are negligible and that the differences between the observed and the calculated times of flow were due to inaccuracies in the measurement of the diameter of the capillary, these errors were found to cause actually a reduction of about 9 per cent in the time of flow as compared with the values calculated on the assumption that such errors are negligible. The data upon which this conclusion is based are presented in the form of tables and graphs and are explained with reference to a diagram of the apparatus.

Outlets for ammonia—present and prospective, V. N. Morris (*Indus. and Engin. Chem., 19 (1927), No. 8, pp. 912–917, fig. 1*).—This is a general review of the use of ammonia for refrigeration, nitric acid from synthetic ammonia for the manufacture of explosives, etc., but is principally concerned with the possibilities of the various synthetic ammoniacal and nitrate fertilizers now in use, under process of development, or apparently capable of commercial development. In the latter connection ammonium, calcium, and potassium nitrates, ammonium sulfate, ammonium phosphate, carbamate, carbonate, and bicarbonate, urea, and such mixtures as, for example, calcium nitrate with calcium monophosphate, made by absorbing the oxides of nitrogen formed in the oxidation of ammonia in a suspension of phosphate rock, are discussed.

The quantitative determination of nitrites in soil. R. P. Bartholomew (*Soil Sci., 25 (1928), No. 5, pp. 393–398*).—Noting that water extracts of soils for colorimetric nitrite estimation are frequently too turbid for use without further clarification when calcium hydroxide is used as flocculating agent, the author of this contribution from the Arkansas Experiment Station reports experiments in which aluminum sulfate was used as flocculant with the subsequent addition of calcium hydroxide to precipitate the aluminum and hasten the clarification.

The effect of treatment with hydrous aluminum sulfate, followed by calcium hydroxide, was first tried with known concentrations of nitrites, with the result that neither reagent alone nor the two in combination were found to have any interfering action in the low concentrations (0.05 to 0.10 part per million) of nitrite tested. It was found, however, that neither standard nor test solutions containing more than 0.2 part per million of nitrite could be used, higher concentrations resulting in the precipitation of a part of the color so that colorimetric readings could not be secured. The extraction of the soil sample (50 gm.) with 250 cc. of a solution of 4.8 gm. of aluminum sulfate per liter, followed, after 10 minutes extraction with shaking, by the addition of 1 gm. of calcium hydroxide well shaken into mixture, constituted a satisfactory method, as evidenced by determinations of known added quantities of nitrite in 12 soils. By means of this method a study was made of the rate of conversion of nitrite to nitrate in several soils, and the conclusion was reached that in unsterilized soils the oxidation of nitrites is rapid and is largely due to biological reaction.

The fluorine content of phosphate rock, K. D. Jacob and D. S. Reynolds (*Jour. Assoc. Off. Agr. Chem., 11 (1928), No. 2, pp. 237–250*).—Applying the method above noted, the authors found the fluorine content of 20 samples of various commercial grades of Florida land pebble phosphate to vary from 3.86 to 4.08 per cent, the average being 3.94 per cent. Tennessee brown rock phosphate showed, in 13 samples, fluorine percentages of from 3.22 to 4.08, the aver-

age for 9 samples of the usual commercial grades, from 68 to 75 per cent calcium phosphate, being 3.67 per cent of fluorine. Of the usual commercial grades of Tennessee blue rock phosphate, 4 samples contained from 3.37 to 3.95 per cent of fluorine, the average being 3.67 per cent. Idaho and Wyoming phosphate rocks, from 63.5 to 72 per cent calcium phosphate, showed a fluorine content of from 3.34 to 3.70 per cent. Analyses of superphosphate from Florida land pebble phosphate indicated that about 25 per cent of the phosphate rock fluorine is volatilized in the manufacturing process. Some further similar data are recorded.

Volatilization method for the determination of fluorine, with special reference to the analysis of phosphate rock, D. S. Reynolds, W. H. Ross, and K. D. Jacob (*Jour. Assoc. Off. Agr. Chem., 11 (1928), No. 2, pp. 225–236, figs. 2*).—An improved form of the volatilization method for determining fluorine is described. This method is based upon the formation of silicon tetrafluoride by digestion of the fluoride-bearing material with from 98 to 98.5 per cent sulfuric acid in the presence of silica flour, a current of dry air being drawn through the apparatus to carry the silicofluoride through purifying reagents, designed to remove sulfur dioxide, oxides of nitrogen, etc., and ultimately into water where the gas is converted into hydrofluosilicic acid and determined by titration with sodium hydroxide.

The introduction of an improved form of digestion flask for the decomposition of the sample with sulfuric acid and silica is especially noted, the boiling of the sulfuric acid, considered by the authors to be a distinctly dangerous operation, being avoided by the aspirated air current and the use of the steady electric heating recommended. It was found possible to recover from 92 to 94 per cent of the fluorine added in the form of pure calcium fluoride in a 1-hour digestion of the sample with from 98 to 98.5 per cent sulfuric acid at 300° C. Calcium, iron, and aluminum phosphates and sodium arsenate were found not to interfere with fluorine recovery, but boron in the form of borax did interfere. By adding lime it was possible to ignite phosphate rock samples for the removal of organic matter at temperatures up to 750° without loss of fluorine.

On the methods of determining fat in plant substances [trans. title], N. D. Prianishnikov and V. V. Iakovlev (*Nauch. Agron. Zhur. (Jour. Landw. Wiss.), 3 (1926), No. 5–6, pp. 407–409, figs. 2*).—The authors compared the method of Soxhlet with that of Ban[1] for the extraction of fat, finding that the Ban method takes less time (from 6 to 7 hours instead of 12 hours) and requires less ether (from 20 to 30 cc. instead of from 80 to 100 cc.). Its apparatus is also simple and cheap, the determination of the residue replacing that of the fat, permitting the use of a solvent of high boiling point, such as benzene. The authors give a diagram of the original Ban extractor and of one of their own, somewhat simplified.

Methods for the analysis of cereals and cereal products, compiled by D. A. Coleman et al. (*Lancaster, Pa.: Lancaster Press, 1928, pp. 176*).—This is a collection of revised methods of analysis selected by the committee on methods of analysis of the American Association of Cereal Chemists and is assembled in loose-leaf form to facilitate additions and revisions. The methods given cover in separate sections wheat, wheat flour, feeding stuffs, bread, and alimentary pastes, and include also a group of miscellaneous determinations. Pages 106 to 176, inclusive, are occupied by tables, revised wherever this has been considered necessary, and designed to assist in the analytical procedure described in the text.

[1] Ztschr. Angew. Chem., 37 (1924), No. 20, p. 290.

Estimation of buttermilk or milk product in a mixed feed by determination of the lactose present, M. R. Coe (*Jour. Assoc. Off. Agr. Chem., 11 (1928), No. 2, pp. 251–257*).—Following the development of a form of the picric acid reduction method especially adapted to buttermilk, the author studied the estimation of dried buttermilk in feeds from the lactose content, for which latter purpose the following form of the lactose method and calculation are proposed:

Reagents.—(1) Dry picric acid of any good grade, (2) 22 per cent solution of sodium carbonate, (3) saturated solution of picric acid and containing 0.0002 gm. of lactose as the standard (this will keep indefinitely in the dark), (4) alumina cream, and (5) 15 per cent solution of sodium tungstate.

Method.—Grind the feed until it passes a 40-mesh sieve and weigh out a 10-gm. sample. Extract with 20 cc. of ether, place in a 300-cc. volumetric flask, and add 2 cc. of distilled water. Heat the flask and contents in the steam bath for exactly 30 minutes, shaking frequently to dissolve all the lactose. After cooling make up to mark. Filter through a Büchner funnel into a flask, and then transfer 150 cc. of the filtrate to a 200-cc. volumetric flask. Add 20 cc. or more of alumina cream, make up to mark, and filter. Pipette 150 cc. of the clear filtrate into a 300-cc. Erlenmeyer flask, boil, cool, and add 0.75 gm. of compressed or brewer's yeast. Allow the mixture to ferment overnight at 25–30° C. (In cool weather at least 2 days may be necessary.) Boil off the carbon dioxide and alcohol and transfer to a 100-cc. volumetric flask. Add 5 cc. of sodium tungstate and 5 drops of thymol lime. Acidify, drop by drop, with concentrated sulfuric acid until a pink color appears, and then add 10 drops more. (The pH of the solution should be 1.5–2.0 for a complete precipitation.) Make up to mark and let stand overnight. If no precipitate appears, add 10 drops more of acid and allow to stand overnight. Filter the next morning. (The filtrate should be clear.) Saturate 30 cc. of the filtrate with picric acid, allow to stand 20 minutes, shaking frequently, and refilter. Place 10 cc. of the filtrate in a Nessler tube so carefully that not even a drop touches the sides in the operation, add 3 cc. of the 22 per cent carbonate solution, and heat in the steam bath for 15 minutes with a standard tube containing 3 cc. of the picric acid solution plus 1 cc. of sodium carbonate. (The color that develops depends on the quantity of sugar present.) After cooling, dilute the solution to a shade a trifle darker than the standard, the latter being diluted to 30 cc. Run a standard with each set of unknowns because the color changes after standing. The Bürker colorimeter is satisfactory for making comparisons. The lactose content and the amount of buttermilk it represents is computed by the following formula:

$$X=\frac{300}{150}\times\frac{200}{150}\times\frac{150}{100}\times\frac{100}{10}\times\frac{\text{dilution of sample}}{\text{dilution of standard}}\times\frac{\text{reading of standard}}{\text{reading of sample}}\times\frac{0.0006\times 100}{W(10)},$$

W=weight of sample,

X=per cent of lactose,

Y=per cent of buttermilk in feed$=\frac{X\times 100}{B}$,

B=the factor (8, 26, or 40) for lactose in the buttermilk used.

Multiply Y by 0.975 to allow for the volume occupied by sample. When using the gravimetric method at least 50 cc. of the clear filtrate would be required.

Detection of lactic acid in presence of other organic acids, F. G. Germuth (*Indus. and Engin. Chem., 19 (1927), No. 7, pp. 852, 853*).—It was found possible to identify lactic acid and its salts, alone or in mixture with such other organic acids as are largely employed for medical purposes when in concentra-

tions of from 0.5 to 5.0 per cent, by means of a 15 per cent potassium thiocyanate solution with the addition of concentrated hydrochloric acid in slight excess of neutrality. In the case of lactates, the lactic acid is set free with a slight excess of hydrochloric acid. The color produced ranges from orange to purplish red. This color is distinguishable from that produced by ferric salts with potassium thiocyanate by adding a concentrated solution of mercuric chloride, this reagent immediately discharging even a strong ferric thiocyanate color while having no effect on the color due to lactic acid. It was found that on adding the potassium thiocyanate reagent to each of two equal portions of an acidified calcium lactate solution, one of which contained ferric iron, the intense color of the iron containing solution became exactly similar to that of the solution containing no iron on adding mercuric chloride solution, the lactic acid color remaining unaltered in both cases, while the color due to the iron was promptly bleached.

Determination of citric acid in fruits and fruit products, B. G. HARTMANN and F. HILLIG (*Jour. Assoc. Off. Agr. Chem., 11 (1928), No. 2, pp. 257–266*).—The following procedure, accompanied by a considerable body of data presented in evidence of the accuracy of the method, is proposed:

Reagents.—(1) Dissolve 50 gm. of potassium bromide in water and dilute to 100 cc., (2) dissolve 5 gm. of potassium permanganate in water and dilute to 100 cc., and (3) dissolve 40 gm. of ferrous sulfate in 100 cc. of water containing 1 cc. of concentrated sulfuric acid.

Method.—Prepare a solution which will contain approximately 25 per cent of solids, either by diluting with water or adding sucrose. If alcohol is present, completely remove by evaporation. Place 100 gm. of the adjusted solution on the steam bath for 15 minutes. Immediately neutralize with 20 per cent potassium hydroxide solution, adding 5 cc. in excess, and allow to stand overnight. Add 40 cc. of a 43 per cent sulfuric acid solution and heat to 50° C. on the water bath for 15 minutes. Cool, transfer to a 200-cc. volumetric flask, make to mark, and filter. The portion required for the determination, 100 cc. of the above filtrate, should contain approximately 100 mg. of citric acid. If the 100 cc. of solution does not contain the required quantity, add pure citric acid. If large quantities of citric acid are present, it will, of course, be necessary to use a smaller quantity of material for the adjustment.

Transfer 100 cc. of the prepared filtrate to a 500-cc. Erlenmeyer flask, add about 0.3 gm. of purified asbestos and 25 cc. of the potassium bromide solution, and hold at from 48 to 50° for 30 minutes. Add 125 cc. of the potassium permanganate solution in 3 portions in rapid succession, shaking after each addition. Do not allow the temperature to rise above 55°. Hold at this temperature for 5 minutes after the first portion of the permanganate solution is added and immediately add 30 cc. of the ferrous sulfate solution to remove the manganese dioxide. Cool, and, without agitating further, place in a refrigerator overnight. Decant onto a thin, tightly tamped pad of asbestos in a Gooch crucible, transferring the precipitate to the crucible with a portion of the clear filtrate. Wash the contents of the crucible at once with 3 portions of 20 cc. each of ice-cold sulfuric acid (1+100) and 3 portions of 20 cc. each of ice-cold water. Dry the precipitate to constant weight over sulfuric acid in a vacuum desiccator, protecting from strong light. Weigh, and remove the pentabromacetone with 3 portions of 20 cc. each of 95 per cent alcohol and 3 portions of 20 cc. each of ether. Again dry and weigh. Multiply the weight of pentabromacetone by 0.424 to obtain anhydrous citric acid. Correct for loss of citric acid by multiplying the weight of the citric acid determined by the factor 1.14. If citric acid has been added, make allowance. (In order to expedite the process, the precipitate may be dried in a current of air passed through sulfuric acid.)

Estimation of methanol in alcohol and alcoholic beverages, using the immersion refractometer, J. F. Williams (*Indus. and Engin. Chem., 19 (1927), No. 7, pp. 844, 845, fig. 1*).—The method proposed, described as simple, rapid, accurate, and involving a minimum of calculation, depends upon the relation between the apparent total percentage of alcohol, determined from the specific gravity, and the refractive index of a solution made 20 per cent on the basis of the total apparent ethyl alcohol content, the immersion refractometer being used for the optical determination. Values of the difference $R-P$, in which R is the refractive index read in the above-described 20 per cent at 20° C. and P the total apparent ethyl alcohol as above defined, are tabulated against percentages of methanol by volume in 1-degree steps from 0 to 100. This table is based on determinations of P from the 20°/4° table of the Association of Official Agricultural Chemists (E. S. R., 55, p. 11). A graph prepared from the same data is also provided for a still more rapid estimation.

Direct iodimetric determination of glucose, A. Voorhies and A. M. Alvarado (*Indus. and Engin. Chem., 19 (1927), No. 7, pp. 848, 849*).—From a series of experiments, noted as being of a preliminary character, the inferences are drawn that the oxidation of glucose to gluconic acid takes place at room temperature "only in a strongly alkaline medium," and that in a weakly alkaline medium oxidation to the gluconic acid stage is incomplete "even at comparatively elevated temperatures." In the main series of experiments here reported "about 30 cc. of 0.1 N iodine solution were added to 24.95 cc. of 0.1 N glucose solution; 6 N sodium hydroxide was added until the color of the solution changed to a light yellow. After standing for a definite length of time the solution was acidified with 6 N hydrochloric acid. The excess of iodine was titrated with sodium thiosulfate, using starch as the indicator."

Work by others on glucose iodometry has been noted previously (E. S. R., 37, p. 714; 40, pp. 114, 312).

A criticism of the theory of the chemistry of saturation [trans. title], L. O. Shnaĭdman (*Nauch. Zap. Gosud. Èksper. Inst. Sakh. Promysh. [Kiev], 5 (1928), No. 9, pp. 273–278*).—When a sugar-lime-solution mixture, having an alkalinity 2.0–2.5, was saturated with CO_2 before thickening of the mass and filtered, it was observed that the polarization of the filtrate was lowered as compared with that of the original solution. When the residue was washed until the wash water showed no polarization and analyzed for sucrose, none was detected. This observation might support the view that in the process of saturation of sugar solutions insoluble calcium sucrates are formed, provided the drop in polarization is constant. However, it was found that an increase in polarization may occur, and the alkalinity and the polarization are considered to depend upon the time when the fractions are analyzed. According to the author the chemistry of the process which takes place in the saturation vat may be represented as follows: $C_{12}H_{22}O_{11}CaO+CO_2=CaCO_3+C_{12}H_{22}O_{11}$.

In the first stage of saturation a colloidal solution of lime forms which with the decrease in alkalinity becomes unstable and begins to gel. The amorphous $CaCo_3$, by virtue of its high surface adsorption power, adsorbs from solution both the sucrose and the monosucrate of calcium. As the amorphous substance crystallizes the active surface decreases and with it the adsorption. This explains why in a delayed filtration the last fractions have more dry matter; there is less adsorption by the crystals than by the gel.

Observations on the crystallization of the fill-mass of the second product in the mixing vats [trans. title], B. È. Krasil'shchikov (*Nauch. Zap. Gosud. Eksper. Inst. Sakh. Promysh. [Kiev.], 5 (1928), No. 10, pp. 309–312, fig. 1*).—It was noted that with a fill-mass of a density 93.63 to 93.17 a lowering of the

coefficient of supersaturation took place, e. g., the crystallization progressed with the cooling of the fill-mass. With a fill-mass of a density 94.55 to 94.09 and at more rapid cooling, the coefficient of supersaturation began to increase with the starting of crystallization and remained high throughout. The purity of the intracrystalline liquid in the second series of experiments toward the end of crystallization was higher than in the first series.

The undetermined losses of sugar in the process of defecation-saturation [trans. title], L. O. Shnaĭdman (*Nauch. Zap. Gosud. Èksper. Inst. Sakh. Promysh.* [*Kiev*], *5 (1928), No. 10, pp. 322–328*).—In the chemical purification of the juices in the process of saturation, a loss of sugar is caused by the adsorptive power of the lime, the amount of this loss depending on the quality of lime obtained in the saturation process, on the lime added in the process of defecation, on the concentration of the sucrose in the juice, on the temperature, and, undoubtedly, on the reaction of the saturated juices. With the increase in the amount of lime used in the defecation, the coloration of the juices should diminish and the loss of dry matter increase. Under ordinary conditions of defecation-saturation, where 2.5 to 3 per cent CaO is added to the diffusion juice, the loss of sugar in the filter-press mud is from 0.7 to 0.9 per cent. Together with the sucrose, some nonsaccharine substances are adsorbed by the filter-press mud, and an analysis of these is important in order to establish the amount of sucrose lost.

On continuous diffusion [trans. title], A. P. Sokolov (*Nauch. Zap. Gosud. Èksper. Inst. Sakh. Promysh.* [*Kiev*], *5 (1928), No. 9, pp. 279–281, fig. 1*).—A description of an apparatus for continuous diffusion in the sugar plant, beginning with the loading of the shavings of the sugar beets, is given. A picture of the apparatus accompanies the article.

On the problem of regulating the density of milk of lime [trans. title], L. D'Iachuk (*Nauch. Zap. Gosud. Èksper. Inst. Sakh. Promysh.* [*Kiev*], *5 (1928), No. 9, pp. 285–287, fig. 1*).—The author describes in detail and illustrates with a diagram a new type of regulator which controls the introduction of the lime during the process of saturation, etc. It is automatic, easy to clean, and simple in construction.

On washing the filter-press mud [trans. title], B. È. Krasil'shchikov (*Nauch. Zap. Gosud. Èksper. Inst. Sakh. Promysh.* [*Kiev*], *5 (1928), No. 9, pp. 287–290*).—Tests were made on the comparative efficiency of cold and ammoniacal hot water washing of the filter-press mud. It was found that there is more sugar in the cold water washings. The hot ammoniacal treatment takes out more solids but less sugar.

METEOROLOGY

The influence of forests on rainfall and run-off, C. E. P. Brooks (*Quart. Jour. Roy. Met. Soc.* [*London*], *54 (1928), No. 225, pp. 1–17, fig. 1*).—Reviewing the work of others on this subject, the author sums up the influence of forests on rainfall and run-off as follows:

"The replacement of forests by field crops or grassland probably tends to increase the general rainfall of the district slightly; their replacement by bare ground probably tends to decrease the general rainfall slightly.

"Forests increase the local rainfall by 1 to 2 per cent, this effect being due to the increase in the effective level of the ground by the height of the trees, and by the greater friction of the wind with the tree surface compared with open ground. To this may be added, in favorable mountain situations, an

increased supply of water collected mechanically from clouds which envelop the forests.

"Afforestation of grass or crop land probably increases the local run-off by 10 to 20 per cent, this amount being made up partly by the decreased loss of water in evaporation and transpiration, partly in the slight increase of actual rainfall. This is likely to be the most noticeable effect of afforestation. Afforestation of bare ground would decrease the run-off, but this effect would be masked by the much greater regularity of the flow.

"Forests, drawing their water supply from deep sources, possibly exercise a slight mitigating effect on droughts."

Forecasts for a week in advance based on Northern Hemisphere weather maps, C. L. MITCHELL (*Bul. Amer. Met. Soc., 9 (1928), No. 5, pp. 101, 102*).—Of 46 weekly temperature forecasts for the eastern United States, based on the map of the previous Saturday and the centers of all cyclones and anticyclones, together with the connecting troughs of low pressure and ridges of high pressure, "26 were considered satisfactory from the forecaster's standpoint, 4 were doubtful, and 16 were considered unsatisfactory. The weekly outlooks for temperature published by the Weather Bureau for the Middle Atlantic and North Atlantic States for the same periods of time were verified as nearly as was practicable, and 15 of the 46 were considered satisfactory.

"Precipitation was predicted on 91 dates during the entire period of 276 days. It occurred at Washington 62 times on zero day, and 21 times within 1 day of zero day. Precipitation in excess of 0.01 in. occurred on 46 days out of the 185 days that fair weather was predicted. Inasmuch as the total number of failures was 75, the percentage of verification for the 46 weeks, for forecasts made 2 to 7 days ahead, was 72.8 per cent."

Climatological data for the United States by sections [January–February, 1928] (*U. S. Dept. Agr., Weather Bur. Climat. Data, 15 (1928), Nos. 1, pp. [198], pls. 3, figs. 2; 2, pp. [200], pls. 3, figs. 2*).—These numbers contain brief summaries and detailed tabular statements of climatological data for each State for January and February, 1928.

Meteorological observations, 1925–26 (*Guam Sta. Rpt. 1926, p. 19*).—A condensed summary of observations at the station on temperature, precipitation, and direction of the wind is given. "The weather during the year may be considered as having been normal, and the rainfall sufficient to make ideal growing conditions. No disastrous storms occurred."

Meteorological observations (*Maine Sta. Bul. 342 (1927), pp. 239, 240*).—A summary is given of monthly and annual temperature, precipitation, cloudiness, and wind velocity during 1927 at the University of Maine, Orono. The mean temperature for the year was 44.63° F., as compared with a 59-year mean of 41.99°. The annual precipitation was 40.41 in., as compared with the 59-year mean of 40.43 in. The snowfall was 86.25 in., practically coinciding with the 59-year mean (86.31 in.). The number of clear days was 138.

Meteorological conditions at Aberystwyth, 1894–1927, M. G. JONES (*Welsh Jour. Agr., 4 (1928), pp. 254–268, figs. 3*).—Summarizing and digesting data on rainfall, temperature, and sunshine, the author concludes that "apart from the alternation of day and night, the chief factor that governs the weather is the variation in length of day, which having a regular periodicity sets an oscillating limit to the maximum hours of sunshine and also causes a corresponding periodicity in temperature. . . .

"When comparing the variation in temperature from month to month on the 34-year average, it was found that the rise or the fall fluctuated with the length of day. When the variation for the same month in different years is

considered, it is found that the temperature does not vary with sunshine or rainfall to any close degree. From general experience of the time at which the growth seasons commenced, however, the temperature factor is of supreme importance. The data collected for the last 8 years strongly suggest that the time at which the temperature crossed the 45° F. was roughly the beginning of the active growing season for most of our commonly grown farm crops and pastures, but before this can be verified it is necessary to have accurate phenological data."

SOILS—FERTILIZERS

The hydrometer method for studying soils, G. J. Bouyoucos (*Soil Sci., 25 (1928), No, 5. pp. 365–369*).—This is a defense of the author's hydrometer method for mechanical analysis (E. S. R., 57, p. 809) and for colloid determinations (E. S. R., 57, p. 710) in soils against criticisms by Joseph (E. S. R., 58, p. 513) and by Keen.[2] The argument consists primarily in the presentation of new data actually obtained by the hydrometer method, but the theoretical objections are also taken up. The experimental work detailed was done at the Michigan Experiment Station.

Making mechanical analyses of soils in fifteen minutes, G. J. Bouyoucos (*Soil Sci., 25 (1928), No. 6, pp. 473–480*).—This report, from the Michigan Experiment Station, continues the author's discussion of the hydrometer as a means for the mechanical analysis of soils (E. S. R., 57, p. 809) and the determination of soil colloids (E. S. R., 57, p. 710). It is considered to have been already shown (see above) that the hydrometer gives an average measurement of density for the entire liquid down to the top of the column of soil solids. The present paper presents determinations of the combined sand, the silt, and the clay, or colloids, in 30 soils, as compared with similar data on the same samples secured by the U. S. D. A. Bureau of Soils with the use of the usual mechanical analysis procedure. It also discusses, as in the preceding papers, above noted, the differences in the silt and clay fractions as determined by the two methods in cases where a considerable portion of the silt is of the finer sizes, reiterating the view that in such cases the silt fine enough to be classed as clay by the hydrometer method should properly be included with the clay, and briefly discusses the application of Stokes law to the calculation of particle size from the hydrometer method data. The conclusions are essentially those noted in the previous papers supported by additional experimental evidence.

The use of highly viscous fluids in the determination of volume-weight of soils, S. H. Beckett (*Soil Sci., 25 (1928), No. 6, pp. 481–483*).—Report is made from the California Experiment Station of a method of which the following is an abbreviated statement:

A cheap fluid of high viscosity was obtained (heavy road oil, heavy fuel oil, or heavy cane sirup were tried with little variation in results), and its specific gravity determined by weighing 1,000 cc. The soil mulch was removed and an area of about 2 sq. ft. carefully leveled. An auger hole was then put down to the depth desired, all of the soil removed being conserved and its dry weight obtained by drying at a temperature of 110° F. The auger hole was rapidly filled with the fluid, the volume added being determined by weighing the container and the fluid before and after filling the hole. From the dry weight of soil and the volume of the fluid, the volume weight was determined.

With each determination made by this method from 3 to 6 determinations were made by the soil tube, the conclusion being reached that the new method

[2] Soil Sci., 25 (1928), No. 1, pp. 9–20.

appears to furnish a rapid and accurate means of verifying the results of the soil-tube method. The level of the heavy sirup dropped but 0.25 in. in 30 minutes, whereas not more than 15 seconds was found to be required for filling the holes. The effect of change in temperature upon the volume of the liquids was found so slight during the brief time occupied in filling the holes that it could not be measured.

A simple speed controller, especially adapted to the moisture-equivalent centrifuge, F. J. VEIHMEYER and C. V. GIVAN (*Soil Sci., 25 (1928), No. 6, pp. 455–461, figs. 4*).—A detailed description, wiring diagrams, and illustration of this apparatus are given in this contribution from the California Experiment Station. It is noted that "the principal advantage of the vibrating reed controller . . . is that it can be constructed by any competent laboratory mechanic at a low cost."

Soil survey of Plymouth County, Iowa, D. S. and A. L. GRAY (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1923, pp. III+799–821, fig. 1, map 1*).—Plymouth County in northwestern Iowa comprises, according to this report prepared in cooperation with the Iowa Experiment Station, 550,400 acres of a broad plain, for the most part gently rolling, though rougher in its southern portion, and drained by the Big Sioux and Floyd Rivers with their tributaries. It is characterized with respect to soils by 14 types, assigned in this report to 10 series, of which Marshall silt loam, covering, with the inclusion of a shallow phase, 81.3 per cent of the entire area of the county, is predominant in extent. Wabash silt loam, 8.5 per cent, is next in areal importance.

The soil regions of the Terek District [trans. title], D. G. VILENSKIĬ (VILENSKY) (*Pochvovedenie (Pédologie), n. ser., 22 (1927), No. 3, pp. 27–41, figs. 3*).—In a preliminary survey of the soils in the Terek District (Caucasia), the author divides the district into three geomorphologic regions based on its topography. A map showing the types of soil in the district accompanies the description and discussion.

On the question of the boundaries between podzolized and forest-steppe zones [trans. title], R. S. IL'IN (ILYIN) (*Pochvovedenie (Pédologie), n. ser., 22 (1927), No. 3, pp. 5–26, pl. 1*).—Since the Government of Kaluga in west-central European Russia is located at the edge of the region of distribution of typical glacial deposits and on the border line of the podzolized and forest-steppe zones, its soils are adapted for the study of the problem of morphology, genesis, and classification of the transition soils from typical podzolized to typical forest-steppe. The distribution of the soils in the region seems to be predetermined with definite regularity. For each type, or rather each soil complex, there is a corresponding altitude, relief condition, and subsoil.

On the basis of this regularity, the soils are divided into groups: (1) Moraines and their derivatives, primarily alluvium (in the physical sense), (2) watershed clays which represent a chemical alluvium of the moraine, (3) loams and clays of diluvial origin with more or less definite characteristics of transition to forest-like types, and (4) fine sandy carbonate loam, loesslike loams, and loess. These four groups, with their parent material as given above, are typical of the higher altitudes of the region. In the low-lying spots a different undeveloped type of post-tertiary deposits is located—alluvial sands and fine sands, the subsoil of group 5. The strongly podzolized soils are typical in group 2 on the watersheds, and also in the moraine deposits of group 1. The less podzolized soils are found in group 5. The medium podzolized soils are found on the diluvial clays and loams of group 3. The slightly podzolized soils are located on the well-drained hillsides in groups 1, 3, and 5.

The cause for the slight development of podzols may be explained by the phenomenon that the soils before reaching the podzol state become waterlogged and are converted into the semimarsh types. This process is due to the impermeability of the lower portion of the B horizon. At this time the surface flora changes, and a peat subhorizon Ao develops underlaid with a semipeat A horizon. The soluble organic matter passing downward strikes the accumulated electrolytes of the impermeable layer, and coagulation takes place. The later development in the process is a disappearance of the ortstein, and eventually a chernozemlike type is developed.

This process in bordering podzol and forest-steppe zones is very characteristic of the region. The transition stages may be grouped in three subclasses: (1) Gray degraded forest-steppe soils, found in group 3 described above, (2) light gray forest-steppe soils, leaning toward podzolized soils, found on the loess forms of parent material in group 4, and (3) dark gray degraded forest-steppe soils. A detailed discussion of these subclasses in relation to the general scheme of genetic classification of the soils in the great Russian plain follows.

Colloidal soil material, P. L. Gile (*Soil Sci., 25 (1928), No. 5, pp. 359–364*).—This paper, a communication from the U. S. D. A. Bureau of Chemistry and Soils, is a brief critical discussion of the current definitions of colloids as found in soils. Though recognizing that colloidal soil material might simply and logically be defined as soil material having an appreciable adsorptive capacity and heat of wetting, the author appears somewhat more in favor of definition on the basis of particle size. Doubt is expressed, however, if the limiting of the term to particles of 1 μ or less diameter is desirable.

"As studies of the colloidal soil material progress, it will doubtless be necessary to distinguish between different kinds of colloidal material that may be present in the same soil."

Manganese as an active base in the soil, C. J. Schollenberger (*Soil Sci., 25 (1928), No. 5, pp. 357, 358*).—In experiments on the relation between surface and the rate of decomposition of calcite in soil, carried out at the Ohio Experiment Station, the calcite was observed to become coated with a film containing a large proportion of manganese. Further examination showed that, aside from an increase in the soil pH from 4.7 to 5.0 or 5.1, the significant change produced by the treatment was a very large increase in the exchangeable manganese. The exchangeable manganese was found to be increased from 0.2 mg. equivalent in the original untreated soil to 1.6 mg. equivalents in the soil treated with calcite and water only and 2.1 in the case of soil treated as above with a further addition of 1 per cent of starch. It was further found that the hydrated oxide of manganese precipitated from manganese chloride without the use of excess alkali produced, when added in regulated quantities to 20-gm. portions of fresh soil, regular decreases in the H-ion concentration, the manganese reducing active acidity to practically the same extent as did equivalent quantities of calcium hydroxide. Other experiments of similar indication are noted.

"It is evident that the ease with which manganese oxides in the soil are reduced, supplying an active base, introduces a complication into soil reaction studies which may be significant."

The action of neutral salts on acid soils with reference to aluminum and iron, S. Mattson (*Soil Sci., 25 (1928), No. 5, pp. 345–350*).—Briefly recapitulating the two views with respect to the leaching out of iron and aluminum from the soil by neutral salt solutions, (1) that the extractable iron and aluminum compounds are those removable because of being present in the soil in an exchange complex, exchange acidity being attributed in this case solely to the hydrolysis of the iron and aluminum salts, and (2) that the extraction

of iron and aluminum is due to a secondary reaction between the liberated acids and the soil material, the author presents the opinion "that no satisfactory evidence has been produced by the defenders of either of the above theories." He reports work designed to assist in the experimental solution of the question, the subjects of investigation being taken up under the headings of the effect of dilute acid and neutral salt solutions, the effect of neutral chloride and dilute acid, and the independence of the exchange acidity.

On treating soil colloid materials alternately with 0.05 N hydrochloric acid and with 1.0 N neutral chloride solutions, appreciable quantities of aluminum and iron were dissolved by the acid solution only in the first few treatments. Neutral chloride, on the other hand, extracted considerable quantities of iron and aluminum each time the material was rendered unsaturated by a preceding acid treatment. It is stated that the reaction is due to the liberated acid, the activity of which was found to be greatly increased by the high chlorine-ion concentration of the salt solution. A mixture of the acid with the salt solution brought about a complete decomposition of the material, and the conclusion is stated that in the case of the specially treated soil colloidal materials the exchange acidity was completely independent of the presence of iron and aluminum.

Fungi in some Colorado soils, E. L. LeClerg and F. B. Smith (*Soil Sci., 25 (1928), No. 6, pp. 433–441*).—Following a brief review of a number of references on the subject of variations among and within individual soils, this contribution from the Colorado Experiment Station notes the isolation from 27 soils, collected from parts of the State where definite soil types have been determined, of 22 species of fungi of the following genera: Aspergillus 2 species, Cephalosporium 1, Fusarium 1, Hormodendrum 1, Macrosporium 1, Penicillium, 10, Rhizopus 1, Spicaria 1, Stachybotrys 1, Trichoderma 2, and Verticillium 1.

It is concluded that Penicillium constitutes the dominant type among the fungi of Colorado soils, Aspergillus appearing only occasionally. Trichoderma was second in numerical importance, and Aspergillus third. Soils low in moisture appeared to favor *R. nigricans* and *T. lignorum*. Moisture was not found to limit the occurrence of *P. expansum*. A considerably smaller number of fungi were isolated from soils of high soluble salt content than from those having less soluble salts. In soils of a high soluble salt content Penicillium was found more abundant than were other fungi. Differences between the flora of productive and of unproductive soils are detailed.

It was observed that the number of species decreased with increasing depth, only two species having been found at a depth of 42 in. The general depth distributions of several species are noted.

Applications of soil microbiology (*Rothamsted Expt. Sta., Harpenden, Rpt. 1925–1926, pp. 40–44*).—It is noted that soil microbiology has already found five practical applications as follows: (1) The inoculation of leguminous crops, (2) the partial sterilization of greenhouse and other soils, (3) the preparation of artificial manures, (4) the preparation of sewage fertilizers, and (5) the use (here allocated specifically to the United States) of sulfur as an amendment for alkaline soil or neutral soil to provide acidity sufficient to inhibit potato scab and to render mineral phosphates soluble. The first four of these applications are dealt with in some detail.

In connection with the inoculation of legumes, a table of the results of three experimenters shows in two cases large increases in yield and increases of the nitrogen in the tops in three experiments of 0.23, 0.99, and 1.01 per cent, respectively. The legume used for these experiments was alfalfa.

Examples of partial sterilization of soils by steam or by the use of carbolic acid or other chemicals are given. The chemical method was found the cheaper of the two, but the steaming process was more effective.

The large losses involved in the failure to utilize sewage nitrogen as fertilizer are noted, and a brief progress report is made on the preparation and utilization of activated sewage sludge. The superiority of the aeration method is considered due largely to bacteria which assimilate the ammonia and to protozoa which assimilate the bacteria, the 6 per cent, approximately, of readily available nitrogen contained in the dried product being believed to consist largely of protein and protoplasm thus elaborated. "The smooth working of the process depends on maintaining the proper balance between the numbers of protozoa and bacteria." A yeast effluent was found in one case so to stimulate the multiplication of the protozoa that these organisms reduced the bacteria to numbers too small to effect adequate purification of the sewage. Stopping the discharge of yeast effluent restored active purification.

Trees and shrubs for producing green manure in the Konkan and North Kanara, V. G. Gokhale and V. S. Habbu (*Bombay Dept. Agr. Bul. 141 (1927), pp. 16, pl. 1*).—Of numerous trees and shrubs, experiments with the leaves and loppings of which for green manure are here described, *Tephrosia candida* was found the quickest growing plant, easy to establish from the seed, rapid in leaf production, and capable of producing bushes 5 or 6 ft. in height and 5 ft. in diameter in the third year provided the plants are nipped off early to induce branching. Thus developed, the plants were found capable of giving 5 lbs. of green matter each so that it is considered that 5 tons of green loppings per acre, with a considerable quantity of dry leaf manure in addition, should be readily secured. The plant is browsed by cattle, however, though it is not a favorite plant, and unless the seeds are planted at least 12 in. deep they were found unlikely to survive the first cold weather.

Calotropis gigantea was found to produce leaves and loppings of remarkable manurial value, but proved difficult to establish. A successful method for this is said to have been evolved, however.

Green manuring as a means of maintaining and improving soil fertility, H. Wenholz (*N. S. Wales Dept. Agr., Farmers' Bul. 156 (1926), pp. 27, figs. 12*).—The first part of this bulletin takes up (1) the benefits of green manuring, (2) importance of nitrogen, (3) economy and utilization of soil-improving crops, (4) types of green manure or cover crops, (5) regional distribution of such crops, (6) fertilizing the green manure or cover crop, (7) crops following green manures, and (8) plowing-in green manure. The second part, taking up the special case of green manure upon orchard land, is a brief general discussion prepared by the author in cooperation with H. Broadfoot.

The crop-producing power of limited quantities of "essential" plant nutrient, C. Hartman, jr., and W. L. Powers (*Soil Sci., 25 (1928), No. 5, pp. 371–377*).—Report is made from the Oregon Experiment Station of experiments consisting in the growing of wheat seedlings in nutrient solutions complete in each case with the exception of one of the anions nitrate, sulfate, and phosphate, or of the cations calcium, magnesium, and potassium. The experiment was begun in each case in the complete absence of that one of the essential nutrients under investigation, this lack being then supplied in increasing increments.

In the case of nitrate as a limiting factor calcium nitrate was supplied in successively doubled increments, beginning with 2 parts per million and reaching 64 parts per million. "Under the conditions provided, 64 parts per million . . . was not sufficient for the proper formation and maturity of seed."

The increasing yields followed the law of diminishing returns. "Up to approximately 30 parts per million a decided decrease in yield is apparent for each additional part per million . . . indicating that this is the economic concentration for the conditions at hand." Calcium nitrate in increments beginning with 1.5 parts per million was used as the source of calcium, the conclusion derived from the experiments with calcium as the limiting factor being as follows:

A greater concentration of calcium is necessary for the first substantial increase in growth than for any other of the essential elements studied. A deficiency of calcium greatly hinders the root development of alfalfa plants, the ratio of tops to roots narrowing at each successive increment of calcium. Large amounts of calcium cause a stocky, healthy looking plant with a stout, thrifty root. Each increment from 6 to 12 parts per million produced the greatest yield per part per million, whereas increments added after 32 parts per million did not further the growth to any extent. The presence of large quantities of magnesium in proportion to the calcium present up to and including 6 parts per million is probably a limiting factor in plant growth.

In the magnesium experiments it was found that the leaves became chlorotic, wilted, and dropped off in the entire absence of magnesium. In the presence of 2 parts per million these effects still persisted to a slight extent, and increases in yield continued up to 128 parts per million. There was no noticeable magnesium injury with a concentration of 128 parts per million of this element in the culture solution.

In the potassium experiments the growth, seriously impaired by the absence of potassium, "increased enormously" with an initial increment of 3 parts per million and continued to increase slightly up to 144 parts per million. In the phosphorus experiments there was no top growth and but little root growth in the complete absence of this nutrient, yields increasing slowly but continuously with increments in the phosphate content of the solution up to 128 parts per million.

In the sulfur experiments alfalfa made a larger growth in the entire absence of the nutrient in question than when grown in the absence of any of the other elements studied. Each increment of sulfate up to 15 parts per million, however, produced a decided beneficial effect, although beyond this concentration a slight tendency to decrease the yield was noted, and at 60 parts per million the yield was approximately the same as was obtained with 10 parts per million.

Phosphate applications and their influence on chernozem.—IV, The reversion of P_2O_5 in soils, M. A. Egorov (*Soil Sci., 25 (1928), No. 6, pp. 463–472*).—This is a communication from the Kharkov Experiment Station, Russia, translated from the Russian by J. S. Joffe of the New Jersey Experiment Stations, reporting experiments on the effect of the various sources of phosphorus on wheat in pot cultures, the extraction of chernozem soil with the primary, secondary, and saturated phosphates of potassium and of sodium, the solubility of soil organic matter in solutions of the above named salts in the presence and in the absence of added lime, determinations of humus content of gray forest loam soils, etc.

It was found that water-soluble calcium and iron salts brought about the reversion of the water-soluble phosphates and a flocculation of the organic matter, and in dialysis experiments calcium in solution prevented the solution of organic matter. The phosphates of potassium differed from those of sodium in giving a less deeply colored extract. Soil treated with N trisodium phosphate solution and subsequently washed with water was found to yield most of the soluble organic matter formed in the treatment. Further treatment with trisodium phosphate did not bring more organic matter into solution. The

procedure brought about an extract of 73.2 per cent of the total organic matter of chernozem and of 86.6 per cent of that of forest loam soils, and in the case of a soil under cultivation for 12 years it is stated that the organic matter extract obtained with 2 per cent of trisodium phosphate solution indicated a specific effect of the crops.

The $CaCO_3$-soil equilibrium and the lime requirement, S. Mattson (*Soil Sci., 25 (1928), No. 6, pp. 429–431*).—The author reviews in this communication from the U. S. D. A. Bureau of Soils a previous paper (E. S. R., 48, p. 618) which records an observation recently announced by Prianishnikov and Golubev[3] that when calcium carbonate is added to a soil in the presence of water a part of the calcium is adsorbed by the soil, the liberated carbon dioxide bringing an equivalent quantity of calcium into solution as calcium bicarbonate.

The relation of the concentration of calcium ion required by alfalfa to the amount present in soil solution, H. W. E. Larson (*Soil Sci., 25 (1928). No. 5, pp. 399–408, fig. 1*).—This work, performed at the Oregon Experiment Station, led to the following conclusions:

With respect to the calcium requirements of alfalfa, this plant appears to have a minimum demand for growth of about 16 parts per million, the most economical growth having been produced, however, at about 32 parts per million. Excessive concentrations of calcium did not appear to be toxic to the plants; in fact, it is considered that increased growth may be produced thereby. Sufficient calcium in the solution was indicated by strong, healthy plants with a stocky root system and a large number of nodules after inoculation.

With respect to the effect of season and treatment on the water-soluble calcium content of soils, it was learned that the water-soluble calcium content is in some soils below the concentration required for the satisfactory growth of alfalfa in solution culture, that ground limestone and sulfur treatment increased the water-soluble calcium in the soils used in this investigation, that ground limestone applications can raise the water-soluble calcium content of some soils above the minimum for alfalfa and maintain this condition throughout the season, and that the water-soluble calcium in some soils appears to be at a minimum during the early part of the season when the alfalfa demand is at its greatest.

From the nutritional, as well as from physical, chemical, and biological standpoints, it is considered that ground limestone applications would prove beneficial.

Studies with sulfur for improving permeability of alkali soil, J. D. Haynes (*Soil Sci., 25 (1928), No. 6, pp. 443–446*).—Report is made from the Oregon Experiment Station of experiments on black alkali soil carried out with the object of learning the effect of chemical treatment, of wetting and drying, of the removal of salts, and of change in H-ion concentration with exchange of calcium for the sodium content of the ultra clay complex. In addition to treatments with sulfur in various forms, experiments were made with manures, green manure, gypsum, lime, alum, and some combinations of these. The effect of these treatments on percolation over prolonged periods through samples of soil in jars was studied. Conclusions derived from these observations include the following:

The permeability of black alkali soil was increased by alternate wetting and drying. Sulfur increased the percolation rate, decreased the alkalinity, and kept the soil more open and permeable during protracted percolation trials than was the untreated soil; and the most effective increase in H-ion concentration was obtained from sulfur treatments. Lime and manure treatments also aided, however, in maintaining permeability during leaching. The rate of percolation

[3] Abs. Proc. 1. Internatl. Cong. Soil Sci., 1927, II, pp. 26, 27.

both in treated and in untreated soils decreased with time. Sulfur treatment with leaching made calcium more reactive and caused its replacement of the sodium of the ultra clay complex.

The rate of availability of various forms of sulfur fertilizers, J. D. HAYNES (*Soil Sci., 25 (1928), No. 6, pp. 447–453, figs. 3*).—In this series of experiments, made at the Oregon Experiment Station and designed to determine (1) the rate of oxidation of sulfur in the various soils use, (2) the relative value of various available forms of sulfur, and (3) the chemical, physical, and biological effects of sulfur treatment, it was found that black gas sulfur became available at approximately the same rate as did inoculated sulfur except when applied to black alkali land. During the first 8 weeks, however, the inoculated sulfur yielded sulfates more rapidly than did the uninoculated. In alkali soils the sulfur appeared to increase the microflora of the soil, an effect considered probably attributable to a neutralizing action. A decided flocculating effect in alkali soils was noted, 2-ton applications causing a rapid flocculation which was observed to begin with approach to neutrality.

AGRICULTURAL BOTANY

Nitrogen organization in plants [trans. title], V. BAMBACIONI (*Ann. Bot. [Rome], 17 (1926), No. 1, pp. 4–23, fig. 1*).—Experimentation, carried on by the author for a long period as to the capability of the aerial parts and of the roots of the plants examined regarding the organization of nitrogen, has not only confirmed the old view that such production goes on in all of the organs traversed by vascular bundles in which carbohydrates come into contact with mineral salts of nitrogen, but has shown also that the roots have in this connection an importance perhaps even greater than have the aerial parts.

Fixation of gaseous nitrogen by higher nonleguminous plants through the agency of soil nitrifying bacteria [trans. title] (*Rev. Bot. Appl. et Agr. Colon., 7 (1927), No. 72, pp. 555–557*).—Reference is made to work done during 1924–1926 by Truffaut and Bezssonoff, some of which has been noted (E. S. R., 58, p. 623), and some details of this work are assembled in the present note. In this study, the work of fixation of nitrogen in maize appears to have been assured through the association of *Clostridium pastorianum* and of *Bacillus truffauti*.

Comparative amounts of gases carbon dioxide, oxygen, and nitrogen found in the body of certain plants, S. A. GAERLAN (*Philippine Agr., 14 (1926), No. 9, pp. 557–567*).—In growing stems of bamboo, oxygen increased progressively, carbon dioxide decreased gradually, and nitrogen showed no change as growth proceeded. Carbon dioxide was more abundant and oxygen in certain cases less abundant at about the noon hour. The average amounts of carbon dioxide, oxygen, and nitrogen in the bodies of closely related plants showed decided differences. Percentages of carbon dioxide and nitrogen obtained from plants were greater, that of oxygen less, than in air.

Equilibrium of cellular constituents and intensity of oxidations in the cell [trans. title], R. JACQUOT and A. MAYER (*Compt. Rend. Acad. Sci. [Paris], 181 (1925), No. 23, pp. 931–933, fig. 1*).—This work dealt with imbibition and the intensity and limitations of oxidation, and with the hydrobiotic yield, using this term in the sense indicated by Mayer and Plantefol (E. S. R., 54, p. 220).

Chemical characters in green, yellow, or red leaves [trans. title], H. COLIN and A. GRANDSIRE (*Compt. Rend. Acad. Sci. [Paris], 181 (1925), No. 26, pp. 1168–1170*).—Tabulations are presented of sugar, water, ash, and alkalinity in yellow, green, and red carrot leaves.

When compared with normal, the red autumn leaves are found to show more sugars and more free organic acids. Yellow leaves were poor in sugar but rich in water and mineral salts.

Soluble ferments secreted by Hymenomycetes [trans. title], L. Lutz (*Compt. Rend. Acad. Sci. [Paris], 183 (1926), Nos. 1, pp. 95–97; 20, pp. 918, 919*).—Fungi studied regarding their influence on oxidation, with results as here detailed in the first paper included *Stereum hirsutum, S. purpureum, Corticium quercinum, Polyporus versicolor, P. pinicola, P. betulinus, P. igniarius, Trametes medullapanis, Collybia velutipes, Pleurotus ostreatus,* and *P. eryngii*. The second paper gives brief details of studies continuing the work as to anti-oxidizing actions.

The question of an afterripening period in cereals newly harvested [trans. title], O. Munerati (*Compt. Rend. Acad. Sci. [Paris], 181 (1925), No. 25, pp. 1081–1083*).—The observations of Harrington (E. S. R., 42, p. 237) that wheat newly harvested may be germinated by employment of temperatures of from 12 to 14° C. (53.6 to 57.2° F.) are said to have been verified by the present author, who denies the claim that an afterripening period is required by newly ripened wheat. Regarding the germination of wheats at low temperatures, varieties may show a rather wide range as to the optima. Varieties are supposed to respond in this regard to a character apparently hereditary. Fresh seeds of other cereals (barley, rye, and oats) behave like wheat in germinating at low temperatures when newly harvested.

Prussic acid for the quick production of germinating-ripeness [trans. title], G. Gassner and K. Hassebrauk (*Pflanzenbau [Berlin], 4 (1927), No. 1, pp. 1–4, figs. 2*).—It was found possible and practical by brief employment of prussic acid so to influence wheat seed, not sufficiently ripe to germinate otherwise normally, that it germinated quickly and completely at a temperature near 20° [C.].

The mechanism of chloroform action on living matter [trans. title], G. A. Nadson and M. N. Meisl (*Compt. Rend. Acad. Sci. [Paris], 183 (1926), No. 1, pp. 82, 83*).—In a study of the action of chloroform on *Saccharomyces ludwigii*, the authors detected two phases which are briefly described, the first only of which is reversible. The behavior of yeasts is briefly indicated.

Traumatic stimulation of plants [trans. title], E. Bünning (*Ztschr. Bot., 19 (1927), No. 8, pp. 433–476, figs. 12*).—In an account of work related to that previously noted (E. S. R., 58, p. 625), the author deals with alterations of growth after wounding, traumatropisms of the coleoptile in the Gramineae, root traumatropisms, relations between plasma changes and growth alterations, and theoretical considerations, stating in connection with particular conclusions that, in general, wound stimulation conditions a growth check which decreases with distance from the wound.

Heightening drought resistance [trans. title], J. J. Tumanow (*Ztschr. Wiss. Biol., Abt. E, Planta, Arch. Wiss. Bot., 3 (1927), No. 2–3, pp. 391–480, figs. 5*).—Studies on the scanting of the water supply and on the causation of wilt in plants in order to heighten drought resistance are reported as made principally with sunflower, buckwheat, and bean. Conclusions are given in considerable detail.

It appears from this work that plants which develop under the condition of insufficient moisture show particular anatomical-physiological characters. These are discussed.

Experimental demonstration of vascular relation between leaf and root [trans. title], A. Dauphiné (*Comp. Rend. Acad. Sci. [Paris], 181 (1925), No. 26, pp. 1159, 1160, fig. 1*).—In the course of work described as done to determine

the influence of certain traumatisms on the development of vascular plants, the author injured mature seeds of *Lupinus albus* in such a way as to suppress certain epicotyledonary portions. These seeds on germination showed a lack of one or more leaves in the resulting plantlets, and the absence of these leaves corresponded, in the root, to the absence of vascular groups more or less important according to the number of leaves suppressed. Transverse sections of such a root are shown as microphotographed.

The relationship which may exist between the presence or absence of a given leaf and root structure in a plant is regarded as furnishing new proof of the complex constitution of vascular plants.

Recent studies on the vascular relations between leaf and root [trans. title], A. Dauphiné (*Compt. Rend. Acad. Sci* [*Paris*], *182* (*1926*), *No. 24, pp. 1484, 1485*).—Having employed methods said to have been described by Molliard in an account of his experimentation apparently related to work that has been noted (E. S. R., 48, p. 433), the author, again working with white lupine as noted above, also with cucurbit and with castor bean, concluded that vessels of primary origin, of which the greater part show the earlier phases of vascular development, may differentiate in a root separated from the embryonic phase of the leafy portions of the plant. It is stated that the differentiation of vessels of secondary origin goes on under dependence upon the foliar portions.

Influence of light on tannin formation [trans. title], Michel-Durand (*Compt. Rend. Acad. Sci.* [*Paris*], *181* (*1925*), *No. 26, pp. 1171–1173*).—Chestnut plants developed in darkness from seeds contain only traces of tannin in the cotyledons, but they rapidly elaborate tannic principles in both aerial and subterranean parts. In general, plants brought under the influence of sunlight showed less tannin than did the corresponding green plants. The aerial organs, stem, and above all the leaves accumulate the tannic principle in their tissues when light is deficient.

These conclusions were verified when the cotyledon of the seeds in germination presented large quantities of tannic substances.

The physiological rôle of tannins [trans. title], Michel-Durand (*Compt. Rend. Acad. Sci.* [*Paris*], *183* (*1926*), *No. 4, pp. 312–314*).—This is a study, made with *Quercus pedunculata*, as to carbohydrates and tannins.

The occurrence and behavior of embryoless wheat seeds, M. E. Lyon (*Jour. Agr. Research* [*U. S.*], *36* (*1928*), *No. 7, pp. 631–637, figs. 4*).—In a previous publication Harlan and Pope reported barley seeds lacking embryos (E. S. R., 53, p. 426). Studies by the author in Colorado showed that 0.1 per cent of wheat grains of several varieties was without embryos. Cytological examinations were made and respiration and enzyme activities studied of the embryoless seeds. While seeds of this character can not grow, they were found to respire when placed under conditions favorable to germination, and they also exhibited enzyme activity. Brief tests showed some starch conversion in the embryo-lacking seed after 6 days in the germination chamber. Further study showed a catalase activity in these seeds equivalent to 0.12 cc. oxygen production in 5 minutes as compared to 0.17 cc. oxygen produced in the same length of time by equal weights of normal seeds.

Leaf development of chimeras in Solanum [trans. title], F. Lange (*Ztschr. Wiss. Biol., Abt. E, Planta, Arch. Wiss. Bot., 3* (*1927*), *No. 2–3, pp. 181–281, figs. 94*).—A considerable number of Solanum chimeras have been studied, and these are reported in considerable detail.

Biochemical separation of sexes [trans. title], H. Burgeff and A. Seybold (*Ztschr. Bot., 19* (*1927*), *No. 9, pp. 497–537*).—In work related to that reported by Satina and Blakeslee (E. S. R., 57, p. 621), the authors detail indications and interpretations.

The sexual stage of fungi induced by ultra-violet rays, F. L. Stevens (*Science, 67 (1928), No. 1742, pp. 514, 515, fig. 1*).—A preliminary account is given of a study of the effect of ultra-violet irradiation on a strain of *Glomerella cingulata* in which perithecia were produced abundantly in the irradiated portion of the culture, while none was produced in the nonirradiated portion. The perithecia are said to have developed in great quantities in the small area irradiated, and only in that area. In four days they appeared as well-developed, spherical black bodies, and asci and spores were soon formed. The perithecia differed from those naturally formed in that they were spherical and nonstromatic, but the asci and spores agreed perfectly with those found in nature.

Tests of other strains of Glomerella, as well as with species of other fungi, showed that they responded to irradiation.

Action of radium on Aspergillus fumigatus [trans. title], A. and R. Sartory and J. Meyer (*Compt. Rend. Acad. Sci. [Paris], 183 (1926), No. 1, pp. 77–79*).—Conditions and results of radium irradiation on *A. fumigatus* are detailed.

The formation of perithecia in Aspergillus fumigatus under the influence of radium [trans. title], A. and R. Sartory and J. Meyer (*Compt. Rend. Acad. Sci. [Paris], 183 (1926), No. 26, pp. 1360–1362*).—Having noted in the course of the work above noted modifications in the reproductive apparatus of *A. fumigatus* associated with the action of radium radiations, the authors have modified and continued that work, obtaining results from which they conclude that radium emanation produces in *A. fumigatus*, cultivated on gelatinized carrot juice of pH 4.7, the formation of fertile perithecia with definite asci and ascospores.

Mycorrhiza, I–XI, M. C. Rayner (*New Phytol., 25 (1926), Nos. 1, pp. 1–50, pl. 1, figs. 4; 2, pp. 65–108, pls. 2, figs. 5; 3, pp. 171–190, pls. 2, figs. 4; 4, pp. 248–263, figs. 4; 5, pp. 338–372, pl. 1, figs. 4; 26 (1927), Nos. 1, pp. 22–45, pl. 1, fig. 1; 2, pp. 85–114, figs. 2*).—The concluding chapter of this comprehensive series sums up the data and indications regarding the physiology of mycorrhiza and the nutrition of mycorrhiza plants, giving a critical review of evidence derived from researches on forest trees, orchids, and heaths, and an account of endotrophic infection in other species, with summary and conclusions.

Mycorrhiza: An account of non-pathogenic infection by fungi in vascular plants and bryophytes, M. C. Rayner (*London: Wheldon & Wesley, 1927, pp. VI+[4]+246, pls. 7, figs. 24*).—This reprinting, though not a page-for-page reprint, gives almost identically the above series in book form.

The species concept in the Phytophthoras [trans. title], J. and M. L. Dufrenoy (*Rev. Bot. Appl. et Agr. Colon., 7 (1927), Nos. 72, pp. 530–536; 73, pp. 593–602, figs. 3*).—Of these two sections, the first is somewhat general, the second dealing with parasitic life among the Phytophthoras. Some practical bearings are indicated.

Studies on aerobic bacteria commonly concerned in the decomposition of cellulose, L. A. Bradley and L. F. Rettger (*Jour. Bact., 13 (1927), No. 5, pp. 321–345*).—In this investigation, which was limited to aerobic cellulose destroying bacteria, it appears that cellulose fermenting organisms are well distributed in nature in association with decaying vegetation and other matter. All but one of the strains employed, the sources of which are indicated, were found to be gelatinolytic. All reduced nitrate to nitrite. None produced indol. The fermentation reactions of the group suggest a possible means for strain differentiation. The cellulose fermenting powers of the strains may be demonstrated gravimetrically. The addition of buffer in the form of secondary potassium phosphate (0.5 to 1.0 per cent) not only delays the development of harmful acid reaction, but also increases the actual amount of cellulose decom-

position during 15 days' incubation. The presence of an enzyme cellulase may be shown by the auxanographic method on cellulose casein-digest agar.

GENETICS

Inheritance of earliness and other agronomic characters in rice, J. W. JONES (*Jour. Agr. Research [U. S.], 36 (1928), No. 7, pp. 581–601, figs. 5*).—The inheritance of several agronomic characters was studied at the Biggs (Calif.) Rice Field Station in a cross between the early Niro Vialone and the midseason Caloro rice.

Data presented on the inheritance of earliness in rice in the F_1, F_2, F_3, and F_4 generations indicated that, while earliness probably is inherited in the same manner as other quantitative characters, the F_2 population studied could not be placed with certainty in any of the simple or modified Mendelian ratios. Transgressive inheritance occurred and the plants massed in the intermediate position in F_2 populations. Considerable variation was observed between families in the F_3 progeny. Two or more genetic factors seemed to be involved in the production of earliness in the varieties studied.

No correlation was apparent between the yield of F_2 plants and date of first spikelet exsertion, indicating that high yield per plant and earliness may be combined in the same variety. While yields per plant and number of culms were definitely correlated, length of panicles and plant height were not correlated with yield per plant. Yield appeared due to multiple factors. While F_2 hybrids exceeded the parents in yield and variability, the F_3 progeny yielded less than either parent but were much more variable. Tallness of plant appeared to be partially dominant in F_2, probably due to heterosis, whereas the F_3 selections were significantly shorter than either parent. The F_2 hybrids were almost exactly intermediate in number of culms per plant between the parents. The F_3 selections had fewer culms per plant than either parent but were equally variable. In length of panicle the F_2 hybrids were intermediate but nearer the longer panicled early parent. The F_3 selections had shorter panicles than either parent and greater variability. Sinuous necks (Niro Vialone) were dominant to straight necks in F_1, and the F_2 and F_3 segregations suggested that at least duplicate genetic factors were probably involved.

Heredity in Helianthus tuberosus dangeardi [trans. title], L. DANIEL (*Compt. Rend. Acad. Sci. [Paris], 181 (1925), No. 25, pp. 1087–1089*).—The author has made further study of *H. tuberosus dangeardi*, previously referred to (E. S. R., 54, p. 429), using the specimens of that variety perpetuated through the agency of tubers, both aerial and subterranean, and of grafts, and the results of that work are outlined. It is stated that the heredity of the aerial tuber habit appears to be established, as it occurred in the progeny of plantings four years after its original appearance in 1921. Other details are given.

Recent studies on heredity acquired by grafting in Helianthus dangeardi [trans. title], L. DANIEL (*Compt. Rend. Acad. Sci. [Paris], 182 (1926), No. 12, pp. 800, 801*).—Detailing certain characters, now apparently stable in heredity, of the strain referred to above, the author discusses these separately. This is considered a genuine case of characters acquired by grafting.

Intermittent heredity in Jerusalem artichoke [trans. title], L. DANIEL (*Compt. Rend. Acad. Sci. [Paris], 183 (1926), No. 20, pp. 908–910*).—This account deals in part with the subsequent history of the line of Jerusalem artichokes previously noted (E. S. R., 54, p. 429). Results are cited which are thought to show the existence of a particular mode of heredity acquired in

grafted Jerusalem artichokes coexistent with the two forms continuous heredity and transitory heredity, and here designated by the term intermittent heredity.

A spontaneous tomato chimera, J. W. MacArthur (*Jour. Heredity, 19 (1928), No. 7, pp. 331–334, figs. 3*).—A brief note on the occurrence of a chimera in the tomato.

Metaxenia in the date palm, W. T. Swingle (*Jour. Heredity, 19 (1928), No. 6, pp. 257–268*).—The author proposes the term "metaxenia" for the direct influence of the pollen as observed by Nixon (E. S. R., 59, p. 43) on the parts of the seed and fruit of the date lying outside the embryo and endosperm. Metaxenia is explained on the assumption that the embryo or endosperm or both secrete hormones or analogous soluble substances which diffuse out into the tissues of the mother plant that constitute the seed and fruit and there exert a specific effect varying according to the particular male parent utilized. Metaxenia is believed not to be limited to the date palm but to occur in many plants, and may perhaps be exerted in some cases on tissues outside the seed and fruit.

The influence of the "purple" gene on the crossing-over between "black" and "cinnabar" in Drosophila melanogaster, A. S. Serebrovsky (*Jour. Genetics, 18 (1927), No. 2, pp. 137–175*).—In a study of the crossing over between black, cinnabar, and purple in *D. melanogaster*, there was found to be less crossing over in *PP* flies than in those carrying *pp*, indicating that the chromosome was shortened in the former type and, carrying the interpretation further, that the gene *P* was smaller than the gene *p*. There appeared to be less crossing over in flies heterozygous for purple than in homozygous flies, although these differences were not significant. Other factors were found to influence the amount of crossing over, the day of emergence particularly being identified.

A résumé of cattle inheritance, J. W. Gowen (In *Bibliographia Genetica. The Hague: Martinus Nijhoff, 1927, vol. 3, pp. 87–140, figs. 10; abs. in Maine Sta. Bul. 342 (1927), pp. 231, 232*).—This is a brief review of the present knowledge of the inheritance of characters in cattle, including those of economic importance such as milk yield, butterfat percentage, beef qualities, characteristics of coat, tick resistance, twinning, coat, tongue, muzzle, and switch color, white markings, horns, and other miscellaneous characteristics.

Hairless, a new recessive lethal in cattle, O. L. Mohr and C. Wriedt (*Jour. Genetics, 19 (1928), No. 3, pp. 315–336, pls. 2, fig. 1*).—The production in certain Holstein-Friesian herds of calves which were full term but hairless, except for the muzzle, ears, and a few other positions on the body, are described. Such animals died soon after birth. This condition was found to be due to a single recessive gene, and its inheritance was discovered by the production of 4 hairless calves from 36 matings of a heterozygous bull back to his daughters. The inheritance was then confirmed in other herds, all of which traced to a bull imported into Sweden in 1902. Histological study of the skin showed that the development of the hair follicles and their appendages was markedly delayed.

Genetics of domestic cats, R. C. Bamber (Bisbee) (In *Bibliographia Genetica. The Hague: Martinus Nijhoff, 1927, vol. 3, pp. 1–86*).—The author briefly reviews the present knowledge of the inheritance of various characters, including coat color, eye color, hair characteristics, polydactyly, and tail characteristics.

Dominant black in cats and its bearing on the question of the tortoiseshell males.—A criticism, R. C. Bamber (Bisbee) and E. C. Herdman (*Jour. Genetics, 18 (1927), No. 2, pp. 219–221*).—Attention is called to certain dis-

crepancies in the paper of Tjebbes and Wr'edt (E. S. R., 57, p. 27), in which dominant black was suggested as the key to the tortoise-shell male problem in cats.

Distribution and inheritance of white spots in guinea pigs [trans. title], N. A. Il'in (Iljin) (*Trudy Lab. Éksper. Biol. Moskov. Zooparka (Trans. Lab. Expt. Biol. Zoopark, Moscow), 4 (1928), pp. 255–349, figs. 55; Eng. abs., pp 347–349*).—From a study of 1,500 guinea pigs, the author has designated 20 points of origin and depigmentation. These points not only influence the white spotting but indicate the order of distribution of yellow pigmentation. The distribution of these points of depigmentation was in general similar on the two sides of the body, though 5 were more frequent on the right side and 2 more frequent on the left side. Seven groups of points of depigmentation were identified by the degree of correlation between them, and suitable matings indicated that the association was genetic. There are thus concluded to be 7 genes which modify spotting.

Heredity of human eye color, C. B. Davenport (In *Bibliographia Genetica The Hague: Martinus Nijhoff, 1927, vol. 3, pp. 443–464*).—A brief review of the present knowledge of the inheritance of eye color in man.

Genetic studies in poultry, V, VI, R. C. Punnett and M. S. Pease (*Jour. Genetics, 18 (1927), No. 2, pp. 207–218, pl. 1, figs. 4; 19 (1928), No. 3, pp. 337–350, figs. 2*).—In continuing this series (E. S. R., 48, p. 471), an analysis of a spotted characteristic, designated as pied, has been carried out in part 5. The pied character was similar to mottled in appearance, but it was found to be due to a simple recessive Mendelian factor. Pied chicks were whiter in the down than normal blacks, although the grade of down pigmentation was complicated by modifying factors.

In part 6, The Gold Barred Rock, crosses of Gold Barred Rocks with birds of other breeds, mostly Barred Rocks and Silver Campines, showed that the barring factor of Gold Barred Rocks was sex linked, but it appeared to exist in at least two allelomorphic states. These, however, differed in the degree of inhibition of pigment formation in the down and adult plumage.

Materials on the genetics of pigeons [trans. title], S. Î. Bessmertnaîa (S. J. Bessmertnaya) (*Trudy Lab. Éksper. Biol. Moskov. Zooparka (Trans. Lab. Expt. Biol. Zoopark, Moscow), 4 (1928), pp. 401–438, figs. 14; Eng. abs., pp. 437, 438*).—A study of the inheritance of various plumage colors and patterns in pigeons has indicated the presence of a dominant autosomal gene determining red tint in the Archangel breed. A correlation is suggested between the white feather color and the brown eye color and between the piebald condition of the head and the iris color.

Cockfeathered pheasants (♀♀) and embryogenesis of sex glands in hens [trans. title], M. M. Zavadovskiĭ (Zawadowsky) and É. M. Zubina (*Trudy Lab. Éksper. Biol. Moskov. Zooparka (Trans. Lab. Expt. Biol. Zoopark, Moscow), 4 (1928), pp. 175–200, pls. 16; Eng. abs., pp. 199, 200*).—Two cockfeathered pheasants were found on macroscopical examination to lack normal glands, but microscopical study of the tissue in the vicinity of the normal location of the sex glands showed the presence of embryonic sex glands of the male type. These birds showed normal female feathering in early life and later developed cock feathering. A parallel case is also described in which the glands were changing from the female to the male type. It is, therefore, suggested that these represent cases of involution of the sex glands of the ovarian type.

Embryogenesis of the right ovary of normal fowls is described, in which it was found that the right ovary remains during postembryonic life as a small

organ showing inactive cords embedded in connective tissue and resembling the embryonic gonad.

Various cases of developing and nondeveloping right ovaries in birds from which the left ovaries were removed are noted.

The equipotentiality of the tissues of males and females in birds and mammals [trans. title], M. M. ZAVADOVSKIĬ (ZAWADOWSKY) (*Trudy Lab. Éksper. Biol. Moskov. Zooparka* (*Trans. Lab. Expt. Biol. Zoopark, Moscow*), *4 (1928), pp. 9–67, pls. 14, figs. 16; Eng. abs., pp. 66, 67*).—The author discusses the equal power of the characters to develop in castrated males and castrated females, but points out that certain characters, including the oviduct, size of body, spurs, sexual behavior, voice apparel, and coloring of the beak, show unequal development. This indicates that these are somosexual characters, and refers to one-sided inheritance which places the location of the genes in the Y chromosome, a hypothesis which has not yet been proved to occur in vertebrates.

FIELD CROPS

The checker-board method of laying out plats, J. P. JONES (*Jour. Amer. Soc. Agron., 20 (1928), No. 4, pp. 400–402, fig. 1*).—The checker-board arrangement of treated and check plats has been found desirable for a crop such as onions, where many plants occur on small areas, making possible the use of small plats, $\frac{1}{80}$ to $\frac{1}{160}$ of an acre. Experience with this method at the Massachusetts Experiment Station in fertilizer tests with onions showed that changes in treatment may be made without sacrifice as the data warrant, reliable results are obtained without difficulty, and uniformity tests before beginning work are unnecessary.

Some ecological aspects of agriculture in the prairie, J. E. WEAVER (*Ecology, 8 (1927), No. 1, pp. 1–17*).—Certain phases of crop production in the mid-continental area of the United States are discussed and interpreted in the light of the prairie vegetation and the conditions which have controlled its development.

[Agronomic experiments in Guam, 1926], J. GUERRERO (*Guam Sta. Rpt. 1926, pp. 6–12, figs. 4*).—Field crops investigations are reported on as heretofore (E. S. R., 56, p. 228).

Paspalum dilatatum, one of the best pasture grasses introduced, made satisfactory growth on stony hillsides and seemed adapted to limestone areas. Napier grass on heavy clay lowland soil treated with cascajo, a ground, raw limestone, produced more forage than that receiving burnt lime. These plats outyielded a plat treated with 0.5 ton of coconut meal per acre. In fertilizer tests Napier grass treated with lime and manure in combination yielded the most forage, followed by the plat limed only. Japanese cane manured only yielded the most forage, followed by the plat receiving lime with manure. With Guatemala grass liming produced the best results, and the combination was the poorest. On rocky limestone hillsides overlain by thin clay Napier grass made the most rapid growth, showed the most drought resistance, and gave the highest yield, followed in order by Guatemala, Merker, and *Pennisetum setosum* grasses and Japanese cane.

Production tests were made with Jala corn, henequen, and alfalfa, and further studies were made on the efficiency of different sorts of beans, velvet beans, mung beans, and cowpeas for cover crops. Black Mauritius velvet beans covered the ground for 171 days, and Hawaiian hybrid cowpeas 115 days. Pigeon peas suppressed weed growth beyond 2 years, *Tephrosia candida* 2

years 4 months, and *T. hookeriana* 2 years 3 months after planting. Of cowpea varieties from the Hawaii Station, Victor made the densest growth, whereas Early Buff, the first to fruit, made the poorest cover and occupied the ground the shortest time.

Porto Rico, Triumph, and Big Stem Jersey led the imported sweet potato varieties, each with 6,000 lbs. or more per acre, while Yap with 2,500 and Peru with 2,150 lbs. led the native sorts. Plats treated with superphosphate (acid phosphate) and coconut meal, and with superphosphate and manure led in sweet potato fertilizer tests. A plat receiving potassium sulfate with superphosphate and coconut meal made less than the check. *Dioscorea alata* and Red yam, both trellised, led the yam varieties in acre yields. In 4 varieties trellised plats outyielded the nontrellised, and in 4 others the reverse held.

[Field crops investigations in India, 1926–27] (*India [Dept. Agr.] Rev. Agr. Oper., 1926–27, pp. 5–39, 43–48, 57, 58, pls. 4*).—Agronomic experiments and breeding work carried on by the imperial and provincial departments of agriculture in different localities in India are reviewed as heretofore (E. S. R., 57, p. 628) for the year 1926–27.

Fibre plants, W. S. Blair (*Canada Expt. Farms, Kentville (N. S.) Sta. Rpt. Supt. 1926, pp. 92–98, fig. 1*).—Experiments with fiber crops included variety, cultural, and fertilizer tests with flax and hemp and cost of production studies with flax for seed and fiber.

In fertilizer tests with fiber flax a noticeable increase in weed growth was observed on plats receiving sodium nitrate in large quantities, and this materially interfered with the proper development of the flax. Test results indicated that from 100 to 150 lbs. of nitrogenous fertilizers, 300 lbs. of superphosphate (acid phosphate), and 50 lbs. of potassium chloride should supply the needs of flax on fairly fertile soils. Where a fertilized, hoed crop has been grown previously, no application of fertilizer seems necessary for flax.

Comparative yields of root crops tested, C. E. Cormany (*Michigan Sta. Quart. Bul., 10 (1928), No. 4, pp. 170, 171*).—Varietal trials with root crops during 1924, 1925, and 1926 showed mangels to average 19.6 tons per acre, turnips 18.21, carrots 16.94, rutabagas 13.16, and garden beets 12.7 tons. The Giant Feeding half sugar mangel was outstanding in yield and sugar content, and mangels appeared to be the best root crop for winter feeding to livestock. Carrots, followed closely by mangels and sugar beets, have kept best in storage.

The control of pastures on some farms in Finland (Suomi) in 1926 [trans. title], C. A. G. Charpentier ([*Finland*] *Valtion Maatalouskoetoiminnan Julkaisuja No. 9, (1927), pp. 73, pls. 2, figs. 12; Eng. abs., pp. 71–73*).—Pasture studies during the period 1924–1926 showed forest pasture to yield from 70 to 130 fodder units per hectare, cleared and clay treated pastures 550 to 900 units, wooded pasture land and arable fields and unfertilized hay fields 700 to 1,500 units, cultivated pasture 1,150 to 2,350 units, seedings on fields and other grazing lands in southern and middle Finland 1,750 to 2,900 units, and cultivated pastures on peat moss ground in South Ostrobothnia 2,400 fodder units per hectare. The production of milk and gain in weight for cows, calves, and swine on the several pasture types are discussed, with data on the cost of establishing and maintaining cultivated pastures and the cost of production per fodder unit.

Bulbous bluegrass, Poa bulbosa, H. N. Vinall and H. L. Westover (*Jour. Amer. Soc. Agron., 20 (1928), No. 4, pp. 394–399, figs. 3*).—A brief account is given of the origin, introduction into the United States, characteristics, uses, reproduction, and culture of bulbous bluegrass. Its habit of growing only during winter and remaining dormant throughout the summer seems to fit this grass to associate with Bermuda grass on pastures, lawns, and golf courses in

the Southeastern States. Favorable behavior has also been reported from Oregon.

Inferiority of foreign red clover seed, B. M. King (*Missouri Sta. Circ. 166 (1928), pp. 4, fig. 1*).—Domestic seed stocks of red clover, averaging 5,417 lbs. of cured hay per acre, were notably superior to foreign strains, which averaged only 3,214 lbs. In no foreign strain did the second cutting constitute a high percentage of the total yield. Prolonged storage and the harmful weed seed frequently found are other objectionable features of foreign red clover.

Illustrations of the application of a criterion of the deviation of an observed from a random distribution to the problem of seedling stand in sea-island, Egyptian, and upland cotton, J. A. Harris, G. J. Harrison, and F. M. Wadley (*Jour. Agr. Research [U. S.], 36 (1928), No. 7, pp. 603–614, figs. 3*).—A comparison of observed and calculated frequencies of number of seedlings per hill in an extensive series of experimental plantings of cotton on the saline soils of Sacaton, Ariz., showed a material excess for the observed frequencies of hills without seedlings and of hills with larger number of seedlings. The application of Pearson's χ^2 test to these empirical and theoretical distributions showed that the chance of the difference between the two being due to random sampling is practically infinitesimal. The field conditions, or the samples of seeds planted in the individual hills, were evidently highly heterogeneous with respect to factors influencing seedling stand. The data presented did not permit the determination of the extent that the observed variations in seedling stand and the observed deviations of the frequency distributions of seedling stand from the theoretical distributions were due to soil conditions and the extent due to the difficulty experienced by cotton seedlings in emerging.

Methods are outlined for determining the theoretical number of seedlings per hill which should be found if the distribution were determined solely by the proportion of the seeds planted which produced plantlets, and for testing the significance of the difference between the observed and the theoretical distributions.

Applicability of Pearson's equivalent probability r method to the problem of seedling mortality in sea-island, Egyptian, and upland cotton, J. A. Harris and M. M. Ness (*Jour. Agr. Research [U. S.], 36 (1928), No. 7, pp. 615–623*).—The present paper indicates methods by which the deviations of the stand from a purely random distribution may be translated into terms of correlation between the fate of the seedlings of the same hill. Stands obtained in the series of experiments, described in the paper noted above, show that a medium correlation exists between the fate of the seeds of the same hill. Thus, either extremely localized conditions or random differences in the capacities of the seeds of the various hills for establishing themselves as seedlings are important in determining variation in seedling stand.

This method of attack expresses relationships in terms of correlations which are more readily comprehensible than those of large values of χ^2 and almost infinitesimally small values of P (the probability of the given distribution having arisen from random sampling). It also permits the use in this field of a combination of methods heretofore employed in field heterogeneity investigations.

Gossypium, G. Watt (*Roy. Bot. Gard. Kew, Bul. Misc. Inform. No. 8 (1927), pp. 321–356*).—Supplementing an earlier note (E. S. R., 57, p. 130), these pages complete the observations on certain specimens of cultivated and wild cottons in the herbaria of the Royal Botanic Gardens of Kew and Edinburgh.

The roots of flax plants, A. C. Arny and I. J. Johnson (*Jour. Amer. Soc. Agron., 20 (1028), No. 4, pp. 373–380, figs. 5*).—This report of the progress of studies at the Minnesota Experiment Station describes and illustrates the

development of the roots of Winona flax at different growth stages and indicates differences between small-seeded and large-seeded types and the effects of soil types.

Yields of Jerusalem artichoke tested, C. E. CORMANY (*Michigan Sta. Quart. Bul., 10 (1928), No. 4, pp. 156–158*).—Three varieties averaged 8.82 tons of green material containing about 22.4 per cent of dry matter and around 6.16 tons of tubers dug either in the fall or spring. The tubers keep much better in the ground where grown than in the root cellar. The yield of tubers was greatly depressed by cutting the tops for silage in the fall. While the crop may have some value as a possible source of medicinal sugars, it is deemed inferior to better adapted crops for pig pasture or silage.

Better oats for South Dakota, E. W. HARDIES (*South Dakota Sta. Bul. 230 (1928), pp. 12, figs. 6*).—Varieties and cultural methods are recommended for oats in South Dakota as a result of extensive tests.

Richland has given the highest yields at Brookings, and Cole led at Highmore. The highest yielding varieties in both localities belong to the early maturing group. Oat yields on corn stubble at Highmore increased with the thoroughness of seed bed preparation. Comparison of rotations at Brookings and Highmore showed that the largest yields were produced by oats in the corn, oats, sweet clover rotation, except at Highmore where oats are seeded on summer fallow. However, the increase due to summer fallowing was not enough to warrant the practice. Seeding tests suggested an April 15 date and acre rates of 8 pk. in the Brookings and Highmore areas and 7 pk. near Eureka.

The effect of nitrogenous fertilizers on the quality of seed stock and the composition of potatoes on four soil types [trans. title], K. KRÜGER (*Landw. Jahrb., 66 (1927), No. 5, pp. 781–843, figs. 4*).—Experiments reported by the Institute for Plant Culture and Plant Breeding at Halle showed that the quality of potato seed on four soil types was quite differently affected by different forms of nitrogen and rates of application. Moor soil produced good seed stock but low yields of tubers and starch, and sandy soil unfavorable in reaction did not quite equal the moor soil. Loess loam produced high yields and the poorest seed stock. Lime soil gave low yields and very inferior seed.

Increasing the nitrogen application resulted in better yields and improved seed stock on the moor and sandy soils, while on the heavier soils increased yields accompanied poorer germinability. Ammonium sulfate, followed by urea, surpassed other nitrogen sources. Lower yields of potatoes with weak germinability followed cyanamide applied just before planting. Calcium nitrate and sodium nitrate gave rather unfavorable results on all soils.

Potatoes from moor and sandy soils had low contents and the loam and lime soils high contents of total and amino acid nitrogen. Increase in the nitrogen application was followed by increase in nitrogenous constitutents, especially when applied in the form of ammonium sulfate on the light soils and as calcium nitrate and sodium nitrate on the heavier soils. Urea resembled ammonium sulfate in effect, whereas cyanamide was quite inferior.

Variations in the amino acid content during winter storage depended primarily on soil type, and increased with the heavier applications of nitrogen. Tubers from moor and sandy soil lost in amino acid nitrogen during storage, whereas those grown on heavier soils gained. Toward planting time tubers from moor and sandy soils greatly increased in amino acid nitrogen, and this was stimulated by increase in nitrogen application, particularly ammonium sulfate, whereas tubers from the heavier soils decreased in amino acid nitrogen content. Potatoes grown on moor and sandy soils showed a wide ratio in amino acid

nitrogen: total nitrogen during winter storage and a narrow ratio approaching planting time, whereas the reverse was observed in tubers from heavy soils.

The H-ion concentration in potatoes appeared to be restricted to the range pH 5.8 to 6.5. Slight variations, especially toward the alkaline side, can be of significance in regard to the health and productivity of the seed stock. Origin and degeneration tests showed the extent that the nitrogenous composition of seed tubers can give a certain developmental tendency to the next crop.

Factors in beet and sugar yields, A. C. Maxson (*Facts About Sugar, 23 (1928), No. 24, pp. 566–569, 570*).—Extensive consideration of cultural practices which influence the yield and quality of sugar beets in the western part of the United States led the author to recommend fall plowing whenever the type of soil and its condition will permit. Alfalfa and sweet clover land should be prepared in the fall if possible. The seed bed should be prepared thoroughly and early, and as soon as soil and weather conditions permit and conditions favor plant growth in the field sufficient seed should be sown to secure a good germination stand. Beets should be blocked and thinned early, leaving the big roots 12 to 14 in. apart. Cultivation should be thorough and as often as conditions require, and irrigation whenever the crop needs water, regardless of the date, size of beets, or weather conditions. It is advised that the earliest beets be harvested first, but that the harvesting of beets following alfalfa, sweet clover, or applications of barnyard manure be delayed as long as conditions permit. Data are cited in support of these recommendations.

Sugar cane test field work, C. B. Gouaux (*Louisiana Stas. Bul. 202 (1928), pp. 32, figs. 2*).—Varieties of sugar cane were planted in comparison in the fall of 1926 at Glenwood, Reserve, Cinclare, Sterling, and Youngsville, La., and were harvested in November, 1927, and subjected to milling tests. The occurrence of mosaic and red stripe disease, cane borer infestations, and the relative growths of the different varieties were also recorded.

The highest field tonnage yields were obtained on sandy clay loam and Olivier silt loam, and the maximum sugar yields per ton were made on Teche clay. The P. O. J. 36, 213, and 234 varieties, which have been released, surpassed the old varieties and other P. O. J. varieties tested in cane yields and in pounds of sugar per acre. P. O. J. 213, followed by P. O. J. 36 and 234, was outstanding in the alluvial sections, while P. O. J. 36, followed by P. O. J. 234 and 213 showed up best in the Teche and southwestern sections. Various milling tests indicated that the P. O. J. varieties 36, 213, and 234 can be milled successfully.

Cane arrows from barreled stools, S. H. Evelyn (*Planter and Sugar Manfr., 80 (1928), No. 21, pp. 402, 403, figs. 3*).—This contribution from the Barbados Department of Science and Agriculture describes the successful production of arrows in 8 and 10 months by the B. 67 and Ba. 11569 varieties of sugar cane grown from cuttings in barrels used for shipping cement. The arrows from the barreled stools were found normal, and were used successfully in hybridization by both the "arrow lantern" and open crossing methods.

A graphic story of sugar, L. A. Henke (*Hawaii Univ., Agr. Studies No. 8 (1928), pp. 24, figs. 25*).—Information is presented graphically on the production of sugar, acreage of sugar cane varieties, and plantation yields in Hawaii and on production costs, production, consumption, and the commercial movement of sugar elsewhere in the world.

[Fertilizer experiments with tobacco in Java], A. N. J. Beets (*Proefsta. Vorstenland. Tabak [Dutch East Indies], Meded. 59 (1927), pp. 127, pls. 2; Eng. abs., pp. 76–81*).—Extensive fertilizer tests were made with tobacco on different soil types in Java during the period 1903–1924. Application of organic

fertilizers, such as manure and dessa earth, generally resulted in increased production of fermented leaf per plant and much better quality. Leaf development was improved, and the leaf became tawnier without much effect on its brightness. When commercial fertilizers were applied after organic materials, striking increases in fermented leaf were usually observed and a favorable effect was noted on the growing crop and on length of leaves, whereas the quality was enhanced on about half the fields and the color was favorably affected in only about one-third of the tests. Replacement of organic manure by boengkils, bat dung, and molasses was not advantageous, although fair results were obtained with ammonium sulfate. Substitution of mixtures of ammonium sulfate and phosphatic fertilizers for the organic manures gave favorable results in many cases and did not seem prejudicial to soil fertility over a 4- or 5-year period.

Distribution of wheat varieties in Washington, E. G. SCHAFER and E. F. GAINES (*Washington Col. Sta. Bul. 224 (1928), pp. 30, figs. 5*).—The wheat variety survey made in 1926 and noted earlier (E. S. R., 59, p. 227) is described in greater detail, and the distribution areas are shown for the leading varieties, with comments on the preferences of farmers.

Baart and Turkey appeared to be the most popular varieties for areas of light rainfall. Jenkin, Federation, and Dicklow were preferred for irrigated land, and Jenkin and Federation seemed especially suitable in areas of greater rainfall, i. e., from 20 to 30 in. Ridit, because of its resistance, will probably increase where smut is most severe. Fortyfold, Bluestem, and Marquis were popular near the foothills where the granitic and basaltic soils meet and in areas usually maintaining a snow cover in winter. Triplet and Hybrid 128 were preferred in the Palouse country along the Snake River.

Inspection of agricultural seeds, H. R. KRAYBILL ET AL. (*Indiana Sta. Circ. 149 (1928), pp. 104, fig. 1*).—The tables presented show the purity, germination percentage, weed seed content, and for legumes hard seed content for 1,416 official samples of agricultural seed collected from seed dealers in Indiana during the period September 1, 1926, to July 1, 1927.

HORTICULTURE

Crop-plant stimulation with paper mulch, L. H. FLINT (*U. S. Dept. Agr., Tech. Bul. 75 (1928), pp. 20, figs. 10*).—Tracing briefly the early history and development of the use of mulch paper and discussing the underlying principles involved, the author reports the results of 4 years' experiments conducted at the Arlington Experiment Farm and at his Aurora Hills, Va., home. In 1924 experiments with field corn, tomatoes, and sweet potatoes, the tomatoes and sweet potatoes were consistently benefited by paper mulches and the corn in most cases slightly adversely affected. In 1925 sweet potatoes mulched with paper outyielded the controls by 126.4 per cent. At the same time small trials with tomatoes, green beans, and potatoes gave consistent results in favor of the paper mulch. In 1926 cotton mulched with paper yielded approximately double that grown under ordinary culture. Of various vegetables tested in 1926 strikingly increased yields were obtained in the case of carrots, beets, cucumbers, and sweet corn. Part of the increase was traced to better germination in the mulched areas. Squash planted in 1927 on the cotton area without removing the paper outyielded and outgrew the controls, and other garden crops responded in a like manner, indicating that the stimulation from paper was not a chance result. In the author's garden in 1927 mulched white potatoes came into blossoming earlier and yielded over four times the crop of the control plants.

Among advantages accruing from the use of paper mulch are listed the practical elimination of weeding and cultivation and the conduction of rain directly to the base of the plants. Soil temperature increases associated with black paper amounted to about 10° F. in direct sunlight and 3° without this radiation. Examination of soil samples collected at various points indicated that the water content of the top 4 in. under the middle of the mulch was 16 per cent greater 2 days after a rain than at a point 18 in. distant from the paper. The author suggests that in dry periods the greater supply of water under paper may render available food supplies in the upper soil layer. In respect to nitrates, the author was unable to detect any significant difference between mulched and unmulched soils. However, determinations showed excess nitrates in the tissues of the mulched plants as contrasted to none or a trace in the nonmulched plants. It is believed that paper mulch may increase soil fertility through stimulation of the microorganisms. As to the kind of paper, any impervious dark paper free from soluble toxic materials such as tar is deemed of potential value for mulching.

Vegetable growing in Missouri, J. T. QUINN and T. J. TALBERT (*Missouri Sta. Circ. 167 (1928), pp. 62, figs. 19*).—Beginning with a general discussion of the principles and practices of vegetable gardening, soils, fertilizers, plant propagation, garden planning, control of pests, etc., the authors discuss the cultural requirements of the various vegetables arranged in alphabetical order.

[Horticultural investigations at the Guam Station], J. GUERRERO (*Guam Sta. Rpt. 1926, pp. 12, 13–15, figs. 3*).—Among new introductions fruiting quite satisfactorily were the Barbados cherry, jujube, avocado, and a selection of *Citrus aurantium*, which, on account of resistance to disease, is being propagated as a rootstock. Little progress was made in an attempt to select fixed types of papaya. Of several kinds of material used in propagating bananas whole unpruned stalks about two-thirds grown were the first to bear ripe fruits. The quality, however, was poor and the bunches very small.

Successful heading was secured in the All Seasons and Surehead varieties of cabbage. Applications of coconut meal as fertilizer for carrots, radishes, and Kentucky Wonder beans showed this material to be particularly valuable for radishes and beans. Yields taken on Chinese White Winter radishes treated with various nitrogen fertilizers and manures were largest on the poultry manure plat and smallest on the sulfate of ammonia and the Leunasalpeter plats.

An account is given of the various plants and seeds distributed.

Ganeshkhind Botanical Gardens, G. S. CHEEMA (*Bombay Dept. Agr. Ann. Rpt. 1926–27, pp. 219–221*).—Studies of the nature of die-back injury of citrus trees indicated that soil aeration is closely associated, since on well drained, light soils, such as those on the banks of rivers, citrus trees were maintained in good condition for a long period. An interesting banana variation with fruits having a pale saffron-colored pulp at the center instead of the normal white was observed. Attempts to cross *Psidium guajava* with *P. molle* gave rise to two fruits, the seeds of which failed to germinate. Guava seedlings raised from a single fruit differed widely in the shape and the size of the fruits. Mango trees from 10 to 16 ft. tall were transplanted successfully.

The influence of the size of onion sets on the development and yield of onions [trans. title], A. BOLOTOV (*Moskov. Oblastn. Selsk. Khoz. Oyptn. Sta. [Moscow Regional Agr. Expt. Sta.] [Bul.] 23 (1927), pp. 135–149, fig. 1*).—Onion sets divided into four groups, small, medium, above medium, and large, yielded per 65.6 ft. of row 28.8 kg. (63 lbs.), 45.1, 48.1, and 58.5 kg., respectively. However, the relative rates of increase according to the weight of the

crop over that of the planted sets were 83.4, 56, 27.8, and 19.6, respectively. The small sets required three more days to start rooting than did the two largest plats.

Varieties of greenhouse tomatoes tested, J. B. EDMOND (*Michigan Sta. Quart. Bul., 10 (1928), No. 4, pp. 187–190*).—A brief report on the results of a comparative test of various forcing tomato varieties.

The leaf surface and the volume of assimilation tissues in relation to the length of the branches on apple trees [trans. title], A. V. PETROV (*Moskov. Oblastn. Selsk. Khoz. Opytn. Sta. [Moscow Regional Agr. Expt. Sta.] [Bul.] 23 (1927), pp. 50–58, figs. 2*).—Records taken on 1-year-old apple shoots with reference to the internodes and number and area of the leaves showed varietal differences in respect to the proportion of leaf area per unit length of shoot. The number and total area of the leaves increased with the length of the shoots, but the density of the foliage, as expressed by the area of leaves per unit length of shoot, decreased with increased length, suggesting the theory that if the power of assimilation is proportional to the green surface of the leaves, a short shoot carrying a fruit bud absorbs more solar energy and produces more plastid substances.

Bud and root selection in the apple, K. SAX (*Maine Sta. Bul. 344 (1928), pp. 21–32, figs. 2*).—Discussing the various factors, environment, seedling rootstocks, scions, etc., that may cause variability in the growth and yield of apple trees, the author reports the preliminary results of a propagation experiment with the apple in which, in two cases out of seven, significant differences in growth were observed which could be associated with the parent trees. In one instance which involved two McIntosh parent trees from the same orchard the buds from the productive parent produced progeny 25 per cent larger than did the buds from the unproductive parent. In the second instance the situation was reversed; buds from the unproductive tree (Delicious) produced significantly larger trees than did buds from the more productive parent.

The author believes that the results suggest at least that hereditary differences in productivity may occasionally occur within an apple variety. The conflicting results suggest, however, the fallacy of basing a system of nursery bud selection on yields alone. At the best the author believes that bud selection apparently only maintains the normal productivity of a variety, and that any system of maintaining normal yields by means of so-called pedigreed nursery stock must be based on progeny tests.

Morphological and biological peculiarities of the most important varieties of apples [trans. title], A. V. PETROV (*Moskov. Oblastn. Selsk. Khoz. Opytn. Sta. [Moscow Regional Agr. Expt. Sta.] [Bul.] 23 (1927), pp. 34–49, fig. 1*).—A total of 40 distinctive markings divided into six main groups, (1) flower characters, (2) leaf characters, (3) shoot characters, (4) crown, (5) fruit markings, and (6) biological peculiarities, are used in a proposed classification of apple varieties. The susceptibility of 25 apple varieties to various fruit diseases is recorded, and notes are given on resistance to winter injury, photosynthetic requirements, etc.

Three years of dust spraying under Missouri conditions, K. C. SULLIVAN (*Missouri Sta. Bul. 259 (1928), pp. 12, fig. 1*).—Discussing the various points in favor of dusts for controlling insect and fungus pests of the apple, the author reports on the results of a comparative trial of dusts and sprays extending over the three years 1925 to 1927. As a whole, dusts were not found as satisfactory as liquids for controlling apple diseases but are deemed promising as supplemental to the liquids for controlling codling moth. Dusts did not remain long on the tree, necessitating twice as many applications as of liquids, but have an

advantage in late summer treatments, because of the freedom from toxic residues on the fruits. A sulfur dust composed of 90 lbs. of sulfur and 10 lbs. of arsenate of lead was equally as effective as one containing 85 lbs. of sulfur and 15 lbs. of lead, and 2 lbs. per tree (from 20 to 30 years of age) was quite as effective as 5 lbs. Home mixed copper dusts proved unsatisfactory, but a proprietary mixture gave good results.

Asserting that dusting machines and dusting chemicals are still in the experimental stage, the author advises that under present conditions in Missouri dusts should not be depended upon to replace sprays entirely. Emphasis is placed on the need of timing applications for codling moth by actual observations of emergence in breeding cages in the orchard.

Blueberry culture in Florida, H. Mowry and A. F. Camp (*Florida Sta. Bul. 194 (1928), pp. 279–297, figs. 11*).—A discussion of the present status of blueberry growing in Florida, of the botany, cultural requirements, methods of propagation, harvesting, etc.

As with northern blueberries, the Florida species was found to vary decidedly in size and shape of fruits. An examination of the fruits showed about 80 per cent of water, 7.5 per cent by weight of sugar, and about 0.38 per cent of acid, calculated as citric acid, in the fresh berries. An extract of the crushed fruit was approximately pH 3.5.

An examination of the roots of a large number of wild and cultivated plants showed mycorrhiza in every instance, and determinations of the soil reaction in the vicinity of the roots gave readings of from pH 5 to 5.6 in the first foot and 5 to 5.2 in the second. The results of propagation tests suggest that cuttings should be taken in early winter, using fully dormant, current season wood. Clean, coarse sand or a mixture of half sand and half peaty muck proved good rooting media. Observations indicated that severe cutting back of old plants resulted in greatly increased yields in the second and third years and also facilitated harvesting.

A new hardy seedless grape, A. B. Stout (*Jour. Heredity, 19 (1928), No. 7, pp. 316–323, figs. 4*).—A brief account of the origin and characteristics of a new seedless grape developed at the New York State Experiment Station by crossing an almost seedless seedling (Triumph×Dutchess) with pollen of the seedless Sultanina rosea.

Citrus maturity test, F. J. de Villiers (*Union So. Africa Dept. Agr. Bul. 37 [1928], pp. [2]+16, figs. 10*).—Stating that the seedling oranges, Valencias, and Navels shipped from South Africa in 1928 must have ratios of soluble solids to acid in juice of not below 5 : 1, 5.5 : 1, and 6 : 1, respectively, the author discusses the principles underlying the test, and with the aid of photographs outlines the methods to be employed in making these determinations.

Coffee, A. D. Le Poer Trench (*Kenya Colony Dept. Agr. Bul. 17 (1927), pp. 38, pl. 1, figs. 34*).—A discussion of principles of pruning as applied to coffee and general observations on the results of various trials.

Growth studies of the pecan, C. L. Isbell (*Alabama Sta. Bul. 226 (1928), pp. 68, figs. 52*).—The full report (E. S. R., 59, p. 38) upon a comprehensive study of growth and fruiting in the pecan.

Cytological observations indicated that differentiation of the staminate flowers (catkins) extends over a comparatively long period, beginning in early spring in the first formed buds and occurring again in mid- or late summer in buds formed in the axils of late appearing leaves on secondary shoots. Catkin differentiation was found so abundant and occurred under such a wide range of conditions that the author doubts if it ever becomes a limiting factor in pecan growing. On the other hand, no evidence was found that pistillate flowers are differen-

tiated, except in a relatively short period as growth is starting in the early spring, and their formation, therefore, is believed to be associated with nutrient conditions within the plant, as determined the preceding summer and autumn, leading to the suggestion that cultural and fertilizer practices during the period that nuts are maturing and nutrients being stored must be exceedingly important.

Observations on the growing habit of the pecan during a year's cycle showed that the tree may form many different types of shoots differing in length and performance. Records taken on trees of several varieties just prior to harvest indicated that very long and very short shoots are not fruitful, with some varietal differences, that each variety has an optimum shoot length in relation to production, and that many of the nonfruiting shoots abscise their terminal buds prior to nut dropping. Longer shoots carried more nuts than did shorter shoots, suggesting a correlation between vigor and fruitfulness.

Studies of the effect of girdling and of pruning on the pecan indicated a rather marked degree of adaptability in this species, buds that normally would never have opened responding when the normal buds were injured or removed. A comparatively large percentage of the overwintering buds was evidently potentially productive, much as has been found for the grape and raspberry. Disbudding as late as April 14 caused buds to fruit that otherwise would have remained latent or produced catkins or short shoots. Little evidence was secured to indicate that pecan yields might be increased practically or profitably by pruning. A marked correlation varying with varieties was noted between the type and the amount of new shoot growth made and the tendency to form pistillate flower producing shoots.

Hardy evergreens, F. A. Schrepfer (*New York: Orange Judd Pub. Co.; London: Kegan Paul, Trench, Trubner & Co., 1928, pp. 127, pls. 11, figs. 14*).—A practical handbook on the planting, growth, and management of all hardy evergreens, exclusive of the broad-leaved species.

Evergreens for the small place, F. F. Rockwell (*New York: Macmillan Co., 1928, pp. XI+84, pls. 6, figs. 58*).—Information of a practical nature is given on the propagation, culture, utilization, and varieties of evergreens.

Spring flowering bulbs, C. L. Thayer (*New York: Orange Judd Pub. Co.; London: Kegan Paul, Trench, Trubner & Co., 1928, pp. 123, pls. 11, fig. 1*).—General information is offered on species and varieties, culture, propagation, and utilization.

Use of cut flowers, A. Laurie (*Michigan Sta. Spec. Bul. 176 (1928), pp. 22, figs. 12*).—Attractively illustrated, this bulletin presents practical suggestions on the effective use of cut flowers, discussing such points as receptacles, arrangement, uses in decorating, winter forcing of spring flowers, use of dried flowers, the care of cut flowers, and the shipping of flowers.

FORESTRY

Annual investigative report for 1927 and program for 1928, Appalachian Forest Experiment Station (*U. S. Dept. Agr., [Forest Serv.], 1928, pp. [3]+52*).—A mimeographed report presenting a review of the work of the station and a survey of the general scope of its activities.

An examination in 1926 of the reproduction on sample plats established in 1923 in a 30-year-old hardwood stand at Berea, Ky., showed a remarkable response to thinning which removed two-thirds of the trees. From 1924 to 1926 yellow poplar and ash increased from 0.5 and 2 per cent of the stand to 10 and 23 per cent, respectively, and the number of advanced-growth seedlings above 7 ft. increased from 64 to 815.

Weeding out in 1923 of chestnut, silverbell, and sumac from reproduction on a 6-year-old burn in the Pisgah National Forest was followed by a very satisfactory increase in the height of the liberated yellow poplar. In 1927 there was recorded a 56 per cent increase above the average height at the time of liberation as compared with little or nothing for the controls. Counts in June of the freshly germinated yellow poplar on a freshly burned over area and on an adjacent unburned area showed 36,000 and 2,400 seedlings per acre, respectively, most of which unfortunately subsequently perished.

A survey in 1927 of cut-over areas unburned since cutting in the Unaka, Natural Bridge, and Shenandoah National Forests showed abundant reproduction. Old trees discarded at the time of cutting were found a menace to reproduction through shading. A study of spruce reproduction in high altitude spruce-fir stands of West Virginia, Tennessee, and North Carolina showed that fires subsequent to cutting practically kill out red spruce, fir, and hemlock and encourage birch and other less desirable trees. Growth rate studies showed spruce seedlings to grow very slowly in comparison with hardwoods.

Thinnings in 1921 and 1923 in permanent sample plats established in 1916 in 16- to 18-year-old pure white pine, mixed shortleaf and white pines, and in sugar maple with a scattering of white pine stands at Biltmore, N. C., showed an 8.7 per cent net gain in volume from thinning. The results of studies of replacement of blight-killed chestnut are again discussed (E. S. R., 57, p. 342), as are also the results of a study of germination and survival in the oak (E. S. R., 57, p. 739).

Preliminary observations of the effect of fire on loblolly pine reproduction indicated that ordinary fires generally destroy trees up to 3 in. in diameter and that unusually severe fires may kill trees as large as 14 in. in diameter. Repeated fires prevented reproduction of pine and on good soils favored hardwood at the expense of pine. On unburned areas from two or more seed trees gave adequate reproduction. It was noted that dominant and codominant seed trees bore more seed and also began to gain in diameter sooner than weaker trees.

Preliminary studies of the rate of decay of logging slash showed that a comparatively long period is needed to complete the disintegration in certain species, such as oak and chestnut. Special studies were conducted upon the best silvicultural practice for various species. Data on the damage resulting from forest fires led to the suggestion that the percentage of kill for any diameter class may serve as an index to the severity of the fire. Low humidity was found associated with the frequency of forest fires, and methods of forecasting hazardous weather are discussed. Of many species tested for the spruce-fir region red spruce and southern balsam fir were most satisfactory, with pitch pine, Norway pine, and Norway spruce quite suitable.

Breeding pines for more rapid growth, L. Austin (*Jour. Heredity, 19 (1928), No. 7, pp. 288–301, figs. 7*).—The author discusses the work, aims, and equipment of the Eddy Tree Breeding Station established at Placerville, Calif., in 1925. Pine pollen was found to germinate most favorably in a 5 to 10 per cent sugar solution in a Van Tiegen cell. Germination was usually completed in about 3 days, with from 75 to 90 per cent of the grains developing pollen tubes. Placed in cotton-stoppered vials held in the dark or in indirect light, pine pollen was kept viable for several months. By making rather wide crosses it is hoped to secure the benefit of hybrid vigor (heterosis), with resulting large size and vigorous growth.

Walnut interplanted with cedar grows rapidly, P. W. Robbins (*Michigan Sta. Quart. Bul., 10 (1928), No. 4, pp. 161–163*).—Observations in a small

plantation of black walnut and white cedar, species arranged in alternate rows 4 ft. between rows and between plants in the row, showed this to be an excellent combination. Measurements on the 478 walnut trees remaining after 18 years showed an average growth per acre per year of 0.95 standard cord. It is suggested, however, that a spacing of 6 by 6 ft. so arranged that when the evergreens were removed the walnuts would stand 12 by 12 ft. would be more ideal. The slow-growing cedars did not compete seriously with the walnuts for light, kept weeds in check, and stimulated height growth in the walnuts, and at the same time were potentially valuable for sale as ornamental plants.

Trees for Wyoming farmers and ranchmen, W. L. QUAYLE (*Wyoming Sta. Circ. 21 (1928), pp. 3*).—This is a revision of Circular 20 (E. S. R., 57, p. 637).

Accompanying the price list of trees available for distribution to farmers and ranchmen there are presented suggestions on the choice of species, selection of sites, planting, and subsequent care of windbreak and wood-lot plantations.

Forestry in Ontario, compiled by A. H. RICHARDSON (*Toronto: Ontario Dept. Forestry, [1928], pp. 73, figs. 25*).—An illustrated handbook presenting general information concerning forests and forestry, with particular reference to protection, propagation, reforestation, and aerial surveys.

Computing results from a forest plantation, A. K. CHITTENDEN (*Michigan Sta. Quart. Bul., 10 (1928), No. 4, pp. 166, 167*).—Data presented on the cost of establishing and carrying forest plantations show, among the various items, land costs to be highly important in determining ultimate profits.

Instructions for the scaling and measurement of national-forest timber (*U. S. Dept. Agr., Forest Serv., 1928, rev. ed., pp. V+103, figs. 14*).—A small handbook of general instruction, rules, and tables.

DISEASES OF PLANTS

The plant disease situation in Illinois during 1925, L. R. TEHON (*Ill. State Acad. Sci. Trans., 19 (1926), pp. 144–150*).—Several accounts presented in various forms by the author on this general subject have been noted (E. S. R., 54, p. 143; 57, p. 539) or are noted elsewhere in this issue (see page 538). This paper, considered as the fifth account, agrees with the general purpose of previous reports. Statements cover, in brief form, weather relationship and, in connection with this, diseases of fruits, cereals, and miscellaneous crops. Crop diseases during the year were in general mild, the very warm, dry weather of the growing season apparently causing the differences noted.

Plant diseases in the Kamouraska region, 1924–1925, E. CAMPAGNA and F. GODBOUT (*Quebec Soc. Protect. Plants Ann. Rpt., 18 (1925–26), pp. 61–68*).—A briefly annotated list is given of the principal plant diseases occurring in the Kamouraska region, Quebec, during 1924–25.

Mycological department [report], E. S. SALMON ([*Southeast. Agr. Col., Wye*], *Research and Advisory Dept. Ann. Rpts. 1924–25, pp. 23–31; 1925–26, pp. 23–31*).—In each of these reports an outline is given of advisory work during the year covered, of the occurrence and significance of plant diseases, of subjects under investigation, and of publications issued.

Mycological investigations, P. H. WILLIAMS ET AL. (*Expt. and Research Sta., Cheshunt, Herts, Ann. Rpt., 12 (1926), pp. 26–46*).—Plant diseases brought to the station which had not been reported previously included arum leaf spot (*Phyllosticta richardiae*), aster blackleg (*Phytophthora cryptogea*) and flower blight (*Stemphylium* sp.), carnation wilt (*Alternaria* sp.), celery leaf spot (*Septoria apii*), cucumber leaf spot (*Phyllosticta cucurbitacearum*), fig leaf bronzing (*Macrosporium* sp.), *Gesneria* sp. bacterial leaf spot (organism not identified), gladiolus dry-rot (*Fusarium* sp.), hyacinth soft rot (bacterial), iris leaf

spot (*Heterosporium gracile*), raspberry cane blight (*Leptosphaeria coniothyrium*), rose leaf curl (cause unknown), *Statice latifolia* root rot (*Ramularia* sp.), a tulip disease (*Botrytis narcissicola*), and grapevine oedema (physiological). A cucumber disease, new to England but previously reported in America, was noted in the Lea Valley in May, 1926. It is caused by *P. cucurbitacearum* and is most injurious at low temperatures. Condensed special reports on observations and investigations are noted separately below.

Thielavia root rot of the tomato, P. H. Williams (pp. 26–29).—It is found that *T. basicola* is a weak parasite of tomatoes, the disease intensity lessening as the growth rate of the plant increases. Below 48° F. infection is slight. Above that point temperature does not entirely govern infection.

"Damping-off" of tomatoes and cucumbers, P. H. Williams (pp. 29–32).—The investigations previously reported (E. S. R., 57, p. 544) have been continued, and it is stated that, though tomato seedlings were never infected by Phytophthora, pot plants of both tomatoes and cucumbers could be infected at certain periods of the year, the first infection period occurring in March and the second during June and July. Minimum, optimum, and maximum temperatures approximate 45, 95, and 112°, respectively.

Bacterial rot of hyacinth, P. H. Williams (pp. 32, 33).—Hyacinth bulbs having a brownish scale stinking rot, sometimes affecting the whole bulb, showed in case of healthy plants and different vegetables an action similar to that of *Bacillus carotovorus*, which it also resembled in culture.

Soft rot of the arum, W. F. Bewley and P. H. Williams (pp. 33, 34).—A treatment used for some years and found effective in most cases included as a fungicide 1 part of 40 per cent formaldehyde in 49 parts of water. A revised treatment, which is outlined, includes steeping the corms for 7 hours in mercuric chloride solution made up of 1 oz. of mercuric chloride in 6 gal. of water.

Tomato mildew, I. C. Jagger (p. 34).—Of 96 tomato varieties tested and found susceptible to *Cladosporium fulvum*, Sterling Castle, Up-to-date, and more particularly Norduke showed some resistance.

Lettuce mildew (*Bremia lactucae, Reg.*), I. C. Jagger (p. 35).—Four lettuce varieties, proved immune in the United States, developed mildew when inoculated with *B. lactucae* collected near London, this fact suggesting that this may be a physiological strain differing from that in the United States. In tests of 68 varieties of lettuce, one repeatedly showed resistance to locally collected *B. lactucae*.

Rhizoctonia "foot-rot" of the tomato, T. Small (pp. 35–37).—As a result of this investigation, which is outlined, control methods are suggested, including removal of the diseased tomato plants with adjacent soil and disinfection of the area with a 0.25 per cent solution of Uspulun, and a top-dressing of ammonium sulfate after replanting; dry, clean cultivation; and steaming the soil after the plants are removed at the end of the season.

A disease of the strawberry, T. Small (pp. 38, 39).—Examinations of plants with isolations and inoculations since the discovery of this strawberry disease in 1925 are said to have shown the trouble to be due to *Diplodina lycopersici*, a study of which is outlined, with the significant findings. Stab inoculations into the base of healthy roots showed that the fungus is parasitic on the strawberry.

"Root-rot" of the cucumber, A. P. Wilson (pp. 39–46).—From cucumber roots decaying prematurely under conditions of commercial culture, there have been isolated *Fusarium* sp., *Phytophthora* sp., *Trichothecium* sp., an ascomycete in the perithecial stage, a fungus having carbonized hyphae, an orange bacillus, a creamy viscous bacillus, and a cream colored bacillus showing dendritic growth. The most important organism appears to be the fungus which produces carbon-

ized hyphae, although no positive results were obtained by inoculating healthy plants with any of the organisms isolated. The fungus with carbonized hyphae thrives at a relatively high temperature, having optimum spore production at 77°. Plants in beds over either a steamed base or an ashes base showed the healthiest roots.

Plant diseases and pests in Denmark, 1925 [trans. title], E. Gram and M. Thomsen (*Tidsskr. Planteavl, 33 (1927), No. 1, pp. 84–148, figs. 7; Eng. abs., pp. 146–148*).—This report covers both plant pests and plant diseases for the period November 1, 1924, to October 31, 1925, which was characterized by high temperatures both winter and summer, winter precipitation supernormal, snow slight, and spring and summer dry, followed by a cool, rainy period after August.

Barley net blotch (*Pleospora teres*) was plentiful, particularly in Prentice varieties. Stripe (*P. graminea*) showed a decrease, due largely to seed disinfection. Smuts were scarce, except *Urocystis occulta*. Foot rot (Fusariums chiefly) was important, particularly in dense growth. *Trifolium pratense* showed mosaic. Beet mosaic was common in seed-growing districts. Beet dry-rot (*Phoma betae*) was very prevalent on soils rich in lime (pH 7.7 and above). Turnip mosaic appeared in a few fields in old seed-producing districts. A cruciferous heart rot was apparently associated with attacks of *Contarinia nasturtii*. Swede dry-rot (*P. napobrassicae*) prevailed in some varieties. Carrots showed leaf spot due to *Cercospora apii carotae*, and *Septoria apii* was injurious in autumn. Potato root galls were caused by *Spongospora subterranea*. Wart (*Synchytrium subterraneum*) was confined to gardens in Schleswig (Slesvig). Strawberry was infested with *Aphelenchus ormerodis* at Copenhagen. Tomatoes were rotted by *F. erubescens*. A cucumber angular leaf spot in the field was caused by *Sporodesmium mucosum pluriseptatum*. Black peat disease in oats was controlled by the use of town refuse mixture, with clay, but better with copper sulfate, 50 kg. per hectare (45 lbs. per acre). A Bordeaux dust tested in comparison with Bordeaux spray for potatoes on farms proved inferior, though it may succeed on small fields.

Mycology, N. K. Pillai (*Travancore Dept. Agr. and Fisheries Rpt. 1925–26, p. 4*).—Investigation of coconut palm root disease developed no parasitic fungus. A coconut palm leaf rot is thought, from work which has been started, to be due to a nematode. A sugar cane disease investigated proved to be red rot. A pepper vine disease appears to be of the nature of stump rot.

Some plant pathological problems of China, R. H. Porter (*China Jour. Sci. and Arts, 5 (1926), No. 1, pp. 35–40*).—Diseases of economic crops, computed as to reduction in unit area yield, cause heavy losses annually in China. The present account seeks to show the importance of certain parasitic fungi in limiting the food supply. Conditions in different areas are shown in tabular detail as to percentages, with discussion.

The work of breeding disease resistant crop plants at the College of Agriculture at Los Baños, N. B. Mendiola and G. O. Ocfemia (*Philippine Agr., 15 (1926), No. 3, pp. 117–128, figs. 7*).—Considerable work has been done at the Philippine College of Agriculture as to plant diseases, susceptibility, and resistance, and in breeding disease-resistant plants. Conditions of resistance and of susceptibility of different economic and related plants to certain diseases are indicated, with listings of such susceptible plants.

Spraying, dusting, and fumigating of plants, A. F. Mason (*New York: Macmillan Co., 1928, pp. XXXI+539, figs. 237*).—"The author has prepared this book to supply in a condensed form for the use of the commercial, professional,

and amateur fruit grower and gardener the latest information on the methods, machinery, and principles involved in combating agricultural pests."

Use of carbon dioxide and colloidal preparations in fungicidal sprays [trans. title], H. Armet (*Prog. Agr. et Vitic. (Éd. l'Est-Centre), 45 (1924), No. 30, pp. 88–96, fig. 1*).—A discussion is given of the composition, properties, and effectiveness of sprays.

Colloidal Burgundy mixture, prepared by the addition of silica in soluble form and gasified by the addition of liquid carbon dioxide, is recommended because of its spreading and wetting qualities, its adherence, and its efficacy against mildew.

Seed-borne disease, E. S. Moore (*So. African Jour. Nat. Hist., 6 (1927), No. 2, pp. 116–126*).—An account, chiefly referential and discussional, is given which covers both local and general aspects of seed-borne plant diseases, with mention of a few modern compounds or treatments which appear promising.

New forms for the mycological flora [trans. title], Z. Gibzitska (*Izv. Kievsk. Bot. Sada (Bul. Jard. Bot. Kieff), No. 5–6 (1927), pp. 165–168, pl. 1, fig. 1*).—In 1925, Giant Yellow gooseberry bushes, which had been rapidly dying out, were found to bear on the bark dots which proved to be fruiting bodies belonging to fungi of several species, including *Hendersonia gigantispora corticola, Diplodina oudemansii,* and two claimed to be new, which are technically described as *Robillarda jaczewskii* and *Leptosphaeria grossulariae.* Other forms, which are technically described as new in this note, include *Fominia rubi idaei* n. g. and sp. on half-dead raspberry; *Monochaetia berberidis* n. sp. on living branches of *Berberis vulgaris; Phyllosticta fomini* n. sp. on living leaves of *Exochorda alberti;* and the new varieties *Stemphylium inflatum ribis grossulariae* on dry branches of *Ribes grossularia,* and *Phlyctaena vagans caraganae* on dry branches of *Caragana arborescens.*

Notable pathogenic fungi in Bohemia [trans. title], A. Nechleba (*Ztschr. Pflanzenkrank. u. Pflanzenschutz, 37 (1927), No. 9–10, pp. 267–270*).—Information is furnished regarding matters including phases of *Polyporus versicolor, Trametes radiciperda, Cenangium abietis,* and *Agaricus melleus.*

Some Vermicularias of economic importance in south India, S. Sundararaman (*Madras Agr. Dept. Yearbook 1926, pp. 10–12*).—These notes describe in detail the morphological characters of several fungi belonging to the genus Vermicularia and causing diseases of crops, including *V. capsici* on *Capsicum frutescens, V. curcumae* on *Curcuma longa, V. zingiberae* on *Zingiber officinarum, Vermicularia* sp. on *Cicer arietinum,* and *Vermicularia* sp. on cabbage.

From tabular results of studies indicated it is concluded that the organisms occurring in chilies, turmeric, cabbage, knolkhol, and cauliflower belong to the same species, and that the organisms on ginger constitute a different species.

Virus diseases [of plants], B. T. Dickson (*Quebec Soc. Protect. Plants Ann. Rpt., 18 (1925–26), pp. 10–13*).—In a brief, general, compilatory article on virus diseases, for which the term "viroses," ascribed to L. R. Jones, is also used, the author lists, with brief discussion, the characteristics of a virus.

Bacterial wilt of marigold, or amarilla, E. F. Roldan (*Philippine Agr., 15 (1926), No. 1, pp. 37–40, figs. 3*).—Amarilla (*Tagetes erecta*) bacterial wilt, first noted in the nursery of the College of Agriculture at Los Baños, Laguna, in October, 1925, and characterized by a wilting of the foliage and, in general, by symptoms much like those of plant bacterial wilt, is constantly associated with a form comparing favorably with the bacterial wilt organism (*Bacterium solanacearum*). The amarilla strain is capable of infecting potato, tomato, tobacco, and castor bean, which are said to have been reported as susceptible. The tomato strain is said to be also capable of infecting amarilla.

The author believes that the bacterium causing amarilla wilt is identical with *B. solanacearum*.

Epidemic diseases of grain crops in Illinois, 1922–1926, L. R. TEHON (*Ill. Nat. Hist. Survey Bul., 17 (1927), Art. 1, pp. [3]+96, figs. 103*).—As the first of the steps necessary in a study of the epidemiology of crop diseases, the Natural History Survey published in 1924 a report (E. S. R., 54, p. 143) on the occurrence and distribution of diseases of Illinois crop plants. This report, which was based chiefly on data obtained during 1921–1923, also contained brief histories of the several diseases. The second step consists in the gathering under precise terminology of accurate year-to-year, season-to-season, regional, and local data to show differences in abundance and severity of disease, here limited to cereal disease. This report, as a whole, outlines general methods used in the survey, data on the year-to-year prevalence and destructiveness of cereal diseases, and some relations of disease to weather and climate, with summary and conclusion.

The methods for collecting data take into account the effect upon the individual plant and its parts rather than upon yield. The use to be made of such exact data has been exemplified briefly, with some of the wheat leaf rust data.

"It has been shown that there is a well defined relation between intensity of attack and annual mean temperatures and yearly totals of rainfall; that in the July-December period of the year temperature has a greater influence than rainfall, while in the January-June period rain is the more important, in determining the destructiveness of a year's rust attack; that there is a possibility of predicting with reasonable accuracy the date upon which the first spring infection will occur in any part of the State in any year; that during the months of May and June the correlation between disease development and weather conditions lies mainly with temperature; and that the degree of destructiveness which an epidemic, once started, is likely to attain may be predicted from the rapidity with which degrees of mean daily temperature accumulate."

Smuts of Colorado grains, L. W. DURRELL (*Colorado Sta. Bul. 334 (1928), pp. 24, figs. 14*).—The more important smuts of grains in Colorado are popularly described, their methods of attacking the host plants explained, and suggestions given for their control.

The use of copper carbonate dust for the control of stinking smut of wheat, millet smut, and kernel smut of sorghum; hot water treatment for the loose smuts of wheat and barley; and formaldehyde for the oat smuts and covered smut of barley are recommended. Tabular directions are given for the various seed treatments.

The dry treatment of grains with fungicides, using continuous dusting machines [trans. title], G. FRIEDRICHS (*Fortschr. Landw., 3 (1928), No. 2, pp. 58–66, figs. 5*).—Comparative tests of a number of continuous dry dusting machines for grains are presented and discussed.

The results are taken to indicate that the problem of continuous treatment of grains with fungicides is not yet completely solved. However, there are machines for intermittent treatment which give good results. The principle of the continuous mixing of grain and dry fungicides does not present as great difficulties as the addition of both materials. It appears necessary to add the dry fungicide in fine dust form in the same stationary tubes through which the grain is introduced. The dust, however, hinders the entrance of the grain, which difficulty has apparently not been overcome.

The results of experiments in the control of stripe disease (helminthosporiosis) of barley [trans. title], J. SMOLÁK (*Věst. Československ. Akad.*

Zemčděl. (Bul. Czechoslovak Acad. Agr.), 2 (1926), No. 10, pp. 1124–1128; Eng. abs., p. 1198).—Barley stripe (*Helminthosporium gramineum, Pleospora graminea*) is said to be increasing in Czechoslovakia, the losses at present amounting to from 20 to 60 per cent of the crop. Contributors on subjects relating to this barley disease and its control are named, and control measures are discussed, including the principal fungicidal media in use, some of which are compared.

Corn root rot studies, B. B. Branstetter (*Missouri Sta. Research Bul. 113 (1927), pp. 80, pls. 8, figs. 5).*—The author summarizes his investigations as follows:

"The experimental data reported in this paper show that most of the kernels on practically every ear of corn grown in Missouri are internally infected with one or more of the following organisms: *Diplodia zeae, Fusarium moniliforme,* and *Cephalosporium acremonium.* Yield tests comparing heavily infected and lightly infected seed show that reduction in yield from planting heavily infected seed is due to reduced field stands caused by seedling blight and not to corn root rot. By increasing the planting rate of heavily infected seed over lightly infected seed so that nearly equal stands were obtained, the resultant yields from both lots of seed were made nearly equal. The employment of certain physical ear characters in selecting lightly infected seed corn was found to be more practical than the germinator method. Inoculation trials carried on in the field and in the greenhouse with *D. zeae, F. moniliforme, C. acremonium,* and *Gibberella saubinetii* showed these organisms were capable of producing a certain amount of seedling blight but not corn root rot, which develops as the corn plant nears maturity. A Pythium-like organism isolated from diseased corn roots was used to inoculate disease-free seedlings grown in uninfected soil in 1927. Typical corn root rot resulted only in the early plantings. From these diseased corn roots the organism used for inoculation was reisolated in pure culture. Corn root rot in Missouri is probably caused by a soil-borne, Pythium-like fungus."

Studies on two Helminthosporium diseases of maize, caused by Helminthosporium turcicum Passerini and Ophiobolus heterostrophus Drechsler (=Helm. maydis Nisikado et Miyake), Y. Nisikado and C. Miyake (*Ber. Ōhara Inst. Landw. Forsch., 3 (1926), No. 2, pp. 221–266, pls. 6, figs. 3).*—Of the two maize diseases here dealt with, the leaf blight organism, *H. turcicum,* is well known and widely distributed. The other, the leaf spot organism, is said to be a distinct species, which the authors have provisionally called *H. maydis.* Both species are dealt with in some detail. Of 25 species and 2 varieties in 21 genera of Graminaceae inoculated with *H. maydis, Zea mays,* the original host, and *Setaria glauca* proved susceptible; *Imperata arundinacea, Phalaris arundinacea genuina,* and *S. italica* slightly or doubtfully susceptible; and the rest apparently either immune or extremely resistant to the fungus.

Some notes on maize rust in the Province of Quebec, R. F. V. Cooper (*Quebec Soc. Protect. Plants Ann. Rpt., 18 (1925–26), pp. 58–61, fig. 1).*—The author discusses the aecial hosts of *Dicaeoma sorghi* known in Quebec. Uredospores probably do not overwinter in Quebec, locally occurring infections of maize being supposedly due largely or entirely to uredinial invasions from the south.

A brief discussion is included of the aecial stage produced for the first time under Quebec conditions on *Xanthoxalis corniculata.*

Crown rust of oats in eastern Canada, W. Popp (*Quebec Soc. Protect. Plants Ann. Rpt., 18 (1925–26), pp. 38–54).*—A systematic account, with bibli-

ography of 61 titles, claims that oat crown rust (*Puccinia coronata*) has at least four physiological forms which are determined by the manner in which they infect three oat strains. Strains were found more or less resistant to one or more of these forms, but no variety proved to be entirely resistant to all of the forms. Pure lines of rust have been developed by starting each culture from a single urediniospore. The physiological forms are not markedly fixed or limited in their distribution.

Smut disinfectants in 1926, J. G. COULSON (*Quebec Soc. Protect. Plants Ann. Rpt., 18 (1925–26), pp. 56, 57*).—Tabulation is given of the results of artificial inoculation of Liberty oats with smut sufficiently to develop the disease in more than 50 per cent in the check plats. Infection developed to the extent of 10.1 per cent in the case of seed treated with DuPont No. 30 disinfectant, 7.3 with DuPont No. 13 disinfectant, 3.7 with nickel carbonate, and 1.2 per cent with Uspulun or with Semesan dust (DuPont). No infection developed in the case of grain treated with DuPont No. 16 disinfectant, copper sulfate and lime, nickel sulfide, nickel hydrate, copper tartrate, copper-carbonate dust, Semesan soak (DuPont), or formalin.

Rhizoctonia disease of rice.—I, A study of the disease and of the influence of certain conditions upon the viability of the sclerotial bodies of the causal fungus, M. A. PALO (*Philippine Agr., 15 (1926), No. 6, pp. 361–375, pls. 4, figs. 3*).—The Rhizoctonia attacking rice and other plants in the Philippines is said to be very similar to *R. solani* and is considered in this work as belonging to the *R. solani* group. It reduces seriously the stand of upland rice. Warmth and moisture favor its parasitism, spread, and destructiveness. It causes both stem rot and blight, being capable of infecting rice when its sclerotial bodies are placed on the plant, under the sheaths, or on the ground near the plants. Entrance is gained through the stomata and uninjured parts. Sclerotial bodies carry it past adverse conditions. Thick planting furnishes a good habitat. In seed beds the disease may be controlled by sterilizing the soil with heat, treating the soil with 1–50 formalin, and planting the seeds at sufficient distances apart.

Rice diseases and their control, N. G. TEODORO and J. R. BOGAYONG (*Philippine Agr. Rev., 19 (1926), No. 3, pp. 237–241*).—The authors deal briefly and in a popular way with rice blast or brusone (*Piricularia oryzae*), Helminthosporium disease (*H. oryzae*), seedling blight (*Sclerotium rolfsii*), stem rot (*S. oryzae*), Rhizoctonia stem rot (*Rhizoctonia* sp.), straight head (unfavorable soil conditions ?), false or green smut (*Ustilaginoidea virens*), black smut or bunt (*Tilletia horrida*), rice grain brown spot (*Fusarium* sp. and *Macrosporium* sp. found), and leaf spot (*Cercospora* sp.).

The annual cycle of the uredoform of Puccinia dispersa of rye [trans. title], E. FISCHER (*Ztschr. Pflanzenkrank. u. Pflanzenschutz, 37 (1927), No. 7–8, pp. 202–208*).—It is now regarded as settled that *P. dispersa* of rye, as is also true of *P. glumarum*, is able to pass through the whole annual cycle in the uredostage.

Control of rye fusariose with dry disinfectants [trans. title], F. ZIMMERMANN (*Ztschr. Pflanzenkrank. u. Pflanzenschutz, 37 (1927), No. 5–6, pp. 163–172*).—Data are presented in tabular form, with discussion, as obtained from tests of Abavit B, Oderberg T, Tillantin, Merck with mercury, and Uspulun.

"New white smut" of wheat, collected at Ste. Anne de la Pocatière, E. CAMPAGNA (*Quebec Soc. Protect. Plants Ann. Rpt., 18 (1925–26), pp. 71, 72*).—D. Pomerleau is credited with the collection of a wheat awn attacked by a disease showing morphologically all the symptoms of the ordinary wheat loose smut, except the fact of the spores all being colorless and nearly transparent.

The question is raised as to the likelihood of its being a mutation of the ordinary loose smut.

A cytological study of Puccinia glumarum on Bromus marginatus and Triticum vulgare, R. F. Allen (*Jour. Agr. Research [U. S.], 36 (1928), No. 6, pp. 487–513, pls. 12*).—The stripe rust of wheat, *P. glumarum*, which was discovered in America in 1915, has been a subject of investigations as to distribution, host range, overwintering, viability of spores, physiological forms, degree of resistance of hosts, etc. To these investigations the author has added cytological studies of the uredinial and telial stages of the rust as it occurs in America. Spore germination, entrance of the fungus to the host, formation of hyphae, development of the mycelium, and the development of uredinia and of telia are described in detail.

Ergots, ergotism, and the milling industry, A. A. Hansen (*Amer. Miller, 56 (1928), No. 5, p. 483, figs. 3*).—Ergot is described briefly, and its potential dangers to the milling industry are explained in this contribution from the Indiana Experiment Station.

Diseases of lettuce, romaine, escarole, and endive, G. F. Weber and A. C. Foster (*Florida Sta. Bul. 195 (1928), pp. 299–333, figs. 19*).—Popular descriptions are given of the diseases found in the field and of those which in transit cause decay of lettuce and the closely related plants, romaine, escarole, and endive. Among the diseases enumerated, for which control measures are suggested, are drop, *Sclerotinia* spp.; downy mildew, *Bremia lactucae;* bacterial diseases, *Bacterium* spp.; damping-off, *S. sclerotiorum, Pythium debaryanum, Corticium vagum,* and *Botrytis cinerea;* anthracnose, *Marssonina panattoniana;* gray mold, *B. cinerea;* bottom rot, *C. vagum;* Alternaria blight of escarole, *Alternaria* sp.; southern blight, *Sclerotium rolfsii;* and leaf spots, *Alternaria* sp., *Septoria lactucae,* and *Cercospora lactucae.*

Seed-bed sterilization and seed disinfection with corrosive sublimate or mercurichlorophenol dusts are recommended for the control of these diseases.

Abaca heart-rot and bunchy-top diseases and their control, N. G. Teodoro and F. B. Serrano (*Philippine Agr. Rev., 19 (1926), No. 3, pp. 243–247, pls. 20*).—The so-called abaca disease, said to be devastating relatively large areas in Cavite, Laguna, and Batangas Provinces, is thought to include at least two distinct diseases and one serious insect pest, the abaca root weevil. The present account sets forth the characters of these two diseases, also precautionary and preventive measures looking to their control.

Abaca heart rot, characterized by the gradual decay of the terminal bud, is described. The cause is a fungus similar to or identical with the fungus causing banana wilt. This may be disseminated by wind, soil, rain, man, animals, suckers, or bulbs.

Abaca bunchy top or root-rot disease, characterized by the general stunting of leaves and stem and believed to be due at least in part to *Heterodera radicicola,* is described in connection with measures recommended for use in attempting control.

Beet mosaic [trans. title], K. Böning (*Ztschr. Pflanzenkrank. u. Pflanzenschutz, 37 (1927), No. 1–2, pp. 19–25*).—Of the several questions raised relative to the control of beet mosaic it is possible to answer one, regarding the spread of beet mosaic, which is said to be closely associated with the presence of the black louse (*Aphis fabae*).

The "clump disease" of groundnuts, S. Sundararaman (*Madras Agr. Dept. Yearbook 1926, pp. 13, 14*).—A clumping, dwarfing condition in peanuts, from which no organism could be isolated, is described, the varieties most severely affected being listed.

[Peanut] rosette disease, A. J. Brooks (*Gambia Dept. Agr. Ann. Rpt. 1926–27, p. 36*).—Peanut rosette outbreaks were much more common within 3 miles of the sea than on upriver farms. The degree of infection was much greater in case of self-sown nuts (left from the previous season) than in case of shelled nuts sown with the rains. In case of the simultaneous germination of two kernels in a shell, in which the plant from one developed rosette and the other not, the seed and descendants from the unaffected plant did not fulfill the expectation of immunity to rosette. Some suspicion attaches to a jassid as a possible carrier of the rosette disease.

Black scurf of potatoes is controlled by corrosive sublimate, J. E. Kotila (*Michigan Sta. Quart. Bul., 10 (1928), No. 4, pp. 184–186*).—Tests made of several organic mercury compounds in comparison with corrosive sublimate are said to indicate that some of the organic mercury compounds now on the market are more or less efficient in the control of Rhizoctonia on potatoes, but that they are not superior to the standard corrosive sublimate treatment.

The author recommends the treating of seed tubers for 30 minutes in a solution of corrosive sublimate used at the rate of 4 oz. to 30 gal. of water.

Celery blight control measures compared, G. H. Coons, R. Nelson, and E. A. Walker (*Michigan Sta. Quart. Bul., 10 (1928), No. 4, pp. 172–175*).—Experiments are reported in dusting and spraying for the control of late blight (*Septoria apii*) of celery in which machine-mixed and commercial copper sulfate and lime dusts were compared with standard Bordeaux mixture, 5–5–50.

Counts were made of spots on the leaves of random samples in the treated and untreated plats, and under the conditions of the experiments the dusts were found to be as effective as the Bordeaux mixture. The condition of the plants on all treated plats was greatly superior to the untreated ones.

Potato black wart [trans. title], L. Mangin (*Prog, Agr. et Vitic. (Éd. l'Est-Centre), 48 (1927), No. 13, pp. 324–326*).—Potato black wart, caused by *Synchytrium endobioticum*, which attacks also, but more mildly, other solanaceous plants, is said to have become established in Great Britain, Ireland, Switzerland, Germany, the Netherlands, the Scandinavian countries, Poland, Czechoslovakia, Roumania, the United States, and South Africa.

Seed potato disease controls compared, H. C. Moore and E. J. Wheeler (*Michigan Sta. Quart. Bul., 10 (1928), No. 4, pp. 162–165*).—Tests were made in 1927 in which a number of organic mercury seed disinfectants were compared with corrosive sublimate for the control of scab and black scurf. Eleven proprietary compounds were used, and the results are said to indicate that corrosive sublimate was fully as efficient as the organic mercury compounds in the control of scab. It was more efficient in controlling black scurf, which is more serious than scab in Michigan. The tests were said to indicate that Michigan growers are not yet warranted in substituting organic mercury compounds for corrosive sublimate in the control of black scurf.

Potato degenerating diseases [trans. title], C. Duriez (*Rev. Hort. [Paris], 99 (1927), No. 14, pp. 367, 368*).—In a very brief review the author deals with phases of the history, literature, and situation as regards degenerating diseases of the potato, including such as mosaic, dwarf, and leaf roll.

Early blight of the potato in lower Quebec, M. J. Gagnon (*Quebec Soc. Protect. Plants Ann. Rpt., 18 (1925–26), pp. 33–37*).—Potato early blight is briefly dealt with as to etiology, pathogenicity, ecology, and control measures. Immune varieties do not yet exist, and the resistant varieties are of no commercial importance.

Production of potato tuber necrosis, A. H. Gilbert (*Science, 67 (1928), No. 1740, pp. 464, 465*).—A brief account is given of investigations conducted to determine the relation between leaf roll and net-necrosis of the potato.

Through the use of cages to exclude undesirable insects, potato plants were grown in the field both from healthy and from leaf roll tubers, and aphids of the species *Myzus persicae* were colonized on leaf roll vines under cages and transferred at intervals to the foliage of healthy vines also under cages.

When the harvested tubers were examined, necrosis of the phloem-necrosis type was found in abundance in all the treated cages. In one, practically 100 per cent of the tubers showed the characteristic discolorations. Microscopic study of the tubers showed the necrosis to be the characteristic phloem necrosis which was the subject of the investigation. Tubers from check cages where the vines had been kept free from aphids and other insects showed no necrosis.

The author thinks that this is the first instance of the production of net-necrosis under control conditions and the first proof of a causal relationship between leaf roll and net-necrosis.

Virus diseases of the potato, D. Folsom (*Quebec Soc. Protect. Plants Ann. Rpt., 18 (1925–26), pp. 14–29, pls. 9; abs. in Maine Sta. Bul. 342 (1927), pp. 237, 238*).—Concluding that the virus disease problem is still in need of considerable research, the author deals briefly with the nomenclature, etiology, symptoms, climatic and edaphic relations, geographic distribution and prevalence, and control of virus diseases in potato. Symptoms are defined and listed for 11 virus diseases as they appear in the Green Mountain variety in northeastern Maine.

Uniformity of nomenclature for the viroses of Solanum tuberosum, D. Folsom (*Phytopathology, 17 (1927), No. 3, pp. 161–165; abs. in Maine Sta. Bul. 342 (1927), pp. 234, 235*).—Reasons are advanced for the standardization of names for potato viroses and suggestions given for uniform nomenclature of the diseases.

A spotting and shrinking of potatoes in storage, H. N. Racicot (*Quebec Soc. Protect. Plants Ann. Rpt., 18 (1925–26), pp. 55, 56*).—In a preliminary report on a disease found on potatoes in storage in 1925 the author claims only that this disease is not common. An account is given of examination and experimentation. An associated fungus is tentatively named *Alternaria fasciculata*. It is thought that the heating of tubers at harvesting time is conducive to the development of the disease. Care and good conditions in storage are considered important.

Spinach mosaic [trans. title], E. Brandenburg (*Ztschr. Pflanzenkrank. u. Pflanzenschutz, 37 (1927), No. 5–6, pp. 173–182*).—This account covers in detail spinach mosaic as regards the symptoms and history of the disease, the occurrence and observation of leaf insects on spinach, transmission studies, oversummering of the disease, and control measures, of which the most effective, according to the author's view, will be the removal of the insect carriers, if practicable, or more probably the development of highly resistant spinach plants.

The red-rot disease of sugar cane and its control, F. B. Serrano and S. L. Marquez (*Philippine Agr. Rev., 19 (1926), No. 3, pp. 263–265*).—The sugar cane red rot disease (*Colletotrichum falcatum*), which first reduces sucrose and later kills the plant, has been reported from almost all sugar-growing countries, particularly Java and India. In the Philippines it is present or prevalent in Balayan, causing a 50 per cent loss; in Calaca, San Luis, Taal, Lemery, Tanauan, and Lipa, Batangas; in San Luis, Pampanga; and in Ilocos Norte probably since about 1921. It may exist in other cane-growing Provinces. The symptoms are described. Control suggestions presented include the usual preventive measures.

Important field diseases of tobacco in the experiment station at Los Baños, and in northern Luzon, Philippine Islands, P. A. David and E. F. Roldan (*Philippine Agr., 15 (1926), No. 5, pp. 287–301, figs. 8*).—The present account is an attempt to describe the symptoms of the common and destructive local tobacco diseases, their nature and causes, the conditions favoring them, and control measures. The diseases dealt with include damping-off or seed bed rot, mosaic, root knot, bacterial wilt, base stem rot, and Cercospora leaf spot or frog-eye.

Disinfection of tobacco seed beds and plats [trans. title], O. Perrin and A. Osman (*Rev. Tech. Monop. Tabacs Turquie, 1 (1928), No. 1, pp. 27–29, pls. 2*).—Organisms mentioned as more or less common on soil intended for tobacco are *Bacillus fluorescens liquefaciens, Rhizoctonia solani, Pythium debaryanum,* and *Thielavia basicola.* The disease conditions developing rapidly in parasitic or saprophytic relation with the first three in close, damp, and warm conditions are controllable by the use of a 2 per cent solution of 40 per cent formalin, as is also *T. basicola,* which, though less frequent, is more serious and is capable of remaining for a long period viable in the soil.

Wilt and blossom-end rot of the tomato, H. H. Wedgworth, D. C. Neal, and J. M. Wallace (*Mississippi Sta. Bul. 247 (1927), pp. 18, figs. 5*).—Tomato wilt caused by *Fusarium lycopersici* and blossom-end rot of unknown cause are discussed with reference to Mississippi conditions. Three years' tests of varieties for resistance to wilt are reported, from which it appears that Marglobe has been an outstanding producer of high quality fruits each year that it has been in the tests. It is said to be the most outstanding variety for early market and for long distance shipping. The Louisiana Red and Louisiana Pink are considered outstanding varieties for midseason, home-garden growing. The Marvana is reported to be the earliest of the wilt-resistant varieties tested and is also a heavy producer. The Norton is considered to be the outstanding late-season variety.

Tests of the same varieties for resistance to blossom-end rot were made, and Marglobe and Kanora appeared to be the most resistant to this disease.

Disinfection of stocks [trans. title], A. Beckerich (*Prog. Agr. et Vitic. (Éd. l'Est-Centre), 47 (1926), No. 37, p. 263*).—The necessity is asserted and explained of adequate disinfection of fruit-bearing plants before the onset of winter.

Apple diseases in Maine (*Maine Sta. Bul. 342 (1927), pp. 238, 239*).—An abstract is given of a paper by D. Folsom.[4] It is claimed that of the numerous diseases of apples in the United States only three are serious in Maine, scab caused by *Venturia inaequalis,* Baldwin spot, and winter injury. Scab is said to be best controlled by spraying, and Baldwin spot and winter injury by a favorable combination of cultural conditions.

The black rootrot disease of apple, F. D. Fromme (*Virginia Sta. Tech. Bul. 34 (1928), pp. 52, figs. 20*).—The black root rot disease of apple was described and discussed by the author and Thomas in a previous publication (E. S. R., 37, p. 754). At that time the causal fungus was considered to be *Xylaria hypoxylon.* Subsequent studies are said to have shown that the species was apparently identical with *X. digitata,* as understood by Ellis, but which is now considered strictly European in its occurrence. The parasite causing the root rot in the United States is described as *X. mali* n. sp.

The fungus causing this root rot has been collected in Virginia, West Virginia, North Carolina, South Carolina, Kentucky, Tennessee, Indiana, Illinois, and Arkansas. A second species, *X. polymorpha,* is said to occur rarely on the

[4] *In* Successful Apple Growing in Maine. Augusta: State [1927], pp. 18–21, figs. 3.

apple in Virginia, but is more common in the Northern States, especially in New York.

The black root rot is said to be recognized by the occurrence of black mycelial incrustations on the surface of infected roots, the brittle, punky character of the invaded root, and the fruiting of the fungus on the trunk at the ground line during late stages of the disease. Studies made in the Shenandoah Valley are said to indicate that black root rot is the most important single cause of apple tree death. The life history of the fungus is described in detail.

Some differences have been observed in the susceptibility of different varieties of apples, and under comparable conditions losses of trees of the York Imperial variety are said to exceed greatly those of Ben Davis. In addition to attacking apple, vigorous development of the fungus has been found on Norway maple and Mahaleb cherry. Less vigorous infection is reported on elm, honey locust, *Pyrus communis*, and *P. ussuriensis*. In the author's experiments no infection developed on ash, butternut, black walnut, chestnut, black locust, silver maple, or box elder.

The author claims that scion roots of the Northern Spy apple have shown considerable resistance in inoculation tests, but when set as replants under severe exposure to infection appreciable percentages died of root rot. Studies of the susceptibility of commercial seedlings, as well as of a considerable number of varieties of known maternal parentage, are said to indicate that such resistance as may exist is a property of individuals rather than of varieties.

Peach chlorosis [trans. title], A. L. Guyot (*Prog. Agr. et Vitic. (Éd. l'Est-Centre, 48 (1927), No. 43, pp. 406–408*).—It is reported from the Station of Plant Pathology of Paris that chlorosis greatly lowers peach production in certain parts of the Rhône Valley. Apparently, also, other fruits are affected. Beneficial results from the winter application of 20 and 40 per cent iron sulfate are reported. The effects are temporary, so that the treatment must be repeated each year. No fungicidal efficacy is claimed for the treatment.

Some observations on the cause of Lanarkshire strawberry disease, C. W. Wardlaw (*Scot. Jour. Agr., 10 (1927), No. 1, pp. 8–12, pl. 1*).—The Lanarkshire strawberry disease, first noticed about 1920, conspicuously bad in 1922 and 1926, and now regarded as almost epidemic, is here allegedly distinguished from a disease recently reported from the south of England. The observations here recorded refer to the variety John Ruskin, particularly susceptible and widely cultivated in Lanarkshire.

The appearance of the diseased plants is described. The soil in infected fields is mostly heavy, close, and somewhat acid, having a pH from 6.0 to 6.8, with an average about 6.4. Fertile soils have a pH near the neutral point, 7.0.

Wounding organisms are not yet excluded by the results of experiments studied. A Pythium isolated by the usual methods was found capable of producing the disease, though other causes have not yet been ruled out. The Pythium is doubtless able to exploit the root system, on which the general health of the plant depends. Further work is in progress.

[Grape or fruit disorders], L. Ravaz (*Prog. Agr. et Vitic. (Éd. l'Est-Centre), 48 (1927), No. 22, pp. 525–530, pl. 1*).—Brief accounts are given of grape black rot, erinose, and court-noué.

Grape anthracnose [trans. title], L. Ravaz (*Prog. Agr. et Vitic. (Éd. l'Est-Centre), 48 (1927), No. 1, pp. 3–7, pl. 1*).—In a discussion of grape anthracnose as reported from vineyards, the author distinguishes the spotting or true form, and a deforming phase, which is said to be harmless and due to hypersensitiveness of the epidermis of certain varieties. The true form is described as to its effects in varieties on leaves, petioles, branches, berries, and seeds.

Treatments included, by weight, iron sulfate from 30 to 35 kg. and sulfuric acid 2 liters in 100 liters of water, or else sulfuric acid 7 liters in 100 liters of water.

Court-noué [trans. title], A. Gauch and J. Durand (*Prog. Agr. et Vitic. (Éd. l'Est-Centre), 45 (1924), Nos. 13, pp. 302–306; 14, pp. 323–327*).—It is stated that court-noué constitutes a serious menace to the interests of many vine growers in Hérault. A systematic account includes detailed recommendations for management of affected vines.

Court-noué [trans. title], L. Rives (*Prog. Agr. et Vitic. (Éd. l'Est-Centre), 45 (1924), Nos. 18, pp. 424–426; 19, pp. 447–452*).—Court-noué of grapevines, long known in France, claims increasingly the attention of viticulturists. A review of tendency and opinion is given.

Court-noué [trans. title], G. Chappaz (*Prog. Agr. et Vitic. (Éd. l'Est-Centre), 45 (1924), No. 20, pp. 469–474*).—A brief account, chiefly historical, is given regarding court-noué of grapevines in France.

Grape court-noué [trans. title], L. Soursac (*Prog. Agr. et Vitic. (Éd. l'Est-Centre), 48 (1927), No. 50, pp. 573–575*).—The author notes analytically two cases in which the methods employed are claimed to have enabled vines, without receiving treatment for court-noué, to improve and to produce good crops.

Phagocytosis and resistance to court-noué [trans. title], L. Rives (*Prog. Agr. et Vitic. (Éd. l'Est-Centre), 48 (1927), No. 6, pp. 139, 140*).—A coincidence is noted between vigorous phagocytosis of endophytic root fungi in the grape variety 333 E. and the high relative freedom of that variety from court-noué. The possible significance of several facts observed is discussed.

Treatments for grape downy mildew [trans. title], A. Cadoret (*Prog. Agr. et Vitic. (Éd. l'Est-Centre), 48 (1927), No. 15, pp. 362–365*).—A review of recent years is said to show that grape downy mildew is not at all dangerous in years which are cool and rainy but not very stormy, as in 1911–1913 and 1920–1925, and that even when precipitation is abundant, if the nights and days are cool and quiet in May and June little damage results. It is claimed that ordinary periods of high humidity and temperature, with storms, are predominant factors in the sudden and violent outbreaks of Peronospora, such as occurred in 1900, 1910, and 1915, in close relation with these conditions occurring near June 10 and July 15. Treatments are indicated.

A new Villedieu formula against grape downy mildew [trans. title], L. Degrully (*Prog. Agr. et Vitic. (Éd. l'Est-Centre), 48 (1927), No. 6, p. 133*).—A formula is given which is said to have been found entirely satisfactory by Villedieu during 1926. The preparation consists of copper sulfate 0.5 kg., lime sulfate (hydrated, and pulverized finely—which is difficult) 2.5 kg., and lime 2 kg. in 100 liters of water.

Mildew [trans. title], Fonzes-Diacon (*Prog. Agr. et Vitic. (Éd. l'Est-Centre), 48 (1927), No. 19, pp. 456–458*).—A discussion of the claims of Villedieu.

[A possible fusariose of a grape variety], L. Rives (*Prog. Agr. et Vitic. (Éd. l'Est-Centre), 48 (1927), No. 27, pp. 8, 9*).—A 20 to 30 per cent loss from a grape variety (4986) is thought to be due possibly to *Fusarium viticolum*, said to be saprophytic under ordinary conditions.

Physiological leaf spotting of American grape varieties [trans. title], I. L. Serbinoff (*Prog. Agr. et Vitic. (Éd. l'Est-Centre), 47 (1926), No. 36, pp. 227–232*).—Examination of cases has led to denial as to the physiological causation of grape leaf spottings in American varieties in France. These defects or injuries are found in connection with different fungi named.

[Grape diseases], L. Ravaz (*Prog. Agr. et Vitic. (Éd. l'Est-Centre), 48 (1927), No. 7, pp. 153–157, 159, pl. 1*).—An account, with a colored plate, of

Oidium on grape leaves and berries is followed by a brief statement regarding excorsiosis. It is stated that the latter disease, which appeared for the first time in 1925 (E. S. R., 58, p. 554), is not, apparently, caused by the organism causing anthracnose.

The fight against Oidium [trans. title], Fonzes-Diacon (*Prog. Agr. et Vitic. (Éd. l'Est-Centre), 46 (1925), Nos. 1, pp. 16–18; 2, pp. 40–42*).—Details are given regarding the use and effects of different forms or preparations of sulfur, the richness of which in available sulfur is credited with the value of the results noted.

Grape rougeot or red scald [trans. title], L. Ravaz and G. Verge (*Prog. Agr. et Vitic. (Éd. l'Est-Centre), 45 (1924), Nos. 1, pp. 11–17, pl. 1, fig. 1; 2, pp. 35–38, figs. 5; 4, pp. 86–89, figs. 4; 5, pp. 110–113, pl. 1, fig. 1; 6, pp. 135–141*).—A descriptive account is given of grape red scald in connection with antecedent conditions, in which a causal rôle has been ascribed by Müller-Thurgau (E. S. R., 30, p. 452; 37, p. 246) to *Pseudopeziza tracheiphila*. The present authors add their own impressions, with those of others. The effects of compression are dealt with, as are the relations of other conditions presumably influential in this connection. Attention is called to the analyses contributed by Ravaz and Roos (E. S. R., 17, p. 568). Treatments and management are outlined.

Rougeau and drought [trans. title], L. Soursac (*Prog. Agr. et Vitic. (Éd. l'Est-Centre), 45 (1924), No. 31, pp. 116–118*).—Vineyards in the dry eastern Pyrenees, though in the main free from serious parasitic diseases, are subject to drawbacks due to drought. The results of examinations are outlined, with recommendations relating principally to soil improvement and adaptation.

Grape white rot [trans. title], H. Faes and M. Staehelin (*Prog. Agr. et Vitic. (Éd. l'Est-Centre), 45 (1924), No. 12, pp. 281–287*).—Studies subsequent to those previously noted (E. S. R., 52, p. 849) are outlined.

The spores of grape white rot (*Coniothyrium diplodiella*) retain germinability for at least two years. The development of white rot is dependent primarily upon a certain sugar content of the berry and a certain elevation of temperature. Atmospheric humidity is secondary.

Treatments applied even a few hours after a shower generally gave very insufficient results.

Bacterial wilt disease of bananas, S. F. Ashby (*Roy. Bot. Gard. Kew, Bul. Misc. Inform., No. 1 (1927), pp. 14–18, pls. 3*).—A study made with a bacterium isolated from banana varieties affected by a vascular wilt disease in Trinidad is said to show full agreement between the characters of the associated organism and those of *Bacterium solanacearum*.

The relation of certain Philippine commercial varieties of bananas to the wilt disease due to Fusarium cubense EFS., G. O. Ocfemia and M. A. Palo (*Philippine Agr., 15 (1926), No. 4, pp. 243, 244*).—A banana plantation containing chiefly Latundan (*Musa sapientum cinerea*), with a few scattered hills of Saba (*M. sapientum compressa*) and other varieties, is said to have first shown the wilt disease in 1923. Practically every hill of Latundan was infected in April, 1925. At that time affected plants were dying prematurely, and the rest were producing very small unmarketable bunches. All the characteristic stages of wilt were well shown. Replacements testing resistance were started in this and another plantation, and the condition of the plants in relation to infection is being watched.

Macrophoma musae (Cke) Berl. and Vogl. and Phoma musae Carpenter, G. O. Ocfemia (*Philippine Agr., 15 (1927), No. 8, pp. 467–469, fig. 1*).—Carpenter reported (E. S. R., 41, p. 153; 44, p. 47) in 1918 and 1919 and Reinking in the same years (E. S. R., 46, p. 845) on banana freckle, or black

spot disease. Measurements made by the present author at Los Banos, Laguna, P. I., at the request of Reinking, and other studies which are indicated, gave results said to correspond closely with those reported by Carpenter in Hawaii.

A brown rot of citrus in Australia (Phytophthora hibernalis n. sp.), W. M. Carne (*Jour. Roy. Soc. West. Aust., 12 (1925–26), pp. 13–41, pls. 5*).—A serious fruit rot, leaf blight, and twig die-back of citrus trees in Australia is described as due to *P. hibernalis* n. sp. The organism is said to be identical with an undescribed species of Phytophthora recently found to cause a citrus fruit rot in Portugal, probably also in other Mediterranean countries. *P. hibernalis* occurs in Victoria, South Australia, Western Australia, and Queensland, but is active only in the cooler months (May to October) under conditions of high atmospheric and soil humidity. Distinguishing characters are indicated. It has been confused with *Pythiacystis citrophthora*, though it proves to be separable from this form on the basis of morphological and cultural characters. It is effectively controlled by spraying with Bordeaux or Burgundy mixture before the oncoming of the cool, wet season.

Coconut bud rot, S. R. Vandenberg (*Guam Sta. Rpt. 1926, pp. 15, 16*).—Negative results were obtained when pure cultures of bacteria were isolated from a virulent case of bud rot and poured among the crown leaves of one tree and injected into the base of the crown shoot of another.

Coffee diseases and their control, N. G. Teodoro and E. T. Gomez (*Philippine Agr. Rev., 19 (1926), No. 3, pp. 249–257*).—To enable coffee growers to recognize and control the diseases to which coffee is subject the authors have discussed the various coffee diseases and their control.

Root disease on lanzones, J. R. Bogayong (*Philippine Agr. Rev., 19 (1926), No. 3, pp. 259–261*).—One of the most serious and widespread diseases of *Lansium domesticum* is the root disease probably due to a fungus limited to the root system and the subsurface stem base. Usually only the old trees are attacked so seriously as to be lost. The symptoms are described, and control measures are indicated. The best remedy known is the proper application of lime, which requires the isolation of the diseased areas by trenching and the placing of unslaked lime in the trench. The lime is supposed to neutralize soil acidity and restore normal equilibrium to the activity of the soil flora. Good cultural practice is advantageous, as is also rotation.

Armillaria mellea killing oak forests in Yugoslavia [trans. title], P. Georgévitch (*Compt. Rend. Acad. Sci. [Paris], 182 (1926), No. 7, pp. 489–491*).—A destructive drying out disease of forest oaks in Yugoslavia is ascribed to the obstructive development in the root and trunk bark and cambium of the mycelium of *A. mellea*.

A study of Ceratostomella pini [trans. title], F. Zach (*Ztschr. Pflanzenkrank. u. Pflanzenschutz, 37 (1927), No. 9–10, pp. 257–260, figs. 6*).—Studies on *C. pini* and other fungi by Münch (E. S. R., 20, p. 1046; 22, p. 152) are cited as furnishing a point of departure for the investigation of *C. pini*, which was brought under culture for two or three months in 1923 on otherwise sterile wood of different conifers infected with *C. pini*. The developments are briefly discussed in their several aspects.

The diseases of Para rubber in Burma, D. Rhind (*Burma Dept. Agr. Bul. 14 (1926), pp. [3]+16, pls. 5*).—Diseases, disorders, and other causes of loss here listed, with discussion, include root wet rot, brown disease, and Ustulina disease; stem black thread, patch canker, pink disease, *U. zonata*, die-back, brown bast, and renewing bark dry-rot; leaf abnormal fall; and in prepared rubber sheet mold, spotting, rustiness, and bubbles.

A recent Delphinium disease [trans. title], M. Simonet (*Rev. Hort. [Paris], 99 (1927), No. 16, pp. 405, 406, fig. 1*).—A brief account is given regarding the

bacterial leaf spot of Delphinium described by Bryan (E. S. R., 52, p. 54). For the control of this disease, a spring preventive use of Bordeaux mixture is recommended.

Biology of Heterodera schachtii [trans. title], R. von Sengbusch (*Ztschr. Pflanzenkrank. u. Pflanzenschutz, 37 (1927), No. 3–4, pp. 86–102, figs. 11*).—This account deals in some detail with the entrance of *H. schachtii* into and its movements within the host, its nourishment, mating, life term, females in summer, cysts, and sex ratios.

Sex ratios in Heterodera schachtii [trans. title], E. Molz (*Ztschr. Pflanzenkrank. u. Pflanzenschutz, 37 (1927), No. 9–10, pp. 260–266, fig. 1*).—Mentioning that von Sengbusch (see above) had been unable to confirm certain statements by Molz regarding sex ratio in nematodes in work related to other research which has been noted (E. S. R., 48, p. 245), the present author deals with matters relative to the significance of the sex ratio as to the injurious influence of nematodes on crops.

ECONOMIC ZOOLOGY—ENTOMOLOGY

The animal pests of agricultural plants, J. Hartmann (*Die Tierischen Schädlinge der Landwirtschaftlichen Nutzpflanzen. Leipzig: Hachmeister & Thal, 1925, pp. 80, pl. 1, figs. 32*).—This is a brief popular handbook dealing with 132 important pests.

Catalogue of birds of the Americas and the adjacent islands, III–V, C. B. Cory and C. E. Hellmayr (*Field Mus. Nat. Hist. [Chicago] Pub., Zool. Ser., 13 (1924), pt. 3, pp. VII+369, pl. 1; 13 (1925), pt. 4, pp. IV+390, pl. 1; 13 (1927), pt. 5, pp. VI+517*).—In continuation of part 2 (E. S. R., 42, p. 847), part 3 of this work deals with the families Pteroptochidae, Conopophagidae, and Formicariidae, part 4 with Furnariidae and Dendrocolaptidae, and part 5 with Tyrannidae. Part 1 has not been published.

The birds of Oklahoma, M. M. and L. B. Nice (*Okla. Univ. Bul. 20, n. ser. (1924), pp. 122, pls. 2, fig. 1*).—Following an introductory account, which deals with the physical features, faunal areas, a historical sketch, changes in bird life, game laws of Oklahoma, the economic value of birds, the attraction and protection of birds, and a list of Oklahoma birds, the species occurring in Oklahoma are dealt with. A bibliography of nine pages and a list of birds whose occurrence in the State is to be expected are included.

Birds of the Pacific States, R. Hoffman (*Boston: Houghton Mifflin Co., 1927, pp. XIX+353, pls. 10, figs. 211; rev. in Science, 67 (1928), No. 1737, pp. 398, 399*).—This is a handbook of some 400 species of birds of the Pacific States, with illustrations accompanying the descriptions and 10 colored plates. The work is prepared with especial reference to their appearance in the field. The review is by T. I. Storer.

A distributional list of the birds of British Columbia, A. Brooks and H. S. Swarth (*Cooper Ornithol. Club, Pacific Coast Avifauna No. 17 (1925), pp. 158, pls. 2, figs. 38*).—This work includes discussions of previous ornithological work in British Columbia, life zones and faunal areas, birds of British Columbia, introduced species, a hypothetical list, a list of birds ascribed to British Columbia on unsatisfactory grounds, a bibliography (pp. 132–143), and an index.

The food of some British wild birds: A study in economic ornithology, W. E. Collinge (*York: Author, 1927, 2. ed., rev. and enl., pp. XVI+[5]+427, pls. 9, figs. 47*).—This is the second revised and greatly enlarged edition of the work previously noted (E. S. R., 30, p. 249).

Official checklist of the birds of Australia, compiled by C. Barrett et al. (*Melbourne: Roy Australasian Ornithol. Union, 1926, 2. ed., rev., pp. X+212,*

pl. 1).—This is the second revised edition of the compilation made by a committee of the Royal Australasian Ornithologists' Union. Seven hundred and seven forms are recognized. An appendix by H. Wolstenholme (pp. 116–142) deals with the scientific names of Australian birds, with notes, vocabularies, and pronunciation of the accepted names. An index of the genera and species is included.

Monograph of the cestodes of the family Anoplocephalidae [trans. title], J. G. Baer (*Bul. Biol. France et Belg., 1927, Sup. 10, pp. VI+241, pls. 5, figs. 43*).—This monograph includes descriptions of new genera and species, a total of 28 genera and 114 species being recognized by the author; a host list, systematically arranged; and an index to genera and species.

Trichostrongylosis in the hare [trans. title], E. A. R. F. Baudet (*Tijdschr. Diergeneesk., 55 (1928), No. 6, pp. 275–278, figs. 3: Ger., Eng., Fr. abs., p. 277*).—The author found the presence of a large number of *Trichostrongylus retortaeformis* (Zed.) in the small intestine of hares to have caused their emaciation. This parasite has not thus far been found in hares in the Netherlands.

Microscopic coprology, M. Langeron and M. Rondeau du Noyer (*Coprologie Microscopique. Paris: Masson & Co., 1926, pp. [6]+132, pls. 2, figs. 129*).—A small handbook, the first part of which (pp. 1–19) deals with methods of technique and the second part (pp. 21–123) with a study of the animal and vegetable parasites of the intestinal excreta.

Relation of spawning of the oyster to temperature, T. C. Nelson (*Ecology, 9 (1928), No. 2, pp. 145–154, figs. 4*).—This is a contribution from the New Jersey Experiment Stations. The study conducted, in continuation of those previously noted (E. S. R., 59, p. 348), led to the conclusion that the American oyster *Ostrea virginica* Gmelin spawns after the water temperature reaches 20° C. (68° F.), over all parts of its range, with no adjustment to the extremes of its distribution. The length of the latent period, after 20° is attained, before spawning occurs, bears a definite relation to the slope of the temperature curve. Subsequent spawnings occur only after still higher temperatures have been attained, the increase necessary being approximately 2°.

A manual of the theory and practice of entomology, V. A. Huard (*Manuel Théorique et Pratique d'Entomologie. Quebec, 1927, pp. IX+164, figs. [51]*).—The first part of this work is devoted to anatomy and physiology (pp. 6–101) and the second part to classification (pp. 102–148), including tables for the separation of the families of the more important orders.

The application of studies in hydrogen ion concentration to entomological research, D. E. Fink (*Ann. Ent. Soc. Amer., 20 (1927), No. 4, pp. 503–512, figs. 2*).—Following a brief introduction in which attention is called to the influence that hydrogen and hydroxyl ions may have upon biochemical reactions within and without the cell, the methods of determining H-ion concentration in small quantities of fluid, including the indicator and potentiometer methods, are considered. Determinations of the pH of the blood of insects belonging to three orders, including 6 forms of Lepidoptera, 8 forms of Coleoptera, and 6 forms of Orthoptera, all of the measurements of which were made by means of the potentiometer, are reported in tabular form. The average for the Lepidoptera was pH 6.53, Coleoptera 6.85, and Orthoptera 7.10.

Two factors of heat energy involved in insect cold hardiness, N. M. Payne (*Ecology, 8 (1927), No. 2, pp. 194–196*).—This is a brief discussion of the quantity and intensity factors.

The thermocouple method of determining temperatures, W. Robinson (*Ann. Ent. Soc. Amer., 20 (1927), No. 4, pp. 513–521, figs. 4*).—This is a contribution from the Minnesota Experiment Station in which are considered the

principle of the thermocouple, the potentiometer, and the pyrovolter; the simplicity of the thermocouple method; the construction of the thermocouple; and single and multiple thermocouples.

A contribution to the study of biological control and parasite introduction in continental areas, W. R. Thompson (*Parasitology, 20 (1928), No. 1, pp. 90–112, figs. 5*).—This contribution from the U. S. D. A. Bureau of Entomology deals with the objections to the biological method in continental areas, the biological control of native insects in continental areas, effects following the transport of continental species into new continental areas, possible and probable causes of the increase and spread of introduced species, methods for the reestablishment of the natural equilibrium, and practical results of parasite introduction in continental areas.

Progress report on light traps for insect control, P. J. Parrott (*New York: Empire State Gas and Electric Assoc., 1927, pp. 12*).—This is a report of cooperative work between the New York State Experiment Station and the Empire State Gas and Electric Association. It takes up a season's catch of insects in orchards, an experiment with light traps against the fruit-tree leaf roller, trapping the codling moth in cold storage houses, tests with traps against stable flies, and color preference of certain insects.

It is considered to have been clearly shown that not all economic insects display like attraction for light traps. Representatives of a wide assortment of species were obtained, but in general only a few destructive insects were caught in large numbers. Catches that are considered significant are those of the fruit-tree leaf roller and other tortricids, tineid moths or leaf miners, cutworm moths, geometrid moths, leafhoppers, plant bugs, and round-headed apple tree borer. Although one of the chief objects of the tests was the determination of light attraction and color preference of the codling moth, and individuals of this species were caught on most nights that the traps were operating, "the catches of this species as compared with the number of moths that were probably present in the different orchards, as judged by the extent of injury to the apple crop, were disappointingly small."

The persistence of a poisonous residue on foliage sprayed with nicotine sulphate, A. Kelsall and F. A. Herman (*Sci. Agr., 8 (1928), No. 7, pp. 465, 466*).—The authors find that a commercial nicotine sulfate of 40 per cent nicotine used in sprays on foliage leaves a fairly persistent poisonous residue of the order of about 5 per cent of the nicotine originally applied. This residue is of importance from the standpoint of the control of at least one major apple pest.

[Economic insects and insect control in Iowa] (*Iowa State Hort. Soc. Rpts., 60 (1925), pp. 36–39, pls. 2, pp. 39–42, 94–106, 114–118, 187–192, pp. 279–356, figs. 18; 61 (1926), pp. 10–12, 33–36, pp. 50–53, fig. 1, pp. 216–220, fig. 1, pp. 220–223, figs. 2, pp. 223–225, figs. 2, pp. 226–228, figs. 2, pp. 248–322, figs. 12*).—The papers in the 1925 report relating to insects and their control here reported include the following: Life History of the Apple Curculio, by B. B. Fulton (pp. 36–39) (E. S. R., 59, p. 255); Report of Progress on the Control of the Apple Curculio, by R. M. Clark (pp. 39–42) (E. S. R., 59, p. 255); Oil Emulsion Sprays: Their Place, Manufacture, and Use, by T. J. Talbert (pp. 94–102); What 1925 Has Taught Us About Spraying, by H. E. Nichols (pp. 102–106); Beekeeping Here and There, by F. C. Pellett (pp. 114–118); and Some Important Greenhouse Pests, by E. Dahlgren (pp. 187–192). The report also includes the proceedings of the fourteenth annual convention of the Iowa Beekeepers' Association (pp. 279–356).

The papers relating to the subject in the report for 1926 include the following: Nursery Spraying and Dusting, by F. L. McDonough (pp. 10–12); Further Report on the Control of the Apple Curculio, by R. M. Clark (pp. 33–36) (E. S. R., 59, p. 256); The Codling Moth Situation in Iowa for 1926, by B. B. Fulton (pp. 50–53); The Corn Earworm in Iowa, by C. J. Drake and H. K. Riley (pp. 216–220); The Control of Cutworms and Armyworms in Iowa (pp. 220–223), The Flower Webworm [*Homeosoma electellum* Hulst], a New Flower Pest (pp. 223–225), and The Common Asparagus Beetle in Iowa (pp. 226–228), all by C. J. Drake and H. M. Harris. The proceedings of the fifteenth annual convention of the Iowa Beekeepers' Association are also included (pp. 248–322).

[**Insects and insect control in Washington State**] (*Wash. State Hort. Assoc. Proc., 22 (1926), pp. 7–9, 18–21, 28–36, 38–46, 47–70, 94–103, 155–159, 183–186, figs. 4*).—The contributions to economic entomology here presented are as follows: Arsenate of Lead Situation, by J. W. Herbert (pp. 7–9); Present-day Trends in Codling Moth Control, by R. L. Webster (pp. 18–21); Spray Residue Removal from Apples, by J. R. Neller (pp. 28–36); Codling Moth Traps as an Aid in Determining Spray Dates, by A. Spuler (pp. 38–43); [*Epicallima coloradella* Walsingham Attacking the Bark of the Apple Tree in Washington], by R. E. Trumble (pp. 43–46); Notes on the Use of Petroleum Oil for Orchard Spraying, by E. R. deOng (pp. 47–53); Trap Baits as a Supplementary Measure for Codling Moth Control, by M. A. Yothers (pp. 53–64) (E. S. R., 58, p. 260); Report of Entomologists' Meeting at the Fifty-ninth Annual Fruit Growers' Convention of California, by E. J. Newcomer (pp. 65–70); The Removal of Spray Residue from Apples and Pears, by R. H. Robinson and H. Hartman (pp. 94–103); Flea Beetle Injury in Southwest Washington, by R. Cowan (pp. 155–159); and Bees and the Fruit Grower, by W. L. Cox (pp. 183–186).

Injurious insects of Nova Scotia, W. H. Brittain (*Nova Scotia Dept. Nat. Resources Bul. 12 (1927), pp. 157, pls. 66, figs. 61*).—This is a practical account of the more important insect enemies of farm crops and animals in Nova Scotia, with means for their control.

[**Economic insects in the province of Quebec**] (*Quebec Soc. Protect. Plants, Ann. Rpt., 19 (1926–27), pp. 12–42, pls. 2, figs. 22*).—Papers of interest to economic entomologists presented at the nineteenth annual meeting of the Quebec Society for the Protection of Plants, held March 30, 1927, include the following: The Household Mosquito, *Culex pipiens* Linn., and Its Control at Montreal, by C. R. Twinn and W. St. G. Ryan (pp. 12–16); Notes on the Control of the Forest Tent Caterpillar (*Malacosoma disstria*), by J. J. DeGryse (pp. 17, 18); The European Corn Borer in Quebec, by L. S. McLaine (pp. 19–21); Notes on Some Barriers Used against Garden Slugs in 1926, by A. G. Dustan (pp. 22, 23); and "Some Remarks on the Feeding Process of the Pentatomidae (Hemiptera-Heteroptera)" (pp. 24–34) and "Keys for the Identification of the Canadian Species of Pentatomidae (Hemiptera-Heteroptera)" (pp. 35–42), both by A. D. Baker.

Second systematic catalogue of the insects which attack plants in Brazil, with a bibliography of Brazilian entomological literature [trans. title], A. da Costa Lima (*Arch. Escola Super. Agr. e Med. Vet. [Rio de Janeiro], 8 (1927), No. 1–2, pp. 69–301*).—This second catalogue (E. S. R., 59, p. 51) presents an annotated list of 864 forms, together with a bibliography of 580 references.

Economic entomology [in southern England], L. N. Staniland (*Jour. Bath and West and South. Counties Soc., 6. ser., 1 (1926–27), pp. 138–147*).—In this report the more serious pests of the year are briefly dealt with, including field investigations and trials conducted.

[Economic insects and their control in France] (*Congrès National pour la Lutte Contre les Ennemis des Cultures, Lyon, 1926 Compte Rendu des Séances. Paris: Serv. Agr. Compagnie des Chemins de Fer de Paris, Lyon, et Méditer., 1927, pp. 107–124, figs. 7, pp. 125–136, 137–140, figs. 3, pp. 141–143, 155–159, 205–221, figs. 8, pp. 223–227, 239–242, 247–262, 263–271, figs. 2, pp. 273–283, 285–295, figs. 7, pp. 297–300, 317–345, figs. 2*).—The papers relating to insects and their control presented at the National Congress on the Control of Enemies of Cultivated Plants, held at Lyon in June, 1926, are as follows: The Colorado Potato Beetle Problem, by J. Feytaud (pp. 107–124); Biology and Control Measures for the Cabbage Butterfly [*Pieris brassicae*], by J. C. Faure (pp. 125–129); The Aphid Enemies of Pottage Plants (pp. 131–136) and the Control of Subterranean Enemies of the Vegetable Garden (pp. 137–140), both by L. Gaumont; An Enemy of the Artichoke, *Apion carduorum* Kirby, by Baillargé (pp. 141–143); Animal Enemies of Cultivated Flowers (pp. 155, 156); Notes on the Thrips Attacking Pinks, by G. Raymond (pp. 157–159); Combating the Cochylis and Eudemis Enemies of the Vine, by B. Trouvelot (pp. 205–219); Insect Enemies of the Olive, by R. Poutiers (pp. 223–227); Principal Insect Pests of Cultivated Fruits and Vegetables in North Africa, by Delassus (pp. 239–242); The Actual Status of Soil Disinfection and Its Application in Vegetable Gardening, by P. Boischot (pp. 247–262); Meadow Voles [Microtinae] and Field Mice [Murinae], by P. Régnier (pp. 263–271); The Rôle of Birds in Agriculture, by A. Chappellier (pp. 273–281); The Pine Processionary, by Voglino (p. 283); Spraying Apparatus, by B. Trouvelot (pp. 285–295); Some General Principles in Combating Fruit Tree Insects, by A. Paillot (pp. 297–299); and The Real Insecticide Problems, by F. Williams (pp. 317–339).

[Contributions to economic zoology and entomology in the north Caucasian region] (*Izv. Sev. Kavkazsk. Kraev. Sta. Zashch. Rast. (Bul. North Caucasian Plant Protect. Sta.), No. 2 (1926), pp. 56–193, pls. 2*).—The translated titles of the contributions included are as follows: The Hessian Fly in the Peasant Holdings of the Terek District, by K. È. Demokidov (pp. 56–62, Eng. abs., p. 188); Notes on the Years of Mass Invasions of Locusts in the Province of Don, by E. V. Zverezomb-Zubovskiĭ (Zverezomb-Zoubovsky) (pp. 63–68); The Problem of the Loss of Wild Animal Life Due to the Poison Bait Used in the Campaign against Rodents, by V. N. Belĭaeva (Belaïeva) (pp. 69–82); A contribution to the Knowledge of the Rodent Fauna in the Kabarda-Balkarian Autonomous Province, by A. M. Radischev (Radistchev) (pp. 83–89); The Causes for the Mass Invasion of the Migratory Locust over the Territory of the North Caucasian Country in 1926, by L. Z. Zakharov (pp. 90–102); Entomological Investigations in the Rural District of the North Caucasian Region, by M. N. Arkhangel'skiĭ (pp. 103–144); The Problem of Insect Pests on Medicinal and Technical Cultivated Plants in Northern Caucasia, by G. I. Lappin (pp. 145–152); On the Knowledge of the Locust Nymphs, by D. P. Dovnar-Zapol'skiĭ (Dovnar-Zapolsky) (pp. 153–172); The Results of the Fall Registration of the Egg-sac Deposits of the Migratory Locust in the Region of Northern Caucasia, by L. Z. Zakharov (pp. 173–178); The First Year of the Work of the Black Sea Regional Plant Protection Station, by K. A. Belĭaev (Belaïev) (pp. 179–182); The Common Wasp as a Pest of Grapes in 1924 in the Terek District, by L. Z. Zakharov (pp. 183–185); On the Quantitative Extent of Injury Done by the Migratory Locust in the North Caucasian Region in the Year 1926, by V. V. Khlamov pp. 186–188); and A Phylloxera Survey in the Kuban District in 1926, by N. N. Sukhorukov (Soukhoroukov) (pp. 189–193).

Report of the entomologist, Burma, for the year ending the 30th June, 1926, C. C. Ghosh (*Burma [Dept. Agr.], Rpt. Ent. 1926, pp. 13*).—This reports

upon the occurrence of insect pests during the year and some investigational work, particularly with enemies of cotton, stored grain, etc.

Annual report of the entomologist to Government, Punjab, Lyallpur, for the year 1925–26, Part II, R. L. CHOPRA (*Punjab Dept. Agr. Rpt. 1925–26, pt. 2, I, pp. 67–125*).—This is an extended and detailed report of work conducted, including entomological research and field operations, much of the data being presented in tabular form. Particular attention is given to studies of cotton pests, including tabular data showing the percentage of bollworm attack at Lyallpur, and pink bollworm attack; moth borers of sugar cane, jowar, and maize, and other insects of lesser importance; pests of fruit trees, particularly the citrus leaf miner (*Phyllocnistis citrella*) and its control by the use of hydrocyanic acid gas, seasonal history of different species of citrus Aleurodidae, spraying for the citrus psylla, and control of the mango hoppers *Idiocerus atkinsoni* and *I. clypealis;* control work with hairy caterpillars; insects attacking vegetables; stored grain pests; termites; lac; rearing of miscellaneous insects; extermination of field rats; porcupine extermination; and examinations of the stomach contents of birds at Lyallpur in 1926.

[Entomological work at the Guam Station], S. R. VANDENBERG (*Guam Sta. Rpt. 1926, pp. 12, 16–19*).—The coconut scale (*Aspidiotus destructor*), which appeared and threatened coconut production in Guam, was combated in 1924 by cutting and burning the leaves in the more severely attacked areas. This method temporarily checked the scale but killed innumerable beneficial insects. With the advent of the rainy season in July, 1925, the parasites and predators began to gain the ascendancy, and by the end of January, 1926, the scale was greatly reduced in numbers. The damage done by the scale was everywhere evident in the mottled yellow color of the leaves and the scurfy-looking remains. With the coming of the dry season, from January to July, the scale began to increase in numbers until at the time of writing, when another rainy season was imminent, the pest was in evidence in most of the localities, though in smaller and therefore less damaging numbers than previously.

The small black ladybird beetle *Cryptogonus orbiculus nigripennis* proved to be the most important natural enemy of the coconut scale in Guam. The important internal parasites mentioned in the annual report of the preceding year (E. S. R., 56, p. 251) were identified by Timberlake as *Aphelinus chrysomphali* and *Aspidiotiphagus agilior.* The entomogenous fungus *Cephalosporium lecanii*, discovered attacking the scale, was reared and distributed on *Aspidiotus destructor* and *Asterolecanium bambusae.* The studies have shown the parasite *A. chrysomphali* to be generally distributed over the infested area, and the small black ladybird beetle *C. orbiculus nigripennis* to be well established on only two or three trees and lightly on those trees immediately surrounding them. Importations of the ladybird beetle *Lindorus lopanthae* from California as a means of controlling the coconut scale failed, but an importation of this beetle from Hawaii was successful. However, when a colony of the latter was placed on an infested tree in the field along with *C. orbiculus* it failed to establish itself, whereas *C. orbiculus* increased rapidly.

In a report by J. Guerrero (p. 12) it is stated that citrus trees on the island were attacked by a tineid leaf miner, a leaf roller, and a buprestid beetle, successful methods of combating which have not yet been developed.

Importations of *Novius cardinalis* from Hawaii were successful. After practically exterminating the cottony cushion scale the Vedalia disappeared, due to its inability to propagate itself on other than this host, which fact will probably necessitate a reintroduction of this predator every few years. The omnivorous ladybird *Cryptolaemus montrouzieri* was imported from Hawaii and bred for

distribution throughout the island to combat mealybugs and *Pulvinaria* sp. (probably *P. psidii*). A shipment of the tachinid fly *Ceromasia sphenophori*, parasitic upon the sugar cane borer *Rhabdocnemis obscura*, was received in three lots from Hawaii and released. The European corn borer did much damage to the corn crop during the year. Two importations of its parasite *Exeristes roborator* were made from Arlington, Mass., but apparently failed to become established. Several insects not previously recorded as occurring in Guam have been identified, including the potato tuber worm; the Florida wax scale, which was found on the mango and a shade tree (*Cassia florida*); and the oblique-banded leaf roller (*Archips rosaceana*), which was observed infesting the leguminous camachile tree.

A simple method for life-history studies of root-feeding arthropods, E. M. Searls (*Jour. Agr. Research [U. S.], 36 (1928), No. 7, pp. 639–645, figs. 4*).—The author reports upon and describes a method for the collection and incubation of eggs, the maturing of larvae, and the production of adults, all under immediately accessible conditions, which after some experimenting was perfected and found quite satisfactory. The work was conducted with the striped cucumber beetle. Some additional study, in which various other insects and arthropods were used, is said to have demonstrated that the method is easily adaptable to the investigation of the life histories of most of the common forms which spend at least a part of their life in the soil.

The author describes the cylindrical cages of 12-mesh wire screen cloth 10 cm. long and 6 cm. in diameter which were used for confining male and female beetles, and their use. Cells made from short pieces of glass tubing, one end stopped with plaster of Paris, were used for the incubation of eggs. Petri dishes containing plaster of Paris were used in rearing the larvae, and small pasteboard pill boxes as cages for pupation.

The oriental fruit moth injury to apples and sprays for aphis control for 1927, E. N. Cory (*Md. Agr. Soc., Farm Bur. Fed., Rpt., 11 (1926), pp. 185–189*).—An account is given of the injury caused by the oriental fruit moth (*Laspeyresia molesta* Busck) as observed at College Park, Md., with notes on aphid control.

In an examination made of 2,210 cull apples from 12 orchards located in every part of the State except the extreme western counties, 284, or 12.8 per cent, were visibly wormy, of which 32 were due to the codling moth and 72 to the oriental fruit moth. An examination of 5,939 cull apples from a privately owned orchard at College Park resulted in the finding of 60 to be infested by the codling moth and 375 by the oriental fruit moth.

Insect enemies of the vineyard, F. Stellwaag (*Die Weinbauinsekten der Kulturländer. Berlin: Paul Parey, 1928, pp. VIII+884, figs. 579*).—Following a brief discussion of grape culture, insect enemies, and methods of control, the insect pests are dealt with in a systematic way, the arrangement being by orders. Bibliographies accompany the several sections. A general bibliography of the insects of the vineyard, a list of the common names, a list of the more important families of insects arranged according to the part of the plant upon which they feed, a subject index, etc., follow.

Enemies and pests of dahlias, C. B. Bolles (*Media, Pa.: Author, 1926, pp. 42, pls. 4*).—A brief popular account.

[Animal enemies of orchids], S. Wilke (In *Die Orchideen*, R. Schlechter. *Berlin: Paul Parey, 1927, 2 ed., rev., pp. 868–908, figs. 13*).—This account of animal enemies of orchids, particularly insects, includes tables for identification of the pests arranged according to the part of the plant attacked. This

is followed by brief accounts of the pests, including their appearance, life history, and methods of control.

Investigations on control of the cotton flea hopper in 1927, H. J. Reinhard and W. L. Owen, jr. (*Texas Sta. Bul. 380 (1928), pp. 27, fig. 1*).—Details of control measures conducted at Granger and at Hutto, particularly with sulfur, are reported in large part in tabular form. The control work relates particularly to investigations conducted late in the season, commencing in July, since infestations of this pest were not sufficient in the early part of the growing season to produce any appreciable damage to the crop.

The outbreaks were controlled satisfactorily on half-acre plats in the two localities in Williamson County by the application of sublimed flowers of sulfur at weekly intervals. The data presented show a reduction of the number of insects on the treated plats, a reduction of the percentage of small squares injured or blasted, and an increase in the number of blooms and of the number of fruits set.

The results secured in 15 triplicate tests on the insecticidal control of the insect on goatweed indicate that superfine dusting sulfur, electric sulfur, sublimed flowers of sulfur, and superfine ventilated sulfur are all effective insecticides when applied at the rate of 15 to 20 lbs. per acre at weekly intervals. The average daily control secured with these grades of sulfur over a 14-day period ranged from 79.8 to 86.7 per cent. Applications of insecticides made at 5-day intervals proved most effective in reducing infestations of the cotton flea hopper. However, applications made under similar conditions at 7-day intervals also resulted in a satisfactory control of the pest. Sulfur applied early in the morning when there was little or no air movement was generally slightly more effective in controlling the insect than applications made later in the day.

Young insects or nymphs are killed by sulfur on goatweed plants when it is applied under favorable climatic conditions. The mature insects or adults were not affected unfavorably by the sulfur applied to the plants under observation.

Five new food plants of the cotton flea hopper, which comprise common species of weeds, were discovered.

Leaf-hoppers and aphids easily controlled, E. I. McDaniel (*Michigan Sta. Quart. Bul., 10 (1928), No. 4, pp. 171, 172*).—Directions are given for the use of contact sprays recommended for the control of leafhopper and aphid attacks on shrubs.

A new species of bacteria and the gall of an aphid, F. E. Lutz and F. M. Brown (*Amer. Mus. Novitates, No. 305 (1928), pp. 4*).—Under the name *Erwinia espinosa* the authors describe a new organism, isolated from the tissues of the *Hammamelistes spinosus* gall on witch-hazel and also from the aphids themselves. The inoculation of witch-hazel leaf buds with the organism gave negative results. It is suggested that plant galls, including those supposed to be directly caused by insects, may be due primarily to bacteria or fungi.

The physiological basis of wing production in the grain aphid, L. Ackerman (*Jour. Expt. Zool., 44 (1926), No. 1, pp. 1–61, figs. 2*).—In studies in which 20,000 apple grain aphids were reared under controlled conditions to determine the effects of environmental influences on wing production, it was found that those raised at temperatures of from 14 to 16° and 24 to 26° C. were more likely to be winged than those grown at 12 or 18 to 20°. It was also found that when aphids that had been growing at a particular temperature for several generations were transferred to a new temperature, they produced a higher percentage of winged forms during the first two or three weeks than they did later on.

A revised handbook of British Lepidoptera, E. Meyrick (*London: Watkins & Doncaster, [1928], [rev. ed.], pp. VI+914, figs. 107*).—This is a revision

of the work issued in 1895. Following the introduction (pp. 1–27), tables are given for the separation of the phyla, families, genera, and species, in connection with technical descriptions, the distribution, etc., of 2,143 species.

Empusa aulicae Reich. in relation to the ravages caused in the forests of Poznań and of Pomerania in 1923–24 by Panolis flammea Schiff. larvae [trans. title], L. Garbowski (*Prace Wydz. Chorób Roślin Państ. Inst. Nauk. Rolnicz. Bydgoszczy, No. 4 (1927), pp. 1–24; Fr. abs., p. 24*).—The author reports that in a limited area the entomophthorid *E. aulicae* was the principal cause of the rapid disappearance of this insect defoliator during the end of June and the early part of July, 1924.

The status of our knowledge of the iris borer (Macronoctua onusta Grote), H. F. Dietz (*Amer. Iris Soc. Bul. 26 (1928), pp. 20–24*).—The author reports that this borer is the most destructive pest of iris of various species and varieties in Indiana, particularly in city gardens rather than in open field plantings. He has observed that the moths at egg-laying time are negatively phototropic, preferring to oviposit on heavy clumps that are partially shaded and protected from heavy winds by fences, shrubbery, buildings, or trees. It was observed in 1923 that the moths seem to be most active during twilight and later in the evening or on cloudy days rather than in bright sunlight. On bright days they secrete themselves in shaded places. The moths are attracted to some extent to light, as the author has collected them on the screens of lighted houses situated in or near infested gardens.

Records kept show emergence of the moths to have taken place from September 11 to October 15 in 1924, September 15 to November 3 in 1925, September 10 (latest emergence not obtained due to constant rainy weather) in 1926, and September 28 to October 12 in 1927, in both cage and field observations. The eggs are all supposed to be laid in the fall and are deposited in folds of iris leaves and sometimes even on other leaves in proximity to the iris. It is ponted out that one observer has found that they may be deposited on leaves from the ground level up to a height of 6 in. Hatching was observed in Indiana to commence on May 10, 1924, on April 5 in 1925, on May 5 in 1926, and on April 15 in 1927.

Upon hatching out the young caterpillars wander over the foliage, chewing small circular holes here and there, such areas taking on a water-soaked appearance. At least some of them tunnel into the tissues of the leaves and act as leaf miners for a few days. Within as short a time as 24 hours some of the larvae find their way into the sheathlike lower halves of the leaves. Here they spend from 6 to 8 weeks, finally working their way down into the rhizomes, which they often reduce to mere shells by tunneling. There is said to be a single generation of caterpillars each year in Indiana.

It is pointed out that infestations of the iris borer in Indiana invariably have been followed by infections of bacterial rot due to *Bacillus carotovorus*, which often kill the plants. The species and varieties observed to be attacked in Indiana, based on definite records, are Pogoniris of all species and varieties, *Iris pseudacorus*, *I. versicolor*, *I. siberica*, *I. spuria*, *I. tectorum*, and *I. kaempferi*, and various varieties of hybrids of these species.

The only practical control of the iris borer in ornamental plantings consists in the application of an arsenical spray or the practice of some cultural method that does not result in injury to the plants and at the same time is not too laborious, including removal of all dead foliage, tree leaves, and other debris from around the plants both in the late fall and very early spring. In this way most of the eggs laid by the moths on the preferred dried outer leaves of the plants will be removed. As soon as growth begins and until the eggs of

the borer have hatched the foliage must be kept covered with spray. By the proper timing of the spray, three or four applications at intervals of a week should be sufficient. During 1924 and 1925 spraying gave between 90 and 95 per cent control. Care should be taken that an excess of the spray does not collect in the flower and leaf sheaths.

Two parasites have been reared from caterpillars collected at Indianapolis, namely, *Apanteles militaris* Walsh and *Amblyteles jucundus* Brulle, notes on which are included.

The iris borer, J. M. SHULL (*Amer. Iris Soc. Bul. 26 (1928), pp. 25–28, figs. 2*).—This brief account is based upon observations made at Washington, D. C. The author feels quite convinced that there must be some emergence and oviposition in the spring.

Diatraea saccharalis and the P. O. J. canes: Some observations and criticisms [trans. title], H. E. BOX (*Rev. Indus. y Agr. Tucumán, 18 (1927–28), No. 7–8, pp. 108–115; trans. in Planter and Sugar Manfr., 80 (1928), No. 9, pp. 161–163*).—In this contribution from the Agricultural Experiment Station, Tucumán, Argentina, it is pointed out that due primarily to the cumulative effects of the mosaic disease, the so-called "native" (Cheribon) types of sugar canes have been supplanted by the Java P. O. J. varieties in Tucumán, and, more recently, in Louisiana. The claim that P. O. J. canes are resistant to attacks of the sugar cane borer is not, however, supported by experiments, the notable reduction in borer infestation in Tucumán having been due primarily to the effects of the abnormally severe winters which occurred at the time when the varietal change took place.

The early detection of outbreaks of the azalea moth (Gracilaria azaleella Brants.) [trans. title], H. GASOW (*Arb. Biol. Reichsanst. Land u. Forstw., 15 (1928), No. 5, pp. 593–599, figs. 5*).—Notes are given on the biology of the azalea leaf miner, an account of which in the United States by Trimble has been noted (E. S. R., 52, p. 660).

The brinjal leaf-webber (Psara (Pachyzancla) bipunctalis Fb.), E. DE ALWIS (*Trop. Agr. [Ceylon], 70 (1928), No. 2, pp. 87–89, pl. 1*).—This is an account of an insect that is a source of injury to the eggplant in Ceylon.

The apple fruit miner, Argyresthia conjugella Zell [trans. title], O. AHLBERG (*Meddel. Centralanst. Försöksv. Jordbruksområdet [Sweden], No. 324 (1927), pp. 127, figs. 57; Eng. abs., pp. 116–122*).—This is an extended account of *A. conjugella*, which has always been very abundant and serious in Sweden, where it is the most destructive enemy of the fruit. The history, geographical distribution, metamorphosis and life history, character of injury, natural enemies, and methods of treatment are dealt with, and a bibliography of four pages is included.

The chain-dotted measuring worm, a blueberry pest, C. R. PHIPPS (*Maine Sta. Bul. 345 (1928), pp. 33–48, pls. 2*).—The chain-spotted geometer first appeared as an enemy of the blueberry in Canada in 1924, although reported in 1904 as feeding on huckleberries in Connecticut. During the season of 1927 the pest appeared in great numbers in Maine and assumed economic importance in a number of blueberry fields, especially in Hancock County.

In this account the author deals with its destructive history, the different stages, range of food, seasonal history, habits and nature of injury, natural enemies, and control measures; gives recommendations; and includes technical data, with descriptions, a host plant list, and parasite records. The host plant list includes 47 distinct plants representing 17 botanic families.

In the course of the studies in Maine, the dipteran *Madremyia saundersii* Willst. and the two Hymenoptera *Meteorus datanae* Mues. and *Itoplectis con-*

quisitor (Say) were reared as parasites of the pest, the first named being by far the most abundant.

As a control measure, it is concluded that the application of arsenate of lead at the rate of 1.5 lbs. in 50 gal. of water on the first appearance of the pest would give effective results.

Studies on the bionomics of American anophelines: The alimentation of anopheline larvae and its relation to their distribution in nature, M. F. Boyd and H. Foot (*Jour. Prev. Med., 2 (1928), No. 3, pp. 219–242, figs. 10*).—It is concluded that the distribution of *Anopheles quadrimaculatus* and *A. punctipennis* is not controlled by nutritional factors, and that other causes, perhaps of a thermal character, exercise an important influence. The details are presented in full-page tables. A brief account of studies by Coggeshall has been noted (E. S. R., 56, p. 62).

Principles and practice of mosquito control, J. F. Marshall (*Hayling Isl., Hampshire: Brit. Mosquito Control Inst., [1928], pp. VIII+[2]+39, figs. 53*).—The first part of this work consists of general notes on mosquitoes and their control. The second part is devoted to an account of the British Mosquito Control Institute. The third part gives some practical details of mosquito control organization. The several appendixes deal with wing venation of mosquitoes, classification of the British mosquitoes, formulae relating to oiling and larviciding, mosquitoes and the Public Health Act, and transmission of glass, liquids, etc., by post.

Why is cultivated Egypt immune from malaria? W. Willcocks (*Cairo: Nile Mission Press, 1927, pp. 15*).—In this discussion attention is called to the relation of the cultivation of clovers in the region to the absence of cases of malaria.

Effect of Paris green on culicine larvae, K. P. Menon (*Jour. Trop. Med. and Hyg. [London], 30 (1927), No. 15, pp. 193, 194*).—"Paris green, when vigorously shaken with water, can be made to sink. Culicine larvae, which feed from the bottom, swallow the granules of Paris green with particles of food and die. Larvae which are in the very early stage of development seem to escape. Paris green is not toxic to mosquito pupae. Larvae of other insects like Chironomidae may be affected."

Chironomus quadripunctatus Malloch (Dipt.: Chironomidae), F. F. Carpenter (*Ent. News, 39 (1928), No. 6, pp. 186–189, pls. 2*).—The author records injury by this dipteran to the leaves and stems of yellow pond lilies in Eagle Lake, Kosciusko Co., Ind.

The rice gall midge in North Kanara, R. M. Hegdekatti (*Agr. Jour. India, 22 (1927), No. 6, pp. 461–463*).—This is an account of *Pachydiplosis oryzae,* described as doing damage to rice in many parts of India in recent years.

The apple maggot, B. A. Porter (*U. S. Dept. Agr., Tech. Bul. 66 (1928), pp. 48, pls. 2, figs. 7*).—This is a monographic account of the apple maggot based upon a study of the literature, a list of 48 references to which is included, and investigations undertaken in 1917 at the field station at Wallingford, Conn., and conducted in cooperation with the Connecticut Experiment Station through the year 1922. Following a brief introduction and historical account, the author deals with the synonymy, description, related species, injury, economic importance, host fruits, varietal susceptibility, distribution, dissemination, seasonal history and habits, natural enemies, and control measures.

In the experiments with insecticides conducted in Connecticut two applications of commercial powdered arsenate of lead, applied as for the codling moth, 1 to 1.5 lbs. in 50 gal. of water, have given satisfactory control. Paste lead arsenate is probably equally effective, and a lime-and-casein spreader may be

added if desired. In southern Connecticut in average seasons the first application should be made about June 25 for early apples, and in the very first days of July for fall or winter fruit. A second application should be made 2 to 3 weeks after the first. In order to avoid excessive spray residue at harvest, emphasis should be placed on the first application, and later applications, if needed, should be rather light. If in spite of this precaution excessive residue is apparent at picking time, the fruit should be carefully cleaned before being placed on the market.

It is pointed out that poor control will result if untreated infestations are closely adjacent to the fruit that is sprayed. Especially at the time of the first application, all trees of all varieties should be sprayed, whether susceptible or not and whether bearing a crop or not, although fair results are sometimes obtained by spraying only the susceptible varieties.

Where it is possible to do so without too great expense, the prompt removal of dropped infested fruit will prove a valuable auxiliary to spraying for the control of the apple maggot. To insure removal before the maggots have begun to leave the fruit, early summer fruit should be gathered twice a week, late summer and fall fruit once a week, and winter apples once in two weeks. The gathered fruit may be disposed of in any feasible way, so long as no maggots are allowed to complete their development and emerge as flies where they may have access to apple trees. The removal of the drops has no effect on the infestation of the current season, and for the immediate control of the apple maggot the grower should rely chiefly on spraying.

Other methods which have been tested proved of little or no practical value in controlling the apple maggot.

A cheap and effective fly spray, C. R. TWINN and F. A. HERMAN (*Sci. Agr., 8 (1928), No. 7, pp. 441–445*).—The authors find that for all practical purposes a 6 per cent pyrethrum-kerosene spray is quite satisfactory. It is prepared by adding 0.5 lb. of pyrethrum to 1 gal. (8.08 lbs.) of kerosene, allowing the mixture to stand, and agitating it at intervals over a period of about 2 hours, thus insuring that practically all the active principle of the pyrethrum is dissolved.

Nutritional studies on the seed-corn maggot, Hylemyia cilicrura Rondani, C. G. HUFF (*Jour. Agr. Research [U. S.], 36 (1928), No. 7, pp. 625–630, fig. 1*).—This is a report of studies conducted with a view to determining whether or not the action of bacteria must precede the attack of the larva upon potato seed pieces, sprouting corn, and other plants susceptible to attack by the insect.

The studies are said to confirm the findings of Leach (E. S. R., 55, p. 763) that sterile larvae do not grow to maturity on sterile beef-extract agar or potato plugs, whereas larvae grow normally on contaminated potato plugs. Experiments using bacteria-free filtrate from unheated potatoes indicated that the failure of larvae to grow on heated potato is not due to the destruction of thermolabile substances such as enzymes. Attempts to grow larvae on sterile potato to which had been added a suspension of heated bacteria were unsuccessful. Potato plugs, beans, and peas which had partially decomposed and then were sterilized by heat proved to be good media for growth. Flies were reared from egg to adult on such media and found to be bacterially sterile. Attempts to grow larvae on potato which had been submitted to artificial digestion by saliva and pancreatic juice were unsuccessful. Growing bean and pea seedlings free from bacteria were found to provide a suitable medium for growth, flies being reared from egg to adult on such seedlings without the presence of bacteria, either dead or living.

The results obtained led to the conclusion that the presence of bacteria, per se, is not essential to the development and pupation of the larvae of the seed-corn maggot, and that in the nutrition of the larvae of this species, the bacteria by their action on the media sometimes play the rôle of preparing a suitable substratum for growth of the larvae. It appears that the substances essential to the growth of these larvae are present in bacteria-free, growing seedlings of beans and some other seeds.

Three new Tachinidae attacking injurious insects in Queensland, C. H. Curran (*Bul. Ent. Research, 18 (1927), No. 2, pp. 165–167*).—Two new species, namely, *Alophora aureiventris* and *Catharosia varicolor*, are recorded as reared from a pyrrhocorid bug, *Dysdercus sidae* Montr., and *Ballardia pallipes*, n. g. and sp., as reared from *Euxoa radians*.

The relation of rat-fleas to plague in Shanghai, E. P. Hicks (*Jour. Hyg. [London], 26 (1927), No. 2, pp. 163–169, fig. 1*).—The author considers the oriental rat flea (*Xenopsylla cheopis*) to be the chief agent in spreading plague in Shanghai.

Chafer beetles ([*Gt. Brit.*] *Forestry Comn. Leaflet 17 (1927), pp. 6, figs. 3*).—This is a practical summary of information on the three species of Scarabaeidae of importance in Great Britain, namely, *Melolontha melolontha* (*vulgaris*) L., *Rhizotrogus solstitialis* L., and *Serica brunnea* L.

Wireworms affecting Maine agriculture, J. H. Hawkins (*Maine Sta. Bul. 343 (1928), pp. 20, figs. 3*).—The abundance of and destruction caused by wireworms in the central and southern farming sections of Maine led the author to conduct the studies here reported. It is stated that only the potato-growing region of Aroostook County seems to have escaped great injury from the attack of these pests.

The account deals respectively with losses to Maine agriculture caused by wireworms, the wheat wireworm, an upland wireworm (*Melanotus* sp.), millipedes, wireworm injury to crops, and wireworm control. The importance of such general farm practices as crop rotation, clean farming, fallowing, immune or resistant crops, and judicious use of fertilizer is pointed out.

The results of experiments in the State are said to agree with the general conclusion that calcium cyanide is an effective soil fumigant for wireworms.

The destructive Mexican book beetle comes to Boston, R. L. Taylor (*Psyche, 35 (1928), No. 1, pp. 44–50*).—This is an account of a tropical anobiid, *Catorama* sp., either *C. mexicana*, the Mexican book beetle of the Hawaiians, or *C. herbarium* of the West Indies, which inflicted severe damage to a large shipment of books from Honolulu to Boston.

Life history of the plum curculio (Conotrachelus nenuphar Herbst.), C. H. Brannon (*Jour. Elisha Mitchell Sci. Soc., 43 (1927), No. 1–2, pp. 79–83, pl. 1*).—This is a report of studies in Georgia, where two generations were reared.

Surface tension of disinfecting solutions for American foulbrood, C. H. Gilbert (*Wyoming Sta. Bul. 159 (1928), pp. 117–131, figs. 5*).—The studies conducted have shown Lux flake soap to be a powerful reducent of surface tension when mixed with distilled water in the proper proportions. When distilled water is not available, rain water or other soft water may be used.

It was found that the temperature has very little effect upon the surface tension of the soap-bath-immersion solution, when the range is from 5 to 50° C. (41 to 122° F.). Ordinary room temperature of 20 to 21° C. was found to be very satisfactory for the immersion solution so far as surface tension is concerned.

It is considered to be a poor practice to incorporate the soap in the disinfecting solution. The soap reduces the surface tension for a short time only,

and during that time the soap breaks the wax, causing a loss in weight varying with the concentration of soap, age and kind of combs, and length of treatment.

The use of calcium cyanide in the apiary, C. L. Corkins (*Wyoming Sta. Bul. 158 (1928), pp. 107–116, fig. 1*).—In control work with colonies infected with American foulbrood the entire colony must be destroyed in order to prevent distribution of the causative organism. In accomplishing this, the author has found calcium cyanide to be a safe and efficient chemical for use in the first stage of the destruction by burning. It also makes possible the destruction of wild bees that may spread the infection. It is recommended for use in the fumigation of stored combs infested with wax worms, and the extermination of mound-building ants in the apiary.

Enzymes and bacteria in the honey bee, F. M. Brown (*Amer. Mus. Novitates, No. 304 (1928), pp. 5*).—The author here reports upon examinations made of the flora of the digestive tracts of 72 presumably normal and healthy honeybees. It is pointed out that care must be taken in work on the enzymes of the digestive tracts of insects to exclude those produced by microorganisms present, and that much of the literature on the digestion of honeybees is to be read and quoted with that fact in mind. Normal intracellular enzymes similar to digestive enzymes must be recognized. The normal native enzymes of the digestive system of honeybees are an invertase, both peptic and tryptic proteolytic enzymes, and a lipase. Other carbonhydrates may be present under special conditions. One cause of bee dysentery is probably an infection of diastase-producing bacteria.

The Sphegidae of South Africa, I–X, G. Arnold (*Ann. Transvaal Mus., 9 (1922), No. 2, pp. 101–138, figs. 22; 9 (1923), Nos. 3, pp. 143–190, pl. 1, figs. 18; 4, pp. 191–253, figs. 13; 10 (1923), No. 1, pp. 1–58, figs. 30; 11 (1924), No. 1, pp. 1–73, pls. 2, figs. 42; 11 (1925), No. 3, pp. 137–175, figs. 25; 11 (1926), No. 4, pp. 338–376, figs. 19; 12 (1927), No. 2, pp. 55–131, figs. 45; 12 (1928), No. 3, pp. 191–232, pl. 1, figs. 18; pp. 233–279, pls. 3, figs. 9*).—This is a synopsis of the wasps of the family Sphegidae, the habits of which differ from other families of Fossores chiefly in the nature of their prey. While the Psammocharidae prey chiefly, if not exclusively, on spiders (excepting parasitic genera like Ceratopales), and the Scoliadae prey on coleopterous larvae, lepidopterous pupae, and sometimes other aculeate Hymenoptera, the Sphegidae prey on Orthoptera, Diptera, caterpillars, Hemiptera, and Hymenoptera, and in only a few species do spiders form the food of the larvae. The account includes a list of the larger publications dealing with the Ethiopian Sphegidae, a key to the Ethiopian genera of Sphegidae, and keys to the species of the several genera. Several plates show wasps in their natural colors.

The introduction and establishment of the larch sawfly parasite, Mesoleius tenthredinis Morley, into southern Manitoba (Hymen.), N. Criddle (*Canad. Ent., 60 (1928), No. 3, pp. 51–53*).—The introduction of the parasite *M. tenthredinis* into southern Manitoba in 1913 has resulted in its gradual increase until in 1926, 66 per cent of the larch sawfly cocoons were parasitized. In 1927 parasitism in some places was as high as 88 per cent, with an average of 75 per cent over the area of the Spruce Woods Timber Reserve.

Parasites and hyperparasites of Diatraea saccharalis in Tucumán sugarcane [trans. title], J. Brèthes (*Rev. Indus. y Agr. Tucumán, 17 (1926–27), No. 7–8, pp. 163–166; trans. in Bul. Ent. Research, 18 (1927), No. 2, pp. 205–207*).—This account relates to *Microdus crossi* n. sp., *Ipobracon tucumanus* Brèthes, *Aulatopria tucumana* n. g. and sp., and *Sarcophaga diatraeae* n. sp.

Parasitism and hyperparasitism in Torymus nigricornis Boh. [Hym. Calcididae] [trans. title], F. Picard (*Bul. Soc. Ent. France, No. 6 (1928), pp. 109–111*).—A brief account of observations in France.

Entomophthora (Tarichium) punctata n. sp. on Phytonomus variabilis Hbst. and E. sphaerosperma Fresen. on Pieris brassicae L. [trans. title], L. Garbowski (*Prace Wydz. Chorób Roślin Państ. Inst. Nauk. Rolnicz. Bydgoszczy, No. 4 (1927), pp. 25–44, figs. 34; Fr. abs., p. 28*).—A new fungus parasite attacking the alfalfa weevil in the Mogilno district of Poznań Province, Poland, is described as *E. (Tarichium) punctata*. Notes are also presented on the course of infection on *Pieris brassicae* by *E. sphaerosperma*.

The Zoocecidia of the Netherlands East Indies, Mrs. J. Docters van Leeuwen-Reijnvaan and W. M. Docters van Leeuwen (*Buitenzorg: 's Lands Plantentuin Bot. Gard., 1926, pp. [4]+601, pls. 7, figs. 1088*).—This is a monographic account in which illustrations of the galls accompany the descriptions. The account includes a chapter by H. H. Karny on phylogenetic considerations (pp. 37–47), a bibliographic index (pp. 566–582), and an index to the gall producers (pp. 597–599).

The biology of the Eriophyidae with special reference to Eriophyes tristriatus (Nalepa), A. S. Hassan (*Calif. Univ. Pubs. Ent., 4 (1928), No. 11, pp. 341–394, pls. 6, figs. 14*).—This report of biological studies includes descriptions of four new species and a bibliography of three pages. The subject is dealt with under the headings of technique, including collecting, mounting, and sectioning; history; morphology in general; classification, including a key to the genera of the subfamilies Eriophyinae and Phyllocoptinae; specific characters and description of species; relationships; morphology of *Eriophyes tristriatus* (Nalepa); relation of blister mites to plant injury; the gall of the black walnut blister mite; development and life history; and distribution.

On the species of gall mites (Eriophyidae) found on the genus Ribes, A. M. Massee (*Bul. Ent. Research, 18 (1927), No. 2, pp. 179–181*).—Notes are presented on *Eriophyes ribis* (Westw.) Nal., *Phyllocoptes massecei* Nal., and *Oxypleurites neglectus* n. sp.

ANIMAL PRODUCTION

The accuracy of cattle weights, J. L. Lush, F. W. Christensen, C. V. Wilson, and W. H. Black (*Jour. Agr. Research [U. S.], 36 (1928), No. 6, pp. 551–580*).—Weights on more than 900 different animals, a total of 9,897 individual weighings, were used as the basis for the data in this study (E. S. R., 57, p. 762). The data include the weights of calves, yearlings, and 2-year-olds, thin and fat, in the feed lots; yearlings, 2-year-olds, and 3-year-olds on pasture in the spring and fall; and dairy cattle. Cattle of Hereford, Shorthorn, Aberdeen-Angus, Jersey, and Brahman breeding are included.

All the weights were not taken with the same degree of accuracy, some being to the nearest pound and others to the nearest 5 lbs. Of the cattle weighed some were quite wild and others very gentle. These points, together with the different methods of feeding, doubtless affected the accuracy of the individual weights. The usual formula for the standard deviation was used in the study.

The experimental error ranged from as low as 4 lbs. to as high as 17 lbs., with an average for a single weight under uniform conditions of between 6 and 12 lbs. The error was somewhat less with younger cattle and distinctly smaller under unchanging environmental conditions. Breeding and temperament of animals had little or no effect upon the size of the experimental error. The size of the error is not directly related to the gross weight of the cattle, but may perhaps be related to the fat-free weight of the animal or to the size and capacity of the animal's digestive tract. Weighing to the nearest 5 lbs. sacrificed a considerable amount of information, while weighing to the nearest 2 lbs. did not lead to any serious loss, except with very small cattle. With these cattle

weighing to the nearest pound added accuracy, but weighing to units smaller than 1 lb. did not possess any advantages.

The probable error of the accuracy of a single weight is approximately equal to two-thirds of the experimental error, about 4 to 8 lbs. The probable error of the accuracy of the average weight of a group may be obtained by dividing the above figures by the square root of the number of steers in the group, which in an ordinary group of 10 steers would be about 1 to 2 lbs. The relative error of 1-day weights and 3-day weights was as the square root of one and the square root of one-third when the comparison was being made between the weight changes made by the experimental lot and the weight changes made by a control lot. Weighing for the two additional days eliminates about 42 per cent of the error contained in 1-day weights. The authors suggest that when it is impossible to weigh more than 1 day the accuracy of 3-day weights may be obtained by using 3 times as many animals, although economic reasons usually do not lend themselves to this practice.

Stacked green corn for cattle, J. W. WILSON (*South Dakota Sta. Bul. 229 (1928), pp. 8, fig. 1*).—As previously noted (E. S. R., 56, p. 667) stacked green corn proved a very poor feed for cattle. During a 56-day preliminary feeding period 5 2-year-old steers on this feed lost an average of 4 lbs. per head in comparison with gains of 49, 94, 124, and 97 lbs. per head for similar steers fed corn fodder, corn silage, limited corn silage and alfalfa hay, and unlimited alfalfa hay, respectively.

Following the preliminary period all lots were placed on a fattening ration of shelled corn, linseed meal, corn silage, and alfalfa hay for 148 days. During this period the respective lots made average daily gains of 3.54, 3.8, 3.12, 2.95, and 3.2 lbs. per head. The finish on the steers in lot 1 at the end of the fattening period was not as complete as the gains would indicate. The stacked green corn was unpalatable to the cattle and proved a wasteful way of preserving the feed, since nearly one-half of the stack was unsatisfactory for use. The corn silage and alfalfa hay ration in this test produced larger gains than silage alone.

Thirty-eighth annual wool review, WINCHCOMBE, CARSON, LTD. (*Sydney: [Authors], 1927, pp. 32*).—A review of wool production in Australia, with special reference to the Sydney and Brisbane markets. Comments on the meat and fat stock trades are also made.

Study feed values for pork production, W. E. J. EDWARDS and G. A. BROWN (*Michigan Sta. Quart. Bul., 10 (1928), No. 4, pp. 158–160*).—Continuing the comparison of alfalfa and rape pasture for hogs (E. S. R., 59, p. 463), 6 lots of 15 pigs each averaging approximately 52 lbs. were fed to an average final weight of 204 lbs. Each lot had 1 acre of forage, lots 1 to 3 being on alfalfa and lots 4 to 6 on rape. In addition to the forage lots 1 and 4 were self-fed corn and protein supplement, lot 2 hand-fed three-fourths as much grain and supplement as lot 1 to approximately 140 lbs. in weight and then self-fed, lots 3 and 6 self-fed ground barley and ground oats, and lot 5 ground barley and protein supplement self-fed. The protein supplement consisted of equal parts of tankage and linseed meal. Each lot had access to a mineral supplement of steamed bone meal, ground limestone, and salt 45:20:30 parts. In addition to the pasture the alfalfa lots produced 2,255, 925, and 2,300 lbs. of hay, respectively.

The average daily gains per pig were 1.23, 1.07, 1.22, 1.31, 1.18, and 1.19 lbs. in the respective lots. The cost of a pound of gain was practically the same in lots 1, 2, and 4. However, the self-fed pigs were ready for market about 18 days ahead of those that had been limited-fed. The rate of gain and the

amount of feed required to produce the gain were approximately the same on both forage crops, except that somewhat more protein supplement was required with the rape pasture. Shelled corn and protein supplement produced faster gains on less feed than ground barley and protein supplement on rape pasture. Ground barley and protein supplement and ground barley and ground oats were practically the same in rate of gain, although the feed requirement and cost of 100 lbs. of gain were lower with the former ration. The chief advantages of the alfalfa pasture in these tests were that it furnished a longer grazing season and did not have to be reseeded each year as did the rape.

Trial on the feeding of Jerusalem artichokes to pigs, K. W. D. CAMPBELL (*Reading Univ. Bul. 35 [1927], pp. 12*).—The results of two trials on the feeding of Jerusalem artichokes to pigs at the University of Reading, England, are reported. In trial 1, 3 lots of 5 pigs, each averaging approximately 130 lbs., were fed the following rations per head daily: Lot 1 meal mixture 5 lbs., lot 2 meal mixture 4 lbs. and artichokes 4 lbs., and lot 3 meal mixture 4 lbs. and artichokes ad libitum. In the second trial similar pigs were fed as follows: Lot 1 meal 3.5 lbs., lot 2 meal 3.5 lbs. and artichokes ad libitum, and lot 3 unlimited meal and artichokes ad libitum. The meal mixture used consisted of barley meal, middlings, bean meal, and fish meal 60:30:5:5 parts. In trial 1 the pigs harvesting the artichokes consumed approximately 10 lbs. per head daily and in trial 2 from 7 to 8 lbs. daily.

Adding 4 lbs. of artichokes in place of 1 lb. of meal to the ration in the first trial resulted in the pigs gaining 12.8 lbs. less than those receiving no artichokes. In the second trial the pigs harvesting the artichokes gained approximately the same as those receiving no artichokes, indicating that this root crop furnished approximately enough nutritive matter to counterbalance the extra work done by the pigs in rooting. Pigs receiving about 10 lbs. of artichokes made 14.2 lbs. more gain than those receiving 4 lbs., indicating that it required approximately 10 lbs. of artichokes to replace 1 lb. of meal.

Coconut-feeding tests for swine, C. W. EDWARDS (*Guam Sta. Rpt. 1926, pp. 2–5*).—Continuing the study of coconut feeding (E. S. R., 56, p. 265), five tests were conducted to compare the relative feeding value of coconut meal and fresh coconuts as a supplementary ration for growing pigs and brood sows given free range on woodlot and open grassland pasture.

In the first test 11 pigs averaging 39.8 lbs. were fed for 92 days as much coconut meal as they would consume twice daily. They made an average daily gain of 0.56 lb. per head and required 206 lbs. of feed to produce 100 lbs. of gain at a cost per pound of 2.58 cts.

The second test was conducted in the same manner for a period of 91 days, using 15 pigs averaging 30.5 lbs. These pigs made an average daily gain of 0.39 lb. per head, and required 259 lbs. of feed, costing $3.24, to produce 100 lbs. of gain.

In trial 3, 8 pigs averaging 25.63 lbs. were fed fresh coconuts ad libitum for a period of 91 days. The average daily gain was 0.43 lb. per head, and it required 341 lbs. of feed, costing $3.41, to produce 100 lbs. of gain.

The fourth test was conducted in the same manner as trial 3 for a period of 59 days, using 10 pigs averaging 32.9 lbs. The pigs made an average daily gain of 0.42 lb. each, requiring 313 lbs. of feed to produce 100 lbs. of gain at a cost of $3.13.

In the fifth trial 2 lots of 2 sows each were run on pasture during the gestation period and the period of nursing their litters. One lot was fed coconut meal and the other lot fresh coconuts. The first lot consumed an average of 2.8 lbs. of meal during the gestation period and 8.4 lbs. during the nursing

period. These sows lost a total of 46 lbs. during the experiment. The sows on fresh coconuts ate 4.4 lbs. during the gestation period and 9 lbs. during the nursing period and lost a total of 69 lbs. during the test. The number of pigs produced was the same in both lots. In the lot receiving fresh coconuts 1 sow showed lameness near the end of the test and later became paralyzed in the hind quarters. The other sow did not relish the coconuts toward the end of the feeding period. The coconut meal was eaten readily without any apparent ill effects. There was no appreciable difference in the cost of feed for the 2 lots.

A study of some problems in bacon hog production, R. D. SINCLAIR and J. P. SACKVILLE (*Alberta Univ., Col. Agr. Bul. 15 (1927), pp. 61, figs. 13*).—In a study of feeding for bacon hog production, the University of Alberta, Canada, dealt with the problems experimentally during the years 1923–1925. Results are published in two parts, the first dealing with the effect of feeds and method of feeding on the type and quality of carcass and the second with the rate and economy of gain.

A higher percentage of "select" pigs were graded from those fed tankage than from those fed skim milk, but there was a higher percentage of suitable Wiltshire sides among the skim milk fed pigs. Pigs on a straight grain ration produced fewer selects and Wiltshire sides due to their poor condition, coarseness, and excessive flabbiness. Self-feeding produced more selects and Wiltshires than limited hand feeding, and the same was true in comparing pasture and dry lot feeding, except that the quality was somewhat better in the dry lot fed hogs. Self-fed pigs were inclined to be "wasty," but when shrunk had a good bacon underline and yielded a thick firm belly. Neither exercise, ration, nor method of feeding had any effect upon the length of carcass. Breeding exerted more influence in the production of bacon type than feeding.

Skim milk feeding resulted in 9.5 per cent more rapid gains than tankage feeding. Grain-alone rations caused pigs to gain 38 per cent slower than when skim milk was fed and 32 per cent slower than when tankage was fed. Self-fed pigs made 17 per cent greater daily gains than limited hand-fed pigs. Heavy feeding of skim milk in these tests reduced pasture consumption to a minimum and placed pasture and dry lot groups on approximately the same basis. Grain-alone rations were not economical when compared to supplemented rations. Limited hand feeding was 18 per cent more economical than self-feeding. Pasture when supplemented with skim milk reduced the cost of gain. Tankage feeding returned the greatest profit and grain-alone feeding the smallest. Self-fed pigs sold on the average 7 per cent higher than those on limited hand-fed rations, but the latter pigs had a wider margin between cost of gain and selling price. Grain-alone rations gave better results when hand-fed than when self-fed. It was found that tankage is worth in dollars per ton three times the value of skim milk in cents per 100 lbs.

Stallion enrollment.—XVI, Report of stallion enrollment work for the year 1927 with lists of stallions and jacks enrolled (*Indiana Sta. Circ. 148 (1927), pp. 48, figs. 3*).—This is the usual report (E. S. R., 57, p. 462).

Growth of chickens in relation to feed consumption, M. A. JULL and H. W. TITUS (*Jour. Agr. Research [U. S.], 36 (1928), No. 6, pp. 541–550, figs. 5*).—An experiment to provide data to test the application of the law of diminishing increment as applied to growing chicks was conducted by the U. S. D. A. Bureau of Animal Industry, using 170 chicks hatched from a pen of Barred Plymouth Rock females mated to Rhode Island Red males. The chicks were weighed individually at hatching time and every 2 weeks thereafter. The

total amount of feed consumed by each lot was determined at the end of each 2-week period.

The equation used in fitting the curve of diminishing increment to the data was $Y=M-Ae^{-kx}$, in which Y is the live weight for any given amount, x, the feed consumed, M the theoretical maximum live weight attainable, A the gain in live weight above the theoretical initial weight of which birds are capable if their growth continues to obey the same law, and e^{-k} the ratio between gains in live weight for successive units of feed. The method is corrected by a suitable "adjustment" equation.

The results indicate that M and A can be considered only as empirical constants and do not represent the maximum live weight actually to be attained and the actual gain necessary to reach that weight. The ratio between gains in live weight for successive kilogram units of feed was approximately 0.92. The authors conclude that the law of diminishing increment expresses the relationship between feed consumption and growth of the domestic fowl.

The growth of Rhode Island Reds and the effect of feeding skim milk on the constants of their growth curves, H. W. Titus and M. A. Jull (*Jour. Agr. Research [U. S.], 36 (1928), No. 6, pp. 515–540, figs. 12*).—In an effort to obtain data on this subject, the U. S. D. A. Bureau of Animal Industry used 2 groups of 174 and 191 chicks hatched March 14 and March 24, respectively. The chicks were weighed individually at hatching and at age intervals of 1 week until 18 weeks old and every other week thereafter to approximately 34 weeks. The methods of housing, brooding, and feeding were the same for each group, except that the later hatched group had access to sour skim milk and water at all times, while the first group had water only. At 10 weeks of age the males and females in each group were separated, and half of the cockerels caponized. Mortality losses, losses due to the operation, and pullets discarded in order to reduce these lots to about the same number as there were cockerels brought the number of chicks in lot 1 to 34 cockerels, 37 capons, and 55 pullets and in lot 2 to 44 cockerels, 37 capons, and 40 pullets at the beginning of the eleventh week.

In interpreting the data the autocatalytic curve was used for describing the growth of the 6 lots during the first 15 to 18 weeks and the formula of the curve of diminishing increment for the remainder of the growth period.

It was found that for the lots receiving skim milk there was a period of high variability in live weight between 0 and 7 or 8 weeks of age and for the lots not receiving skim milk between 0 and at least 12 weeks. Feeding sour skim milk had no marked effect on the calculated mature weights, but the data indicate that it accelerated growth during the first 15 or 18 weeks. This acceleration took place mainly between the first feeding and the age of 11.5 to 14.5 weeks. Chicks not receiving skim milk had a higher rate of growth during the later stages than those receiving skim milk. The calculated average-rate-of-growth curves for the first 15 to 18 weeks were found to be narrower and higher for the lots receiving skim milk than for the lots not receiving it. The point of inflection of the growth curve occurred earlier in the case of chicks receiving skim milk, suggesting that the more nearly a perfect condition of nutrition is reached the more nearly will the all-growth curve approach the curve of diminishing increment.

The mature weights of Rhode Island Red cockerels, capons, and pullets were found to be 4,459, 4,049, and 3,351 gm., respectively. Cockerels and pullets reached maturity in from 21 to 23 months and capons in 17.4 months.

Growth values of proteins from commercial animal products.—I, Commercial meat and bone scraps, R. W. Prange, C. W. Carrick, and S. M.

HAUGE (*Poultry Sci., 7 (1928), No. 3, pp. 95–105, figs. 4*).—Meat and bone scraps from three manufacturers were fed to crossbred chicks in 3 trials and to White Leghorn chicks in 1 trial at the Indiana Experiment Station. The numbers of chicks in each of 3 lots in the respective trials were 17, 12, 20, and 14. The percentage of animal protein in the rations varied from 5 to 15 per cent.

Optimum growth was obtained when the proteins furnished by meat and bone scraps supplied 10 to 12 per cent of the ration used for young chicks. The products from the different manufacturers, even when fed at the same protein level and with mineral differences equalized, did not give the same rate of growth. Feeding the maximum amount of meat and bone scraps did not appear to increase mortality.

Useful facts concerning foodstuffs employed in poultry rations, W. C. THOMPSON (*New Jersey Stas. Hints to Poultrymen, 16 (1928), No. 6, pp. 4, fig. 1*).—A popular presentation of the facts to be considered in the preparation of poultry rations. The composition and particular uses of some of the commonly used foodstuffs are given.

Summer management of the young stock, J. C. TAYLOR (*New Jersey Stas. Hints to Poultrymen, 16 (1928), No. 9, pp. 4, fig. 1*).—This is a popular discussion of the management and feeding of young stock during the summer in order to obtain normal growth and development.

The death rates of three standard breeds of fowl, J. A. HARRIS and D. C. BOUGHTON (*Poultry Sci., 7 (1928) No, 3, pp. 120–131, figs. 2*).—The death rates of White Wyandottes, Rhode Island Reds, and White Leghorns have been studied, using the records of the international egg-laying contest at Storrs, Conn., from 1911–12 to 1921–22 (E. S. R., 57, p. 665) as the source of data. Three different formulas were devised for expressing the percentage of death rate, and the records of each breed were worked out according to each formula.

It was shown that during the first laying year the death rate of the White Wyandotte breed is significantly higher than that of the Rhode Island Red or the White Leghorn breed, the difference being 6.4 and 9.7 times as large as the probable errors. These results held true, with slight exceptions, whether the death rates were based on the number of birds alive at the beginning of the year or at the beginning of an individual month, also for the individual months of the year, for the annual death rates of the 11 individual years, or for the annual death rates for the whole period of 11 years. The death rate of the Rhode Island Red breed was somewhat higher than that of the White Leghorn breed, the difference being 3.7 times as large as the probable error.

There was an essential likeness between the average monthly egg production and the monthly death rate of each breed. They both increased from the beginning of the laying year to a maximum and then decreased, suggesting a relationship between the strain placed upon the organism by heavy egg production and mortality.

Relation of age of parents to hatchability, livability, and fecundity in the domestic fowl, F. A. HAYS (*Poultry Sci., 7 (1928), No. 3, pp. 106–115, figs. 3*).—Using the records in work previously noted from the Massachusetts Experiment Station (E. S. R., 59, p. 72), a study was made of the age of sires as a possible factor in the hatchability of their mates, of the mortality records of the daughters of these sires during their pullet laying year, and of the annual egg record of all normal surviving daughters. In one group the sires were constant for 2 years and the dams varied, in a second group the dams were constant for 2 years and the sires varied, and in a third group the dams and sires were identical for 2 successive years.

There was no statistically significant difference in the mean hatchability of the mates of cockerels and the mates of the same males as yearlings, but the majority of females mated to the two groups of males showed a slightly greater hatchability from the yearling mates, indicating that mature males are more likely to have higher hatchability than cockerels. To a less significant extent the yearling hens tended to give a slightly higher hatchability than the same individuals as pullets. In four of five identical matings, the yearling parents gave a higher hatchability than the younger parents, and the mean hatching record was also higher during the second year. The mortality records were complicated by an epidemic of chicken pox and roup during two of the three years, so that no deductions seemed justifiable. There was no evidence of any relationship between the age of the parents and fecundity.

Record of performance and registration, M. A. JULL (*Poultry Sci., 7 (1928), No. 3, pp. 132–138*).—The author gives a tentative outline for official State recognition of records of egg production made on the producer's premises and also for the registration of such production.

The method of awarding prizes at exhibitions of utility poultry in Germany, WEINMILLER (*Poultry Sci., 7 (1928), No. 3, pp. 139–141*).—The author has worked out a method by which actual laying performance is valued, together with the standard of breed perfection in the judging of utility types of poultry in Germany. Birds to be exhibited are held at a control station for 6.5 months previous to showing and their egg production recorded. The total weight of eggs produced by any bird is scored at the rate of 60 points during the months from November to January, of 45 points during February, and only 30 points for the following months. In pen exhibits additional points are awarded for uniformity of performance of all birds in the pen. Performance of ancestors of the birds is also given consideration. This score, together with the score obtained during the actual judging, is used as the basis for awarding prizes.

How New Jersey poultrymen may use the egg laying contests, W. C. THOMPSON (*New Jersey Stas. Hints to Poultrymen, 16 (1928), No. 7, pp. 4, fig. 1*).—After a brief discussion of the reasons, advantages, and objects of egg-laying contests, the author gives a general outline of the contests conducted by the stations.

Securing summer and fall eggs, C. S. PLATT (*New Jersey Stas. Hints to Poultrymen, 16 (1928), No. 8, pp. 4, fig. 1*).—The economic importance of summer and fall egg production having been discussed (E. S. R., 57, p. 569), the author describes the following points which must be considered in order to secure such production: Selection of stock with a natural ability for production at this season, feeding, use of artificial lights, providing cool clean laying houses, growing young stock rapidly, confining birds, and the proper water supply.

Osmotic activity in eggs of different breeds of the common fowl, F. E. RICE and D. L. YOUNG (*Poultry Sci., 7 (1928), No. 3, pp. 116–118*).—In an effort to determine the cause of "watery" whites in storage eggs, studies were made at the North Carolina Experiment Station of the physical properties, especially the osmotic activity of the eggs of four breeds of poultry. Numerous investigators have reported that the chemical composition of eggs of various breeds is quite uniform, and analyses in connection with this study have borne out these conclusions. Refractive index, which is a measure of total solids, and freezing point, which is proportional to the osmotic pressure, were determined in the yolks and whites of the eggs, but the differences found were not significant. The authors conclude that any difference in appearance of the eggs of different breeds could not be attributed to osmotic activity.

Find disinfectants slightly affect eggs, J. L. Boyd (*Michigan Sta. Quart. Bul., 10 (1928), No. 4, pp. 175–178*).—In determining the effect of disinfecting solutions upon the hatching qualities, 700 eggs were divided into 5 uniform groups. Each group was further subdivided into groups of 35 eggs each. The first 35 eggs of each of the four groups were immersed in a distinfecting solution, removed immediately, and placed on the incubator trays, the second 35 eggs were immersed for one minute, the third for three minutes, the fourth were sprayed on the incubator trays. The last group was used as a check. The solutions used in their respective order were sterilac, sodium hypochlorite, iodine suspensoid, and chlorinated lime. The eggs were hatched in the same machine and under the same conditions.

The hatchability in the respective groups was 57.1, 54.3, 62.1, 57.1, and 67.1 per cent. The total of infertile eggs was 29 in the chlorinated lime group, 28 in the check group, 23 in the sterilac and iodine suspensoid groups, and 22 in the sodium hypochlorite group. Lots 1 and 2 had 16 dead germs each; lot 3, 13; lot 4, 8; and the check 4. In lot 1 there were 14 chicks dead in shell, 13 in lot 2, 11 in lot 3, 9 in lot 4, and 7 in the check group. Lot 1 produced 5 crippled chicks; lot 2, 6; lot 3, 3; lot 4, 2; and the check lot, 5.

The author concludes that the detrimental effect from treating eggs with disinfecting solutions is approximately the same with any solution used.

Talking turkey, W. A. Billings ([*University Farm, St. Paul*]: *Minn. Univ., Agr. Ext. Div., [1927], pp. 23, figs. 5*).—A practical outline of a plan for domesticating and raising turkeys in semiconfinement. Special reference is made to the prevention of the common ailments of turkeys. A section on the care and feeding of poults day by day has been prepared by A. C. Smith.

DAIRY FARMING—DAIRYING

Japanese honeydrip sorghum silage versus June corn silage for milk production, W. S. Cunningham and J. R. Reed (*Arizona Sta. Bul. 122 (1927), pp. 143–155, figs. 2*).—The results of two experiments using two lots of 4 and 5 cows, respectively, which were conducted to compare the value of sweet sorghum and corn silage for milk production are reported. Each experiment was divided into two periods of 28 days each preceded by a 7-day preliminary period. The reversal system of feeding was used for the silages.

The grain ration consisted of wheat bran and rolled barley, 210 lbs. each, and cottonseed meal 100 lbs. This was fed at the rate of 1 lb. for each 5 lbs. of milk produced by Holstein cows and for each 4 lbs. of milk produced by Jersey cows. Alfalfa hay was fed collectively to each group. In feeding the silage each cow was given as much as she would eat twice daily. The cows were milked twice a day and the milk weighed at each milking. A 2-day composite sample was analyzed for butterfat at about the middle of each experimental period.

In the first test corn silage produced 1.5 per cent more milk and 4.3 per cent more butterfat, and in the second test 1.68 per cent more milk and 2.94 per cent more butterfat than the sorghum silage. Each ton of sorghum silage produced about 91 per cent as much milk in the first trial and 95.8 per cent as much milk in the second trial as corn silage on the basis of quantity consumed. More sorghum silage was eaten than corn silage in both tests, but there was little difference in the effect of either upon the weight of the cows. It was estimated that with corn silage valued at $8 per ton the sorghum silage in the first test was worth $7.28 per ton and in the second test $7.66 per ton. The yield of sorghum silage per acre was 21.6 tons in trial 1 and 35.6 tons in trial 2. The corresponding yields for corn silage were 10.1 and 21 tons, respectively.

Dairy cattle need phosphorus in ration, O. E. Reed and C. F. Huffman (*Michigan Sta. Quart. Bul., 10 (1928), No. 4, pp. 151–156, figs. 3*).—Heifers fed raw rock phosphate (E. S. R., 55, p. 368) at the rate of 1.5 per cent of the grain ration from the time they were a few days of age developed in about 2.5 years teeth that were sensitive to cold water. Examination of the teeth showed that they had become soft and in some cases were worn down to the gums.

Two lots of 3 cows each were fed for 20 days on a basic ration of grain mixture, silage, and timothy hay. For the next 20 days 1 lot received in addition 3 per cent of the grain ration as bone meal and the other lot 3 per cent raw rock phosphate. The latter lot went off feed the second day they received the mineral. The lot on bone meal had normal appetites. During the third 20 days the basal ration was fed again, and during the fourth 20 days the minerals were again added, but the lots were reversed. Again the lot receiving raw rock phosphate went off feed. Not only was the palatability of the grain ration affected by raw rock phosphate, but the consumption of hay and silage was reduced. It was apparent that this mineral brought about a digestive disturbance. Similar results were obtained with other raw rock phosphates and when fed to cows in the dairy herd there was a marked drop in feed consumption.

Sources of phosphorus and the methods of feeding this product are also discussed.

The effects of cod-liver oil on the calcium and phosphorus metabolism of the lactating animal, D. Harvey (*Biochem. Jour., 21 (1927), No. 6, pp. 1268–1276, figs. 2*).—A series of six experiments, most of which consisted of a preliminary period, an experimental period, and a post-experimental period, were conducted with milch goats at the Rowett Research Institute, Aberdeen, Scotland, to determine whether cod-liver oil would stimulate the calcium and phosphorus metabolism of the lactating animal. The tests were made at various stages of the lactating period. Hay and grain in suitable amounts were fed at the same level throughout the test, and distilled water was given ad libitum. During the experimental period daily collections were made of the excreta, which was analyzed every four days for calcium, phosphorus, and iodine. Composite samples of milk were analyzed for the same mineral elements and for butterfat content.

The calcium balance of goats was improved with cod-liver oil feeding by reducing the amount of calcium excreted in the feces, but the effect on the phosphorus excretion was variable. The percentage and total amount of calcium in the milk of animals in the later stages of lactation were increased by cod-liver oil feeding. The iodine content of the milk was increased by the feeding of either cod-liver oil or potassium iodide. In one test olive oil with an equivalent amount of iodine as potassium iodide replaced the cod-liver oil, but the effects of the latter were not reproduced.

Dairy cattle feeding with some pointers on management, N. C. Jamison (*Oreg. Agr. Col. Ext. Bul. 402 (1928), pp. 22, fig. 1*).—A popular bulletin dealing with the feeding and management of dairy cattle.

Feeding the dairy herd for profit, T. M. Olson (*South Dakota Sta. Bul. 231 (1928), pp. 96, fig. 1*).—A popular bulletin dealing with all the phases of feeding dairy cattle. Appended are tables giving facts and information pertinent to this operation.

Calf meal studies, I, II, J. G. Archibald (*Jour. Dairy Sci., 11 (1928), No. 2, pp. 119–135, figs. 2*).—Continuing the study of rearing calves on a minimum of milk at the Massachusetts Experiment Station, the test with calf meals herein reported was divided into two parts. The first part dealt with the

physical improvement of the meals in the laboratory and the second part with feeding cooked and uncooked meal. The meal used in this work was designated as No. 7 in the work previously noted (E. S. R., 53, p. 473).

The laboratory test consisted of increasing the fineness of the meal, adding a protective colloid (gelatin), partial cooking, and combinations of these methods. The efficiency of these methods was tested by using the suspension test, placing 20.97 gm. of meal in 250-cc. beakers, adding 200 cc. of water, mixing thoroughly, and then observing at varying intervals the amount of sediment and the character of the supernatant liquid. The results obtained indicated that, while a reasonable degree of fineness is necessary in a calf meal, very fine grinding was impracticable and probably unnecessary. The addition of gelatin to calf meal gruels as ordinarily prepared was without effect. Heating to not above 60° C. (140° F.) appeared to be the most efficient method of improving the physical character of calf meals and also the most practical.

Two groups of 5 Holstein bull calves each were fed in the usual manner, except that one group received raw meal and the other group meal heated to 60°. This feeding continued until the calves were 4 months old. Digestion trials of 10 days' duration were carried on with 6 of the calves, and the results gave no significant indications of any effect due to cooking. The calves fed the raw meal were consistently better than those fed the cooked meal. Cooking apparently lowered the palatability of the meal and hence the consumption, and calves fed this meal had a tendency to scour and to develop "pot bellies."

Selection and use of the dairy bull, H. A. Hopper (*N. Y. Agr. Col. (Cornell) Ext. Bul. 163 (1927), pp. 30, figs. 6*).—A popular discussion of the selection, value, and use of dairy bulls. The results of using good bulls and systems of breeding are discussed. Appended are a model service record sheet and a breeder's calendar.

The variations in milk yields caused by season of the year, service, age, and dry period, and their elimination, I, II, H. G. Sanders (*Jour. Agr. Sci. [England], 17 (1927), Nos. 3, pp. 339–379, figs. 14; 4, pp. 502–523, figs. 8*).—In the first of a series of papers the author discusses the effect of the season in which cows calve upon their total lactation yield. The data were accumulated by the Penrith and Norfolk Milk Recording Societies. The paper is divided into three parts, comparing in section A the Norfolk and Penrith cows, section B breeds, and section C high and low yielders.

Under section A two points were brought out in making the comparison: (1) Penrith cows are kept principally for sale and milk products are secondary, and (2) the feeding in this district is generally a pasture proposition.

Lactation curves show that Norfolk cows calving in the fall have a higher total yield than cows calving at other seasons of the year. Such cows start at a high level of yield, maintain their milk flow well throughout the winter, reap considerable benefit from the spring flush, and in summer gradually dry up. Winter calving brings cows to the summer drop earlier in the lactation period and so decreases their yield, while late spring and summer calvers begin their period at the worst time of the year. The author believes that the summer drop, which is due to poor pastures, might be overcome by arranging a system of catch crops that would provide a continued supply of succulent feed. On the other hand, in the Penrith section where conditions are bad for milk production from February to April, the most favorable time for calving seems to be in the spring, when the cows have the advantage of the spring flush. The cows in the Norfolk district yielded 22.8 per cent more milk than those in the Penrith district, of which only about 6 per cent is due to better cows and approximately 17 per cent to better conditions of feeding and management.

A study of the records of cows of the Red Poll, Lincoln Red, and Friesian breeds and of the common cattle showed a marked similarity for all according to season. This led to the conclusion that only one set of standardizing corrections is necessary for the month of calving.

It was found that the effect of the month of calving is proportionally the same with all cows, whether high or low yielders. One half of the difference between the high and low yielders was due to physiological capacity and the other half to persistence of yield. In the Penrith district persistency was a very definite individual characteristic besides being subject to environment.

Continuing the study noted above, the variations caused by service are discussed. The article is divided into two parts, the first dealing with the effect of the length of service period on the total lactation yield and the second with the effect of fetal growth on the lactation curve.

In part 1 it was found that a rather positive relationship existed between long service periods and high yields. Curves obtained from the data agree both for cows with their first calves and for other calves. Correlation tables between the length of service period and yield are presented for the breeds of cattle studied, and corrections for the effect of length of service period on yield are calculated for high and low producers separately.

In the second part, it is shown that the effect of fetal growth on milk flow is of the same type in all the breeds. The Friesian cows conformed to the variations for all cattle, while Red Polls showed less effect and the fall was quite marked with the Lincoln Reds. The decline in milk flow during pregnancy was proportional for both the high and low yielders. The data brought out that (1) there seems to be a slight decrease in yield associated with the onset of heat; (2) immediately after service the yield settles down on a slightly lower level than before, where it continues for about 20 weeks; and (3) at or about the twentieth week of pregnancy a sudden and continuous fall sets in. These variations of yield during pregnancy suggest the effect of a definite physiological factor.

Influence of diet and sunlight upon the amount of vitamin A and vitamin D in the milk afforded by a cow, H. Chick and M. H. Roscoe (*Biochem. Jour., 20 (1926), No. 3, pp. 632–649, fig. 1*).—Continuing the studies of Luce (E. S. R., 53, p. 177), rats that had been on diets deficient in vitamin A but supplied with vitamin D in the form of irradiated cottonseed oil and also rats on low phosphorous rachitic diets were fed samples of milk from a cow fed and housed under varying conditions. The milk samples were pasteurized and stored in a refrigerator until used. Where butter was used in the tests, the cream was separated from the milk produced in one week, and after churning stored at —8 to —10° C. until used. Luce's arbitrary standard for a "growth unit" (E. S. R., 52, p. 277) was used to test the growth-promoting value of the milk.

It was found that the vitamin A content of the cow's milk was dependent on the diet, being at a maximum when the animal received fresh green feed and at a minimum when a winter ration of cereals and roots was fed. Exposure to sunlight had no effect on the vitamin A content. The cow when fed fresh green feed in a darkened stall produced milk as potent in vitamin A as when out on pasture.

The vitamin D content of the milk was found to be principally dependent upon the degree of insolation of the animal. However, there were indications that a diet of fresh green feed was a contributory factor to the vitamin D content. When the cow was exposed to sunlight, but receiving a ration of cereals

and roots, the vitamin D content of the milk was inferior in spite of the exposure.

The maximum amount of both vitamins A and D was found in the milk when the cow was on pasture in the summer. Butter made from milk potent in vitamin D preserved its potency after storage in a frozen state for more than two years.

The physics of dairying, O. RAHN and P. F. SHARP (*Physik der Milchwirtschaft. Berlin: Paul Parey, 1928, pp. VIII+280, figs. 46*).—A treatise dealing with the physical characteristic of the various products of the dairy industry.

A study of the apparent viscosity of milk as influenced by some physical factors, G. M. BATEMAN and P. F. SHARP (*Jour. Agr. Research [U. S.], 36 (1928), No. 7, pp. 647–674, figs. 4*).—Experiments at the New York Cornell Experiment Station were undertaken to make a systematic study of the viscosity of skim milk under varying conditions of treatment, to determine if some of the changes taking place in the viscosity of whole milk are due to changes associated with the fat or to changes in the skim milk phase, and to investigate the rate of flow of milk through capillary tubes at varying pressures. The milk used was obtained from the station herd, held at 0° C. until used, and precautions taken to prevent, as far as possible, contamination or decomposition. The fat and milk solids content of the milk used was determined. A Bingham viscometer was used and all determinations carried out at 25°±0.01°.

It was found that the viscosity coefficient of whole milk, condensed milk, and even skim milk was not independent of the rate of shear, but decreased as the rate of shear increased, approaching a constant value at high rates of shear. The same viscosity coefficients, according to the author, will not be obtained unless the viscometers used are identical, since the bending of the viscosity pressure curve is greatest in the region of the shearing force.

Mechanical agitation caused a decrease in the viscosity of milk containing fat globules, but did not decrease the viscosity of skim or homogenized milk. Skim milk progressively increased in viscosity with age, and the viscosity of such milk could not be brought back to the value which it had when fresh by repeatedly running through capillary tubes. The viscosity of whole milk showed a distinct rise following homogenization, while practically no change occurred when skim milk was homogenized. Skim milk pasteurized at 62° for 30 minutes showed a slight decrease in viscosity. The viscosity of milk frozen one day was decreased, but after aging in this state for several days the viscosity approached that of the fresh sample. Alternate freezing and thawing each day for seven days produced the same effect as holding in the frozen state the same length of time.

The viscosity values obtained on skim milk diluted with varying amounts of water fell on a slight curve, indicating that viscosity is not strictly a linear function of the total solids. The author concludes that viscosity determination of milk samples does not necessarily indicate accurately the total solids content except possibly for very restricted groups of samples.

A statistical study of the Babcock test, D. H. NELSON (*Jour. Dairy Sci., 11 (1928), No. 1, pp. 108, 109*).—Independent readings of the fat columns in Babcock tests at the California Experiment Station with some 2,000 samples showed a probable error in reading of ±0.02 with a possible variation between different readers of 0.1 per cent. Greater variations were found when the fat columns were not amber colored, translucent, and free from visible suspended particles. The fat content of the milk had no appreciable effect on the probable error of pipetting or the method of determining fat content.

Forty-four tests of 6 samples of milk by the Babcock method and 16 tests by the Mojonnier method showed the average of the two methods to agree within the probable error of the Babcock method.

Test for keeping qualities of milk modified, E. D Devereux (*Michigan Sta. Quart. Bul., 10 (1928), No. 4, pp. 190–194*).—In an effort to modify the method of determining the keeping qualities of milk (E. S. R., 46, p. 479), approximately 1,000 samples of milk were examined during the four seasons of the year. One set of 100 samples was examined in duplicate. One set of the duplicate tests was carried on according to the test originally devised. Another set was warmed to 37° C. as soon as inoculated and then placed in the 37° incubator for 7 hours. The tubes were then removed, chilled in cold water, and placed in the ice box at 3 to 5°. Twenty to 24 hours later the tubes were removed from the ice box, warmed to 37°, and incubated for 1 hour. Readings were then made and compared with those tubes which were incubated 8 hours without interruption. In the same manner data were collected on tubes incubated 6 hours one day and 2 hours the next, 5 and 3, 4 and 4, 3 and 5, 2 and 6, 1 and 7, and 0 and 8. In addition another group of 100 samples were examined by the original method as soon as they reached the laboratory. The remainder of each sample was placed in the ice box and scored again 20 to 24 hours later to determine the effect of storage on the score.

Results comparable to those obtained by the old method were found when the milk-inoculated tubes were iced from 20 to 24 hours, thus helping to eliminate the "time factor" criticism of the old method. The most efficient results were obtained when the interruptions came after 6, 5, 4, and 3 hours of incubation and the remaining incubation carried out the next day. The new method checked with the control tubes in 93 to 94 per cent of all cases.

A method of awarding marks for uniformity of low bacterial count in clean milk competitions, C. H. Chalmers (*Jour. Dairy Sci., 11 (1928), No. 2, pp. 155–162, figs. 4*).—The author describes a method of awarding high marks in "clean milk competitions" in England to competitors who consistently produce milk of a high bacterial standard. This is a revision of the scale of points according to the guide previously noted (E. S. R., 53, p. 176).

Certified milk conferences held in 1927: Twenty-first annual conference of the American Association of Medical Milk Commissions, Inc., and the Certified Milk Producers' Association of America, Inc. . . . (*Amer. Assoc. Med. Milk Comns. Proc., 21 (1927), pp. IV+[2]+322, figs. 10*).—A compilation of the proceedings of the twenty-first annual conference of the American Association of Medical Milk Commissions, held at Washington May 16 and 17, 1927 (E. S. R., 57, p. 372); also the proceedings of the annual meeting of the Metropolitan Certified Milk Producers, Inc., held in New York January 31, 1927. Both meetings were held in conjunction with the meetings of the Certified Milk Producers' Association of America.

The possibility of producing iodized milk, C. F. Monroe (*Jour. Dairy Sci., 11 (1928), No. 1, p. 106*).—An analysis of the milk of cows at the Ohio Experiment Station fed 0.1 gm. of potassium iodide per head daily showed that iodine was present in the milk in amounts varying from 1 part in 10,000,000 to 1 part in 100,000,000. Milk from cows receiving no iodine had an iodine content of less than 1 part in 100,000,000 if present at all. The potassium iodide was first fed mixed with salt and this product mixed in the grain. Later a 25 cc. solution containing 0.1 gm. of potassium iodide was sprinkled over the dry grain.

The hydrogen ion concentration of cold storage butters, E. H. Parfitt (*Jour. Dairy Sci., 11 (1928), No. 1, p. 102*).—The H-ion concentration on entering storage and at the end of a 3-month storage period of the butter entered in

the butter storage contest at the 1926 National Dairy Show was determined at the Indiana Experiment Station. The concentration increased from an average of pH 6.13 to 6.43. As the score of the butter decreased in storage the pH decreased, except in butter scoring over 94 or under 89. Butters showing large numbers of proteolytic organisms increased more in pH than those having a small number of proteolytic types, also butters with an alkaline flavor increased more in pH than did those not having this flavor. The butters containing starters varied least in pH.

The keeping qualities of ghee, V. H. PATIL and B. W. HAMMER (*Jour. Dairy Sci., 11 (1928), No. 2, pp. 143–154*).—Ghee, a product prepared by heating unsalted butter over a slow fire for a considerable period and then straining, was compared with butter and butterfat in tests at the Iowa Experiment Station to estimate its keeping qualities.

Ghee had better keeping qualities than butter at both room and cooler temperatures. Butterfat, however, more nearly approached ghee in keeping qualities than did butter. Adding sterile water to ghee reduced its keeping qualities, indicating that moisture rather than the presence of curd governs the deterioration of the product. Ghee made from poor butter had an off flavor and odor which was not removed during the heating process. Using high temperatures in the production of ghee caused a pronounced heated flavor and odor and also produced a product with better keeping qualities due to the almost complete removal of moisture. During the deterioration of ghee the most definite change was an increase in the acid values.

This work suggests the development of products made almost entirely of butterfat which may be used as butter and kept under severe temperatures.

Wensleydale cheese, J. LONG (*Milk Indus., 8 (1928), No. 11, pp. 54, 55*).—The author gives detailed directions for the making of Wensleydale cheese.

A method of obtaining crude milk sugar and other solids from sweet whey, R. W. BELL, P. N. PETER, and W. T. JOHNSON, JR. (*Jour. Dairy Sci., 11 (1928), No. 2, pp. 163–174, fig. 1*).—A new method of obtaining crude milk sugar from fat-free whey has been devised by the U. S. D. A. Bureau of Dairy Industry. A soluble powder composed of the solids other than sugar is also obtained by this process.

Under the new system only one condensing process is necessary to obtain a Baumé reading of approximately 32° as against two such operations necessary under the present system. The yield of milk sugar under the new system is estimated to be 4 per cent and of powder 1.5 per cent. The advantages of the new method are the economy of production and having two salable products as against one under the present system.

Condensed milk, A. MIYAWAKI (*New York: John Wiley & Sons; London: Chapman & Hall, 1928, pp. XI+380, figs. 79*).—This treatise deals with all the phases of the condensed and powdered milk industry. Appended are facts and formulas pertinent to the industry.

Methods of adding sugar to the ice cream mix, W. H. MARTIN (*Jour. Dairy Sci., 11 (1928), No. 1, pp. 102, 103*).—Studies at the Kansas Experiment Station showed that the addition of sugar to an ice cream mix before homogenization increased the viscosity to a greater extent than adding the sugar after homogenization. Fat was more highly dispersed in mixes homogenized without sugar than in those in which sugar was present. Adding sugar to the mix after homogenization increased the ease of obtaining overrun, decreased the resistance of the ice cream to melting at room temperatures, and had no effect upon the body or texture of the finished product.

A handbook of dairy statistics, T. R. Pirtle (*U. S. Dept. Agr., 1928, pp. II+109*).—This is a revision of the work previously noted (E. S. R., 48, p. 273), with data brought up to date.

VETERINARY MEDICINE

[Reports of the Ontario Veterinary College, 1926 and 1927] (*Ontario Vet. Col. Rpts. 1926, pp. 69, figs. 8; 1927, pp. 60, figs. 9*).—The papers contained in the report for 1926 include three noted elsewhere in this issue, and the following: Diseases of Cattle (pp. 11–23), Diseases of Pigs (pp. 23–26), and Diseases of Sheep (pp. 27–30), all by R. A. McIntosh; Small Animal Diseases (pp. 30, 31); Intersexuality in Mammals, by L. Stevenson (pp. 32, 33); The Black Fox Industry in Ontario (pp. 35, 36) and Fascioliasis in a Cow (p. 36), both by H. E. Batt; and Veterinary Science in Japan, by F. Schofield (pp. 66–69). The following papers and two others noted elsewhere in this issue are given in the report for 1927: Cattle Diseases (pp. 12–24), Diseases of Pigs (pp. 25–28), Diseases of Sheep (pp. 28–31), and Small Animal Diseases (p. 31–33), all by R. A. McIntosh; The Use of Vermifuges in the Control of Intestinal Parasites of Foxes, by H. E. Batt (pp. 34–36); A Report of the Post-mortem Findings in Twenty-five Pigs Received from the Ontario Agricultural College, by F. W. Schofield (pp. 37–39); and A Report on the Results Obtained from the Use of Abortion Vaccine and Bacterin as Supplied by the Ontario Veterinary College (pp. 39–41); and Two Case Reports on Fowl (pp. 57–60), by R. Gwatkin.

A new animal board, I. F. Huddleson and E. R. Carlson (*Jour. Lab. and Clin. Med., 13 (1928), No. 7, pp. 660, 661, figs. 3*).—This contribution from the Michigan Experiment Station describes and presents photographs of a board that has been found satisfactory for use in work with laboratory animals.

An investigation of the American wormseed as grown in South Dakota, Chenopodium ambrosioides L. var. anthelminticum Gray, A. Hogstad, jr. (*S. Dak. Agr. Col., Div. Pharm. Bul. 1 (1926), pp. 31, figs. 8*).—An account particularly of the pharmacology of this plant, which includes a table recording the percentage of ascaridol content, etc. It is pointed out that practically the entire world's supply of the anthelmintic, oil of American wormseed, *Oleum chenopodii* U. S. P. IX, is obtained from Maryland, the major portion being produced in the southern part of Carroll County.

A so-called "Western" (South Dakota) oil of American wormseed has been produced in Brookings County (South Dakota State College), which complies with the requirements of the U. S. P. IX. The oils obtained from the flowering plants yielded from 2 to 10 per cent of ascaridol, those from the partially mature herbs from 20 to 30 per cent, and those from the fully matured herb from 40 to 60 per cent.

The newer knowledge of bacteriology and immunology, edited by E. O. Jordan and I. S. Falk (*Chicago: Univ. Chicago Press, 1928, pp. X+1196, pls. 16, figs. 117*).—This work, prepared in an attempt to make the latest results of investigation in various lines of bacteriology and immunology available for students and active workers, consists of articles by 82 contributors, as follows:

The Newer Knowledge of the Morphology of Bacteria, by H. C. Ward (pp. 1–13); The Chemical Structure of Bacteria, by T. Baumgärtel (pp. 14–18); Staining Reactions of Bacteria, by J. W. Churchman (pp. 19–37); Morphological Changes during the Growth of Bacteria, by P. F. Clark (pp. 38–45); Growth Curves of Bacteria, by R. E. Buchanan (pp. 46–57); The Rise and Fall of Bacterial Populations, by C. E. A. Winslow (pp. 58–83); The Dissociative Aspects of Bacterial Behavior, by P. Hadley (pp. 84–101); Bacterial Associations, by

W. L. Holman (pp. 102–119); Classification of Bacteria, by R. G. Perkins (pp. 120–135); Atoms, Ions, Salts, and Surfaces, by W. D. Harkins (pp. 136–178); The Effect of the Surface Tension of the Menstruum upon Bacteria and Toxins, by W. P. Larson (pp. 179–187); Oxidation-reduction Potentials of Dye Systems and Their Significance in Bacteriology, by W. M. Clark (pp. 188–197); Anaerobiosis, by I. C. Hall (pp. 198–210); Bacterial Oxidations and Reductions, by J. W. McLeod (pp. 211–217); Protein (Nitrogen) Metabolism of Bacteria, by L. F. Rettger (pp. 218–226); The Utilization of Carbohydrates by Bacteria, by A. I. Kendall (pp. 227–242); Utilization of Aliphatic and Aromatic Compounds by Bacteria, by S. A. Koser (pp. 243–249); Gas Metabolism of Bacteria, by M. H. Soule (pp. 250–267); Enzymes of Bacteria, by S. A. Waksman (pp. 268–278); Synthetic Culture Media, by H. W. Schoenlein (pp. 279–284); Determinations of Thermal Death-time, by J. R. Esty (pp. 285–300); The Standardization of Disinfectants and Antiseptics, by G. F. Reddish (pp. 301–309); Nature, Distribution, and Functions of Soil Micro-organisms, by S. A. Waksman (pp. 310–321); Autotrophic Bacteria, by R. L. Starkey (pp. 322–331); The Root-nodule Bacteria of Leguminous Plants, by E. B. Fred (pp. 332–340); Micro-organisms in Relation to Soil Fertility, by J. G. Lipman (pp. 341–350); The Rôle of Bacteria in the Treatment of Sewage, by F. W. Mohlman (pp. 351–361); Some Problems in Water Bacteriology (pp. 362–370) and The Action of Ultra-violet Light on Bacteria and Their Products (pp. 371–377), both by J. F. Norton; Bacteria in Milk, by R. S. Breed (pp. 378–394); Bacteria in Dairy Products, by L. A. Rogers (pp. 395–402); The Bacterial and Health Aspects of Pasteurization, by M. J. Rosenau (pp. 403–418); Mechanical and Engineering Aspects of Pasteurization, by G. W. Putnam (pp. 419–436); Contamination and Deterioration of Food, by C. Thom (pp. 437–442); The Bacteria of Food Poisoning, by E. O. Jordan (pp. 443–451); The Spirochetes, by H. Noguchi (pp. 452–497); Current Problems on Yeasts, by F. W. Tanner (pp. 498–508); The Aspergilli, a Typical Group of Molds, by C. Thom (pp. 509–516); Filterable Viruses, by T. M. Rivers (pp. 517–524), previously noted (E. S. R., 58, p. 274); The Bacteriophage: Present Status of the Question of Its Nature and Mode of Action, by J. Bronfenbrenner (pp. 525–556); Filterability of Micro-organisms, by S. P. Kramer (pp. 557–564); A Theory of Microbic Virulence, by I. S. Falk (pp. 565–575); Elective Localization of Bacteria in the Animal Body, by E. C. Rosenow (pp. 576–589); Bacteria in Relation to Plant Diseases, by G. K. K. Link (pp. 590–606); Communicable Diseases of Laboratory Animals, by K. F. Meyer (pp. 607–638); Bacteria of the Intestinal Tract, by L. F. Rettger (pp. 639–649); Bacteria of the Respiratory Tract, by D. J. Davis (pp. 650–659); Intestinal Protozoa of Man and Their Host-Parasite Relations, by R. Hegner (pp. 660–678); The Immunological Bases for Different Types of Infection by the Blood Protozoa, by W. H. Taliaferro (pp. 679–701); Antigens and Their Specificity, by H. G. Wells (pp. 702–710); The Chemistry of Antigens, by S. E. Branham (pp. 711–720); Antigenic Properties of the Bacterial Cell and Antibody Reactions, by H. Zinsser and J. H. Mueller (pp. 721–732); Heterophile Antigens and Antibodies, by C. G. Bull (pp. 733–738); The Physical Chemistry of Toxin and Antitoxin, by M. E. Maver (pp. 739–744); The Preparation and Purification of Toxins, Toxoids, and Antitoxins, by E. J. Banzhaf (pp. 745–758); The Titration of Toxins and Antitoxins by the Flocculation Method, by S. Bayne-Jones (pp. 759–771); Sublethal Intoxications with Bacterial Products, by J. P. Simonds (pp. 772–781); The Mechanism of Agglutination, by J. H. Northrop (pp. 782–801); The Functional Rôle of Agglutinins, by G. H. Bailey (pp. 802–810); Bacterial Agglutinins and Their Applications, by J. G. Fitzgerald and D. T. Fraser (pp. 811–823); Precipitins and Their Applications,

by H. M. Powell (pp. 824–830) ; The Complement Fixation Reaction with Bacterial Antigens, by A. Wadsworth (pp. 831–837) ; The Complement Fixation Test for Syphilis, by R. Gilbert (pp. 838–847) ; The Kahn Reaction, by R. L. Kahn (pp. 848–860) ; The Mechanism of Phagocytosis, by W. O. Fenn (pp. 861–869) ; Phagocytes and Phagocytosis in Immunity, by W. B. Wherry (pp. 870–880) ; Local and Tissue Immunity, by F. P. Gay (pp. 881–891) (E. S. R., 48, p. 675 ; 51, p. 478) ; The Human Blood Groups, by K. Landsteiner (pp. 892–908) ; The Heredity of the Blood Groups, by R. Ottenberg and D. Beres (pp. 909–920) ; Antibacterial Sera, by F. M. Huntoon and R. H. Hutchison (pp. 921-933) ; The Use of Human Serum from Convalescent Cases in Prevention and Treatment, by W. H. Park (pp. 934–946) ; Control and Standardization of Biological Products, by G. W. McCoy (pp. 947–965) ; Anaphylaxis and Anaphylactoid Reactions, by H. T. Karsner (pp. 966–988) ; The Technique of Experimentation in Anaphylaxis, by W. H. Manwaring (pp. 989–1003) ; Atopy, by A. F. Coca (pp. 1004–1015) ; Tuberculin and the Tuberculin Reaction, by E. R. Long (pp. 1016–1034) ; Origin of Antibodies, by K. M. Howell (pp. 1035–1048) ; The Isolation of Substances with Immune Properties, by A. Locke and E. F. Hirsch (pp. 1049–1055) ; Abderhalden's Dialysis Reaction and Theory of the So-called "Protective" Ferments, by J. Bronfenbrenner (pp. 1056–1065) ; Venoms and Antivenins, by A. do Amaral (pp. 1066–1077) ; A Critique of the Ehrlich Theory, with an Outline of the Enzyme Theory of Antibody Formation, by W. H. Manwaring (pp. 1078–1085) ; Non-specific Protein Therapy, by W. F. Petersen (pp. 1086–1100) ; and Chemotherapy of Bacterial Diseases, by J. A. Kolmer (pp. 1101–1133).

Infection of rats by Gärtner's bacillus, C. Price-Jones (*Jour. Path. and Bact., 30 (1927), No. 1, pp. 45–54, figs. 2*).—The author's investigations show that rats can be readily infected with *Salmonella enteritidis* (Gaertn.) through feeding. The bacillus can be found in the spleen and liver of nearly all the fed animals in about 48 hours, and after about 10 days begins to disappear so that at the end of about 2 months it can be recovered from only about 10 per cent. In a minority it survives at least 5 months. Specific agglutinins develop and can be found long after the animal has got rid of the bacilli. Agglutination persists particularly in animals which still harbor the bacilli. These surviving animals, which are to outward appearance healthy, can initiate an epidemic among fresh rats and can be reinfected.

A spontaneous epidemic in mice associated with Morgan's bacillus, and its bearing on the aetiology of summer diarrhoea, G. S. Wilson (*Jour. Hyg. [London], 26 (1927), No. 2, pp. 170–186, figs. 4*).—The author describes two epidemics among mice that were closely associated with Morgan's No. 1 bacillus. In both of these epidemics the mice, which were fed on oats and raw beef, were found at autopsy to be suffering from peculiar lesions—an advanced degree of anemia, pale and swollen kidneys, and general pallor and dryness of the tissues—not hitherto encountered in any other epidemic. Evidence is advanced to show that *Bacterium morgani* was the specific cause of these epidemics, and it is suggested that the peculiar lesions described were the result of a chronic intestinal infection with this organism.

Food-poisoning due to bacilli of the type B. morbificans bovis (Basenau), A. F. Sladden and W. M. Scott (*Jour. Hyg. [London], 26 (1927), No. 2, pp. 111–117*).—The authors describe an outbreak of food poisoning in which *Bacillus morbificans bovis* was the causative agent.

Bacterium abortus infection in man: The results of the agglutination test applied to more than 10,000 human sera, J. G. McAlpine and F. L. Mickle (*Amer. Jour. Pub. Health, 18 (1928), No. 5, pp. 609–613*).—This is a

contribution from the Connecticut Storrs Experiment Station and the State Department of Health. The data presented are based upon agglutination tests made of 10,157 samples of human sera that were submitted for the Wassermann examination.

The results, which were obtained in a State where preliminary testing has shown at least 90 per cent of the dairy herds to be infected with *B. abortus* and only approximately 60 per cent of the milk is pasteurized, would indicate that infection of man with this type of undulant fever is relatively rare.

Malta fever in Canada: Report of cases, N. M. HARRIS, S. H. MCCOY, R. S. STEVENS, and W. S. LYMAN (*Pub. Health Jour., 19 (1928), No. 6, pp. 272, 273*).—The authors here briefly present a preliminary report on the occurrence of undulant fever as met with in three instances in persons living in Ottawa and vicinity during the preceding 4 months, the first to be recognized in Canada. Samples of the blood from all three cases gave positive reactions when tested by the Hygienic Laboratory of the U. S. Public Health Service for *Brucella abortus*, and this organism was isolated from one of the three cases.

Preliminary report of three cases of undulant (Malta) fever, D. L. MACLEAN, N. E. MCKINNON, G. S. YOUNG, and A. M. JEFFREY (*Pub. Health Jour., 19 (1928), No. 6, pp. 274, 275*).—The blood of one of the cases of undulant fever here reported gave a positive agglutination for *B. abortus* at a dilution of 1 in 1,280, and the agglutinin absorption test also indicated that the affection was due to *B. abortus*. The second case, that of the bacteriologist who had conducted the tests of the first case, was found to react to the agglutination test for *B. melitensis* and *B. abortus* in dilution of 1 to 640. The agglutinin absorption test indicated that *B. melitensis* was the causative organism. The blood from the third case agglutinated both *B. melitensis* and *B. abortus* in a dilution of 1 to 320, but the absorption test indicated that *B. abortus* was the cause.

Pasteurella avicida vaccination by the oral, subcutaneous, and intravenous methods, LAV. BARNES (*Jour. Immunol., 15 (1928), No. 3, pp. 289–297*).—"Intravenous vaccination is superior to the oral and subcutaneous methods in stimulating the production of agglutinins for *P. avicida* in chickens and rabbits. The subcutaneous method is superior to the oral method in this respect. Greater resistance to intravenous injections of *P. avicida* is produced by intravenous vaccination than by the oral and subcutaneous methods. It is probable that, from the standpoint of local immunity, the method of application of vaccine should correspond to the portal of entry of the infecting organism. The results obtained in this series of experiments do not disagree with Besredka's theory of local immunity [E. S. R., 56, p. 775]."

Studies on the antigenic properties of the ultraviruses, I–III, E. W. SCHULTZ ET AL. (*Jour. Immunol., 15 (1928), No. 3, pp. 229–241, 243–263, 265–281*).—The first part of this account, by Schultz, consists of introductory remarks. In the second part Schultz, L. T. Bullock, and F. Lawrence deal with the antigenic properties of vaccinia virus, and in the third part Schultz, Bullock, and H. V. Brewer take up the antigenic properties of the rabies virus. Each part contains a bibliography of four pages.

The effect of chloroform on the immunizing action of vaccine virus, F. DURAN-REYNALS (*Jour. Immunol., 15 (1928), No. 3, pp. 283–288*).—In experiments at the laboratories of the Rockefeller Institute for Medical Research it was found that when vaccine virus was so far inactivated by chloroform that no eruption resulted from the intradermal injection of very large doses no immunity was induced in the animals. When the chloroform virus produced any lesion whatever, the rabbits subsequently proved immune when tested by a second injection of untreated virus.

A contribution on the paratuberculosis of cattle, with particular consideration of water transmission, E. SCHUSTEREIT (*Beitrag zur Paratuberkulose des Rindes unter besonderer Berücksichtigung der Infektionsfähigkeit des Wassers. Inaug. Diss., Hessischen Ludwigs-Univ., Giessen, 1926, pp. 67*).—The author's experiments have shown that the paratubercular infection (Johne's disease) may be transmitted by the water from contaminated pools. The account includes a list of 66 references to the literature.

Udder diseases of the cow and related subjects, A. S. ALEXANDER (*Boston: Richard G. Badger, 1928, pp. 213, pl. 1, figs. 25; rev. in North Amer. Vet., 9 (1928), No. 4, p. 64*).—The several chapters of this work deal with structure of the udder, diseases of the udder, teat sores and injuries, surgery of the teats and udder, systemic diseases affecting the udder, conditions affecting milk yield, vices, abnormalities of milk, milk hygiene, examinations and tests for soundness, and disinfection and disinfectants.

Diseases [of poultry in Guam], C. W. EDWARDS (*Guam Sta. Rpt. 1926, pp. 5, 6*).—A survey of the poultry disease problem in Guam has shown the greater part of the losses to be due to the outbreak of chicken pox. It is said that chicken pox has attacked the station flocks each year for the past several years, but each time the disease has been quickly eliminated with little loss of life by promptly isolating the sick fowls, giving them epsom salts, and treating the lesions with creolin or mercurochrome.

Tests to determine whether or not Cantonese chickens are resistant to chicken pox, in which they were exposed to the infection and inoculated by scarifying the combs, have shown that they are no more resistant or immune to the disease than is the average grade fowl.

Daubentonia seed poisoning of poultry, A. L. SHEALY and E. F. THOMAS (*Florida Sta. Bul. 196 (1928), pp. 335–342, figs. 5*).—This is a brief account of studies which have shown that the seed of *D. longifolia*, a native of Mexico that has become naturalized in the northern part of Florida, and also occurs in the other Gulf States, often being found in back yards, is poisonous to poultry. An account of the coffee bean as a poisonous plant, by Marsh and Clawson, has been noted (E. S. R., 44, p. 678).

The seeds were found to be highly toxic, as few as nine causing death in 3 of 5 birds that were tested. There is an individual variation in the resistance of fowl to the poisonous seed. The first symptom noted in Daubentonia seed poisoning is a staggering gait, followed by a drooping of the wings. The feathers are ruffled, and the bird shows signs of profound depression, general debility, and unthriftiness. The comb becomes dark purple in color and drops over to one side of the head. Muscular twitching (jerking) is noted over different parts of the body. A profuse diarrhea is present even in the early stages of the disease. When the symptoms are prolonged for 3 to 8 days, there is a rapid loss of flesh and extreme weakness is noted. Many seeds pass through the digestive tract in an undigested condition, and such seed, when fed to poultry, is also toxic. Death may take place quite soon after the seeds are consumed.

The loss of poultry may be prevented by picking the seed pods before they reach maturity.

Experiments on the virus of fowl plague, I. C. TODD (*Brit. Jour. Expt. Path., 9 (1928), No. 1, pp. 19–27*).—The author found that in the centrifuged blood of infected fowls the virus occurs mainly in the white cell layer, its concentration in this layer being roughly 100 times that in the clear plasma or in the washed red corpuscles. "In this respect fowl plague presents interesting analogies to cattle plague and to human typhus. Attempts to repeat Marchoux's [E. S. R., 20, p. 1191] and Landsteiner and Berliner's [E. S. R., 29, p. 180] work

on the cultivation of the virus in vitro gave entirely negative results with the particular strain of the virus used. The cloacal secretions of sick birds are very highly infective, and the infection of healthy fowls is produced with ease by dropping a dilution of these secretions into the cloaca without otherwise touching the mucous membrane. Although the possible rôle of ectoparasites of the fowl in the natural transmission of the disease has not yet been adequately investigated, there is reason to believe that direct infection may be commonly effected by means of the sexual intercourse between sick and healthy birds."

A note on the cultivation of the virus of fowl-pox, G. M. FINDLAY (*Brit. Jour. Expt. Path., 9 (1928), No. 1, pp. 28, 29*).—A method is described for the cultivation of the virus of fowl pox in vitro.

Salmonella pullora infections, R. GWATKIN (*Ontario Vet. Col. Rpt. 1926, pp. 39–48*).—This is a report of investigations conducted in continuation of those previously noted (E. S. R., 55, p. 680). The author obtained unusually good results from the application of the agglutination test and the elimination of reactors followed by suitable sanitary measures, the chick mortality returning to normal or being much reduced. In some cases, usually in flocks containing a large number of reactors, the benefits obtained were negative. An examination of 4 negative flocks comprising 214 birds showed that normal agglutinins did not produce more than a slight reaction in 1:25, and that the diagnostic dilution of 1:50 was satisfactory from this viewpoint.

"Fifty-three cultures obtained from outbreaks of bacillary white diarrhea were shown to be *Salmonella pullora*. Four of these strains were anaerogenic. Three out of four cultures from infections in adult fowl were anaerogenic. To avoid splitting lactose and maltose the broth and sugars were autoclaved separately.

"Three cases of lung infection alone were observed in 65 chicks examined, showing the necessity of culturing the lungs in routine examinations. A number of lungs that appeared normal or very slightly changed gave more growth than the other organs. Well-marked nodules occurred in 15 cases."

Salmonella pullora studies, R. GWATKIN (*Ontario Vet. Col. Rpt. 1927, pp. 42–53*).—The author has found the agglutination test to be more satisfactory than the pullorin test as employed in three flocks. Cultures from 134 outbreaks of bacillary white diarrhea were shown to be *S. pullorum*. Twenty strains did not produce gas under the conditions of medium and incubation supplied. Two of the seven strains from adult infections did not form gas. Maltose in ox serum-water was not split by any of the 144 strains of *S. pullorum* examined. There were a number of instances in which the rapid and regular agglutination tests were not in agreement. However, the results were not controlled by post-mortem and bacteriological examination, and the number of sera was small. It is stated that work with these tests is being continued under controlled conditions.

Bacteriophage experiments, R. GWATKIN (*Ontario Vet. Col. Rpt. 1926, pp. 48–58*).—In the studies here reported races of pullora bacteriophage were isolated from the ovaries of eight infected hens, a bacteriophage being isolated in every case where *Salmonella pullorum* was present. These races were found to vary in strength. "Those isolated toward the end of the experiment were titrated by the method advocated by d'Herelle. One series of tubes prepared from the feces of a chick that had previously been given a dose of bacteriophage remained sterile for two weeks, at which time they were accidentally discarded. They were possibly permanently sterile. No race was isolated that could be considered as being of extreme (+ + + +) virulence by d'Herelle's

method, but nearly all were of high (+ + +) virulence. (A bacteriophage was present in the feces of a goose that had died of goose septicemia (*Pasteurella avicida* infection). It was not strong. In the only instance in which chicken feces were examined for a colon bacteriophage, there was no evidence of bacteriophagy in broth or on agar plates.

"Experiments were carried out to test the protective power of various races of pullora bacteriophage in one natural and several cases of artificial infection In some cases there appeared to be a delay in appearance of symptoms, but in no case was there any definite evidence of protection. The races employed were of high (+ + +) but not extreme (+ + + +) virulence.

"Two unsuccessful attempts were made to produce natural infection with *S. pullora* by placing chicks in quarters in which artificially infected chicks had died. A weak pullora bacteriophage was obtained from pus from an abscess in a rabbit injected with *S. pullora*."

Further bacteriophage experiments, R. GWATKIN (*Ontario Vet. Col. Rpt 1927, pp. 53–57*).—Continuing the work of the preceding year (noted above), "attempts to increase the virulence of six races of pullora bacteriophage were unsuccessful. Several strains of *S[almonella] pullora* were employed. Failure may have been due to the use of unsuitable bacterial strains. Two of them were found to be mixed cultures (bacteria + bacteriophage).

"Examination of one of the lysed bacterial controls of *S. pullora* showed the presence of regular and atypical colonies. The bacteria in the latter were coccus-like. They were not agglutinated by specific serum. They gave the same carbohydrate reactions as the regular colonies. Growth was heavier than the regular type, but later both appeared alike.

"Mixed cultures were encountered in three instances, apart from the two already referred to. Attention was drawn to them by the fact that growth was poorest where the blood or pus was thickest on the plates. Subsequent cultures showed the presence of the bacteriophage. This suggests the possibility that failure to isolate *S. pullora* from some dead chicks in outbreaks of bacillary white diarrhea may be due to the action of the bacteriophage."

Some experiments on the disinfection of eggs and incubators, R. GWATKIN (*Ontario Vet. Col. Rpt. 1926, pp. 58–65*).—In disinfection work, whole eggs were found to be unsatisfactory for experimental dipping.

"*Salmonella pullora* on egg shell resisted the action of 95 per cent methyl hydrate for from 5 to 55 minutes. In no case, however, was the organism destroyed by the few seconds dipping ordinarily employed. The irregular results observed with the same culture did not appear to be due to the strength of the infecting suspension. The same organism resisted dipping in freshly made solution of chloride of lime of a strength of about 1 lb. to 50 gal. of water.

"*Pasteurella avicida* resisted drying in the dark at room temperature for the 14 days it was tested.

"*Salmonella pullora* resisted drying on shell in the dark at 37° C. for 12 days, after which time no growth occurred. Infested pieces of shell stored in the dark at room temperature gave growth up to 44 days, at which time the supply of shell gave out.

"An incubator, 4 ft. 7 in. by 4 ft. 2 in. by 11.5 in., containing eggs, was satisfactorily disinfected with formaldehyde on one occasion 6, and on another 8 times, during hatching, without doing any apparent harm to the hatch. Thirty cc. of formalin and 10 gm. of potassium permanganate were used to generate the gas. Disinfection was checked by exposing pieces of infected shell in the incubator. It was found necessary to seal the doors to prevent escape of gas."

AGRICULTURAL ENGINEERING

The agricultural engineering programs at the agricultural experiment stations, R. W. TRULLINGER (*Agr. Engin., 9 (1928), No. 5, pp. 139–142, figs. 4*).—In a contribution from the U. S. D. A. Office of Experiment Stations an analysis is given of the work in progress at the agricultural experiment stations in agricultural engineering. The conclusion is drawn that the relatively small number of active projects in some branches of the subject at the experiment stations as compared with previous programs may be attributed, in a measure, to the activities of experiment station administrative officials in reorganizing station programs. "On the whole there is a striking indication that these officials are not so much in the dark as to what constitutes sound investigation in agricultural engineering as they perhaps were when the subject was entirely new. This has resulted in the elimination of many of the superficial or unproductive projects at some stations and the substitution therefor of stronger work where this was forthcoming. This procedure seems to have slashed into some agricultural engineering programs quite extensively. On the whole, however, it appears to have been a profitable move, since it has undoubtedly increased the percentage of quality of some programs."

Graduate training facilities in agricultural engineering (*Agr. Engin., 9 (1928), No. 5, pp. 142, 143*).—Data are presented on graduate training facilities for agricultural engineers, which have been secured by the Research Committee of the American Society of Agricultural Engineers.

Rate of infiltration of water into soils, M. R. LEWIS and E. H. NEAL (*Agr. Engin., 9 (1928), No. 5, pp. 147, 148, figs. 2*).—Studies conducted at the Idaho Experiment Station are reported which resulted in data permitting the correlation of the rate of infiltration with the porosity of the soil. The formula governing this relation is $I=1150\ P^{18}$, in which I is the rate of infiltration in feet per hour after 24 hours irrigation and P is the porosity expressed as the fraction of the total volume of the soil which is occupied by air or water spaces. No indication could be found that the size of the container had any effect on the rate of percolation except as it affected the amount of settlement and therefore the porosity. Apparently the effect of porosity on the rate of infiltration is very great.

Wear tests of concrete, C. H. SCHOLER and H. ALLEN (*Kansas Engin. Expt. Sta. Bul. 20 (1928), pp. 36, figs. 19*).—The first object of the test described in this bulletin was to develop a method of determining the resistance of concrete to wear which could be used in any laboratory having standard equipment. The second object was to study the effect of various factors on the resistance of concrete to wear.

It was found that the testing of three 9-in. spheres of 60-day concrete in a standard paving brick rattler for 900 revolutions is a satisfactory and convenient method for testing the resistance to abrasion. The French coefficient of the coarse aggregate does not materially affect the resistance to wear or the strength of Portland cement concrete of a 1:2:3.5 mix. This is taken to indicate that good results may be obtained by the use of any coarse aggregate which is structurally sound.

The use of a surface hardener increased the resistance of concrete to abrasion. An excessive amount of mixing water was found to reduce the resistance to wear of concrete in about the same proportion as it reduced the strength. The replacement of 12.5 per cent or more of the volume of the Portland cement with natural hydraulic cement in a 1:2:3.5 mix reduced the strength of the concrete and the resistance to wear in proportion to the amount of Portland cement replaced.

Lumnite cement concrete was found to have the same resistance to wear at 48 hours as Portland cement concrete of the same proportions at 60 days.

Power for cultivation and haulage on the farm ([*Rothamsted Expt. Sta., Harpenden*], *Rothamsted Conferences, No. 6 (1928), pp. 61*).—This number of the Rothamsted Conferences contains special papers on Horse and Mechanical Power in Farm Operations, by B. A. Keen (pp. 7–15); The Design of a General-Purpose Tractor, by H. G. Burford (pp. 15–19); The Care of the Tractor on the Farm, by G. W. Watson (pp. 19–27); Practical Experience of Power on the Farm, by E. Porter (pp. 27–34); Rotary Tillage, by R. D. Mozer (pp. 34–38); and Electric Ploughing and Transport, by R. B. Matthews (pp. 39–44).

The use of electricity on Kansas farms, H. S. Hinrichs (*Kansas Engin. Expt. Sta. Bul. 21 (1928), pp. 63, figs. 28*).—The results of a large number of studies of the use of electricity for different purposes on Kansas farms are summarized.

It was found that the skill of the operator is an important factor in determining the amount of energy used for cooking with electricity. The cost of cooking with electricity under the most efficient management will be below or equivalent to the cost of cooking with coal, based upon an electric energy charge of 4 cts. per kilowatt hour and with coal costing $10 per ton. It was found that from 25 to 45 per cent of the energy used by electric ranges under average conditions is for the heating of water if no other water heating devices are used, and the tendency is to use more hot water in the home when electric water heaters are used than when the water is heated on the top of a range. The energy required for heating water with electricity for household, bath, and laundry purposes in a family of 4 was found to vary from 200 to 225 kw. hours per month.

The results indicated that an electric refrigerator under most conditions can be operated at a lower cost than ice refrigerators if the cost of the delivery of ice is considered. Economical electric refrigeration depends primarily upon a well insulated box.

The average amount of energy used for washing clothes with electricity was found to be 2.4 kw. hours per farm per month, or 1.71 kw. hours per 100 lbs. of clothes washed. The use of electric hand irons required 1.27 kw. hours of energy per person per month. Depending upon the skill of the operator, an electric ironing machine was found to save from one-third to one-half the time required for ironing with electric hand irons, and the amount of energy used was one-third more.

The average cost of operating vacuum cleaners was less than 3 cts. per month for an 8-room house at an energy rate of 10 cts. per kilowatt hour. Data on the amount of energy required for a large number of other minor equipment are also given.

It was found that a satisfactory barn light fixture should include porcelain enameled steel reflectors, threaded to the socket for rigidity and easy removal for cleaning. The most satisfactory location for barn light fixtures is near the ceiling, preferably between ceiling joists. The spacing between barn light fixtures equipped with shallow bowl type reflectors should be twice the distance from the fixture to the light plane. The spacing between barn light fixtures equipped with dome type reflectors should be 1.5 times the distance from the fixtures to the light plane.

It was found entirely practicable to fill silos with electric motors of from 5 to 10 h. p., and the amount of energy used for filling silos with cane, kafir, or corn forage varied from 1 to 3.36 kw. hours per ton. The amount of energy required for grinding forage with a grinder of the cutter and recutter type varied

from 8.64 to 36.6 kw. hours per ton of dry feed ground. The use of a small electric motor to operate a fanning mill eliminated 1 man from this operation.

Based upon electric energy at 4 cts. per kilowatt hour, kerosene at 12 cts. per gallon, and labor of attendance at 25 cts. per hour, the cost of operating electric incubators was found to be less than that for the oil heated machines. The cost of brooding chicks with electricity also compares favorably with the cost of using other sources of heat if the electrical energy can be secured at from 2.5 to 3 cts. per kilowatt hour.

Low-cost rural construction, G. W. KABLE (*Elect. World, 91 (1928), No. 20, pp. 1015–1017, figs. 5*).—In a contribution from the Oregon Experiment Station data are presented on the utilization of lightweight X-frames for rural electric construction. Single-phase rural lines were constructed for $333 per mile.

Results of a study of the strength of wooden and metal breakpins, A. H. HOFFMAN (*Agr. Engin., 9 (1928), No. 5, pp. 144–146, figs. 9*).—Studies conducted at the California Experiment Station on the comparative physical and mechanical properties of wooden and metal breakpins for use in tractor drawbars are reported.

The results showed that wooden pins were much less uniform in breaking strength than the metal pins, and that they were weakened more markedly by the spacing of the bars than were the metal pins. The pins of smaller diameter were more affected by spacing than were those of larger diameter, and spacing also seemed to affect the ¾-in. oak pins more than the maple pins of the same size. The compression of ¾-in. maple pins into a tapered punched hole $\frac{11}{16}$ in. in diameter markedly increased their breaking strength.

Determination of the basic requirements of farm structures, M. C. BETTS (*Agr. Engin., 9 (1928), No. 5, pp. 133–138, figs. 4*).—In a contribution from the U. S. D. A. Bureau of Public Roads an analysis is given of the basic requirements of farm structures with the idea of outlining a program of investigation along certain definite lines.

A self-feeder of simple design and low cost, D. G. CARTER (*Agr. Engin., 9 (1928), No. 5, pp. 152, 153, figs. 3*).—In a contribution from the Arkansas Experiment Station this structure is described and diagrammatically illustrated.

Safe method for handling the herd sire, F. E. FOGLE (*Michigan Sta. Quart. Bul., 10 (1928), No. 4, pp. 180–183, figs. 4*).—Plans and other data are given for fencing the bull yard and building a safety bull house and breeding pen.

An automatic temperature regulator for poultry houses, H. GIESE (*Agr. Engin., 9 (1928), No. 5, p. 155*).—In a contribution from the Iowa Experiment Station an automatic temperature regulator for use in studies of the air and temperature requirements of poultry in control poultry houses is briefly described.

Ice cooling applied to apple storage, C. I. GUNNESS (*Agr. Engin., 9 (1928), No. 5, pp. 149, 150, figs. 2*).—Data from studies conducted at the Massachusetts Experiment Station are reported.

The temperature of refrigerated storage was always less than that of common storage. An uninsulated room was always about 10° warmer than a refrigerated room. Records of a number of common storages showed that a temperature of 6° F. can be expected in such storages on October 1, while in insulated refrigerator rooms the temperature is around 50° at that time.

RURAL ECONOMICS AND SOCIOLOGY

"Average farm labor income" and "average cost of production" (*Washington: Chamber Com. U. S., Agr. Serv., 1928, pp. 24*).—This is a mimeographed report, the purpose of which " is to show the wide range, and the reasons

for this range, in the figures which are used to compute 'average farm labor income' and 'average cost of production.'"

The appendix includes tables showing data presented in U. S. Department of Agriculture and State agricultural experiment station publications and records.

The economic holding or the family farm, M. L. DARLING (*Agr. Jour. India, 22 (1927), No. 6, pp. 399–410; 23 (1928), No. 1, pp. 16–27*).—The amount of land required to support a family in moderate comfort in different European countries, especially Italy, France, and Belgium, and in different sections of the Punjab, is discussed.

Economic studies of dairy farming in New York, VIII, E. G. MISNER (*New York Cornell Sta. Bul. 462 (1928), pp. 38, fig. 1*).—The results for the fourth year—that ended April 30, 1925—of the study previously noted (E. S. R., 56, p. 287) are reported in the same form as in the previous bulletins. Ninety-one farms were studied. The averages for the year per farm were cash receipts $4,921, total expenses $3,681, farm income $1,240, labor income $489, and net return $252, or 1.7 per cent on capital.

Texas agricultural outlook for 1928, L. P. GABBARD (*Texas Sta. Circ. 51 (1928), pp. 20*).—The national agricultural outlook for 1928 (E. S. R., 58, p. 782) is briefly summarized, supplemented by facts and figures applicable to Texas, and interpreted in terms of Texas agriculture.

The representation and organisation of agricultural workers (*Internatl. Labor Off., Geneva, Studies and Rpts., Ser. K, No. 8 (1928), pp. 210*).—This is a report prepared for the tenth session of the International Labor Conference in pursuance of a resolution of June 2, 1925, of the seventh session of that body. It is based upon material drawn from the records of the International Labor Organization and of the League of Nations and from information obtained from workers' organizations.

Part 1 (pp. 7–28) consists of an examination of the representation of agricultural workers within the International Labor Organization; part 2 (pp. 29–65) discusses what constitutes an agricultural worker; and part 3 (pp. 66–207) discusses the character of the trade union movement among agricultural workers in the several countries, the conditions under which it has developed, and the natural limits of its extension.

Agricultural rent liens as a menace to commerce, C. J. FOREMAN (*Jour. Land and Pub. Utility Econ., 4 (1928), No. 2, pp. 157–170*).—The present forms of agricultural liens in the several States, the development of these forms, and their effects upon freedom of trade are discussed, and suggestions are made for improving legislation on this subject.

Taxing rental versus taxing salable value of land, H. G. BROWN (*Jour. Polit. Econ., 36 (1928), No. 1, pp. 164–168*).—The differences in the effects of the two types of taxes are discussed.

Agricultural credit in the Philippine Islands [trans. title], Y. HENRY (*Bul. Écon. Indochine, n. ser., 30 (1927), No. 187, pp. 337–377, pl. 1*).—The provisions of the several articles of the law of February 5, 1915 (No. 2508), on agricultural credit and the amending laws (Nos. 2566 and 3160); the laws approved March 2, 1919 (No. 2818), and March 10, 1922 (No. 3039), regarding loans of the national bank and rice and maize funds; and the law approved May 18, 1921 (No. 2938), regarding agricultural loans by the Philippine National Bank are explained, and the effects of and results under them are discussed.

The present state of the co-operative rural bank movement in Finland, H. GEBHARD (*Helsingfors: Pellervo Society, 1927, pp. 55, pl. 1, figs. 21*).—This pamphlet, prepared on the occasion of the twenty-fifth anniversary of the

founding of the Finnish Credit Societies, describes the founding, development, and present status of the cooperative rural banks and the Central Cooperative Bank.

Denmark: Agriculture and cooperation, A Gascon y Miramon (*Dinamarca: Agricola y Cooperativa. Madrid: Sucesores de Rivadeneyra, [1926], pp. 325, figs. 4*).—This book describes agriculture and agricultural education in Denmark, and the organization of and results obtained by cooperative associations for the advancement of agriculture and assistance in the production, processing, distribution, marketing, etc., of agricultural products in that country.

Proceedings of the National Association of Marketing Officials . . . 1927 (*Coop. Marketing Jour., 2 (1928), No. 2, pp. 31–156*).—Included are the address of the president of the association, L. M. Rhodes, at the ninth annual meeting, held at Chicago, November 28–30, 1927, and papers, with discussions, on Quotation Committee—Eastern Shore Farmers' Association, by F. B. Bomberger (pp. 35–41); Unifying the Commodity Industry—Three California Examples, by W. A. Sherman (pp. 41–48); Organization of the Orange Growers of Florida, by L. M. Rhodes (pp. 48, 49); Functions of Bureau of Agricultural Economics as Related to Marketing Organizations, by C. W. Kitchen (pp. 67–70); Cooperative Marketing, by W. M. Jardine (pp. 70–75); The Work of the Institute of American Meat Packers, by W. W. Woods (pp. 76–78); Clearing House on Market Legislation, by H. F. Fitts (pp. 84–89); The Consumers' Influence on the Market, by P. R. Taylor (pp. 93–95); Consumer Demand for Apples in New York City, by E. R. French (pp. 96–100); New York Food Marketing Research Council—Its Purposes and Objectives, by E. R. French (pp. 100–103); The Chicago South Water Market, by C. E. Durst (pp. 110–112); Truck Transportation and Its Relation to the Marketing of Fruits and Vegetables, by C. W. Waid (pp. 112–117); Truck Transportation and Its Relation to the Marketing of Fruits and Vegetables, by A. E. Mercker (pp. 118–121); Recent Developments in Meat Standardization and Grading, by W. C. Davis (pp. 126–128); Shipping Point Inspection Problems and Experience with Compulsory Grades (discussion), by C. M. White, S. B. Shaw, W. T. Derickson, and W. H. Esslinger (pp. 131–136); New York State Egg Grades—Progress in Grading under the New Standards, by H. D. Phillips (pp. 139–141); Would It Be Desirable to Buy Eggs in Corn Belt Territory on Basis of Grades? by H. B. Collins (pp. 142–145); A Program of Economic Research in Dairy and Poultry Products, by F. A. Buechel (pp. 145–148); and Egg Marketing Problems (discussion), by A. A. Brown, C. N. Kennedy, W. T. Derickson, Brown, R. C. Potts, and Grant (pp. 148–154).

Also included are the reports, with discussions, of the committees on sales and consignments, cooperative organizations, legislation, market reporting, crop and livestock estimates, city markets, transportation, and standardization.

Markets for the farm products of the Billings trade area, E. J. Bell, jr. (*Montana Sta. Bul. 212 (1928), pp. 47, figs. 16*).—This bulletin embodies the results of a study made during the summer of 1926 to determine how local business men can best aid agricultural development in the area. The region, present market systems and situation, outside markets for staple farm products of the area, and the types of agricultural development possible in the area are discussed.

Appendixes give statistics of general crops and tables showing for Billings the local deliveries, shipments in from other States, and shipments out to smaller towns of different crops, livestock, and livestock products.

Disposition of American wheat since 1896, H. Working (*Wheat Studies, Food Research Inst. [Stanford Univ.], 4 (1928), No. 4, pp. [1]+135–180, figs.*

20).—This study, which was undertaken with special reference to changes in year-end stocks, was made for the purpose of bringing together the best existing data on supplies and disposition of wheat in the United States for the crop years 1896–97 to 1926–27, with a view of demonstrating the existence and importance of problems raised by the changes in wheat stocks in adjusting annual supplies to the demand.

Tables are given showing for each year the production, imports, exports, quantities milled and used for seed, apparent change in stocks plus "feed and waste," and the stocks and changes in stocks on farms and at terminals and in the outside commercial stocks, the total disposition other than feed and waste, and calculated "feed and waste." The methods used in arriving at the several items are described, and the movements of stocks arrived at by these methods are compared with the movements arrived at by other methods. Some of the most significant results and conclusions were as follows:

(1) The actual changes in year-end stocks over most of the period have been nearly twice as great as has been indicated by the existing statistics. In 11 of the 31 years the increase or reduction in stocks exceeded 50,000,000 bu. (2) Changes in year-end stocks have played about an equal part with variations in exports in absorbing the fluctuations in the crops. (3) There are important errors in the statistics of supplies and disposition of wheat in the United States for even the more recent years. (4) More information is needed on the amounts of wheat used for feed.

Rye in its relations to wheat, A. E. Taylor et al. (*Wheat Studies, Food Research Inst.* [*Stanford Univ.*], *4* (*1928*), *No. 5, pp.* [*1*]+*181–234, figs. 2*).—The production, marketing, and uses of and the trade in rye, the characteristics and consumption of rye flour and bread, price relationships of rye and wheat, and the prospects for use and production of rye are discussed and statistics given.

The behavior of prices, F. C. Mills (*Natl. Bur. Econ. Research* [*New York*] *Pub. 11* (*1927*), *pp. 598, figs. 81*).—The objectives of this study of the National Bureau of Economic Research were "first, to secure a fuller understanding of the behavior of individual commodity prices and, secondly, to increase our knowledge of the working of the price system and of the interrelations between its component elements."

Chapters 1 and 2 (pp. 37–212) deal with the development of measures which describe the behavior of individual commodity prices, the material being considered in sections on price changes between specific dates; variability of commodity prices; trends of commodity prices; timing, duration, and amplitude of individual price changes during general price movements; relations between prices and price-determining factors—price flexibility; relations among commodity price characteristics; regional differences in prices; and regional differences in price behavior.

Chapters 3 and 4 (pp. 213–439) are concerned with the behavior of prices in combination. Chapter 3 considers the measurement of price instability in sections on price relations and economic processes—price instability, the description of price relatives in combination, changes in the level of wholesale prices, price dispersion, price displacement, the characteristics of the population of prices, and relations among measures of price instability; and chapter 4 the measures of price behavior in sections on group characteristics of measures of price variability and trend, and group characteristics of measures of cyclical price movements.

The rural social organization of Clark County, E. A. Taylor and F. R. Yoder (*Washington Col. Sta. Bul. 225* (*1928*), *pp. 52, figs. 10*).—This bulletin

reports the results of a study "made to get a picture of a cross section of a typical part of Washington in reference to the groupings of rural people, and to show the present day trends of rural social life and rural and urban institutions serving farmers." It is based chiefly on interviews obtained through the summer of 1927 with farmers, farm leaders, editors, teachers, ministers, bankers, merchants, and others, and is prepared in cooperation with the Bureau of Agricultural Economics of the U. S. Department of Agriculture.

The survey showed 4 town-country neighborhoods or communities and 65 village-country and open-country communities with from 5 to 225 families each, the total number of families being 3,287. Group consciousness was high in 14 neighborhoods, medium in 25, and low in 30. Of the 62 open-country communities 57 had schools, 23 churches, 11 granges, 26 stores, and 24 clubs. In 14 the leading factor holding the neighborhood together was the school, in 5 the church, in 9 the store, in 8 the grange, in 2 nationality, in 6 clubs, and in 11 the location. In the other 10 neighborhoods there were 2 or more factors.

The general characteristics of the county, the types of communities, the factors holding communities together, and the town service centers of the county are described and discussed.

Leaders in village communities, E. R. Hooker (*Social Forces, 6 (1928), No. 4, pp. 605–614, figs. 8*).—This study was made in connection with the study of American agricultural villages, previously noted (E. S. R., 58, p. 385).

In the 140 villages studied 1,370 persons were designated as leaders by the persons interviewed. The average number of leaders per 1,000 persons was 12.5 in villages with population less than 1,000, 7.5 in villages with 1,000 to 1,750, and 5 in villages with population of 1,750 to 2,500. Of the total number of leaders, 25.4 per cent were women, of whom 18.2 were single and 22 per cent were wives of men leaders. Of the men leaders, 49.2 per cent were 50 years of age, and of the women 37.1 per cent. The percentage of the leaders born in the community varied from 10.9 in the far West to 55.6 in the Middle Atlantic section, averaging 39.2 per cent. Of the leaders not born in the community, 33.4 per cent had been there 25 years or more, 36.1 per cent from 10 to 25 years, and 16.8 per cent less than 5 years. Of the men leaders, 62.8 per cent were owners or managers, 28.8 per cent professional men, 4.7 per cent public officials, and 3.7 per cent workmen and clerks. Sixty of the 348 women leaders were gainfully employed. Of the 85 foreign-born leaders, 62 came from northwestern Europe. Of the 1,370 rural leaders, 92.5 per cent of the women and 82 per cent of the men were church members.

FOODS—HUMAN NUTRITION

Factors affecting interpretation of experimental baking tests, M. J. Blish and R. M. Sandstedt (*Cereal Chem., 4 (1927), No. 4, pp. 291–299*).—This is a general discussion of the factors upon which the interpretation of baking tests conducted according to the fixed type of procedure (E. S. R., 57, p. 687) can be based. The chief points considered are the question of judging fermentation tolerance by a single baking test and the problems arising from the common practice of adding strong oxidizing agents in flour and bread production. In regard to the former, it is emphasized that in so far as visible bread characteristics are concerned fermentation tolerance is almost entirely associated with the gas production factor, i. e., sugar or diastase, and that with proper control of environmental conditions in the fixed method crust color is an index of diastatic activity of the flour. Allowance should be made for the fact that experimentally milled flours are generally much lower in diastatic value than flour commercially milled from the same wheat.

The use of a differential test is suggested as the best means of taking into account the practice of adding oxidizing agents. This test consists of baking two loaves, one by the ordinary fixed process and the other with the addition of a small but definite quantity of an oxidizing agent such as potassium bromate. A comparison of the two loaves may indicate that the flour has already been over-treated to an extent which renders it unadaptable for baking purposes, that it has been treated to such an extent that the use of an additional oxidizer in the bakeshop is inadivsable, or that it is advisable to use additional oxidizers, and, under certain conditions, to indicate how much of the oxidizer may be safely used.

Report of committee on standardization of the experimental baking test, 1926–1927, M. J. Blish et al. (*Cereal Chem., 4 (1927), No. 4, pp. 299–310*).—This consists of a general report by the chairman with the definite recommendation of the fixed type of procedure previously described (E. S. R., 57, p. 687), followed by comments on the proposed test by L. H. Bailey, R. C. Sherwood and C. H. Bailey, C. B. Morison, and L. D. Whiting

Standard experimental baking test, M. J. Blish et al. (*Cereal Chem., 5 (1928), No. 2, pp. 158–161, figs. 3*).—This further report of the committee noted above consists of a statement of the formula and method to be employed in the standard fixed procedure for experimental baking tests as approved by the committee.

The soybean as human food, A. A. Horvath (*Chinese Govt. Bur. Econ. Inform., Booklet Ser. 3 [1927], pp. [2]+86*).—Previously noted from another source (E. S. R., 57, p. 192).

Chilled meat: Its hygienic and food value, industry, commerce, and culinary utilization, L. Laure (*La Viande Frigorifiée: Sa Valeur Hygiénique et Alimentaire, Son Industrie, Son Commerce, Son Utilisation Culinaire. Paris: Félix Alcan, 1927, pp. VIII+123, figs. 27*).—This is a nontechnical discussion of the principles involved in the preservation of meat by refrigeration, with personal observations and statistics on the industry in Argentina. The final chapter contains brief directions for the thawing and subsequent cooking of frozen meat.

Sanitary quality of some commercial milk powders, J. H. Shrader, C. L. Ewing, F. A. Korff, and L. W. Conn (*Amer. Jour. Hyg., 8 (1928), No. 3, pp. 386–397, fig. 1*).—A total of 100 samples of milk powders from widely scattered sources collected in the City of Baltimore by food inspectors of the health department was examined for plate count, count of *Escherichia coli*, and Breed count per gram, and for *Mycobacterium tuberculosis* by animal inoculation tests. The samples were also analyzed for ammonia, total, and amino acid nitrogen.

All of the samples gave negative results for viable tubercle bacilli. There were wide variations in both the plate and the Breed counts, one sample having as high counts as 26,000,000 and 190,000,000 per gram, respectively. The average values were approximately 750,000 and 20,000,000 per gram, respectively. The comparison of the Breed counts with the nitrogen distribution showed a fairly regular increase in ammonia with increase in bacterial count, but no apparent relationship between the amino acid content and bacterial count. The correlation between bacterial count and ammoniacal nitrogen is thought to indicate excessive bacterial counts before manufacture in those samples showing high ammonia.

"To the extent that the above samples represent the present condition of the milk powder industry, it has been shown that the milk powders are not handled in as sanitary a manner as experience has taught is possible for even a poorly controlled municipal milk supply."

The advancement of learning in medicine through biochemistry, W. J. MAYO (*Indus. and Engin. Chem., 20 (1928), No. 5, pp. 456–460*).—Included in this address, delivered at the 1928 meeting of the American Chemical Society at St. Louis, are illustrations of the relation of chemistry to metabolism such as the acid base equilibrium, the significance of iodine in nutrition, the irradiation of ergosterol, and the action of liver in pernicious anemia; and of biochemical phases of oxidation, particularly the rôle, in controlling combustion in the body, of catalysts such as epinephrine, thyroxin, insulin, and glutathione.

Prediction of the basal metabolism of infants from the measured insensible perspiration, S. Z. LEVINE, J. R. WILSON, and M. KELLY (*Soc. Expt. Biol. and Med. Proc., 25 (1928), No. 7, pp. 554–558, figs. 2*).—This preliminary report suggests the possibility that measurements of insensible perspiration by weighings on a sensitive balance may serve as an index for the basal metabolism of infants. As this suggestion is based on a comparison of the two methods of only 9 normal infants, 6 marasmic infants, and 1 cretin, it is emphasized that more confirmatory work must be done before the method can be adopted for purposes of prediction.

Investigations on the histological changes in the skin of rats on various diets, K. PORTMAN (*Acta Path. et Microbiol. Scand., 4 (1927), No. 4, pp. 341–348, figs. 6*).—Histological examinations of suitably stained sections of skin from the back and belly of rats which had succumbed to deficiencies in vitamin A, in vitamin B, or in total food (prolonged partial inanition) showed marked changes from the normal, but nothing specific for the particular deficiency. The changes consisted chiefly in a general atrophy and a marked reduction in the number of hairs, as well as in their length and thickness.

The effect of low protein and protein-free diets and starvation on the voluntary activity of the albino rat, F. A. HITCHCOCK (*Amer. Jour. Physiol., 84 (1928), No. 2, pp. 410–416, figs. 3*).—As a supplement to a previous study of the effect on the activity of the albino rat of the addition of a large amount of meat to the diet (E. S. R., 56, p. 590), a similar study has been made on the effect of a low protein diet consisting of whole wheat flour 92.5 per cent, cottonseed oil 5, calcium carbonate 1.5, and sodium chloride 1 per cent, and also of the effect of brief periods of protein starvation and of total starvation.

The low protein diet was found to depress the activity, while both the protein starvation and total starvation for short periods increased the activity.

By means of a formula, given in a previous paper (E. S. R., 58, p. 693), the average caloric value of the weight lost by albino rats during a short fast has been computed to be approximately 5 calories per gram.

The transformation of creatine into creatinine by the male and female human organism, W. C. ROSE, R. H. ELLIS, and O. C. HELMING (*Jour. Biol. Chem., 77 (1928), No. 1, pp. 171–184*).—A long-continued creatine metabolism experiment conducted on two human subjects, a male and a female of the same initial weight, is reported, with results paralleling closely in some respects those of Benedict and Osterberg on dogs.[5]

The percentages of creatine transformed into creatinine in the present study were 33 and 42.2 per cent for the male and female, respectively, as compared with 29.1 and 34.2 per cent in the earlier study. The relatively close agreement in the two studies is considered all the more striking in that the daily intake of creatine in the earlier study was much larger, 37.5 to 43 mg. (expressed as creatinine) per kilogram of body weight per day as compared with 11.4 mg. in the present study. The results differed from those of Benedict and Osterberg in that the maintenance of the original body weight in the male and only slight

[5] Jour. Biol. Chem., 56 (1923), No. 1, pp. 229–252.

gains in the female subject indicated no increase in nitrogen retention as reported in the earlier study. It is thought, however, that the difference may be accounted for by the smaller amount of creatine ingested.

The male subject excreted no unchanged creatine and the female only 6 gm. more than the calculated amount. The total recovery of the administered creatine amounted to 50.8 per cent in the female as compared with 33 per cent in the male. The latter figure is thought to indicate, as had been suggested by Benedict and Osterberg, that creatine is metabolized in two or three ways, only one of which yields creatinine. The unchanged creatine in the female subject is thought to suggest that the property of retaining and storing creatine or the ability to catabolize it by methods which do not yield creatinine may be less effective in women than in men.

Insects as test animals in vitamin research.—I, Vitamin requirements of the flour beetle, Tribolium confusum Duval, M. D. SWEETMAN and L. S. PALMER (*Jour. Biol. Chem., 77 (1928), No. 1, pp. 33–52, fig. 1*).—The confused flour beetle, *T. confusum*, has been shown to be an extremely sensitive agent for the detection of vitamin B, the adequacy of a ration in respect to this vitamin being measured by the length of time under standardized constant conditions of the larval period or time from hatching to pupation.

It was first shown that commercial wheat embryo is an optimum food for this insect, but that the embryo after prolonged extraction with alcohol and ether does not permit pupation. The addition to the extracted embryo of an alcoholic extract of the embryo containing vitamin B restored the ability to pupate, but butterfat as a source of vitamin A was without effect. Similar results were obtained with synthetic rations, vitamin B being necessary and vitamin A without effect. The addition of a fat with or without vitamin A accelerated growth, however.

The method has been tested for its value for the measurement of vitamin B by comparing the growth rates with definite sources of vitamin B, and was found to be capable of detecting amounts of vitamin B-containing materials as small as 0.5 per cent of the ration. Qualitative differences in different sources of vitamin B, such as wheat embryo and alcoholic extract of wheat embryo and yeast, were also detectable.

The various factions of yeast obtained by the Levene-Van der Hoeven method (E. S. R., 56, p. 11) were tested with results duplicating for the most part those obtained in animal experiments. The method has also been tested as a means of tracing the distribution of vitamin B in different structural parts of the cereal grains. Whole wheat, wheat embryo, and the embryo end of the kernel gave uniformly good growth, thus duplicating the findings of Bell and Mendel (E. S. R., 47, p. 860), but with corn, contrary to the results reported by Croll and Mendel (E. S. R., 54, p. 793), the vitamin B did not appear to be confined solely to the embryo. Corn did not appear to be as rich in vitamin B as wheat. Barley gave normal growth if the embryo or embryo end of the endosperm was used, but development was retarded with the distal end. Polished rice appeared to contain a small amount of vitamin B as determined by this method.

The sterility of white rats maintained on certain synthetic diets, U. SUZUKI, W. NAKAHARA, and N. HASHIMOTO (*Japan Med. World, 8 (1928), No. 2, pp. 31, 32*).—Previously noted from another source (E. S. R., 59, p. 294).

The nature of the anoestrous condition resulting from vitamin B deficiency, A. S. PARKES (*Quart. Jour. Expt. Physiol., 18 (1928), No. 4, pp. 397–401, fig. 1*).—A further investigation of the effect of a lack of vitamin B on the reproductive processes in the rat (E. S. R., 54, p. 262) has led to the conclusion

that the abrupt cessation of the oestrous cycle after about four weeks on a vitamin B-deficient diet (1 per cent or less of yeast extract as the sole source of vitamin B) is due to the failure of the animal to produce oestrin rather than to inability to respond to the oestrous-producing stimulus. This was indicated by the observation that injection of oestrin during the anoestrous state resulted in the induction of oetrous symptoms in the accessory organs without causing the atrophied ovary to ovulate.

A new differentiation between the antineuritic vitamin B and the purely growth-promoting vitamin B, H. M. EVANS and G. O. BURR (*Jour. Biol. Chem., 77 (1928), No. 1, pp. 231–240, figs. 3*).—Data are reported, showing that when the authors' diet 519, consisting of highly purified casein 24, McCollum's salt mixture 185 3.8, and recrystallized sucrose 72.2 per cent, is supplemented with dried yeast (0.7 gm. daily) and cod-liver oil (3 drops daily) good growth ensues for a time, ceasing when the rats are from 130 to 150 gm. in weight. If lard is added growth is normal. If in place of yeast 2 drops of the antineuritic vitamin concentrate, tikitiki extract, is administered, there is practically no growth, and increasing the dosage to 6 drops results in only slight growth. The addition of the tikitiki extract to diet 232, consisting of commercial casein 32, salt mixture 4, cooked cornstarch 40, commercial lard 22, and cod-liver oil 2 parts, results in considerable growth. It is concluded that the antineuritic concentrate is almost devoid of the "purely growth-promoting vitamin B" (vitamin G), and that the better growth on the less pure diet is due to the presence of this factor in the cornstarch and commercial casein.

Feeding experiments with plants at different stages of development.—III, Synthesis of vitamin in corn, M. KARSHAN, F. KRASNOW, and B. HARROW (*Amer. Jour. Physiol., 84 (1928), No. 2, pp. 314–316*).—In addition to the vitamin A studies which have been noted in the preliminary report (E. S. R., 57, p. 789), similar vitamin B studies have been conducted, using ungerminated corn, germinated corn, and green seedlings as the sole source of this vitamin. All of these materials contained vitamin B, but there was no evidence of any increase in the green seedlings.

The vitamin content of Japanese food products [trans. title], SHIMODA, FUJIMAKI, and S. SAIKI (*Bul. Soc. Sci. Hyg. Aliment., 15 (1927), No. 10, pp. 524–530*).—According to the brief summaries reported, the Japanese summer orange contains vitamin A in such amounts that when the juice was added to a vitamin A-free diet to the extent of 20 per cent eye symptoms did not appear until after an average of 53 days, as compared with an average of 46 days on the basal diet alone. Preserved prunes were found to be lacking in antineuritic and antiscorbutic properties.

Radish juice protected guinea pigs against scurvy in 5-cc. daily doses. A comparison of peeled radishes and the radish peelings showed that the greater part of the vitamin C was concentrated in the peelings. Radishes preserved in a paste of rice polishings had a lowered vitamin C content and preserved in salt were entirely without antiscorbutic properties. Radish leaves were rich in vitamin A, 2 gm. daily sufficing for the cure of ophthalmia and the resumption of growth.

Buckwheat flour was found to contain a considerable amount of the antineuritic vitamin but no, or only insignificant traces of, vitamin A. Oysters were rich in vitamin A. A group of rats receiving 1 gm. per rat daily was cured of xerophthalmia in from 18 to 37 days. Two other groups receiving 3 and 4 gm., respectively, were cured in an average of 10 days.

Red beans were comparable to buckwheat in their content of antineuritic vitamin. Dried eels were effective in the cure of xerophthalmia in amounts of 0.1 gm. daily.

Study of the food value of prune pits: Their content in vitamins [trans. title], A. Giaja (*Bul. Soc. Sci. Hyg. Aliment., 15 (1927), No. 10, pp. 517–523, fig. 1*).—From a limited number of experiments, the author concludes that prune pits contain vitamin B, practically no vitamin A, and no vitamin C. Pigeons were used in the vitamin B tests.

The examination of yeast-fat for the presence of vitamins A and D before irradiation and of vitamin D after irradiation, E. M. Hume, H. H. Smith, and I. Smedley-MacLean (*Biochem. Jour., 22 (1928), No. 1, pp. 27–33, fig. 1*).—Yeast fat prepared by direct extraction of brewery yeast with ether was tested for vitamin A by the method of Chick and Roscoe (see page 573) in which vitamin D is supplied by irradiating part of the basal diet. Under these conditions no evidence could be obtained of the presence of vitamin A in yeast fat. This is thought to indicate that the growth obtained with yeast fat as the sole source of vitamin A in earlier work of Luce and Smedley-MacLean (E. S. R., 53, p. 502), without provision of vitamin D, was due to the presence of vitamin D but not A. The fat obtained from yeast incubated for 48 hours on glucose phosphate solution showed no evidence of the presence of vitamin D, as judged by determinations of the ash content of the bones of rats receiving it as the sole source of D, until after irradiation. Both kinds of yeast fat, together with a sample of fat prepared from yeast after a preliminary boiling with normal acid, were irradiated and tested for vitamin D. The best results were obtained with the fat derived from the incubated yeast, which promoted growth and bone formation in daily doses of 0.005 mg.

On ergosterin, isolated from a Japanese edible mushroom, Cortinellus shiitake, M. Sumi (*Imp. Acad. [Japan] Proc., 4 (1928), No. 3, pp. 116–119, figs. 5*).—The author has isolated from a Japanese edible mushroom, *C. shiitake*, a sterol which corresponds in chemical properties and absorption spectrum to ergosterol. The alcoholic solution of the purified sterol was irradiated in a sealed quartz tube for ½ hour at a distance of 30 cm. from the light source, which was a Silectra standard mercury vapor lamp of 90 volts, 10 amperes. The solution was then evaporated and dried in a vacuum desiccator, and the residue dissolved in linseed oil and tested for its antirachitic properties in curative tests on rats rendered rachitic by the Steenbock diet No. 2965. On a dosage of 0.5 mg. daily, 3 of 4 rats recovered completely and 1 partially in 3 weeks. In another group of 5 rats receiving 1 mg. daily, the healing was much more marked. An amount of 0.2 gm. of irradiated powdered mushrooms was nearly equivalent in activity to 0.5 mg. of the irradiated ergosterol. Ergosterol was also isolated from spores of *Aspergillus oryzae*, and both the spores themselves and the isolated ergosterol showed antirachitic properties on irradiation.

Irradiated ergosterol in the treatment of rickets, R. Aidin (*Lancet [London], 1928, I, No. 5, pp. 229, 230*).—This report of the treatment of five cases of active rickets with Radiostol, a commercial preparation of irradiated ergosterol, emphasizes particularly the rapidity of the cure as compared with other methods of treatment, and on this account the harm that may result if rickets involving severe deformities is thus treated without preliminary attempts to correct the deformities by massage.

Treatment of rickets with irradiated ergosterol (Vigantol), S. Karelitz (*Soc. Expt. Biol. and Med. Proc., 25 (1928), No. 7, pp. 576–578*).—Nine children under the care of the author at Mount Sinai Hospital, New York City, have been treated for rickets with irradiated ergosterol in oil (Vigantol), for the most part in doses of 3.3 mg. daily with one of the milk feedings. In all but one case definite cures have been effected, and in this there was progressive healing, but not a complete cure even after 8 weeks. One history is given in detail, and for all

the rapidity of healing as observed in various ways has been compared with data from the literature, chiefly from German sources.

Rickets in rats.—V, Comparison of effects of irradiated ergosterol and cod liver oil, A. T. Shohl, H. B. Bennett, and K. L. Weed (*Soc. Expt. Biol and Med. Proc., 25 (1928), No. 7, pp. 551–554*).—In this continuation of the series of studies previously noted (E. S. R., 58, p. 91), a comparison is reported of the curative effect for standardized rickets in rats of cod-liver oil and irradiated ergosterol as determined by blood serum analyses, the examination of histological preparations, the analyses of the bones, and the metabolism of calcium and phosphorus. The rats were fed on the Sherman diet B (two-thirds whole wheat-one-third whole milk) until 28 days of age, and were then placed on the Steenbock-Black high calcium-low phosphorous diet (diet 2965) plus 10 per cent of lard. After 21 days, 2 per cent of the lard was replaced by cod-liver oil or a preparation of irradiated ergosterol in olive oil in amounts furnishing 0.01 mg. per rat per day. Both cod-liver oil and ergosterol were fed separately from the basal diet. The experiment was continued for 14 days, at the end of which the animals on the curative diet and the controls on the basal diet alone were killed.

As judged by all criteria, the effects of cod-liver oil and of irradiated ergosterol were similar. There was a definite increase in the calcium and phosphorous content of the blood serum and in the ash content and A/R ratio of the fat-free bones. The metabolism data showed no great increase in the retention of calcium or phosphorus over the controls. The histological preparations showed moderately advanced healing in both of the treated groups as compared with unhealed rickets in the control group.

A colour test for radio-sensitive substances, C. J. Bond (*Brit. Med. Jour., No. 3483 (1927), p. 637*).—A simple test for the detection of ergosterol and other substances capable of being rendered active by irradiation is described. As applied to ergosterol, the test is as follows:

A small quantity of crystalline ergosterol is rubbed with a heated glass rod on a previously warmed microscopic slide until a thin translucent covering is formed. Half of the slide is then exposed to the rays of a quartz mercury vapor lamp for half an hour at a distance of 12 in., the other half being protected from the rays. The whole film is then covered with a starch solution which has been boiled in a 5 per cent aqueous solution of potassium iodide. After a short time the film of ergosterol on the irradiated slide takes on a rich pink color which, on washing with water, changes into the clear blue of iodized starch. It is stated that the test is so delicate that it shows the different intensity of irradiation in ergosterol irradiated through water and in the air.

Relationship between the antirachitic activity and the dielectric constant of cholesterol solutions irradicated with ultra-violet light [trans. title], P. Ellinger (*Arch. Expt. Path. u. Pharmakol., 122 (1927), No. 3–4, pp. 238–246, figs. 4*).—A method is described by means of which it is possible to follow alterations in the dielectric constants of liquids during irradiation with ultra-violet light. With the use of this method it has been demonstrated that oils and solutions of cholesterol in alcohol and paraffin undergo an increase in dielectric constants on irradiation. This increase does not take place when the irradiation is conducted in the absence of oxygen. Since the formation of the antirachitic substance on irradiation is not dependent upon oxygen, it is concluded that the two processes are entirely independent of each other. The increase in the dielectric constant on ultra-violet irradiation is considered to be due to the formation of an oxidation product of cholesterol.

Calcium and ultra violet irradiation.—A, The effect of ultra violet radiation upon serum calcium. B, Calcium utilization on a calcium-poor diet with ultra violet radiation, L. T. Fairhall (*Amer. Jour. Physiol., 84 (1928), No. 2, pp. 378–385, figs. 3*).—In view of the conflicting evidence on the effect of irradiation on the content of calcium in blood serum, the author has conducted a series of blood calcium determinations on three dogs over a period of 31 weeks broken only by a rest period of 4 weeks. The dogs were maintained on a uniform diet of cooked meat, bread, and dog bread, with a small amount of bone meal and with liver three or four times a week. During the course of the investigation, the dogs were irradiated three times a week for periods of from 5 to 20 minutes, samples of the blood being taken immediately, 10 minutes, and 30 minutes after the irradiation.

During the period before irradiation, the average calcium values of the serum of the three dogs were 11.44, 11.73, and 11.15 mg. per 100 gm. of serum. During the initial irradiation period there was a slow increase in the calcium content of the serum of one dog, an increase to 16.85 mg. in the second, and no change in the third, but in the normal period following, the values for the first and third dogs rose to 16.38 and 16.95 mg., respectively. Lower periods of irradiation produced slight increases over the intervening nonirradiation periods, but not as great as the first, and a final exposure of twice the length brought about no change.

In the second study reported, young rats on a low calcium diet were exposed daily to ultra-violet light for 10 minutes at a fixed distance and a pair was killed every week for determinations of the calcium content. The rate at which calcium was deposited in the bodies was greater than for unexposed rats, but less than the figures reported by Sherman and MacLeod (E. S. R., 54, p. 593) for normal rats, the males having a calcium content of 71.7 per cent and the females 70 per cent of that of normal animals. A comparison of the growth and calcium content of rats kept in the dark and others irradiated for 10 minutes daily showed a much greater increase in weight of the irradiated than the nonirradiated animals. The calcium content was higher in the irradiated animals, but was again much below the normal figures as reported by Sherman and MacLeod. Half of the nonirradiated rats died before the end of the experiment, while all of the others survived and were in good condition. "This demonstrates rather conclusively that while an animal may be maintained in a healthy condition even on a diet deficient in calcium, providing it is given a sufficient dosage of ultra-violet rays, yet this alone is not sufficient to bring his calcium content up to normal. The diet itself must be adequate from the point of view of calcium."

Experimental researches on the biochemistry of scurvy [trans. title], G. Mouriquand and A. Leulier (*Jour. Physiol. et Path. Gén., 25 (1927), No. 2, pp. 308–318*).—This is a general summary of a series of studies conducted under the direction of the senior author on the metabolism of scorbutic guinea pigs.

The most marked disturbances are thought to be in the metabolism of iron and of cholesterol. The former follows closely the progress of the scorbutic syndrome and accompanying anemia and responds equally rapidly to the action of fresh juices rich in vitamin C. The cholesterol content of the blood and of various organs remains unchanged, but that of the adrenals is considerably lessened. This is in marked contrast with simple inanition in which there is no decrease in cholesterol content but sometimes an increase. The metabolism of glucose, calcium, and phosphorus remains unchanged.

The blood of guinea pigs in the course of experimental scurvy [trans. title], M. Hryniewicz and A. Lawrynowicz (*Jour. Physiol. et Path. Gén., 25*

(*1927*), *No. 4, pp. 674–677*).—As compared with normal guinea pigs, the blood of scorbutic guinea pigs showed no notable differences in the red blood cells, a quantitative diminution in leucocytes, a predominance of polynuclear cells in place of mononuclear, and no important changes in the coagulation time. It is pointed out that the most important change is the opposite of the change taking place in human scurvy, in which there is generally a diminution of polynuclear and an increase of mononuclear cells.

An inquiry into the results of the liver treatment of pernicious anaemia (*Lancet [London], 1928, I, No. 17, pp. 872–879*).—Reports from 11 English hospitals on the use of liver and liver extracts have been obtained in response to specific questions, one of which was the experience in the treatment of secondary anemia. In all cases the reaction appeared to be specific for pernicious anemia.

Liver in pernicious anaemia (*Lancet [London], 1928, I, No. 17, pp. 863, 864*).—An editorial review of the steps leading up to the Minot-Murphy liver treatment of pernicious anemia. In commenting upon the occasional beneficial effect of liver on secondary anemia, it is stated that similar benefits might have been attained by any form of high protein diet, whereas the response in pernicious anemia is specific.

MISCELLANEOUS

Report of the Guam Agricultural Experiment Station, 1926, C. W. EDWARDS ET AL. (*Guam Sta. Rpt. 1926, pp. [2]+19, figs. 9*).—This contains reports of the director, the assistant in agronomy and horticulture, and the entomologist, and meteorological observations. The experimental work recorded is for the most part abstracted elsewhere in this issue. Scraping the infected area of citrus trees, disinfecting the wound with corrosive sublimate solution, and applying Bordeaux paste to it proved an effective control measure for scaly bark.

Abstracts of papers not included in bulletins, finances, meteorology, index (*Maine Sta. Bul. 342 (1927), pp. 227–247+XIII*).—This contains the organization list of the station; abstracts of 13 papers, 5 of which have been previously noted, 4 noted elsewhere in this issue, and the following: City Marketing, by C. H. Merchant [6] (pp. 229, 230); The Certifying of Seed Potatoes in the U. S. A., by D. Folsom [7] (pp. 232, 233); The Spread of Spindle Tuber by the Knife, by R. Bonde [8] (p. 235); and Selection in Relation to the Potato Seed Plot, by D. Folsom [9] (p. 236); meteorological observations, noted on page 508; a financial statement for the fiscal year ended June 30, 1927; an index to Bulletins 336–342, inclusive, which collectively constitute the forty-third annual report of the station; and announcements as to the work and publications of the station.

Michigan Agricultural Experiment Station Quarterly Bulletin, [May, 1928], edited by R. S. SHAW and A. J. PATCH (*Michigan Sta. Quart. Bul., 10 (1928), No. 4, pp. 149–203, figs. 10*).—In addition to articles abstracted elsewhere in this issue, this number contains the following: Progress Shown in Potato Seedling Selection, by C. E. Cormany (pp. 167–169), and Electricity Gives Farmers a New Hired Man, by H. J. Gallagher (pp. 178, 179).

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[6] Natl. Assoc Marketing Off. Proc., 8 (1926), pp. 86–88.
[7] Illus. Landw. Ztg., 47 (1927), No. 4, pp. 43–46, figs. 5.
[8] Amer. Potato Jour., 4 (1927), No. 5, pp. 51, 52.
[9] Amer. Potato Jour., 4 (1927), No. 6, pp. 61–63.

NOTES

Colorado College and Station.—Dr. R. H. Walker, assistant professor of agronomy and assistant agronomist, has been appointed assistant chief in soil bacteriology in the Iowa College.

Louisiana University and Stations.—At the last session of the legislature a special appropriation of $40,000 per annum was made to the stations for the current biennium for additional investigational work and for disseminating information on sugar cane problems. This in an increase of $15,000 over the previous appropriation for the same purposes.

Provision was also made by the legislature for establishing a cotton experiment station in the Delta section of the State. A site has been tendered in Tensas Parish, which is under consideration.

W. B. Mercier, assistant extension director, has been appointed director of extension. M. G. Snell has been appointed assistant professor of animal husbandry, succeeding E. L. Jordan, resigned.

Mississippi Station.—E. B. Ferris, assistant director in charge of the South Mississippi Substation, has resigned, effective September 1, and will be succeeded by W. R. Perkins, formerly director of extension in the Louisiana University.

New York State Station.—Paul A. Hansen, research bacteriologist at the Butter Control Laboratory of the Ministry of Agriculture, Irish Free State, has been appointed assistant in research (bacteriology) to fill the vacancy created by the resignation of Dr. P. S. Prickett previously noted and will enter upon his new duties about October 1.

North Carolina College.—A short course in soils and fertilizers for fertilizer manufacturers and salesmen was given by the college August 7, 8, and 9. The sessions of the first two days were held on the campus, while on the final day the soils of the Coastal Plain were studied in place.

South Dakota College.—Dr. A. T. Evans has been succeeded as professor of botany and plant pathology by Dr. Ward L. Miller.

Washington College and Station.—The first unit of what will ultimately be a new range of experimental greenhouses has been completed and will be in use this fall.

Dr. Leon K. Jones, associate in research (plant pathology) in the New York State Station, has been appointed assistant professor of plant pathology and plant pathologist. Clarence Svendby has been appointed assistant in forestry. Both appointments are effective September 1.

American Home Economics Association.—The twenty-first annual meeting of the association was held at Des Moines, Iowa, June 25–29, 1928. It was preceded by a special conference of extension workers; the third annual conference of the supervisors and teachers of home economics called by Dr. J. J. Tigert, U. S. Commissioner of Education; and a conference of Purnell research workers on food consumption and standard of living studies called by the committee on rural home management studies of the Association of Land-Grant Colleges and Universities and presided over by Dr. H. G. Knight, chief

of the Bureau of Chemistry and Soils, U. S. Department of Agriculture. An informal conference on time studies was held at the same time under the leadership of Hildegarde Kneeland, U. S. D. A. Bureau of Home Economics.

Outstanding features of the association program were a greater coordination of its various interests and an increasing emphasis on research. The general sessions opened with the annual progress meeting, at which a representative of each of the ten sections gave a ten-minute talk on the outstanding achievements in her field during the year, thus bringing to the attention of the whole association the developments in the various units constituting the home economics of the present time. At the first of two general evening meetings Miss Lita Bane, University of Wisconsin, gave the presidential address on Home Economics Outward Bound, and at the second Judge Florence E. Allen of Columbus, Ohio, spoke on Significant Factors in Home Life as Revealed through the Courts. The annual banquet was made the occasion of emphasizing international relations in home economics. The guests of honor who brought greetings from other lands included representatives from Chili, Germany, and England, who are studying various phases of home economics in this country, and Ulrich Bensch, chancellor of the Swiss consulate at Chicago, who was in attendance at the meetings as the official representative of the International Federation of Home Economics Instruction in Fribourg.

The section programs included several joint meetings between sections having common interests. Among these was a joint meeting of the food and nutrition, education, and economic and social problems sections at which papers dealing with research in various fields were presented as follows. Research in the Field of Household Management, by Dr. Margaret M. Justin; Purpose of Research and Essential Qualities and Training for Workers in the Various Fields, by Dr. Hazel Kyrk; Food Consumption, by Dr. Edith Hawley; Time Studies, by Maud M. Wilson; Household Equipment, by Eloise Davison; and Materials Which the High School Teacher Wishes from the Research Worker, by Kate W. Kinyon.

At a joint meeting of the textile and homemakers sections papers on the general subject of textile fabric conservation were given, as follows: The Consumer of Textile Fabrics, by Rosamond Cook, University of Cincinnati; Durability of Textiles, the Manufacturer's Viewpoint, by E. C. Morse, Cotton Textile Institute; Moth Proofing of Textile Fabrics with Demonstrations, by L. E. Jackson, Mellon Institute; Laundering of Textiles, by G. H. Johnson, Laundry-owners National Association; and Recent Developments in the Dry Cleaning Industry, by F. A. Weller, National Association of Dyers and Cleaners.

The food and nutrition section devoted an entire afternoon and the textile section part of an afternoon to progress reports of research conducted by section members.

Three morning sessions were devoted to the usual business and council meetings. Special interest was shown in the report of the committee on the reorganization and relation of sections under the chairmanship of Frances L. Swain. A reorganization of the association into subject matter divisions and professional interest departments with various coordinating committees was proposed and will be given consideration during the coming year.

The final afternoon and evening were spent at Ames as guests of the home economics department of Iowa State College.

The newly elected officers include Dr. Justin as president; Effie Rait, University of Washington, vice president; Frances Zuill, University of Iowa, secretary; and Lita Bane, University of Wisconsin, counselor at large.

EXPERIMENT STATION RECORD

VOL. 59 NOVEMBER, 1928 No. 7

The Fourth International Congress of Entomology was one of the outstanding events of the past summer, whether viewed from the broad standpoint of general science or its specific applications to agriculture. It assembled a considerably larger number of the active entomologists of the world than had ever before been brought together. Its program was well planned and ably executed, and the success of the congress in bringing to public notice the economic importance of entomology and its intimate contacts with everyday life was unmistakable.

All of the three previous congresses were held in Europe, the first at Brussels in 1910, the second at Oxford in 1912, and the third in Zurich in 1925. Little doubt had been expressed that the fourth congress would exceed all earlier gatherings as to numbers, but some fears were felt that the first venture on American soil would prove disappointing as regards the attendance from abroad. These misgivings proved unfounded. Through the utilization of funds provided by the Carnegie Endowment for International Peace and other sources, an enrollment of well over 100 delegates from some 38 foreign countries was attained. Aside from the large Canadian contingent, the delegations were well distributed in numbers, and they were especially noteworthy for their inclusion of entomologists of acknowledged eminence and standing.

Much the same could be said for the attendance from the United States, which was drawn from over 40 States, the District of Columbia, Hawaii, and Porto Rico. Of these many were credited to the Federal Department of Agriculture and the National Museum, but the list of State departments of agriculture and colleges and universities was likewise long and impressive. Prominent among them were the representatives of the experiment stations from 39 States, distributed from Maine to California, and from the State of Washington to Florida. The aggregate registration of the congress was nearly 700, which compares very favorably with that for other bodies of broader scope and appeal.

The organization of the congress was under the direction of the American organization committee, made up of representatives of the Entomological Society of America, the American Association of

Economic Entomologists, and the Entomological Society of Ontario, with Drs. J. G. Needham and O. A. Johannsen of the New York State College of Agriculture of Cornell University as chairman and American executive secretary. These and other members of the Cornell staff also served as the committee on local arrangements and as secretaries of most of the various sections and subsections. In this way a compact and well-centralized organization was obtained, and its efficiency was widely attested.

Most of the week's sessions of the congress were held on the campus of Cornell University, where ample accommodations were available. One day was given over to a visit to the New York State Experiment Station at Geneva, and excursions to near-by points of interest were interspersed in the proceedings on other days. At the close of the congress a 12-day trip to important entomological centers was undertaken, including visits to the Carnegie Museum of Pittsburgh, the Bureau of Entomology and elsewhere in Washington, D. C., and various points of interest in and about Philadelphia, Boston, and New York.

Nearly 200 papers were tendered the congress, of which about 20 were presented before the 4 general sessions and the remainder divided among the 8 sections, which collectively held about 30 sessions. An unusually large proportion of the authors were present in person, but there was little congestion on the program and no serious linguistic difficulties, although less was attempted in preparing advance abstracts for distribution than in some similar congresses. Reasonable opportunity was afforded for discussion in most instances, yet unduly protracted meetings were the exception, and with no evening sessions ample time was available for such supplementary features as the inspection of the numerous exhibits, the frequent showings of moving pictures of entomological appeal, and the various social features. Conspicuous among these was the banquet on the final evening, August 17, which was largely attended and gave emphasis to the international character of the congress by the brief responses, often in their own language, of a delegate from each of the various countries represented.

The congress was formally opened with a general session on the morning of August 13. Addresses of welcome were given by Dean W. A. Hammond, representing the Cornell University faculty, and Dean A. R. Mann, the New York State College of Agriculture. These greetings were followed by the address of the president of the congress, Dr. L. O. Howard of the U. S. D. A. Bureau of Entomology, three papers by foreign delegates, and a brief report by Dr. Karl Jordan as secretary of the permanent executive committee.

The great value of the personal contacts fostered by gatherings of this sort was dwelt upon by both Deans Mann and Hammond. In the words of the latter, "we regard these congresses and associations, national and international, where scholars come into living contact and at times into stimulating intellectual conflict with one another as an especially important phase of modern science and letters." Dean Mann amplified this thought when he stated that "in any field of learning, and more particularly in the physical and the biological sciences, the experimental sciences, contact among the workers in similar and cognate fields is the surest guarantee of reliable progress and the greatest incentive to superior achievement; and it is also conducive to that proper humility of spirit which characterizes the honest seeker after truth. Correspondence and the interchange of publications between individuals—never sufficiently well done—must always be the main dependence, but the association is vastly enriched when personal acquaintance has entered. This, perhaps, is the most valuable product of such international gatherings as this."

Moreover, it is peculiarly appropriate, he declared, that agriculture, "which is a meeting ground of all the sciences, and the problems and fuller understanding of which are common to all the nations, should be made the occasion for frequent and varied assemblage of the leaders in progress from many lands. In much of the civilized world the solution of the more apparent and the relatively superficial problems of agriculture has been accomplished, and the time is here when the more fundamental and the more obscure and difficult problems have become the main lines of attack, calling for scientific preparation, application, and collaboration of the highest order. Here, if anywhere, progress will be accelerated by an increasingly close and intimate fellowship among men of science and the integration of minds engaged in related fields of inquiry."

The presidential address of Dr. Howard dealt especially with the need of greater attention in college and university instruction to the subject of entomology as "the most important part of zoology." This characterisation he based on the "dominant place that the class Insecta holds in the whole animal kingdom." "It is a startling thought to egotistical humanity that this is not the age of man; it is the age of insects; that man is a newcomer; that he is as yet an experiment, and that the same may be said of his immediate and in fact of his very remote ancestors—of the whole vertebrate series."

"I see the time coming, however," he predicted, "perhaps it is almost here—when the full importance of entomology will be realized and when those educational institutions which long ago uncloistered themselves from the dominance of the dead languages and higher mathematics will still further broaden their teaching to rank entomology as a study of prime importance." Specifically he announced

his agreement with Lameere that "whereas no one thinks of disputing the separation of the biologists into zoologists and botanists, there will be great advantages in establishing three categories, giving entomology an importance at least equal to that of botany or to the rest of zoology."

Dr. Howard also discussed the relations of economic entomology to the so-called "pure science" phases of the subject, maintaining that "the great support that has been given to entomological work with the practical end in view, perhaps notably in the United States, but with rapidly increasing strength in other countries, has not only encouraged the development of many strong workers who have brought about highly valuable results, but it has shown these workers in a very forceful way the basic value of the labors of those ardent entomologists who have been carried away by the fascinating scientific interest of other aspects of the science. It is in this way that more and more support is being given to work in entomology as a whole. It has had its effect upon college laboratories, upon museums, and upon entomologists everywhere. The science through all its innumerable ramifications is acquiring a solidarity which means very much for the future—for the broadest recognition of its importance."

The remaining papers presented at the general sessions covered a wide range of subjects and a correspondingly extended geographical distribution of authorship. For instance, an account of the Distribution over North America of the Trechinae, by Dr. René G. Jeannel of France, was followed by a discussion of Problems of Distribution and Variation of North American Fleas, by Dr. Karl Jordan of England, and Fauna of the Soil in Swedish Forests, by Prof. I. Trägårdh of Stockholm. The relation of Taxonomy to Other Branches of Entomology was discussed by Prof. Filippo Silvestri of Italy, and the Development of Entomological Science in Egypt, by Dr. Hassan C. Efflatoun Bey. The biological control of weeds was considered in turn by Dr. R. J. Tillyard, chief entomologist of Australia, and Dr. A. D. Imms of Rothamsted. The contributions from the United States to the general sessions included A Neotropical Myremecophyte (*Cordia alliodora*) and its Tenants, by Prof. William Morton Wheeler of the Bussey Institution; The Mutual Relations of Museums of Science and Taxonomic Specialists, by Dr. W. J. Holland of the Carnegie Museum of Pittsburgh; Insect Inhabitants of the Upper Air, by Dr. E. P. Felt of Connecticut; and Restrictions Enforced by the United States on Entry of Foreign Plants and Plant Products for the Purpose of Excluding New and Dangerous Pests, by Dr. C. L. Marlatt, chief of the Bureau of Entomology, U. S. Department of Agriculture.

The eight sections into which the congress was divided dealt, respectively, with systematic entomology and zoogeography; nomen-

clature and bibliography; morphology, physiology, embryology, and genetics; ecology; medical and veterinary entomology; apiculture; forest entomology; and economic entomology. Each of these sections drew a good attendance despite the overlapping of programs of wide appeal.

By far the largest following was that of economic entomology. This section was further subdivided into subsections of citrus fruit insects, deciduous fruit insects, cereal and truck crop insects, cotton insects, and insecticides and appliances. These subsections held from one to three sessions each, an arrangement which gave opportunity for papers by most of the specialists from foreign countries. Participation by workers in this country was more restricted but fairly representative, and in some subsections, notably that on insecticides and appliances, the programs consisted almost wholly of station, Department, and Canadian contributions. However, there were also papers from many other sources. Among them were discussions of insect problems of the citrus industry by delegates from Palestine, Italy, and New South Wales, and similar data as to cotton insects from Australia, Haiti, the British West Indies, and middle Asia. In the subsection of deciduous fruit insects, papers were presented on the capsids of apple orchards in England, *Ceratitis capitata* in Spain, the fruit fly problem in Mexico, *Cochylis ambiguella* and *Polychrosis botrana* in Germany, and codling moth control in South Africa. The subsection of cereal and truck crop insects heard several papers on sugar cane pests in Java, Hawaii, Cuba, and Australia. Japan was represented by two on sericulture, and others of miscellaneous scope were contributed by the Union of Socialistic Soviet Republics, Germany, Czechoslovakia, and Spain. There were also a number of papers discussing the present status of economic entomology abroad, and specifically in Bulgaria, Spain, and the Union of Socialistic Soviet Republics, including the Ukraine.

The section devoted to medical and veterinary entomology held three sessions to which delegates from England, Germany, Canada, and China, as well as the United States, contributed. These dealt largely with the disease-transmitting insects, one-half of the number relating specifically to mosquitoes and malaria. The general subject of arthropod transmission of diseases, Rocky Mountain spotted fever, and tularemia, arthropods as intermediate hosts of helminths, the insect carrier of a nematode in Liberia, poisonous arthropods of North and Central America, the cattle grub problem, and animal coloration as related to parasite attack constituted the other contributions.

The section on forest insects was an innovation in the congress, but corresponded to the formation of a section on forestry in the

International Congress of Plant Sciences and the special consideration given forest soils at the First International Congress of Soil Science, and illustrates the increasing interest and steady development of what may be termed a distinctive application of the various sciences to forestry. A number of the papers presented at the three sections attracted general attention, among them several from the U. S. D. A. Bureau of Entomology, the Forest Service, and the Connecticut State Experiment Station.

Considerable interest was also manifested by economic entomologists in the more general sections, notably that on nomenclature and bibliography. A paper on The Future of Zoological Nomenclature was given by Dr. Charles W. Stiles, secretary of the International Commission on Zoological Nomenclature, followed by a forum for the informal discussion of the theory of nomenclature, family names, and other problems, and the consideration of a recent report by the British National Committee on Entomological Nomenclature proposing a revision of the international code. This report was ultimately referred to a committee on nomenclature set up by the congress, with expressions of commendation and some suggestions for future study. It is understood that this committee and the International Commission will cooperate, the committee handling in the future most of the cases of entomological nomenclature and referring to the commission only those cases involving pronounced differences of opinion or undetermined principles or the relations of nomenclature in entomology to nomenclature in other groups.

The day at Geneva was devoted in part to an inspection of the station grounds and to demonstrations thereon of apparatus and equipment for the control of insect pests and plant diseases, especially the European corn borer. The date set had been selected to coincide with the summer meeting of the New York State Horticultural Society, so that the visiting entomologists were brought closely into contact with the membership of this large and progressive body of practical fruit growers. An address was given in the morning under the auspices of the society by Mr. Thomas B. Byrd of Virginia, and sessions were held in the afternoon by several sections of the congress.

At the closing general session a decision was reached to hold the next congress in Paris in 1932. The selection of its president was deferred until a later date, but Dr. O. A. Johannsen was elected a member of the executive committee. During the congress honorary membership was conferred upon Drs. W. J. Holland of Pittsburgh and Stephen A. Forbes of the University of Illinois, thereby increasing to 14 the number of persons holding this distinction. Of these, the only other living American is Prof. John Henry Comstock,

founder and head of entomological work in Cornell University from 1875 practically without interruption to 1914. Resolutions of sympathy were extended to Prof. Comstock, who is living in Ithaca but was physically unable to attend the sessions, and to him and to his wife, Mrs. Anna Botsford Comstock, many tributes were paid by speakers during the proceedings.

The Fourth International Congress of Entomology is the last of the important series of international gatherings which have been held in the Western Hemisphere in recent years. Within the last half decade there have preceded it, in close succession, the World's Dairy Congress of 1923, the Pan-Pacific Food Conservation Conference in 1924, the International Congress of Plant Sciences in 1926, and the First International Congress of Soil Science, the Third World's Poultry Congress, and the Second International Country Life Conference in 1927. Taken collectively, these meetings have been of great significance, both in the development of their respective fields and in promoting closer international relationships and better understandings.

To the United States and Canada the several opportunities to serve as hosts have been especially beneficial and welcome, for, as Dean Mann remarked at Ithaca, "by reason of our physical remoteness from many of the world's greatest centers of learning, our participation in international meetings of this character has never been in proportion to our interest in them or our desire to share in their benefits." The virtual completion of the present cycle indicates that not for many years will a similar opportunity again be available. However, as the scene of activities shifts to European soil for a season, there will remain an abiding appreciation of what this series of congresses has meant to American agriculture and its leaders of this and the rising generations.

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RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

Fats and related compounds in plants [trans. title], A. KALUZHSKIĬ (*Izv. Saratovsk. Gosud. Inst. Selsk. Khoz. i Melior., No. 3 (1927), Sup., pp. 1–31*).—The author deals with the fats, waxes, and lecithin in plants, discussing the rôle of fats and their distribution, the composition of fats, their properties, refraction, and iodine number, the hydrogenation of fats, drying and nondrying oils, the saponification of fats, the transformation of fats in germinating seeds, the rôle of saturated and unsaturated acids in the process of formation of carbohydrates in plants, the synthesis of fats in plants, the composition and rôle of plant waxes, and the composition of lecithin, its hydrolysis, properties, and distribution in plants.

Control of diastatic activity in wheat flour, R. C. SHERWOOD (*Thesis, Univ. Minn., Minneapolis, 1925, pp. 54, figs. 5*).—The data reported in this thesis have been noted from another source (E. S. R., 56, p. 204). A considerable bibliography is appended.

The determination of moisture in dry skim milk by the Bidwell-Sterling toluene-distillation method, P. A. WRIGHT (*Jour. Dairy Sci., 11 (1928), No. 3, pp. 240–242, fig. 1*).—In a comparison of the vacuum oven and the Bidwell-Sterling toluene-distillation methods (E. S. R., 53, p. 805), the U. S. D. A. Bureau of Dairying found the latter to be more reliable. The tests were conducted with a number of lactose and dry milks. Because of the continuous loss of weight due to the decomposition of lactose, an arbitrary distillation time of two hours was set for this method and a 50-gm. charge recommended. This method is also more suited to commercial conditions.

SOILS—FERTILIZERS

Practical soil investigation, E. HEINE (*Die Praktische Bodenuntersuchung. Berlin: Gebrüder Borntraeger, 1928, 2. rev. ed., pp. XII+178, pl. 1, figs. 26*).—This is essentially similar to the edition of 1910 (E. S. R., 26, p. 215), but has been revised and brought up to date. In its present form the first 7 chapters form a general section, dealing with soil and plant; investigations in the field; physical and petrographic properties of the soil; chemical investigation; biological investigation, determination of the fertilizer requirements; and soil classification. The remaining section comprises, wth an introductory statement concerning the soil types of northern Germany, chapter 8, the development of the northern German plains, glacial theory, 9, description of the soil types distributed over the north German plains, and chapter 10, the geologic agronomic survey.

The evolution and classification of soils, E. RAMANN, trans. by C. L. WHITTLES (*Cambridge, Eng.: W. Heffer & Sons, 1928, pp. XII+128, pl. 1*).—This is an English translation from the German edition of 1918 (E. S. R., 44 p. 417). The translator's preface notes an endeavor to adhere as closely as

possible to the German text, though it is stated that some difficulty was encountered in finding suitable English equivalents for the names of soil types and some "do not lend themselves to translation and have been retained in their original form." Some additional notes and references, mostly to the English literature, have been included.

A possible method for the continuous mechanical analysis of soils [trans. title], S. I. Tĭuremnov) (Turemnov) (*Pochvovedenie (Pédologie), n. ser., 22 (1927), No. 3, pp. 77–92, figs. 5*).—The author describes his method of continuous mechanical analysis, by which a curve is obtained with the abscissas, giving the size of the particles and the ordinates the percentage of particles of which is smaller than the value of the corresponding abscissa. The construction of the curve for the mechanical analyses is based on the calculation of the change in concentration of the suspension in relation to the time and height of the column of liquid in which the soil mass is suspended.

For the settling of the suspension, a cylinder graduated in millimeters, 40 to 50 cm. high and 4 cm. in diameter or larger (such as a liter graduate) is used. Through a fitted stopper from 6 to 10 siphons are placed at different heights in such a manner that each siphon is to withdraw 100 cc. of the suspension. The tips of the siphons are bent to open in a horizontal direction to decrease the chances of drawing from the lower layers. The liquid obtained is used for the determination of the specific gravity by means of a hydrostatic balance.

Besides the siphons, a glass tube is put through the stopper with its end just above the liquid. This serves as an air inlet. The outside ends of the siphons are stoppered with glass rods, and all the siphons are so arranged that the withdrawal of the liquid through each one takes the same time interval, 1 to 1.5 minutes.

The soil suspension is poured into the cylinder, shaken vigorously, and put aside for settling. After a definite time period the first siphon is put in operation by forcing air through the extra tube. While the liquid is being poured out the glass rod stopper from the second siphon is removed and transferred to the first when all the liquid from that level has been siphoned off. The level is recorded, as is also the time when the second siphon begins to operate. The other siphons are similarly operated.

The relation between the specific gravity of the suspension and the amount of weighed soil mass is determined by the following equation:

$$d=1+\frac{n\ (D-1)}{1{,}000D},$$

where d equals the specific gravity of the suspension, D equals specific gravity of the soil mass, and n equals amount of soil in grams per liter of suspension. To simplify the calculation, the value for D may be taken as 2.7 for a large number of soils, then

$$d=1+0.00063n$$

The suspension is prepared by boiling the soil for 1 hour in five times its weight of water under a reflux condenser. If the soil material is coagulated, a N/1,000 solution of Na_2CO_3 is used. A comparison of the new method with others more time consuming but accurate show that it may be used to great advantage.

Soil survey of Lawrence County, Indiana (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1922, pp. IV+1955–2000, pls. 4, fig. 1, map 1*).—This

report, prepared in cooperation with the Indiana Experiment Station, is in two parts:

I. [*Soil survey*], W. E. Tharp, T. M. Bushnell, and J. E. Adams (pp. 1955–1985).—Lawrence County, in south-central Indiana, comprises 284,160 acres of land varying in topography from broad uplands, including much undulating or gently rolling ground, with some nearly level tracts, to a sharp relief of narrow, steep-sided ridges and deeply-intrenched streams, and drained by the East Fork White River, its tributaries, and other small streams.

The present survey shows Frederick silt loam to cover 25.4 per cent of the section surveyed, with Muskingum stony silt loam 14.2, Bedford silt loam 14.1, Tilsit silt loam 11.7, and Hagerstown silt loam 10.1 per cent, following in order of areal importance. There were also found 21 other types belonging to 14 series, together with rough stony land and quarries.

II. *The management of Lawrence County soils*, A. T. Wiancko and S. D. Conner (pp. 1987–2000).—General information is given on the management of these soils, chemical analyses and suggestions as to fertilizer needs being included.

Soil survey of Harrison County, Iowa, T. H. Benton and N. J. Russell (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1923, pp. III+823–858, fig. 1, map 1*).—Harrison County abuts upon the western boundary of the State and is the fourth county from the southern boundary. It comprises 442,240 acres of a once level plain, now divided as the result of erosion and stream action into an eroded upland plain and the deep, broad alluvial valley of the Missouri River, to which latter sections are adjoined narrower and shallower valleys of tributary streams which furnish drainage. Straightened artificial channels now prevent flooding, formerly frequent and destructive.

Marshall silt loam, with 45.8 per cent of the total surface of the county, and Wabash silt loam, with 15.0 per cent, are the types of significant extent among the 22 here classified into 11 series, mapped, and described. The work was carried out in cooperation with the Iowa Experiment Station.

Soil Survey of Yadkin County, North Carolina, W. D. Lee and S. F. Davidson (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1924, pp. III+24, fig. 1, map 1*).—This survey, carried out in cooperation with the North Carolina Department of Agriculture and Experiment Station, is concerned with an area of 221,440 acres located in the northwestern part of the State and consisting for the most part of an elevated plateau dissected by numerous stream valleys to form a surface varying in topography from gently rolling to steep or broken land. The Yadkin River, forming the northern and the greater part of the eastern boundary of the county, receives the drainage of the entire section.

The soils as mapped and described in the present survey consist of eight series in which are included 12 types and three phases. Cecil fine sandy clay loam 32.6 per cent of the total area surveyed, Cecil clay loam 32.7 per cent, and Davidson clay loam 9.9 per cent are the more extensive in surface covered, and, with Appling fine sandy loam, 5.7 per cent, constitute the agriculturally important lands of the county. Meadow, 2.1 per cent, and riverwash, 0.3 per cent, unclassified, are also noted.

Soil survey (reconnaissance) of west-central Texas, W. T. Carter et al. (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1922, pp. IV+2041–2131, pls. 7, figs. 4, map 1*).—An area including four tiers of counties extending about 250 miles into the State from the western boundary and having a depth of about 130 miles with an areal extent of 17,141,760 acres is dealt with in this survey. The work was carried out in cooperation with the Texas Experiment

Station. The section surveyed includes topographical features ranging from broad flat plains to dissected surfaces of very uneven or rugged character. Being an area of low rainfall, west-central Texas is well drained throughout, principally by the Colorado and Pecos Rivers.

In the 27 counties included in the present survey, a total of 37 soil types were recognized and were assigned to 17 series, the most extensive types being Amarillo fine sandy loam 17.8 per cent, and Valera stony clay 10.5 per cent of the total area. Unclassified areas of dune sand 3.2 per cent, rough stony land 2.6 per cent, and rough broken land 0.4 per cent are also noted.

Contribution to the study of solonetz in the chernozem belt of western Siberia [trans. title], K. P. Gorshenin (*Pochvovedenie* (*Pédologie*), *n. ser., 22 (1927), No. 3, pp. 42–59*).—A series of chemical analyses of samples from alkali soil profiles, differing by the depth of the A horizons, is presented, together with the morphological structure of the various types of solonetz. The results are summarized as follows:

(1) The most pronounced leaching is noted in the crusted solonetz; with the transition from this type to the columnar the leaching of the upper horizon is slower. (2) Because of the shallow depth of the overcolumnar horizon A and, therefore, a smaller amount of the mineral portion, which has undergone decomposition, the absolute amount of R_2O_3 in the alluvial horizon of the crusted solonetz is small. There is more of the R_2O_3 in the deep-columnar solonetz. (3) In the columnar solonetz the alluvial layer is found in horizon B_2; the columnar horizon B shows distinct evidence of alluviation. (4) The absolute amount of humus in the deep solonetz is greater than in the crusted. The amount of humus in the B_2 horizon of the latter increases, while in the deep solonetz it decreases with the depth. (5) The crusted solonetz is richer in absorbed bases, absolutely and relatively, than the deep solonetz. (6) The absolute amount of absorbed bases in all types of solonetz is at a maximum in the B_2 horizon; the relative amount of absorbed bases in the crusted colonetz is at a maximum in the B_1 horizon; in the deep solonetz, in the B_2 horizon. (7) The capacity for absorption by the overcolumnar horizon in the crusted solonetz is smaller than in the deeper solonetz. (8) There is no definite relation between the amount of humus and absorption capacity of the soils; neither is there any relation between the R_2O_3 content and the absorption capacity. (9) Degraded solonetz by its chemical properties approaches the crusted solonetz.

Alkali soil studies and methods of reclamation, P. S. Burgess (*Arizona Sta. Bul. 123 (1928), pp. 157–181, figs. 6*).—Following a brief general introduction, this bulletin presents in part 1 a more or less popular explanation of the origin and present location of deposits of alkali salts in soils. The part played by zeolites in the formation of black alkali from white alkali in the processes of natural or artificial leaching, the nature of "freezing up," etc., are discussed, and the general nature of the measures necessary to the reclamation of white alkali and black alkali and of "slick spots" is stated, with a brief explanation of the purpose of each treatment recommended.

Part 2 details the measures taken and results secured in the reclamation, by methods described in part 1, of a field of about 10 acres at the Yuma Valley Experiment Farm, approximately one-half of this land having carried at the beginning of the reclamation experiments so large a proportion of alkali that the germination of seed was rendered impossible. Numerous chemical analyses and other data showing the condition of this land initially, at various stages of the work, and after the completion of the reclamation processes, are given, together with photographs showing the recovery of the crop-producing power of

the land. Leaching and treatment with calcium chloride and with gypsum, each with and without manure, were among the measures employed. The planting of rice as a cash crop on alkali soils which are being reclaimed by leaching is also briefly discussed.

Reclamation of the Fresno type of black alkali soil, W. P. KELLEY and E. E. THOMAS (*California Sta. Bul. 455 (1928), pp. 37, figs. 25*).—Field experiments on a section of alkali soil in a vineyard at Fresno with gypsum, sulfur, iron sulfate, and alum as a means of reclaiming the alkali soil, entirely unproductive at the beginning of the experiments, are described.

The unproductivity of the soil was found to be due to two causes: (1) An excess of soluble salts, especially sodium carbonate, and (2) an abnormal chemical composition of the clay part of the soil. The necessity for remedying both these conditions is emphasized, i. e., not only must the soluble salt excesses be leached out, but at least a part of clay constituents must be transformed into calcium compounds.

The soil amendments above noted were all beneficial, but sulfur, found to be effective at the rate of 1 ton per acre when used alone and capable of good results at 1,000 lbs. per acre when used in conjunction with stable manure, proved much more economical than the other materials tried. Gypsum gave uniformly successful results only when used at a rate exceeding 10 tons per acre. Relatively large quantities of iron sulfate and alum were also required.

An estimate of $45 per acre for the material itself, as the cost of reclaiming such land, is based on satisfactory natural drainage conditions and the current quotation for practically pure, finely ground sulfur. It is thought probable that less expensive crude sulfur concentrates will also prove effective, materially reducing the cost of reclamation. No special advantage on this soil was shown for artificially inoculated sulfur. The use of sulfur is recommended only for black-alkali types of soils and alkali soils which contain relatively large amounts of replaceable sodium, and not where the soil contains a considerable amount of soluble calcium salt.

Though the leaching experiments have not thus far brought about satisfactory reclamation, it is noted that without adequate drainage permanent reclamation is not to be expected and that frequent irrigation of crops grown in the early stages of reclamation is of extreme importance.

With respect to the drainage conditions it is considered that in the Fresno section the water table should at no time be less than 6 ft. below the surface, and should preferably be kept at a lower level. In the experiments here described this was not done by tile drainage but by pumping from a deep well close to the experimental area all the water used for the irrigation of the plats, and discharging any surplus into a near-by canal.

The height of the capillary rise of water in soils, and methods for its determination [trans. title], S. ASTAPOV (*Pochvovedenie (Pédologie), n. ser., 22 (1927), No. 3, pp. 60–76, figs. 4*).—The author constructed an apparatus which affords a rapid and fairly accurate method for estimating the capillary rise of water. The method is based on the fundamental proposition in hydrodynamics formulated by Zhukovskiĭ that "on the surfaces of sand covered with water the pressure is equal to that of the bathing water; on the dry open surface of the sands the pressure is equal to the water pressure, minus the capillarity."

In its simplest form the experiment of Zhukovskiĭ may be performed by feeding the water from the bottom into a 15 to 20 cm. column of sand in a tube with a sieve-like bottom in such a way that the water is lifted by the capillary force of the sand. For this purpose the water supply was connected to the sieve-like bottom through a U tube, the level of which was kept with that of

the sieve, and as the water was lifted by the capillary force more water was added to the open arm of the U tube. When capillary draught ceased, the level of the water in the left arm of the tube was lowered by means of a stop-cock. This lowering was continued until the water column at the point of junction with the sieve broke away and the levels in the arms equalized. The difference in levels at the moment of the breaking away of the water from the soil (sand), caused by the pulling force of the sand, characterizes the capillarity of the given soil.

In order to prove that this breaking-away force represents the capillarity of the soil, analogous experiments were conducted with capillary tubes. A U tube, one end of which is drawn out to a capillary, is filled with water in such a way that the water enters the capillary. The difference in level between the wide arm and the capillary is determined by the diameter of the capillary. On lowering the level of the water in the left wide arm if the tube the level of the right wide arm tube does not go down. At the same time the height of the column in the capillary originally formed, when the wide levels of the two sides of the U tube were equal, begins to drop. Continuing the lowering of the level in the left arm, it will be noticed that at the moment when the meniscus of the capillary approaches the wide portion of the right arm the water level in this arm begins to drop and the difference between the two levels in the U tube becomes zero. This experiment and others with capillaries of different diameters show that the lowering of the level in the wide arm corresponds to the height of the water in the capillary. The surface tension of the capillaries is expressed by the height of the column of water, designated by h; in order to pull away this column from the capillary it is necessary to apply similar force to the left arm equal to h. Use was made of the Juren formula $h=\frac{2T}{Rdg}$, where T is the surface tension, "d" the density of the liquid, and "g" the gravity factor. Applying this principle to soils, the water-lifting power of the soil may be measured quickly and with fair accuracy. A simple form of an apparatus is described and illustrated which may easily be constructed from the diagram given. Comparative experiments with the new apparatus and data obtained with capillary experiments in long tubes showed that the results are identical.

In order to get some light on the process of the water movement in the capillaries, moisture determinations were made on the soil column after determining the height of the pull as expressed by the difference in levels.

For heavy soils the size of the U tube necessarily becomes too large, and for that reason the formation of the difference in levels was accomplished by a corresponding ratification of the air in the U tube, measuring this with a manometer. The construction of this apparatus is given and clearly illustrated. A number of experiments were conducted with this more complicated apparatus, and it clearly shows the relation of the fineness of the particles to the capillary rise.

It is claimed by the author that the apparatus may be used on soil samples with an undisturbed structure.

Soil colloids and base exchange, F. W. Parker and W. W. Pate (*Alabama Sta. Rpt. 1926, p. 12*).—A study of the properties of the colloids extracted from 14 soils has indicated that the base exchange property of soils is restricted to the colloidal fraction, and that there is a good correlation between the chemical composition and the base exchange capacity of the colloid. Preliminary indications of a correlation between the buffer capacity and the exchange base content of soils and soil colloids were also obtained. The availability of

exchangeable calcium was found dependent in general on the soil H-ion concentration.

The action of aluminum, ferrous and ferric iron, and manganese in base-exchange reactions, O. C. MAGISTAD (*Arizona Sta. Tech. Bul. 18 (1928), pp. 445–463*).—From an analysis of the previous work on aluminum, iron, and manganese, the author concludes that the evidence presented has not been sufficient to show (1) "that replacement of the cation in the soil zeolite was not due to hydrogen ions in the acid aluminum or iron solutions; and (2) that aluminum or iron actually entered into the zeolite complex in such form that it could be subsequently quantitatively removed by other bases." He then presents the results of a series of experiments on the behavior of aluminum, ferrous and ferric iron, and bivalent manganese (1) with respect to synthetic zeolites and (2) in connection with alkali soils, the artificial zeolites being used in the preliminary work to simplify conditions. The data tabulated cover the effects of ferric chloride, both in aqueous and alcoholic solutions, of aluminum chloride in alcoholic solution, of ferrous sulfate, manganese sulfate, and manganese chloride upon calcium or sodium zeolites and upon calcium zeolite soil, etc.

A further treatment of the resulting aluminum, iron, and manganese-containing zeolites with barium chloride was also made for the purpose of determining if the heavy metal ions were actually present in the zeolites, natural or artificial, in the exchangeable condition.

It was found that (1) neutral or acid solutions of iron and aluminum salts released the base previously present in the artificial zeolites. (2) The residue usually contained no hydrogen zeolite, but neither ferric iron nor aluminum was introduced into the zeolite complex in the exchangeable form. (3) Chemical analyses indicated neither addition nor loss of aluminum resulting from treatment with aluminum chloride in alcohol. Ferric iron in water and in alcoholic solutions replaced the aluminum in the zeolite, this reaction being almost complete in the case of alcoholic ferric chloride. The substitution did not take place in equivalent quantities, however. (4) Both soils and artificial zeolites lost, when treated with solutions of aluminum or ferric salts until all previously held zeolitic bases had been removed and the solutions remained acid, all their base exchange capacity. (5) The decrease in base exchange capacity was found to be a function of the concentration of the ferric iron or of the aluminum salt solutions used. (6) From ferrous sulfate ferrous iron readily replaced the calcium in artificial zeolites and in soils, and was itself readily replaceable by barium from barium salt solutions. (7) Manganese in the form either of manganous sulfate or of manganous chloride readily replaced calcium both in the zeolites and in the soils, and was itself readily replaceable by barium In addition to the manganese and iron entering into the zeolites and soil exchange complexes as replaceable base, some further quantity of the metal in both cases was precipitated. (8) In the case of the manganese sulfate reaction the reaction equation for this salt and the particular zeolite used was determined, and was found to be of the type common to base exchange reactions in general. (9) It is noted that if base exchange be a factor in plant feeding, the destruction of base exchange capacity by aluminum salts might lead to serious consequences.

Experimental study of the microbiological processes in Saratov soils [trans. title], A. OBRAZTSOVA (*Izv. Saratovsk. Gosud. Inst. Selsk. Khoz. i Melior., No. 3 (1927), pp. 205–214*).—This is a report of a preliminary study of nitrogen fixation in various soils, cultivated and fallow. The silica gel method of Winogradsky (E. S. R., 54, p. 119) was used.

Some relations of green manures to the nitrogen of a soil, T. L. LYON and B. D. WILSON (*New York Cornell Sta. Mem. 115 (1928), pp. 29, figs. 7*).—

The experiments detailed in this paper were designed primarily as a test of the comparative effectiveness, in causing an accumulation of nitrate nitrogen in soil into which they were incorporated, of hairy vetch, field peas, rye, oats, and buckwheat, the observations recorded covering a period of 10 years. In addition to the green manure crops studied, the effect of continuous sod was also kept under observation, and comparisons were made of spring and fall plowing.

The greatest accumulation of nitrates during fallow occurred in the soil into which vetch had been incorporated, the other crops following in the order of rye, peas, oats, and buckwheat. It was therefore concluded that "not all legumes are more effective than nonlegumes in producing a high content of nitrate nitrogen during the main part of the growing season."

With respect to time of plowing under, "a comparison of the effects of fall and spring plowing was in favor of fall plowing in so far as a high content of nitrate nitrogen in the spring and early summer was concerned. By midsummer there was not much difference in the effect of the time of plowing under."

Liming the soil increased the accumulation of nitrate nitrogen, the effect being more pronounced in the rye than in the vetch and oats plats. There was a close correlation between the nitrate nitrogen accumulation in the plats planted to the various cover crops and the loss of total nitrogen in the soil of these plats.

During 11 years the vetch plats lost total nitrogen amounting to but 42 lbs. per acre, but the rye, peas, oats, and buckwheat lost 217, 380, 382, and 412 lbs., respectively. The plats continually in sod gained 415 lbs. of total nitrogen per acre. In case of serious loss of fertility, laying the soil down to grass and cultivating vetch or other legumes most active in fixing nitrogen is suggested.

A comparison of different nitrogenous fertilizers and their influence on soil reaction, W. H. Pierre (*Alabama Sta. Rpt. 1926, p. 13*).—Experiments have shown a correlation between the buffer capacity of soils and the amount of ammonium sulfate required to produce a given pH value.

General soil fertility test (*Indiana Sta. Circ. 152 (1928), pp. 2–4*).—Continuing the tests previously noted (E. S. R., 57, p. 614), it is noted that the spread between the good and poor treatments is becoming greater year by year, and that the better treatments are becoming more and more profitable. Phosphorus is by far the most important plant food need on this soil. The largest returns have been secured on the limed land.

[Soil fertility studies at the Rhode Island Station] (*Rhode Island Sta. Rpt. 1927, pp. 36–39, 41–48*).—This report continues, in part, studies previously noted (E. S. R., 57, p. 413).

Organic matter for the soil.—The commercial starter chemical Adco was found to effect satisfactory decomposition of refuse consisting of cut corn stover, rye straw, and other vegetable refuse, the check pile of the same materials without the chemical mixture showing but little decomposition after standing from the early summer of 1926 till the spring of 1927. With the use of the starter chemical the nitrogen content of the dry matter was 1.67 per cent and without the starter chemical 1.31 per cent. Progress report is made of current results from the use of green manures, stable manure, etc., as a supply of organic matter for the soil.

Efficiency of fertilizers and manures.—A manganese salt injected into the leaf tissue of spinach, where it could have no effect on the soil, was as beneficial as when applied to the soil. On beets, manganese supplied as a spray was more effective than when supplied as a fertilizer before planting. Application in the fertilizer was apparently satisfactory in the case of oats and

spinach, however. Annual sweet clover showed no manganese deficiency in neutral soil where alfalfa, red clover, alsike clover, and oats did show a deficiency and were benefited by 30 lbs. per acre of manganese sulfate.

Among a group of miscellaneous crops, most yielded less with magnesium-potassium sulfate as a source of potassium than with other sources of this element. The sodium in kainit was found useful as a supplement to insufficient potassium for tomatoes and cabbage, but did not show this effect on parsnips or potatoes. Potatoes liberally supplied with potassium were found superior in a cooking test to those grown with less potassium. Potatoes from plats which had had no potassium for 17 years were placed last in judging the results of this test.

Plant differences and needs.—Brief progress reports are made on rotation studies and tests with different vegetables. For the third successive season the proportions of nitrate nitrogen, phosphate phosphorus, and potassium found in the juice of growing plants correlated with the amounts of these nutrients added to the soil.

Modification of sour soils.—In plats of the phosphate experiments a pH value of 6.5 and a calcium oxide absorption of 1,400 parts in two million were found on the portion which had received more and a pH value of 5.1 with a calcium oxide absorption of 2,630 parts per two million in the portion which had had lesser quantities of lime. Squashes, barley, parsnips, cabbages, and carrots grew better on the side which had had the greater and potatoes and watermelons on the side which had had the lesser applications of lime. The less aluminum resistant crops showed twice as much depression on the less limed side when only 50 lbs. of phosphoric acid was supplied annually as when 150 lbs. of phosphoric acid was applied.

Such organic aluminum compounds as the citrate were found toxic even in solutions only very slightly acid, for example, at pH 6.5 to 6.8, but very small concentrations of aluminum, approximately from 3 to 15 parts per million, stimulated such moderately sensitive crops as buckwheat, oats, and barley. Phosphates in quantities equivalent to the aluminum present overcame the aluminum toxicity. Aluminum remained toxic to barley roots "even when precipitated (presumably at least in part as the hydroxide), and apparently in such form that it could not pass through a collodion membrane."

Phosphorus nutrition of plants, F. W. PARKER (*Alabama Sta. Rpt. 1926, p. 12*).—The soil solution of 20 soils was found to contain an average of 0.09 part per million of inorganic and 0.47 of organic phosphate ion, less than 0.05 part per million of inorganic phosphorus having been found in the displaced soil solution of several productive soils. Absorption experiments with corn and with soy beans gave results which are considered to show that organic phosphorus is not absorbed by plants.

Culture solution experiments were made in which one corn plant was grown in 7,500 cc. of solution, the phosphate ion content of which was renewed twice per day, absorption data indicating that even this procedure did not maintain the phosphate ion concentration at a constant value. Maximum corn growth was obtained at a concentration of the phosphate ion of 0.50 part per million in the culture solution, growth at 0.05, 0.10, and 0.25 part per million of the phosphate ion having been 19, 37, and 71 per cent, respectively, of the maximum. These results are stated to indicate that if the phosphate ion concentration of the soil solution could be maintained constant, maximum growth of corn could be secured at a concentration in the culture solution of 0.20 part per million of the phosphate ion.

Comparison of different phosphates (*Indiana Sta. Circ. 152 (1928), pp. 4–6*).—Data similar to those of the preceding report (E. S. R., 57, p. 614) are

summarized. The largest returns have been secured from the combination of lime, manure, and heavy applications of acid phosphate. On limed land superphosphate (acid phosphate) has been the most profitable source of phosphorus, but without either lime or manure rock phosphate has been more profitable.

The influence of liming on the phosphate and potash content of the soil solution, F. W. PARKER and J. W. TIDMORE (*Alabama Sta. Rpt. 1926, p. 12*).—Lime was found to have increased the phosphate content of the soil solution and of extracts both of untreated soils and of soils treated either with superphosphate (acid phosphate) or with basic slag. The influence of lime on the solubility of rock phosphate was not great nor in all cases positive, and the solubility of steamed bone meal phosphorus was decidedly depressed by lime.

Limited data indicated a frequent reduction of the potassium content of the displaced soil solution by liming.

AGRICULTURAL BOTANY

Plant physiology [trans. title], HÖSTERMANN (*Landw. Jahrb., 64 (1926), No. 2, pp. 50–74, figs. 13*).—Sections on physiology, breeding, and protection of horticultural plants are detailed in analytical form.

Physiological processes of plants during drought [trans. title], A. A. NICHIPOROVICH (*Nauch. Agron. Zhur. (Jour. Landw. Wiss.), 3 (1926), No. 5–6, pp. 341–358; Eng. abs., pp. 357, 358*).—In view of the fact that drought resistance in plants depends upon their ability to carry on normally the physiological processes under drought conditions, the author determined transpiration rates and the accumulation of assimilation products in leaves. The resulting data are indicated, also the chlorophyll content per unit area and volume.

Xerophytes decreased greatly their transpiration under severe midday conditions. Mesophytes showed no such decrease.

Botany, W. A. GARDNER (*Alabama Sta. Rpt. 1926, p. 16*).—In studies of their physiology, sweet potatoes kept better at 13° C. (55.4° F.) than at either 8 or 18°. Changes in composition at 13° were found to be intermediate to those at the other temperatures. Shrinkage during curing and storage is said to have shown a loss of 7.5 per cent during the curing period, which was increased to a loss of 10 per cent during the first 2 weeks of storage. Dry ventilated banks proved best for storage of sweet potatoes under the conditions of the experiment.

The presence of an enzyme in California oranges that decomposed the chlorophyll of cowpeas was demonstrated. The temperature relationships of the enzyme were determined. An enzyme occurring in cucumber rinds when activated by oxygen was able to decompose the chlorophyll of cowpeas. The tolerance of the chlorophyll decomposing enzyme of oranges to various chemicals was determined.

Light and growth, II–IV, J. H. PRIESTLEY (*New Phytol., 25 (1926), Nos. 3, pp. 145–170, pls. 2, figs. 7; 4, pp. 213–247, figs. 4*).—These three sections continue the account previously noted (E. S. R., 56, p. 424).

II. *On the anatomy of etiolated plants* (pp. 145–170).—The methods used in this investigation have all been employed in the examination of plants grown under the controlled conditions described in the first paper, referred to above.

"The facts summarized above are shown to be consistent with the conclusion that the main morphological and structural features of etiolation are determined by a redistribution of meristematic growth at the shoot apex, consequent upon the greater difficulty experienced by the meristem in drawing nourishment from the vascular supply because, when growing in the dark, the walls between vascular strands and meristem are relatively impermeable by the

retention in them of the protein and fatty substances that form the surface of the protoplast."

III. *An interpretation of phototropic growth curvatures* (pp. 213–226).—In the light of experimentation following up that of Blaauw (E. S. R., 42, p. 128), a new explanation of the negative phototropic curvature of light-sensitive roots is advanced which is based upon the view that such curvature is due to the quicker extension of the cells which are just beginning to vacuolate as the result of their stronger illumination. On the other hand, the slower growth rate of these roots in light is explained as due to the fact that in the light the cells of endodermis and cortex finally attain a shorter adult length.

Most roots are not light-sensitive. The difference between shoots and roots in this respect appears to be due to the different disposition of the meristematic tissues at the growing points.

IV. *An examination of the phototropic mechanism concerned in the curvature of coleoptiles of the Gramineae* (pp. 227–247).—"Recent experiments with the coleoptile in which the apex is replaced upon the decapitated stump are supposed to demonstrate that lateral light falling upon the apex causes the production or release of growth-regulating substances which diffuse to the lower part of the coleoptile and there cause phototropic curvatures. Such an experimental demonstration of the reception of a tropic stimulus in one region, followed by tropic response in another, if fully established excludes the possibility of explaining phototropic curvature as a simple 'light-growth' reaction such as is suggested by Blaauw.

"But when the numerous facts as to the conduction of phototropic curvature from the decapitated apex are considered it is found that their explanation in terms of the classic theory of stimulus and response entails numerous difficulties, and some of the assumptions made at present are mutually inconsistent. The facts are, therefore, reconsidered after the structure and growth of the coleoptile has received fuller elucidation. . . . It is then shown that an interpretation of the phenomena of phototropic curvature in the coleoptile which is consistent with the 'light-growth' hypothesis of Blaauw can be applied with less difficulties and fewer inconsistencies than any interpretation yet attempted on the lines of stimulus and response."

Methods for the study of assimilation and respiration in closed systems, B. D. Bolas (*New Phytol., 25 (1926), No. 2, pp. 127–144, figs. 5*).—Utilizing a method which is described, as is also the apparatus, for the preparation of carbon dioxide mixtures and their circulation in a closed system containing a living plant, the author compared the Haldane gasometric method, the electrical conductivity change method, and the indicator method. Of these, the indicator method was found, when improved and standardized, to be suitable for rapid determination of carbon dioxide in the study of respiration and assimilation. The most satisfactory indicator was bromocresol purple in the form of its sodium salt and buffered with sodium carbonate, in aqueous solution. The indicator color is matched against colored glass slips under constant lighting conditions. No evidence was obtained that cut shoots of *Vicia faba* or of *Eupatorium* sp. give off volatile products introducing error.

The control of atmospheric humidity in a closed system, B. D. Bolas (*New Phytol., 25 (1926), No. 2, pp. 119–126, figs. 4*).—The results of a preliminary trial as presented, though admittedly not very accurate, are thought to indicate the value of the method as described. It is thought that the accuracy may be improved.

The katharometer as an instrument for measuring the output and intake of carbon dioxide by leaves, J. C. Waller (*New Phytol., 25 (1926),*

No. 2, pp. 109–118, figs. 4).—The katharometer is described on account of its adaptation to measurements of respiration and synthesis in a single leaf and its presumed general utility in the study of certain problems in plant physiology, with some account of the experimental arrangements and some results obtained.

Is living protoplasm permeable to ions? W. J. V. Osterhout (*Jour. Gen. Physiol., 8 (1925), No. 2, pp. 131–146, fig. 1*).—"The experiments indicate that under normal conditions little or no H_2S enters the cell sap of *Valonia macrophysa* except as undissociated molecules."

Studies on the permeability of living cells.—VI, The penetration of certain oxidation-reduction indicators as influenced by pH; estimation of the rH of Valonia, M. M. Brooks (*Amer. Jour. Physiol., 76 (1926), No. 2, pp. 360–379, figs. 7*).—It is stated that in the course of experiments with 2,-6,- dibromo phenol indophenol, only reduced dye enters the sap, the penetration of the dye into the sap following the course of a bimolecular reaction curve. The dye in the sap at equilibrium is proportional to the amount of undissociated dye in the external solution. In sap more acid than normal more dye is present and vice versa. At higher temperatures and lower concentrations the curves follow a course like that for two consecutive unimolecular reactions.

In experimentation with other oxidation-reduction indicators methylene blue penetrated into the sap in an oxidized form. The amount present did not vary with either external or internal changes in pH from 5 to 9. K-indigo tetrasulfonate was found to penetrate the sap in a yellow form. K-indigo disulfonate was not found in the sap by means of the methods used. Results with these indicators failed to support the hypothesis that only undissociated molecules enter living cells.

The penetration of methylene blue into living cells, M. M. Brooks (*Natl. Acad. Sci. Proc., 13 (1927), No. 12, pp. 821–823*).—In this report, said to be preliminary though following the one above noted, the author attempts to show that the amount of methylene blue found in the sap of Valonia at equilibrium is independent of the pH value of the external solution; that the penetration rate is influenced by temperature and the pH value of the external solution; and that methylene blue, as such (and not in the form of a lower homologue, trimethyl thionine or methylene azure) penetrates into the sap of Valonia. Certain of the results, and the inferences therefrom, are very briefly discussed.

The influence of external osmotic pressure and of disturbance of the cell surface on the permeability of Spirogyra for acid dyes, G. W. Scarth (*Protoplasma, 1 (1926), No. 2, pp. 204–213*).—It is found that the permeability of living Spirogyra cells to acid dyes increases with the osmotic pressure of the medium in which the dye is applied. The increase is greatest during the phase of adjustment to an osmotic pressure change, especially when the cytoplasmic surface is disturbed thereby, as during its dislocation from the cell wall by plasmolysis or its rapid extension during deplasmolysis. The effect increases with the viscidity and adhesiveness of the surface involved, even though in the absence of mechanical disturbance such a condition is usually attended by abnormally low permeability. The observed facts are thought to point to the presence of an organized film on the surface of the cytoplasm as the regulator of permeability.

On the accumulation of dye in Nitella, M. Irwin (*Jour. Gen. Physiol., 8 (1925), No. 2, pp. 147–182, figs. 12*).—When living cells of Nitella were placed in different concentrations of brilliant cresyl blue solutions at pH 6.9, it appeared that the greater the concentration of the external dye solution the

greater was the speed of accumulation of the dye in the cell sap and the higher was the concentration of dye found in the sap at equilibrium. The process may be regarded as a reversible pseudo-unimolecular reaction. When the concentration of the cell sap is plotted as ordinates and the concentration in the outside solution as abscissas, the curve is convex toward the abscissas. It is thought that secondary changes involving injury take place as the dye accumulates, and that if these changes did not occur the curve would be concave toward the abscissas.

"The process may be explained as a chemical combination of the dye with a constituent of the cell. This harmonizes with the fact that the temperature coefficient is high (about 4.9). Various other possible explanations are discussed."

The effect of small amounts of chemicals in increasing the life activities of plants, F. E. Denny (*Natl. Acad. Sci. Proc., 13 (1927), No. 7, pp. 555–561*).—Experimentation, which is described, increased the life activities of plants by employment of chemical treatments. The materials used varied so in chemical character that no relation became evident between type of chemical used and character of results obtained. In most cases it did not seem probable (if possible) that the substance used was utilized as food, and in no case could such substance have supplied sufficient energy to account for the resulting increase of activity. No understanding has been arrived at as to the mode of action of these chemicals or the details of the methods by which plant processes, once inhibited or retarded, may be induced to start again or to quicken their rate. Suggestions offered do no more than to indicate the sort of experimental work needed to test the hypotheses that have been proposed.

On the form of the protoplast in cells of the genus Ceramium and those of Dasya coccinea, R. W. Phillips (*New Phytol., 25 (1926), No. 4, pp. 277–293, figs. 12*).—The author, giving an account of studies on the diaphanous or incompletely corticated series of Ceramium (*C. ciliatum, C. echionotum,* and *C. strictum*), the rubrum or completely corticated series of Ceramium, and *D. coccinea,* details theoretical conclusions.

Further studies on biochemical differences between sexes in plants, S. Satina and A. F. Blakeslee (*Natl. Acad. Sci. Proc., 13 (1927), No. 3, pp. 115–122*).—Referring to related contributions by others and also to their own reports, previously noted (E. S. R., 57, pp. 621, 622), the authors set forth the results of their recent work, stating that the power of plant extracts to reduce $KMnO_4$, as tested in a large number of individuals, shows a high average difference between sexes if the material tested is strictly comparable. The $KMnO_4$ and the Manoilov reaction run closely parallel. The reducing substances responsible for the differential behavior in respect to sex of these two reactions, in part at least, are not identical. Both reactions depend immediately on quantitative rather than on qualitative differences. The developmental stage of the plant is an important factor. The most distinct differences found in green plants between male and female individuals occurred from three to four weeks after flowering, the least differences appearing in leaves collected during the flowering period. In Mucors the best results were obtained with cultures from 7 to 10 days old.

The possibility of a serological varietal differentiation in potato, W. Maschmeier (*Versuche über die Möglichkeit einer Serologischen Sortendifferenzierung bei der Kartoffel. Inaug. Diss., Landw. Hochschule, Berlin, 1927, pp. [4]+37, fig. 1*).—This is a thesis presented to the Berlin Agricultural High School in completion of the requirements for the degree of doctor of agriculture.

GENETICS

The species problem, G. C. Robson (*Edinburgh: Oliver & Bird, 1928, pp. VII+283*).—The author has assembled records of differences between groups of animals and plants which are rated as species by the systematist and considered the extent to which recognition of species is relevant in evolutionary problems. Further, the various theories explaining the phenomena of evolutionary divergence as manifested in the various assemblages of specific and varietal rank of natural populations of plants and animals have been examined.

The new genetics, G. C. LaMaster (*Akron, Ohio: Author, 1928, pp. 80, figs. 19*).—The author has given a popular presentation of his theories in regard to reproduction and the inheritance of characters, based largely on his assumption that the spermatozoa carry the controlling characteristics for the development of the nervous system while the heart and venous system is transmitted to the offspring by the female parent.

Application of goodness of fit tests to Mendelian class frequencies, L. E. Kirk and F. R. Immer (*Sci. Agr., 8 (1928), No. 12, pp. 745–750*).—Application of the χ^2 test to data from the sweet clover studies of Elders (E. S. R., 58, p. 824) and Smith (E. S. R., 57, p. 422) led the authors to suggest that "conclusions based on the ratios obtained by summation of class frequencies in Mendelian studies may be widely misleading even though the sums of the frequencies approach very closely to the expected ratio. The χ^2 test of goodness of fit provides a useful means for comparing the observed results from Mendelian class frequencies with expectation both for single segregating progenies and also when large numbers of families are involved."

On the chromosomes of Beta vulgaris [trans. title], N. E. Kuz'mina (Kuzmina) (*Trudy Prikl. Bot., Genet. i Selek. (Bul. Appl. Bot., Genet. and Plant-Breeding), 17 (1927), No. 3, pp. 241–252, figs. 15; Eng. abs., pp. 251, 252*).—A preliminary scheme of the individual chromosome types in *B. vulgaris saccharifera* is presented. Compared with the diversity of chromosome sizes observed in this beet, all chromosomes in *B. maritima* appeared to be very similar in their dimensions.

The chromosomes of some species of the genus Linum L. [trans. title], K. K. Martsenitsina (Martzenitzina) (*Trudy Prikl. Bot., Genet. i. Selek. (Bul. Appl. Bot., Genet. and Plant-Breeding), 17 (1927), No. 3, pp. 253–264, figs. 14; Eng. abs., pp. 263, 264*).—Study in 10 species demonstrated that the genus Linum is not cytologically homogeneous. Grouped according to number (diploid) and size and shape of chromosomes, the species were as follows: *L. austriacum, L. tenuifolium, L. corymbiferum, L. punctatum,* and *L. perenne* (18); *L. grandiflorum* (16); *L. usitatissimum* and *L. angustifolium* (32); *L. flavum* (30 or 32?); and *L. catharticum* (57+).

On the karyotype of Solanum tuberosum [trans. title], G. A. Levitskiĭ (Levitsky) and G. K. Benetskaĭa (Benetzkaja) (*Trudy Prikl. Bot., Genet. i Selek. (Bul. Appl. Bot., Genet. and Plant-Breeding), 17 (1927), No. 3, pp. 289–303, figs. 24; Eng. abs., pp. 301–303*).—Variations in the chromosomes observed in three varieties of potatoes during mitosis are described in detail and illustrated.

Androlethal factors in Oenothera, H. de Vries (*Jour. Gen. Physiol., 8 (1925), No. 2, pp. 109–113*).—"We find that the trisomic condition, caused by nondisjunction of one of the chromosomes combined with the presence of an androlethal factor, constitutes the main difference between the specific mutants of *O. lamarckiana* and the hereditary behavior of wild species. A possibility of eliminating it and of returning to a uniform and isogamic condition without

androlethals is indicated by the use of *O. gigas* in crosses with the specific mutants. In this way the difference would disappear, at least mainly, and the comparison of experimental mutants and wild species would lose one of its greatest present difficulties."

A survey of the cultures of Oenothera lamarckiana at Lunteren, H. DE VRIES and R. R. GATES (*Ztschr. Induktive Abstam. u. Vererbungslehre, 47 (1928), No. 4, pp. 275–286, figs. 5*).—The main forms of mutants of *O. lamarckiana* are described and are grouped according to their hereditary qualities.

The breeding of strains of A-Tester Yellow Dent corn, K. M. LIU (*Michigan Sta. Tech. Bul. 90 (1928), pp. 40, figs. 4*).—Strains of A-Tester Yellow Dent, derived in the studies reported from crosses between colored-kernel strains and the A-tester corn of Emerson (E. S. R., 40, p. 436), have such factorial composition that their contamination by any common corn containing the *A* factor can be determined readily in the current crop. Breeding behavior in the F_1 to F_3 generations is discussed in detail, with agronomic data on the A-tester yellow strains produced. The relation of the factors R_g and r_r to the development of anthocyanic pigment as found in the experiment is also considered.

Soybean seeds with two embryos, F. V. OWEN (*Jour. Heredity, 19 (1928), No. 8, pp. 372–374, figs. 2*).—Soy bean seeds with two embryos appearing at the Wisconsin Experiment Station in a Chinese variety, C4, and in F_2 and F_3 of crosses between C4 and other varieties were evidently not identical twins but truly independent embryos within one seed coat.

A sterile character in soybeans, F. V. OWEN (*Plant Physiol. 3 (1928), No. 2, pp. 223–226, figs. 2*).—A single factor mutation was held responsible for behavior in a progeny of Manchu soy beans at the Wisconsin Experiment Station, segregating for sterility in about the ratio of 3 normal plants : 1 sterile. Both ovules and pollen grains appeared to be nonfunctional. The sterile plants are perfectly normal during early growth stages, but after flowering sterile plants take on a much darker green color, the leaves thicken, the stems sometimes enlarge greatly, and the leaves remain green and firmly attached to the stem long after normal segregates have matured. This peculiar behavior is probably due to the natural deprivation of storage for elaborated food material.

The genetics of Sonora wheat, H. H. LOVE and W. J. CRAIG (*Jour. Amer. Soc. Agron., 20 (1928), No. 3, p. 307*).—No awnless wheat variety studied at Cornell University, except Sonora, was found to carry factors for the complete awned condition. The appearance of awned and partly awned forms in the F_2 and later generations of crosses between Sonora and other awnless forms of common wheat showing a segregation approaching 15 : 1 suggests that Sonora although awnless carries a factor for awnedness. When Sonora was crossed with awned sorts a preponderance of awned plants was noted.

Transgressive and normal segregations in a cross of Marquis × Federation wheats, G. STEWART and D. C. TINGEY (*Jour. Amer. Soc. Agron., 20 (1928), No. 6, pp. 620–634, fig. 1*).—Both parents in a cross at the Utah Experiment Station between pure lines of Marquis and Federation wheats were observed to be awnless, except for short tip awns, and homozygous for normal height. Marquis has somewhat longer awns and white glumes and red kernels. F_1 plants were awnless, or nearly so, bronze-glumed, red-kerneled, and normal in height.

There were F_3 progenies homozygous for a considerable development of awns, homozygous F_3 progenies of awn development similar to Marquis, and some of less development with awning resembling Federation. Other progenies segregated for beaks and short awns. The homozygous beaked progenies, the hetero-

zygous progenies, and the homozygous awned progenies occurred in about a 1:2:1 ratio. While this transgressive segregation of awns indicated a single major factor difference, it seemed that some complementary relationship present permitted the expression of awns and that minor factors are involved.

Glume color gave a close fit for a ratio of 3 bronze:1 white, and the inheritance of grain color was explained by a difference of two (duplicate) factors. Grain color and glume color segregated independently. Dwarfs appearing in two F_2 families seemed to follow the 13:3 ratio in F_2, and also gave the proper F_3 behavior for the theory of one dominant factor for dwarfing (*Dd*) and one dominant inhibiting factor (*Ii*).

Inheritance in poultry (*Rhode Island Sta. Rpt. 1927, pp. 49, 50*).—Light Brahma and Single Comb White Leghorns were found to attain a maximum growth at 10 months of age, but the growth of the first and second generation crossbreds was more rapid than that of the Leghorns and equal to that of the Brahmas up to 7 months of age. The F_1s were intermediate in weight between the parent breeds, but showed greater variation. Larger mean weights were attained by the F_1s from Leghorn males×Brahma females than from Brahma males×Leghorn females. Maximum development was not attained until 10 months of age for the first or second generation birds, agreeing with the results reported for the Hamburgh-Cornish cross (E. S. R., 53, p. 629). Three different stages of growth were identified.

On the fixation of chromosomes in mammals and some other animals, O. Minouchi (*Japan. Jour. Zool., 1 (1927), No. 6, pp. 219–234, pl. 1*).—The author describes a method which has proved superior to others in common use for fixing the chromosomes of particular animals with the minimum degree of modification in appearance. Slight changes in the formula were recommended for different animals and for variation in the ages of the animals.

Spermatogenesis of the albino rat (Mus norvegicus albus), O. Minouchi (*Japan. Jour. Zool., 1 (1927), No. 6, pp. 235–254, pls. 2*).—A study of spermatogenesis in the rat with especial reference to the number and form of the chromosomes and the behavior of the heterochromosomes in the first and second spermatocytes is noted. Methods described in the above paper were employed in fixation. The diploid chromosome count was 42 without exception in the equatorial plate stage. Two of these chromosomes were identified as the sex chromosomes, which showed somewhat different behavior, especially in synapsis.

The spermatogenesis of the dog, with special reference to meiosis, O. Minouchi (*Japan. Jour. Zool., 1 (1927), No. 6, pp. 255–268, pl. 1*).—Using methods described in the paper noted above, the author has studied spermatogenesis in the dog with special reference to the chromosome numbers and their behavior in the spermatogonium and the first and second spermatocytes. The diploid chromosome number was found to be 78, of which 2 were the X and Y chromosomes, which differed somewhat in shape from each other and in their behavior in synapsis.

On the chromosomes of the domestic mouse (Mus wagneri var. albula), O. Minouchi (*Japan. Jour. Zool., 1 (1927), No. 6, pp. 269–273, pl. 1*).—In studying the chromosome numbers in the mouse by the methods of fixation noted above, it was found that the diploid count was 40, of which 2 were the X and Y chromosomes.

A new conception of the mode of synapsis, O. Minouchi (*Japan. Jour. Zool., 1 (1927), No. 6, pp. 275–280, figs. 6*).—The author discusses possible arrangements of the chromosomes in synapsis and suggests the classification of the mode of synapsis as symmetrical or asymmetrical, depending on how

the component parts are joined according to their polarity as determined by the attachment of the spindle fiber or polar granules.

How far can recent studies on the ovarian follicular substance be applied to the human? A brief discussion of the therapeutic aspects of the problem, E. Novak (*Endocrinology, 11 (1927), No. 3, pp. 173–194, figs. 3*).—In discussing studies of the oestrous cycle in mammals and the part played by the follicular and corpus luteum secretions, two types of sexual cycle are noted in monkeys. The one is dominated by the follicle, while the corpus luteum is relatively unimportant, and menstruation may occur with ovulation. The other type is dependent upon ovulation, and in this the corpus luteum plays an important rôle, at least in the production of a pregravid endometrium similar to that observed in woman. The former type corresponds to that observed in the lower animals, while the latter is customary in the human. A few definite experiments with women in the treatment of amenorrhea showed that menstruation could be induced in some cases by the administration of both follicular and corpus luteum extracts.

Corpus luteum in its relation to menstruation and pregnancy, J. P. Pratt (*Endocrinology, 11 (1927), No. 3, pp. 195–208*).—The author presents evidence from the literature and case reports to show that the corpus luteum is an important factor in the control of the menstrual cycle, but its rôle in implantation and pregnancy is uncertain, since pregnancies proceeded normally in five women on which bilateral oophorectomy was performed during the first month.

Selective fertilization, D. F. Jones (*Chicago: Univ. Chicago Press, 1928, pp. XII+163, figs. 21*).—Results of investigations at the Connecticut State Experiment Station on unequal fertilization and aberrant ratios in corn are presented, with a brief review of evidence of similar import from other plants and animals. The subject matter is discussed under the topics of dependent segregation and recombination, pollen tube factors, fertilization in pollen mixtures, sterility within species, sterility among species, assortative mating, and physiological isolation in evolution. The bibliography comprises about 160 titles.

FIELD CROPS

Correcting yields in rod-row trials with the aid of the regression equation, F. Griffee (*Jour. Amer. Soc. Agron., 20 (1928), No. 6, pp. 569–581*).—According to this contribution from the Oklahoma Experiment Station, correlations calculated in rod-row trials with winter wheat varieties according to the method devised by Hayes (E. S. R., 54, p. 731) varied from 0.611±0.019 for plats 10 ft. apart to 0.707±0.015 for rows 3 ft. apart. When yields were corrected by means of the regression equations and the check plats, the ranking of varieties was changed markedly. In the group of wheats yielding 7 bu. per acre or better yields tended to be raised by the correction, while in the group yielding less than 7 bu. the yields seemed to be depressed. The probable errors were reduced by correcting the yields. The probable error calculated from all the checks and expressed in bushels agreed the best with that calculated on the basis of variation due to random sampling.

[Agronomic experiments in Alabama], J. T. Williamson, W. H. Appleton, W. A. Gardner, J. F. Duggar, R. W. Taylor, and C. L. Isbell (*Alabama Sta. Rpt. 1926, pp. 6–11, 16, 22, 23, 24*).—On Hanceville sandy loam, limestone with fertilizer made a slight increase in seed cotton yields but not without potash. Alone or with a complete fertilizer lime increased corn yields more than 3 bu. per acre. On Kalmia sandy loam, lime alone increased cotton yields 108 lbs. and with complete fertilizer 43 lbs., whereas without potash the yield decreased

52 lbs. Limestone's largest increase with corn, 5.9 bu., was made in combination with a complete fertilizer.

On Dekalb sandy loam in rotation complete fertilizer produced an average increase of 381 lbs. of seed cotton per acre and with lime 489 lbs. Without lime basic slag as a phosphorus source made better yields of cotton and corn than did superphosphate (acid phosphate), but the latter was the better on limed plats. Liming was very profitable on this land. On Greenville sandy loam good increases followed the use of nitrogen, phosphorus, potassium, and limestone. Superphosphate and basic slag produced about the same on unlimed land, while on limed plats superphosphate was the superior for both cotton and corn. Lime produced remarkable increases in cotton yields and a very slight decrease in corn yields.

Corn variety tests showed that Weekley, Neal Paymaster, Watson, Pee Dee No. 5, and Douthit have yielded best in north Alabama and Neal Paymaster, Hastings, Whatley, Garrick, and Watson have led in south Alabama.

Variety tests with cotton over several years showed strains of Cook, Acala, and Cleveland to lead in north Alabama, strains of Cook and Cleveland and Dixie Triumph on sandy soils in central Alabama, Cook and Cleveland strains and Dixie Triumph and Bottoms on Black Belt soils, and strains of Cleveland, Acala, and Cook, Bottoms and College No. 1 on nonwilt land in south Alabama. Cooperative fertilizer tests with cotton showed the Auburn Minimum, i. e., sodium nitrate 100 lbs., superphosphate 200 lbs., and potassium chloride 25 lbs., to make a substantial profit on all except Black Belt soils. On all except Houston and Trinity soils the Auburn Maximum (double the Minimum) was the most profitable fertilizer. On every soil the second largest profit was made where 200 lbs. of sodium nitrate were applied. Omission of nitrogen or phosphorus or potassium could serve as a factor limiting yield. On sandy soils the highest cotton yield and greatest increase from sodium nitrate were obtained by applying 100 lbs. at planting and 100 lbs. 35 days after planting, though no advantage came from supplying the sodium nitrate in three separate applications. The divided application also produced a higher yield than a single application on heavy soils, but the small increase in seed cotton resulting from three applications instead of two was not enough to pay for the additional labor. The difference in cost was small enough to justify the separate picking of white and stained cotton, and the separation greatly increased the grade of the bulk of the crop so harvested.

Sweet potatoes kept better at 13° C. than at 8 or 18°, and the changes in composition at 13° were intermediate to those at 8 or 18°. The sweet potatoes showed a total shrinkage of 7.5 per cent during curing, which rose to more than 10 per cent during the first 2 weeks in storage. A dry ventilated bank was superior to a wet ventilated bank.

In Escambia County potatoes treated with complete fertilizer gave better yields than where potassium or phosphorus was omitted. Response to superphosphate was greater on Norfolk fine sandy loam than on Orangeburg fine sandy loam. Dried blood and cottonseed meal gave similar yields. When sodium nitrate was all applied before planting yields were higher than when part was applied as a side dressing.

The yield of alfalfa on gray prairie upland fertilized when 1 year old was greatly increased by superphosphate, basic phosphate, and ground rock phosphate. Using superphosphate alone, 800 lbs. per acre produced an increase of 1,990 lbs. of hay during a dry season, whereas other fertilizers, including sulfur, were of slight value.

Studies on the hardiness of winter legumes showed that a few, e. g., purple vetch, were injured at certain growth stages by 22° F., but endured the same

temperature at other ages. California bur clover was killed at different growth stages by 9°. In general, the period between the emergence of seedlings and nodulation of nearly every individual plant was short in warm weather and long in cool weather. Vetch species differed notably in the rapidity of nodulation under like conditions. Delay in planting winter legumes, grasses, and grain did not proportionally retard the time of blooming or heading.

[Agronomic experiments in Hawaii], H. L. CHUNG and J. C. RIPPERTON (*Hawaii Sta. Rpt. 1927, pp. 13–19, figs. 2*).—Breeding work with edible canna, sweet potatoes, corn, and lettuce, and miscellaneous tests with taro, white potatoes, ginger, sorghum, forage grasses, and edible pod peas are described as heretofore (E. S. R., 57, p. 326).

Edible canna investigations discussed briefly included growth studies, selection work, and perfection of the manufacturing process for starch, mill control, and starch evaluation methods. Studies of factors affecting the properties of canna starch showed that even extreme variations in the amount of rainfall did not affect the starch much. Age has little effect so long as the rootstocks have not begun to deteriorate. With deterioration in the older rootstocks a loss in viscosity occurs in the starch, and climate has a decided effect. Starch from rootstocks grown at Waimea was decidedly higher in viscosity than that from rootstocks grown at the station. Storage of the rootstocks, even for as short a time as 48 hours, reduced viscosity, indicating that delays in the milling process should be avoided.

[Crop experiments at the Moses Fell Annex Farm, Bedford, Ind.], H. J. REED and H. G. HALL (*Indiana Sta. Circ. 152 (1928), pp. 1, 7, 8, 10, 11, fig. 1*).—Varietal leaders were generally the same as those noted earlier (E. S. R., 57, p. 628). Applications of superphosphate (acid phosphate) to crops in rotation have given profitable increases. Fertilizer both alone and with lime made good returns of green forage and hay in pasture tests. Rye as an orchard cover made excellent growth with ammonium sulfate and superphosphate but nearly failed with superphosphate alone.

Results of field crop investigations in Abkhasia and upper Svanetia [trans. title], I. G. BAKHTADZE (J. G. BAKTADZE) (*Izv. Abkhazsk. Selsk. Khoz. Opytn. Sta. (Pub. Agr. Expt. Sta. Abkhasia), No. 35 (1927), pp. 56, pl. 1, fig. 1*).—This report of the activities of the station during 1926 and 1927 discusses data obtained on the climate, soils, and crop production in the valleys, piedmont, and mountains. The region is suitable for grain, legumes, potatoes, cucurbits, cotton, and tobacco.

The crops of the Bombay Presidency: Their geography and statistics, II, G. R. AMBEKAR (*Bombay Dept. Agr. Bul. 146 (1927), pp. [3]+V+148+VIII, pls. 23*).—This publication gives practical information on the distribution, acreage, cultural methods, insect pests and diseases, harvesting practices, uses, and in some instances composition of cereal, legume, oil seed, fiber, sugar, fodder, dyestuff, condimental and drug crops, vegetables, and fruits cultivated in Bombay Presidency.

Irrigation and crop production, E. MCK. TAYLOR (*Empire Cotton Growing Rev., 5 (1928), No. 2, pp. 109–112*).—Considered largely from the viewpoint of the Nile Valley in Egypt, crop rotation, quality of water, drainage, and biological conditions are discussed as factors influencing crop yield under irrigation.

Losses on storage of farm crops 1926–27 (*Jour. Southeast. Agr. Col., Wye, Kent, No. 25 (1928), pp. 195–199*).—Storage studies on stacked oats, barley, and wheat by W. Goodwin and F. L. C. Scrivener showed that grain in good condition when stacked undergoes only slight changes, and the loss probably does not exceed 1 per cent. The serious losses sometimes occurring seem due to

other causes, as immaturity or damp condition on stacking, poor stacks, or vermin.

Potatoes stored in clamps from October to June by Goodwin and H. Martin did not lose appreciably until February, when sprouting started and changes in composition of the tubers became very marked.

Rules and regulations for the certification of Grimm and Cossack alfalfa seed, C. B. AHLSON and L. D. RAEDER (*Idaho Sta. Bul. 158 (1928), pp. 17, figs. 3*).—These rules and regulations deal with certification methods, grades, fees, inspection, disposition of the seed, and authorized cleaning plants. The several forms used are illustrated.

The comparative value of scarified and unscarified alfalfa seed, C. W. LEGGATT (*Sci. Agr., 8 (1928), No. 11, pp. 726–728*).—Further trials at Lacombe and Brooks, Alberta, wherein scarified and unscarified alfalfa seed were compared under approximately farm field conditions confirmed earlier findings (E. S. R., 58, p. 534) that the hard seed of alfalfa are almost as able to make a stand as are the permeable seed. In view of the greater winter hardiness of hard seed, unscarified seed evidently have as much agricultural value as scarified seed.

St. Vincent arrowroot, G. WRIGHT (*Trop. Agr. [Trinidad], 5 (1928), No. 7, pp. 162–166, fig. 1*).—Statistics on the production and commercial movement of arrowroot starch are reviewed, and cultural methods and starch manufacture are outlined briefly.

Fifth report on the influence of soil, season, and manuring on the quality and growth of barley, 1926, E. J. RUSSELL (*Jour. Inst. Brewing, 34 (1928), No. 6, pp. 307–320*).—Further experiments (E. S. R., 57, p. 328) were conducted at 12 centers in England. The season of 1926 differed completely from those of the earlier experiments in having far less sunshine during the barley growing season. This brought out important properties of the nitrogenous fertilizing not observed in the previous experiments. In nearly half the experiments the nitrogen gave no increase in crop yield, and in certain centers there was evidence of a harmful effect on yield. It tended to lower the valuation of the barleys and malts, especially those of higher price, and to raise the nitrogen percentage in the barley and lower the 1,000-kernel weight.

At the center where lodging was studied the barley lodged worst had the lowest valuation and 1,000-kernel weight and the highest nitrogen content, whereas that lodged least had the highest valuation and 1,000-kernel weight and the lowest nitrogen content. Grain lodged to an intermediate degree was intermediate in these characteristics.

The percentage of nitrogen in the barley grain did not differ significantly from previous years. Results obtained to date suggested that the nitrogen percentage in the grain is affected more by the farm (presumably the soil) than by the season or the fertilizer, if not too heavy. The 1,000-kernel weight is slightly less variable.

The diastatic power of the malts was higher where the barley received ammonium sulfate than where it had not. There were indications that diastatic power is increased when the nitrogen of the grain increases. Ammonium chloride again surpassed ammonium sulfate, showing none of the harmful effect of the sulfate at Rothamsted, and at Rothamsted and Woburn lowering the percentage of nitrogen in the grain as compared with ammonium sulfate.

The barley experiments of 1926: Malting and analytical results, H. M. LANCASTER and H. L. HIND (*Jour. Inst. Brewing, 34 (1928), No. 6, pp. 321–333*).—The results of malting tests and analyses (E. S. R., 57, p. 328) are tabulated for the barleys from the experiments reported above and for barley

varieties being tested under the auspices of the National Institute of Agricultural Botany.

The barley experiments of the institute's research scheme, E. J. RUSSELL (*Jour. Inst. Brewing, 34 (1928), No. 8, pp. 436–446*).—A review of the experiments noted above.

The adaptation of medium red clover strains, A. C. ARNY (*Jour. Amer. Soc. Agron., 20 (1928), No. 6, pp. 557–568*).—Extensive strain tests at the Minnesota Experiment Station cooperating with the U. S. Department of Agriculture showed that medium red clover seed from France, Chile, and Italy are of no value for planting in Minnesota and do not seem to be generally adapted for agricultural use in the United States. The use of northern-grown domestic or of Canadian-grown seed is indicated. See also a previous note (E. S. R., 51, p. 234).

Irrigation of cotton, J. C. MARR and R. G. HEMPHILL (*U. S. Dept. Agr., Tech. Bul. 72 (1928), pp. 38, figs. 18*).—Information compiled on the irrigation of cotton, practiced in districts in Texas, New Mexico, Arizona, and California, deals with soils, preparation of land, irrigation methods, varieties, cultural practices, indications of the need for irrigation, and the quantity of water used.

Studies at Mercedes and Medina, Tex., in cooperation with the Texas State Board of Water Engineers, using Mebane and Kasch cotton, indicated a water requirement of about 18 in. on sandy loam soil under southern Texas conditions. An inconclusive test on loam soil at Mercedes suggested a requirement in the vicinity of 14 or 15 in.

Studies in Khandesh cotton, Part I, S. H. PRAYAG (*India Dept. Agr. Mem., Bot. Ser., 15 (1927), No. 1, pp. [1]+49, pls. 8, figs. 5*).—Cotton production in Khandesh, a district in the east of the Bombay Presidency, is described, with details of the history, characteristics, extent of mixtures, trials of the constituent types, improvement work by selection, and a study of the factors influencing yield in Khandesh cotton. Khandesh cotton largely pertains to *Gossypium neglectum*, although *G. indicum* and *G. hirsutum* occur in admixture. Spinning test results on some of the improved strains are appended.

Maarad cotton, A. S. PEARSE (*Internatl. Cotton Bul., 6 (1928), No. 24, pp. 731, 732*).—Maarad cotton, a pedigree selection from Pima, has outyielded Sakellaridis and other Egyptian varieties in the Nile Delta. Spinners suggest that Maarad has the qualities needed in a fine cotton, except that it does not have the full strength of Sakellaridis.

Moisture tests of Egyptian cotton, A. S. PEARSE (*Internatl. Cotton Bul., 6 (1928), No. 24, pp. 716–727*).—A summary of 941 tests, representing 29,657 bales of the 1927–28 crop of Egyptian cotton received in England, Czechoslovakia, France, Germany, and Switzerland shows an average excess of 0.551 per cent of moisture on dry weight over the 8.5 per cent regain. The excess moisture for uppers averaged 0.482 per cent and for delta cotton 0.662 per cent.

[Seventh annual report of the Empire Cotton Growing Corporation] (*[London]: Empire Cotton Growing Corp., 1928, pp. 44*).—This is a progress report of the cotton production activities of the corporation in British dominions and colonies for the year 1927–28.

A contribution to the comparative anatomy of the stem of Russian flax [trans. title], A. N. MEL'NIKOV (MELNIKOV) (*Trudy Prikl. Bot., Genet. i Selek. (Bul. Appl. Bot., Genet. and Plant-Breeding), 17 (1927), No. 3, pp. 273–288, figs. 32; Eng. abs., p. 288*).—Observations were made at Leningrad on pure lines and Russian and American varieties of fiber flax and on seed flax varieties from different localities in the Union of Socialistic Soviet Republics. The separate pure lines proved anatomically more or less homogenous, and only in single

cases, probably under the influence of different environmental conditions, were observed deviations in the structure of the flax stem. Anatomically all of the flax varieties represented more or less complex populations. However, these populations were not quite disordered, the variety often being characterized by special complexes of anatomical forms.

Longevity and viability of kafir seed, R. E. KARPER (*Jour. Amer. Soc. Agron., 20 (1928), No. 5, p. 527*).—Germination tests on kafir seed stored under the rather dry conditions of Lubbock, Tex., for 10 years gave results indicating that seed of kafir and probably of other similar grain sorghums stored under laboratory conditions have a rather consistent germinability up to 7 years, after which they lose their viability quite rapidly and, judging by the rate of decline, are worth little after 10 years.

Pennisetum typhoideum: Studies on the bajri crop.—I, The morphology of Pennisetum typhoideum, S. V. GODBOLE (*India Dept. Agr. Mem., Bot. Ser., 14 (1927), No. 8, pp. 247–268, pls. 10*).—The plant organs and agronomic characters of pearl millet, principally of the Deccan variety, are described in detail, and data are given on their variation. Important varieties are described briefly.

Studies on German potato varieties [trans. title], E. KLAPP (*Mitt. Biol. Reichsanst. Land. u. Forstw. No. 35 (1928), pp. 291, figs. 77*).—The merits of different stalk, tuber, and agricultural characters in distinguishing potato varieties are treated at length from the author's studies. The discussion is supplemented by a determinative key to important sorts, varietal descriptions, synonymy, and a bibliography.

Soybean production in Illinois, J. C. HACKLEMAN, O. H. SEARS, and W. L. BURLISON (*Illinois Sta. Bul. 310 (1928), pp. 466–531, figs. 15*).—Results of extensive varietal trials with soy beans at the station and at DeKalb are reported, and practical information is presented on the merits of the crop for feed, hay, and soil improvement and in rotations, cultural and field methods and harvesting and threshing practices, and the commercial utilization of the crop. Varieties are described, and comment is made on differences among and within soy bean varieties. Different aspects of the investigations supporting many of the recommendations have been noted earlier (E. S. R., 58, p. 327).

Sugar beet trials in Norfolk, 1924–1927 (*Norfolk Agr. Sta. [Sprowston, Norwich] [Pub.] 7 [1928], pp. 36*).—Experiments at the Norfolk Agricultural Station, England, dealt with nitrogenous fertilizers, bolting, ridged v. level culture, and other factors influencing sugar beet yields.

Gauged by root yields, the application of 3 cwt. per acre of sodium nitrate has given definitely profitable returns. The sugar percentages were evidently not affected by the higher nitrogen applications applied early in the season. Sodium nitrate proved superior to calcium nitrate.

Analyses showed that the earlier in the season the beets commence to bolt the greater is the loss in weight and sugar percentage. However, the later bolters have not reached the seeding stage by lifting time, and while the sugar percentage is decreased, their weights are not appreciably altered. Bolters were evidently encouraged by cold spells during germination, increasing the quantity of nitrogenous fertilizers, and varietal peculiarities. Although the sugar losses due to bolting have not been large, the greatest loss likely to be incurred thereby lies in the possibility of one or more bolters being present in the sample analyzed by the factory for sugar content. Ridging did not seem warranted at intervals closer than 24 in.

The relation between numbers of plants and yield, factors influencing stands, and the effect of downy mildew upon yields of roots and sugar contents are also reported on briefly.

[Experiments with sugar beet varieties in France in 1927], E. Saillard (*Com. Cent. Fabric. Sucre France, Circ. Hebd., 40 (1928), No. 2049, Sup., pp. [13]*).—The beet yields and percentages and yields of sucrose are shown for 7 French and 7 foreign varieties of sugar beets compared on 13 farms in the sugar beet districts. The sucrose contents ranged from 17.97 to 15.91 per cent and sugar production per hectare from 5,752 to 4,899 kg. (2.56 to 2.18 tons per acre). Janasz, Granum, Kuhn, Martin, and Bourdon led in sugar content, and Dobrovice, Granum, Legland R, Kuhn, Bourdon, and Dippe W. I. produced the most sugar per unit area.

Seed production in Czechoslovakia, G. Heidler (*Facts About Sugar, 22 (1927), No. 49, pp. 1184, 1185, figs. 2*).—The scope of investigations by the Semcice Sugar Beet Breeding Station is outlined, and the characteristics sought for in beet improvement are described.

Germination of sugarcane pollen in artificial culture media, N. L. Dutt and G. G. Ayyar (*Agr. Jour. India, 23 (1928), No. 3, pp. 190–202, pls. 2*).—Investigation at the sugar cane station at Coimbatore showed that the best germinations of cane pollen were obtained in a 26 per cent solution of sucrose plus 0.7 per cent of agar culture medium. The moist chamber adopted was a glass ring 7.5 mm. high and 17 mm. in diameter covered by a cover glass containing dusted pollen on the culture medium, and several drops of this medium at the bottom of the chamber supplied moisture satisfactorily. Tests of both thick and thin sugar cane varieties and Java, Coimbatore, and other seedlings showed a fairly wide range in germination percentages. M. 54111, a station seedling, gave the highest germination, 61 per cent. Germination proceeded at from 22 to 33° C. (71.6 to 91.4° F.), although at 30 and 33° there was a tendency to burst. Pollen germinated in spite of cloudy or rainy weather. Pollen of Saretha Desi, a thin variety, retained viability for 2 hours when exposed to air in the laboratory and for 1 hour when exposed to open air in direct sunlight.

The ratios of ash constituents in different cane varieties, C. E. Coates, E. A. Fieger, and L. G. Salazar (*Planter and Sugar Manfr., 80 (1928), No. 22, pp. 421, 422*).—The moisture, ash, and nitrogen contents and the constituents of the ash are shown for leaves, stalks, and roots of the D. 74, P. O. J. Nos. 36, 213, and 234, Louisiana Purple, and Louisiana Striped varieties of sugar cane, with data on the pounds of sugar per pound of potash and of phosphoric acid in the dry matter of the first four sorts. The work had not progressed far enough for definite conclusions.

Deterioration of sugar content in P. O. J. canes, G. B. Sartoris (*Facts About Sugar, 23 (1928), No. 28, pp. 662–665*).—Experimental results at the U. S. Sugar Plant Field Station at Houma, La., and on plantations near Houma and Lafayette showed that the varieties P. O. J. Nos. 36, 213, 234, and 826 will withstand average winter weather without appreciable loss in sugar content or fall in the coefficient of purity. In the event, however, that temperatures should fall below normal, low enough to split the cane, it seems advisable to windrow. Tests on cane cut for the mill, stripped, and placed in heap rows indicated that during very warm weather, especially if continuous for several days and if there has been no cold weather, the cane cut for the mill deteriorates quite rapidly. Later in the season and during normal fall weather the rate of spontaneous inversion is very slow, and the loss in sucrose is not significant during the first 10 days after cutting. While cane burned in December while standing in the field did not deteriorate rapidly, results did not seem conclusive because under warm weather conditions deterioration may proceed faster.

Experiments in the harvesting of burned cane, H. H. Dodds and P. Fowlie (*Facts About Sugar, 23 (1928), No. 25, pp. 594, 595*).—Burning tests with Uba

sugar cane at the Natal Sugar Experiment Station (E. S. R., 57, p. 733), considered together with the studies of De Froberville (E. S. R., 52, p. 735) and Dymond (E. S. R., 53, p. 838), showed that the changes in sugar cane after harvesting leading to diminution in weight, sucrose content, and purity were delayed for from 7 to 9 days by burning the cane before cutting under the experimental conditions but appeared to set in at an accelerated rate thereafter. Cane left standing after burning with moderate intensity did not suffer deterioration in purity, sucrose content, or Java ratio for 9 days, but from then on showed a slow and gradual diminution in sucrose content and purity, probably associated with the renewed growth in the cane. Regardless of agronomic objections, burning before harvest tended to improve keeping qualities as compared with unburnt cane over the first 10 days after harvesting.

Helianthus argophyllus, K. S. Markley and W. T. Schreiber (*Indus. and Engin. Chem., 20 (1928), No. 6, pp. 636, 637*).—The analysis presented indicates that in regard to the content of crude fiber, protein, and nitrogen-free extract, *H. argophyllus* has about the same roughage value as the common sunflower (*H. annuus*). The yield of furfural is far below that for oat hulls and corncobs. The total cellulose content, 46.5 per cent, compares favorably with that of cotton stalks. This material probably could not compete with wood in the cellulose ester, rayon, or paper industries at present. However, considering the diminishing wood supply it might compete with such materials as bagasse, cotton stalks, and grain hulls as sources of cellulose.

The objectives of wheat breeding, C. L. Alsberg and E. P. Griffing (*Wheat Studies, Food Research Inst. [Stanford Univ.], 4 (1928), No. 7, pp. [1]+269–288*).—Factors entering into the breeding of wheat for yield or protein content and plant characteristics are reviewed, with brief discussion of the breeding of soft and durum wheats, history of wheat breeding, and the complexity of the problem. The economic aspects deemed now important are the outgrowth of a long evolution in agriculture, in milling and baking technology, in the science of genetics, and in standards of living.

Some plant characters determining yields in fields of winter and spring wheat in 1926, K. S. Quisenberry (*Jour. Amer. Soc. Agron., 20 (1928), No. 5, pp. 492–499*).—The yields of fields of wheat and grain per head were determined from the heads cut from 24 4-ft. lengths of drill row taken at random in fields of winter wheat in different localities in Oklahoma, Kansas, Nebraska, and Montana, and spring wheat in Montana.

The estimate from the sack sample in most cases gave an approximation ($r=+0.5909\pm0.0347$) to actual yields reported by the farmers. The data suggested that, under the cropping conditions in the fields sampled, number of heads per unit area was a factor of prime significance in determining yield and was closely followed by number of kernels per head or size of head. Plumpness of grain or weight of 1,000 kernels was not so important in determining yield as the other two factors. There appeared to be little relationship between number of heads per area and size of heads or plumpness of grain, emphasizing the importance of full stands and demonstrating that thin seeding does not increase the size of kernels.

Results from cooperative rod-row wheat trials in 1927, L. R. Waldron (*Jour. Amer. Soc. Agron., 20 (1928), No. 5, pp. 500–510*).—Results in 1927 from 21 cooperative rod-row wheat trials variously located in North Dakota appeared to be satisfactory when judged by the size of the probable errors, the rank in yield of certain wheats of known previous behavior, and by the general consistency of the results among themselves. Garnet outyielded Marquis significantly, and in eastern North Dakota the rust resistant hybrid selection

1656.85 significantly outyielded all wheats, although in one region it yielded less than Mindum durum. For 12 localities in eastern North Dakota 1656.85 yielded about 16 bu. more than Marquis. The essentially immune variety Hope stood about midway between Marquis and 1656.85.

In western North Dakota, with less rust, 1656.85 did not show the same advantage over Marquis as farther east. It appeared that factors other than rust caused losses equal to or surpassing those due to rust. The estimated loss of common wheat in North Dakota in 1927 due to stem rust was 28.6 per cent, or about 26,000,000 bu.

Locality and the rapidity of after-ripening in winter wheat [trans. title], E. A. Bychikhina (Bytschikhina) (*Zap. Semenovedeniiu (Ann. Essais Semences, Jardin Bot. Leningrad), 5 (1927), No. 4, pp. 33–43, fig. 1; Ger. abs., p. 43*).—The rate of after-ripening of pure lines of winter wheat from the Odessa district remained independent of the region where grown and was typical for each line. Late harvest resulted in delay in attaining the physiological maturity of the seed.

The official seed-testing station: Record of operations for 1927, N. R. Foy (*New Zeal. Jour. Agr., 36 (1928), No. 5, pp. 330–338*).—The average purity and germination are shown for 10,768 samples of agricultural seed tested at the New Zealand seed-testing station at Wellington during 1927. Examinations showed that with few exceptions the so-called cheap pasture mixtures were very poor in quality and worth much less than their cost.

The application of physiological methods to weed control, P. B. Kennedy and A. S. Crafts (*Plant Physiol., 2 (1927), No. 4, pp. 503–506*).—Field experiments at the University of California suggested that the effectiveness of morning-glory control by the spray method apparently depends upon atmospheric and soil conditions which produce a water deficit resulting in a subatmospheric pressure within the xylem system, and a period of exposure to the spray long enough to provide for penetration of the toxic solution. Penetration is influenced by insect injuries to the cuticle, temperature, and death of the cells, which renders the tissues readily permeable.

The spray solution must render permeable the tissues from epidermis to xylem. This has been accomplished by acids, bases, and hydrocarbons in commercial sprays now used as herbicides. It must also kill the tissue in the roots after translocation therein. Arsenic has been most effective in the latter case.

HORTICULTURE

[Horticultural investigations at the Alabama Station], R. W. Taylor and C. L. Isbell (*Alabama Sta. Rpt. 1926, pp. 23, 24*).—Of seven apple varieties, Winesap, Stayman Winesap, Red June, Golden Delicious, Delicious, Red Astrachan, and Hackworth, tested on a stiff, red clay soil in Talladega County, the two Winesaps made the greatest growth, as measured by trunk girth, and the Winesap and Red Astrachan were the most productive. The orchard was planted in 1917.

In experiments conducted in Mobile County cottonseed meal on the basis of equivalent nitrogen content gave higher yields of cabbage than did nitrate of soda. Muriate of potash proved more efficient than did sulfate of potash.

[Horticultural investigations at the Hawaii Station], W. T. Pope and J. C. Ripperton (*Hawaii Sta. Rpt. 1927, pp. 3–13, 20, pls. 3, fig. 1*).—This report as usual (E. S. R., 57, p. 335) consists largely of data on cultural and acclimatization tests with various plants, mostly subtropical fruits such as the avocado, mango, papaya, breadfruit, cherimoya, Macadamia nut, and fig. A comparison

of the results of analyses of vegetables grown in the Hawaiian Islands with those grown at Arlington, Va., showed only minor differences that could be attributed to environment. The Hawaiian vegetables compared favorably in their mineral constituents with those grown on the mainland.

[Horticultural investigations at the Moses Fell Annex Farm, Bedford, Ind.], H. J. Reed and H. G. Hall (*Indiana Sta. Circ. 152 (1928), pp. 10, 11*).—Further observations on flower bud hardiness in peaches (E. S. R., 57, p. 635) showed Captain Ede, Salway, Hale, and Shipper Late Red to have lost all their buds in 1927 and 1928; Rochester, Greensboro, Gold Drop, and Crosby had enough live buds for a crop; Belle, Hiley, Champion, and Carman had prospects of a partial crop; and Heath and Krummel had only a few live buds.

In ordinary cellar storage Grimes Golden and Jonathan apples were held satisfactorily for from 1 to 3 months, depending on weather conditions during the harvest season. Late maturing varieties, such as Rome, York Imperial, Winesap, and Ben Davis, were carried through until spring. The use of ice with the cooled air circulated by an electric fan enabled Grimes Golden apples to be held in good salable condition about one month longer than without ice.

[Horticultural investigations at the Rhode Island Station] (*Rhode Island Sta. Rpt. 1927, pp. 40, 41*).—The usual annual statement of progress (E. S. R., 57, p. 435).

Of 10 varieties of tomatoes tested prior to the beginning of a fertilizer study the Shirley Bonny Best gave much the largest total yields of first class fruits. Contrary to the results of the two preceding years, the green strain of Hubbard squash outyielded the blue in 1927.

In a fertilizer experiment with small fruits, red raspberries were more affected by qualitative changes in the fertilizer than were grapes, blackberries, and black and purple raspberries. Under the conditions of the experiment red raspberries were affected in decreasing order by the omission of potash, nitrogen, and phosphoric acid. The Plum Farmer and Gregg black raspberries and the Delaware grape were found unsuited to the environment. Of four red raspberries tested, Latham, Cuthbert, Herbert, and June, the Latham was found the most vigorous.

The inheritance of flower types in Cucumis and Citrullus, J. T. Rosa (*Hilgardia [California Sta.], 3 (1928), No. 9, pp. 233–250, figs. 6*).—Pointing out that horticultural varieties of melons and cucumbers belonging to the genus Cucumis and of watermelons belonging to Citrullus may be divided according to the arrangement of the sex organs into two groups, (1) andromonoecious (plants with staminate and hermaphroditic flowers), and (2) monoecious (plants with staminate and pistillate flowers), the author states that horticultural varieties of melons (*Cucumis melo*) are predominantly andromonoecious, while cucumbers and watermelons, on the other hand, are practically all monoecious. The variations of melons, cucumbers, and watermelons were found to be remarkably constant. Of hundreds of watermelon and cucumber flowers examined no case was found of hermaphroditic flowers on monoecious varieties of plants. Variations in the hermaphroditic flowers were occasionally observed in the andromonoecious varieties of watermelons, there being sometimes only one or two stamens in place of the usual three. Occasional pistillate flowers, 15 in 2,802, were recorded on andromonoecious plants of certain varieties of *C. melo*. The author suggests that these variant blooms are possibly the result of simple somatic mutations. The fruits developing from the offtype blooms were larger, longer, and had more pronounced sutures than did sister fruits on the same plants. Based on this change in fruit shape, the author estimates an

occurrence of about 1 in 400 fruiting flowers in inbred lines of the Salmon Tint variety.

Hybridizing experiments suggested that the monoecious condition depends upon a single dominant factor in all three of the species studied. The F_2 generation closely approximated the expected Mendelian 3:1 ratio. The author believes that hermaphroditic flowers are the primitive type from which the pistillate have arisen by dominant gene mutation. Furthermore, it is believed that the flowers of Cucumis and Citrullus were originally pentamerous throughout, and that the now prevailing tricarpellate ovary has arisen by the elimination of two carpels. Further support for this theory is seen in the presence of one single and two double stamens in the tricarpellate melons. Crosses of tricarpellate with five-carpellate varieties showed the five-carpellate condition to be recessive and probably dependent on a single major factor difference. An association of shape with carpel number was observed in melons, the five-carpellate fruits of the F_2 progeny being globose or oblate as compared with oval or oblong shape in tricarpellate fruits.

Lettuce seed and its germination, H. A. Borthwick and W. W. Robbins (*Hilgardia [California Sta.], 3 (1928), No. 11, pp. 275–305, figs. 24*).—Emphasizing the fact that lettuce seed, particularly freshly harvested seed, is distinctly inhibited in germination by high temperatures, the authors discuss the morphology of the lettuce seed as relates to germination and report the results of various physiological studies.

At from 1 to 25° C. (34 to 77° F.) germination in the New York variety was excellent but fell off abruptly above 25°. Certain varieties, such as Drumhead, Grand Rapids, Iceberg, Salamander, and Tom Thumb, showed higher temperature resistance, germinating well at 29°. In general freshly harvested seed possessed lower germinability than that several months old. Records of germination of seeds held in a dry state for 0 to 37 days at temperatures of 4°, 12°, and laboratory temperature showed no significant benefit as a result of the lower temperatures. However, with seeds exposed for 6 days at low temperatures (1 and 4°) while moist there was found a distinct benefit when the seed were subsequently sown at 30°. Subsequent drying slowly reduced germination in the treated seeds, after 14 days the germination being 32 per cent as compared with 67 in the beginning. A successful commercial application was devised in which lettuce seed in cheesecloth was laid on ice for 5 days prior to planting. Immersion in cold water gave unfavorable results, apparently because of the lack of sufficient oxygen.

The failure of lettuce seed to germinate at high temperatures is believed due to the retardation of gas exchange by the two layers of endosperm cells and integumentary membrane which closely invest the embryo. Naked embryos placed at 30° in a moist environment grew strongly, but when the membrane and endosperm were not removed no germination occurred. Increased oxygen pressure increased germination of seeds at 30°. Since growth proceeded at high temperatures when once initiated, the authors suggest the probability that certain changes once under way are irreversible.

Native crabs: Their behavior in breeding, C. S. Crandall (*Illinois Sta. Bul. 311 (1928), pp. 533–560*).—Recognizing six native American species of crab apples, *Malus coronaria, M. angustifolia, M. soulardii, M. ioensis, M. fusca,* and *M. dawsoniana,* all of which are growing at the station and have been used in breeding operations, the author presents a summary of the results of various pollinations between these crabs and cultivated apples and of self-pollinations of the crabs, other crablike apples, and of cultivated apples.

In general the seedlings obtained from cross-pollination were outstandingly lacking in vigor, a large percentage dying in the nurseries. Self-pollination of the native crabs gave rise to no viable seed in the case of *M. coronaria*, *M. ioensis*, *M. soulardii*, and the Mercer County Crab. The only success was one seedling obtained from *M. dawsoniana*. From the 38 foreign crabs there were obtained very few seedlings by self-pollination. Only 11 of the 38 yielded seedlings of good vigor, and of these 11, 7 are each represented by a single tree. Of 35 orchard varieties self-pollinated 26 were absolutely fruitless or produced no living seedlings, and only two, Longfield and Wythe, produced good seedlings.

FORESTRY

The national forests of Colorado (*U. S. Dept. Agr., Misc. Pub. 18 (1928), pp. [2]+38, figs. 26*).—Discussing the general purposes and the administration of the national forests, this paper takes up each of the 15 Colorado National Forests in particular, directing attention to their location, accessibility, forest stands and timber resources, reforestation activities, grazing values, principal scenic features, recreational facilities, etc.

DISEASES OF PLANTS

Author and subject index to the publications on plant pathology issued by the State agricultural experiment stations up to December 1, 1927, compiled by J. M. Allen (*U. S. Dept. Agr., Library, Bibliog. Contrib. 16 (1928), pp. XIII+251*).—Author and subject indexes are given to the publications on plant pathology that have appeared in station reports, bulletins, circulars, and the *Journal of Agricultural Research*. Anonymous contributions, publications on diseases caused by insects, press bulletins, and certain other popular series are not included in the list, which replaces Bibliographical Contribution 2 (E. S. R., 47, p. 347).

The literature of plant protection [trans. title], H. Morstatt (*Angew. Bot., 8 (1926), No. 6, pp. 351–364*).—A classified bibliography is given covering general and special contributions bearing upon protection of plants against both pests and diseases.

[Plant disease studies at the Alabama Station], W. L. Blain (*Alabama Sta. Rpt. 1926, pp. 16, 17*).—Experiments are said to have shown that 25 strains of sweet potatoes received from Mayaguez, P. R., were resistant to the attack of black rot when grown in soils heavily inoculated with diseased material.

Pecan scab (*Fusicladium effusum*) was isolated from the pecan variety Delmas and grown in cultures. It was found that scab can be commercially controlled on susceptible varieties by thorough spraying at short intervals.

Phytopathological communications [trans. title], J. Eriksson (*Arkiv Bot., 19 (1925), No. 2, pp. 1–29, figs. 12*).—Information, with references to the literature, is given regarding bean anthracnose (*Colletotrichum lindemuthianum*), bean rust (*Uromyces appendiculatus*), beet mildew (*Peronospora schachtii*), and apple fusariose (*Fusarium willkommi*).

Report of the Institute for Plant Diseases [trans. title], [R.] Schander (*Landw. Jahrb., 64 (1926), No. 1, pp. 63–113*).—This report, made up chiefly of summaries signed by the collaborators separately, covers the portions indicated of the Provinces, Grenzmark and Brandenburg.

Plant disease control in Germany [trans. title] (*Nachrichtenbl. Deut. Pflanzenschutzdienst, 7 (1927), No. 2, pp. 19–24*).—Tabular detail and discussion are given regarding tests made in February, 1927, of materials for treating

cereal seed and for similar use in connection with wine, fruit, and garden industries, as well as for use against weeds and rodents.

List of the more notable cases of plant disease observed in 1926 [trans. title], L. PETRI (*Bol. R. Staz. Patol. Veg.* [*Rome*], *n. ser.*, *7* (*1927*), *No. 1, pp. 1–45, figs. 2*).—Recent forms of pathology are reported systematically as affecting plants, which are for this purpose given a practical classification.

Phytopathological research and pest control in Russia [trans. title], A. BUCHHEIM (*Angew. Bot.*, *8* (*1926*), *No. 1, pp. 1–8*).—A condensed general account is given of plant disease and pest protective measures in the Soviet Union, with a bibliography of 15 titles, 12 in Russian.

Mycological notes, W. SMALL (*Trop. Agr.* [*Ceylon*], *67* (*1926*), *Nos. 2, pp. 94, 95; 4, pp. 237–239; 6, pp. 323–326; 68* (*1927*), *No. 2, pp. 73–75, pl. 1*).—*Rhizoctonia bataticola*, formerly designated *Sclerotium bataticola* (E. S. R., 57, p. 745) and recently found frequently on tea and other plants in Ceylon, is present in widely separated districts and is a factor to be reckoned with in the raising of certain locally-grown crops. It is thought possible that susceptibility differs locally. Several new hosts have been recorded, namely, *Coffea robusta*, Albizzia seedlings, plantains, tomato, orange, and *Amherstia nobilis*, and additional data are given concerning the occurrence of the fungus on rubber and chili. The number of species of Ceylon plants affected by *R. bataticola* is now 27. A large number of examples of rubber root disease have been examined in recent months, and *R. bataticola* has been associated with every case.

Recent work on root disease of economic and other plants in Ceylon, W. SMALL (*Trop. Agr.* [*Ceylon*], *68* (*1927*), *No. 4, pp. 201–212*).—In statements intended to apply particularly to Ceylon, but suspected to have also a far wider application, it was attempted to show that in every recent case of root disease *Rhizoctonia bataticola* has been present either alone or associated with another fungus; that such other fungus may be entirely secondary to *R. bataticola;* and "that *R. bataticola* must be regarded as a destructive parasite of woody plants and trees, in fact, as the only parasite of present importance in the causation of root disease and its secondary results, for example, dieback and stem-gumming, in Ceylon." Other points were mentioned, and the above stated views were subjected to critical discussion, which is briefly reported.

Root diseases of economic crops, C. H. GADD (*Trop. Agr.* [*Ceylon*], *68* (*1927*), *No. 6, pp. 363–370*).—This is a discussion, partly critical, of the statements by Small, above noted.

Rhizoctonia bataticola and root disease, W. SMALL (*Trop. Agr.* [*Ceylon*], *68* (*1927*), *No. 6, pp. 370–381*).—A reply is made to critical statements by Gadd, above noted.

[Plant diseases, Deli], S. C. J. JOCHEMS (*Meded. Deli Proefsta. Medan, 2. ser., No. 45* (*1927*), *pp. 11–16*).—Chiefly, tobacco diseases are dealt with in this report.

Influence of the previous crop on the development of slime disease (Bacterium solanacearum) in Arachis and certain other plants [trans. title], M. B. SCHWARZ (*Dept. Landb., Nijv. en Handel* [*Dutch East Indies*], *Meded. Inst. Plantenziekten, No. 71* (*1926*), *pp.* [*3*]+*37; Eng. abs., pp. 23, 24*).—In a summary by C. Hartley, it is stated that on soils in which the disease percentage in Arachis is high, the disease intensity in tomato and tobacco is proportionally high. Soils sick for Arachis, however, are not always sick for *Hibiscus cannabinus*, and no correlation was found between the amounts of disease present in Arachis, *Solanum melongena, S. tuberosum, Rumex sagittatus, Heliotropium indicum*, and *Eleutheranthera ruderalis*. Cropping repeatedly a given soil with a susceptible host increased disease intensity for that host, but

not for all other hosts. The tentative conclusion is drawn that the strain which attacks Arachis, tomato, and tobacco at Buitenzorg differs from the strain or strains attacking the other species above named, though the Hibiscus is attacked either by the Arachis strain or by some other. The conclusion concerning Hibiscus is supported by evidence from Deli and Sumatra, as well as from Buitenzorg. Preliminary but inconclusive trials were made also with *Vigna sinensis* and with *Zinnia elegans*.

The field results outlined are said to confirm the inoculation experiments of Stanford and Wolf (E. S. R., 38, p. 250).

Annual report of the mycologist for 1926, [A. Sharples] (*Malayan Agr. Jour., 15 (1927), No. 5, pp. 152–159*).—This report (E. S. R., 58, p. 156) deals with rubber wet rot (*Fomes pseudoferreus*), sun-scorch, die-back, *Diplodia* sp., collar patch canker (*Phytophthora faberi*), a broken branch stem disease (*Ustulina maxima—U. zonata*), seedling leaf attack (*Helminthosporium heveae*), young rubber attack (*F. lignosus*), brown bast, black stripe, and mouldy rot; coconut palm bud rot (*P. palmivora*), a fruit-bunch disease (*Marasmius* sp.), and nut fall; African oil palm crown disease and bud rot; and a few miscellaneous diseases.

Parasitism in the genus Comandra, E. H. Moss (*New Phytol., 25 (1926), No. 4, pp. 264–276, figs. 9*).—In an account regarding the semiparasitic habit and host plants of Comandra, referring somewhat particularly to *C. richardsiana* and especially to the parasitism of fine roots by *C. livida*, the haustorium by which attachment is effected with the underground parts of the host is compared with haustoria of other semiparasites. Close resemblance to the haustorium of Santalum is noted, and the morphological nature of the haustorium is discussed.

Penetration by the haustorium is effected through prying folds which thrust aside the periderm, and by a median sucker which pushes through cortex and phloem to the xylem. A well-defined gland, which frequently develops in the sucker of the haustorium, presumably functions as a producer of digesting enzymes. The haustorial tracheids become intimately associated with the host xylem. Food material transfer is discussed. Self-parasitism occurs in Comandra as in other santalaceous forms. In various localities *C. livida* shows in large numbers variegated and more or less dwarfed individuals. Histologically, the leaves of these abnormal plants show features typical of mosaic diseases.

Mosaic diseases [trans. title], E. Schaffnit (*Angew. Bot., 8 (1926), No. 5, pp. 304–313*).—This gives significant statements from an address delivered at Düsseldorf, September, 1926, with a bibliography of 17 titles.

Mosaic symptoms on raspberry [trans. title], W. Müller (*Nachrichtenbl. Deut. Pflanzenschutzdienst, 7 (1927), No. 7, pp. 65, 66*).—This discussion bears upon the statements by Schaffnit noted above.

New methods in Phytophthora control [trans. title], E. Köhler (*Nachrichtenbl. Deut. Pflanzenschutzdienst, 7 (1927), No. 4, p. 37*).—Critical discussion is offered regarding Van Everdingen's statements (E. S. R., 58, p. 342) relative to an account given by Löhnis.

Preventive and curative treatment for plant tumors [trans. title], H. R. Oppenheimer (*Angew. Bot., 8 (1926), No. 1, pp. 8–29, pl. 1, figs. 6*).—An account is given regarding tests of disinfection measures, methods, and materials for the control of plant tumors, the principal successful fungicide employed being Uspulun, which is stated to be essentially a sulfate of mercury chlorophenol.

Pythium damping-off of seedlings, J. C. Ramos (*Philippine Agr., 15 (1926), No. 2, pp. 85–97, pl. 1, fig. 1*).—Seedling damping-off is common in seed beds in

the College of Agriculture at Los Banos, Laguna, attacking seedlings throughout a wide varietal range and causing under favoring conditions large losses in the seed beds. The disease attacks seedlings 2 to 5 days after their emergence, just above the soil surface, causing water-soaked and sunken lesions, loss of turgidity, drop, and rot. The organism *P. debaryanum* is favored by excessive moisture, warmth, and thick planting.

"The severity of damping-off in seed flats can be reduced by sterilization with heat. Sulfuric acid, Uspulun, and U–175 in solution of 0.75 to 1.0 per cent, when applied in the amount of 250 cc. to every 3 kg. of soil 4 or 5 days before sowing, showed considerable reduction of damped-off seedlings in experimental seed flats."

Virus diseases of plants [trans. title], K. Böning (*Prakt. Bl. Pflanzenbau u. Schutz, 5 (1927), No. 2, pp. 33–42*).—An account, containing a bibliography of 17 titles, is given of the history and present state of knowledge concerning virus diseases of plants, for the control of which only resistant varieties as yet offer much encouragement.

Estimating the effective contents of plant protectives, I [trans. title], J. Bodnár and S. Terényi (A. Terényi) (*Kisérlet. Közlem., 30 (1927), No. 3, pp. 280–287; Ger. abs., pp. 286, 287*).—Simple and rapid analytical methods are indicated for ascertaining the effective fraction in plant protective preparations, two of which are named.

Methods of testing dry fungicides in the laboratory [trans. title], A. Winkelmann (*Nachrichtenbl. Deut. Pflanzenschutzdienst, 7 (1927), No. 2, pp. 15, 16, fig. 1*).—The author describes a method which is said to correspond to natural conditions and at the same time to permit a convenient and microscopic control, and which is said to have been proved practical by field tests.

Dry fungicides [trans. title], G. Friedrichs (*Pflanzenbau [Berlin], 4 (1927), No. 10, pp. 145–149, figs. 5*).—Detailed conclusions include a statement regarding the need for preparations freer from the heightened water absorption and from the increased action of iron containers that are met with in certain dusts.

Water and its uses for spraying purposes, T. Parker (*Gard. Chron., 3. ser., 79 (1926), No. 2061, pp. 458, 459, fig. 1*).—Brief discussion is given of causes and phases of water hardness, water-softening methods, and practical considerations connected with the use of water as a diluent and carrier in fungicidal operations.

Fungicidal activity of furfural, H. H. Flor (*Iowa State Col. Jour. Sci., 1 (1927), No. 2, pp. 199–223*).—Toxicity studies employing *Puccinia coronata holci, Ustilago hordei,* and *Sphacelotheca sorghi,* subjected to dilute solutions of formaldehyde, butylaldehyde, benzaldehyde, furfuraldehyde, propylaldehyde, and acetaldehyde, showed these aldehydes to differ as regards their toxic action on the three fungi used, the greatest toxicity being shown by benzaldehyde, formaldehyde, and butylaldehyde. The action of the different fungicides is described.

Dust derivatives of furfural reduced but did not control smut. Mercuric-chloride dust or a mixture of 2 parts mercuric-chloride dust to 1 part of copper carbonate or furfuramide reduced oat smut considerably, but did not entirely eliminate it. Mercuric-chloride dust proved injurious to wheat and oat germinations in all cases. Dust derivatives of furfural and copper carbonate benefited wheat germination in case of poor quality seed. Under similar conditions formaldehyde caused more injury to seed germination than did furfural in equal concentrations.

Treatment of seed potatoes infected with Rhizoctonia employing solutions of 1–100, 1–50, and 1–33 furfural for 2 minutes at 50° C. controlled Rhizoctonia as

well as did 1–120 hot formaldehyde treatment in 1924. The 1–200 furfural and furfuramide dust treatments proved unsatisfactory. In the 1925 field trials the 1–200 hot formaldehyde treatment controlled Rhizoctonia better than did any other treatment.

Post-blossoming use of lime-sulphur spray, and fruit-dropping, N. H. GRUBB and R. G. HATTON (*Gard. Chron., 3. ser., 79 (1926), No. 2053, pp. 324, 325*).—Considering critical accounts by Bagenal, Goodwin, Salmon, and Ware, some of which have been noted (E. S. R., 56, p. 849), the present authors emphasize the statement "that fruit dropping, following the application of lime sulfur spray at normal concentrations to apple trees after the petals fall, is a factor to be seriously considered by growers," as the risk is very great of reduction of commercial crops by this means.

Seed treatments [trans. title], WEIDINGER (*Prakt. Bl. Pflanzenbau u. Schutz, 5 (1927), No. 6, pp. 141, 142*).—Several proprietary preparations were tested.

Species in cereal rusts [trans. title], J. DUFRENOY (*Rev. Bot. Appl. et Agr. Colon., 7 (1927), No. 69, pp. 305–309*).—An account in outline, with a dozen references, is given of rust susceptibility and resistance, physiological races of rusts, the influence of age and other conditions, specialization in parasitism, and hereditary transmission of resistance.

Fusarium as causal in cereal stem base disease [trans. title], O. KRAMPE (*Angew. Bot., 8 (1926), No. 4, pp. 217–261, pls. 4*).—Foot disease resembles considerably seedling disease, in which stage of infection it may have its origin. Fungi are listed which have been isolated from cereal stalk base diseased areas.

Wheat leaf anatomy and rust resistance [trans. title], H. SCHRÖDER (*Landw. Jahrb., 65 (1927), No. 3, pp. 461–487, pls. 3, fig. 1*).—In an account of studies on resistance in wheat to *Puccinia glumarum*, dealing more particularly with leaf anatomy and listing selected literature, the author states that winter hardiness bears no necessary relation to rust resistance. Early-ripe varieties appeared in 1925 and 1926 to be more susceptible to rust, though no relation is claimed to exist between maturity and rust resistance. Leaf spotting may indicate resistant varieties. Ear form has no relation to hardiness. Density of head appears to bear a loose relation to resistance, and the same is true of stalk length. Potassium is higher in resistant varieties. Stomatal number and size are without significance, as are other characters indicated. The relative importance of characters is discussed.

Wheat rust resistance [trans. title], W. RUDORF (*Pflanzenbau [Berlin], 4 (1927), No. 3, pp. 36–39*).—An account is given regarding a study of methods of artificial rust infection in the search for resistant varieties, also of the preliminary data from infections with brown rust in the case of 88 winter wheats and of 32 spring wheats, with 23 references to related literature.

Causes of differing varietal susceptibility of wheats to stinking smut [trans. title], W. STRAIB (*Pflanzenbau [Berlin], 4 (1927), No. 9, pp. 129–136, figs. 2*).—Of 26 winter wheats, studied for resistance to stinking smut, 24 varieties were highly susceptible and in almost equal degree, the other 2 (red) varieties showing only about half the percentage of infection shown by the others. In 8 spring wheats rapidity of growth corresponded to a delay (ranging as high as 10 days) in the appearance of the smut outbreak. Susceptibility in most of the spring wheats was much lower than in the winter varieties. Stinking smut percentage of attack was about equal throughout the spring varieties.

Wheat stinking smut susceptibility appeared to be a quality inherent in the variety, though attack percentage shifts considerably under the influence of changing chemical, physical, and climatic factors.

Wheat seed treatment against stinking smut [trans. title], J. Bodnár and S. Terényi (A. Terényi) (*Kisérlet. Közlem., 30 (1927), No. 3, pp. 275–279; Ger. abs., p. 279*).—Tillantin B and Tillantin C at 0.2 per cent (as previously tested) and even at 0.4 per cent produced no injurious effect on wheat seed germination. Smut spores were completely killed.

A nematode discovered on wheat in Saskatchewan, R. C. Russell (*Sci. Agr., 7 (1927), No. 10, pp. 385, 386, figs. 2*).—A wheat root infesting nematode was discovered in the summer of 1926 in the Humboldt district, where it was associated with stunting of the wheat plants but was not found on other plants. This organism is said to resemble closely *Heterodera schachtii*, which attacks severely sugar beets in Germany and in the United States and has been reported on wheat in Germany, but not in the United States. Saskatchewan soil temperatures are indicated in this connection.

Bean bacterial wilt [trans. title], C. Stapp (*Nachrichtenbl. Deut. Pflanzenschutzdienst, 7 (1927), No. 9, pp. 88–90, figs. 5*).—Brief discussion refers to the bean wilt, from which Hedges had previously isolated an organism (E. S. R., 47, p. 148; 55, p. 846) described as *Bacterium* (*Pseudomonas*) *flaccumfaciens*.

Clover canker [trans. title], Flachs (*Prakt. Bl. Pflanzenbau u. Schutz, 5 (1927), No. 3, pp. 69, 70*).—Severe winterkilling of clover by clover canker (*Sclerotinia trifoliorum*) is stated to have occurred recently. Means for effective control have not yet been worked out, though some suggestions are available.

A study of Fusaria common to cotton plants and cotton soils in the Central Provinces, J. Singh (*India Dept. Agr. Mem., Bot. Ser., 14 (1927), No. 6, pp. 189–198, pls. 3*).—Data are given of isolations and studies of eight forms of Fusarium obtained from wilted cotton plants or cotton wilt soils in localities indicated.

The parasitism of all the strains of Fusariums isolated from various sources was tested by inoculation experiments during the cotton seasons of 1924–25, 1925–26, and 1926–27, heavily infecting the soil with vigorously growing cultures one or two weeks before sowing the seed, at the time of sowing, or when the plants were from two to four weeks old. Some plants were inoculated every fortnight for six months. None of the inoculated plants developed wilt. From the inoculated soil the fungus was reisolated six months later, the Fusarium remaining viable in the soil but incapable of infecting plants sown in such soil.

Cotton wilt studies.—I, Relation of soil temperature to the development of cotton wilt, V. H. Young (*Arkansas Sta. Bul. 226 (1928), pp. 50, figs. 10*).—A detailed account is given of a study of the relation of soil temperatures to the development of cotton wilt (*Fusarium vasinfectum*) under controlled conditions in the greenhouse. The results are also given of observations on the effect of the same factor under field conditions. Preliminary accounts of various phases of this study have been noted (E. S. R., 58, pp. 336, 548).

According to the author, little or no wilt commonly appears in Arkansas before early in June. The disease develops slowly during June and reaches its maximum in July and early August. Some of the more resistant varieties are said to have a longer period of incubation, and the greatest amount of wilt appears in them later in the season.

Under controlled soil conditions, Trice cotton is said to be affected with wilt more severely when soil temperatures are near 30.5° C. (86.9° F.), but temperatures from 28 to 32° are favorable to wilt development. The disease is said to fall off rapidly above 33°, and little wilt was observed above 35.5°. The amount of wilt is said to decrease gradually below 28°, and only small

amounts were observed to occur at 18°. The author believes that serious cotton wilt infections probably will not occur in the field at soil temperatures below 23°, except in especially susceptible varieties.

The effect of soil temperature upon the development of cotton wilt is said to be closely correlated with the effect of temperature upon the growth of the cotton wilt fungus in the laboratory. The optimum temperature for the development of cotton wilt is believed to be slightly higher than the optimum temperature for the development of the fungus.

Air temperatures as low as 24° are said to check considerably the rate of development of *F. vasinfectum* in the stems of the cotton plant, even though soil temperatures are favorable for its development in the roots. While the most favorable soil temperatures for the development of wilt were slightly below those determined by others, it is believed tha they fall within the range which is not at all unfavorable to the development of the cotton plant.

Under field conditions, air-temperature records are said to suggest very strongly that the failure of appreciable amounts of wilt to appear even in extremely susceptible varieties for more than one month after planting is due to the inhibiting effects of low soil and air temperatures rather than to any lack of susceptibility in cotton seedlings. It is considered that in all probability soil temperatures are most favorable to the development of wilt during July and August.

A close relationship was found to exist between the conditions which bring about rapid saprophytic development of the pathogene in the soil and the development of cotton wilt, and it is suggested that under natural conditions warm, well aerated sandy soils with sufficient amounts of organic matter for the development of the pathogene may allow a rapid spread of the fungus through the soil and thus favor the attack on cotton roots.

The author's investigations are said to indicate that cotton wilt is most favored by a range of warm soil temperatures not commonly encountered in Arkansas until summer is well under way.

Onion diseases and pests [trans. title], G. Russo (*Estac. Agron. Moca [Dominican Repub.] Circ. 2 (1928), pp. 25, pls. 6*).—The chief of the station of entomology in the National Agronomy Station and Agricultural College at Moca reports on both insect pests and plant diseases causing injury or loss to interests in onion culture.

Potatoes in highlands [trans. title], J. Costantin (*Compt. Rend. Acad. Sci. [Paris], 181 (1925), No. 19, pp. 633–636*).—On account of observations here noted, it is held that the potato in the highlands may be subject to degenerating diseases, though in less important degrees than in the lowlands.

Potato diseases [trans. title], [R.] Schander (*Landw. Jahrb., 64 (1926), No. 1, pp. 72–97*).—In this section an account is given of potato leaf roll and other diseases, also of varietal tests regarding susceptibility to Phytophthora, and of breeding research.

A new treatment for potato diseases [trans. title], Eberhardt and J. Chevalier (*Compt. Rend. Acad. Sci. [Paris], 181 (1925), No. 20, pp. 733–735*).—Applications of sulfureted hydrocarbons are said to be efficient as insecticides and to act equally well against such disease organisms as *Sphaerotheca pannosa* and *Phytophthora infestans*. They seem to arrest the development of degenerating diseases of potato, and they are claimed also to accentuate leaf and whole plant growth and to prolong development, so that a clearly increased tuber yield is obtained.

Seed potato germination and disease [trans. title], Koltermann (*Pflanzenbau [Berlin], 4 (1927), No. 6, pp. 93–95*).—In this author's abstract are sum-

marized tabular and other details and results of germination tests of potato tubers affected with various diseases.

Biology of potato canker, I [trans. title], F. ESMARCH (*Angew. Bot., 8 (1926), No. 2, pp. 102–135*).—A study relating particularly to the physiology of germination of the resting sporangia of potato wart (*Synchytrium endobioticum*) is said to show that the resting spores germinate only when a certain degree of moisture is present. Germination could not be shown to depend upon the presence of any material given off by the roots of potato plants. Sporangial germination apparently depends upon certain water-soluble chemical materials in the soil, particularly limy and humus soils, though no relation was established between sporangial germination and soil reaction.

Lasiodiplodia tubericola on potatoes in Egypt [trans. title], A. TROTTER (*Bol. R. Staz. Patol. Veg. [Rome], n. ser., 7 (1927), No. 1, pp. 93–98, figs. 4*).—Sweet potato (*Ipomoea batatas*) black rot is briefly discussed as to its characters, causal organism (*L. tubericola*), and danger of its introduction into Italy.

Beet heart rot [trans. title], E. GÄUMANN (*Beibl. Vrtljschr. Naturf. Gesell. Zürich, 70 (1925), No. 7, pp. 106, figs. 20*).—An elaborate presentation, with bibliography, is made of the results of a study of beet heart rot, which was particularly severe in peat soil. Outward and inner symptoms are described and illustrated. Apparently, two disease processes are involved, one primarily physiological, the second parasitic, the physiological disturbance rendering the root liable to infection by *Phoma betae*. Relations are detailed.

Some host plants of curly top, H. H. P. SEVERIN and C. F. HENDERSON (*Hilgardia [California Sta.], 3 (1928), No. 13, pp. 339–392, pls. 4, figs. 24*).—The results are given of an investigation carried on cooperatively by the California Experiment Station and the U. S. Department of Agriculture on the occurrence of curly top on plants belonging to the families Chenopodiaceae, Leguminosae, and Cucurbitaceae.

Natural infection was observed on *Beta maritima*, sugar beets, garden beets, 7 varieties of mangels, Swiss chard, and spinach of the family Chenopodiaceae; 8 varieties of beans, Blackeye cowpeas, and alfalfa among the Leguminosae; and on 8 varieties of squash, 2 of watermelon, 3 of cucumber, 3 of muskmelon, and 1 of cantaloupe among the Cucurbitaceae. In addition a much larger number of species and varieties, about 120 in all, were experimentally inoculated with sugar beet curly top.

Experiments to control the sugar beet leaf spot disease (Cercospora beticola Sacc.) in the year 1926 [trans. title], S. CSETE (A. CSETE) (*Kisérlet. Közlem., 30 (1927), No. 3, pp. 205–224; Eng. abs., pp. 223, 224*).—In studies which are detailed as to the effect of seed treatments against sugar beet leaf spot diseases, it is stated that the seed treatments showed no considerable effect as regards control of Cercospora, no yield increase appearing except in the case of formaldehyde. The sugar content was, however, increased as was also the beet top weight. Plants grown from treated seed suffered less from root rots later in the season than did the untreated checks.

Field dustings and sprayings increased both foliage and root weight considerably, and both processes increased sugar content. Root rot due to species of Phoma and of Aphanomyces was decreased by spraying.

Beet disease protection [trans. title], [R.] SCHANDER (*Landw. Jahrb., 64 (1926), No. 1, pp. 98, 99*).—These data relate chiefly to beet root rot and to tests of protectives, partly proprietary.

The mosaic disease of sugar cane, G. M. REYES (*Philippine Agr. Rev., 20 (1927), No. 2, pp. 187–228, pls. 5*).—Sugar cane mosaic, said to have been noted

first in Java in 1890 and in the Philippines about 1910 or 1911, and found at present practically all over the islands and known all over the world, is described as to its salient visible features, namely, the leaf streakings and the stem cankered areas.

Though no specific organism has been found, the disease is thought to be due to a protozoan or to a living, ultramicroscopic, filterable, and infectious organism. Losses in local areas are large. The host range is wide, including several grasses, though some plants related to sugar cane are not attacked.

The corn aphis (*Aphis maidis*), found throughout the world, is the chief vector, breeding freely on corn, sorghum, Sudan grass, and Tunis grass. Apparently the disease is not seed borne, that is, not carried by true seeds. Tops or cuttings from diseased plants, though sometimes masking the disease, invariably give rise to diseased stools.

Susceptibility varies with varieties, a list of which, as furnished in this connection, ascribes high resistance to such varieties as P. O. J. Nos. 2714, 2725, 2727, 2878, 100, 36, 213, 979, 234, 826, 1228, and 2379; E. K. Nos. 2 and 28; 247 B.; C. A. 12735; D. 1135; Yellow Caledonia; Badila; Java 247; New Guinea 24 A. and 24 B.; Cagayan; Uba; and Kavangire. Treatments thus far tried have appeared ineffective. Fertilizer tests have not yet been adequately made. Selection and hybridization have been extensively undertaken in Java, the West Indies, the United States, the Philippines, and elsewhere.

Selection of mosaic free cuttings of sugar cane, J. O. Unite and J. M. Capinpin (*Philippine Agr., 15 (1926), No. 2, pp. 67–73*).—The mottled character in sugar cane mosaic is most clearly shown by the inner newly developed leaves. The term mosaic-free cuttings as used in this report means cuttings from plants the leaves of which do not show the characteristic mosaic mottling. This paper reports experiments on selection of mosaic-free cuttings as performed by the division of plant breeding of the agronomy department of the College of Agriculture of the University of the Philippines, covering the period from the year 1923 to the latter part of 1925.

The first generation plant canes, selected for mosaic resistance from a badly infected sugar cane field, showed no symptoms of mosaic. This is thought to show that, even in a severely infected cane field, it is possible to segregate strains free from the mosaic organism. From results of tests as shown it is regarded as possible that by continually subjecting the clons used to mosaic, and then selecting only the plants which remain healthy, mosaic resistant types may eventually be obtained. The fact is emphasized also that in a mosaic infected field the selection of healthy cuttings will lessen the spread of the disease in the following planting season and in the ratoon.

Diseases of Deli tobacco [trans. title], S. C. J. Jochems (*Meded. Deli Proefsta. Medan, 2. ser., No. 43 (1926), pp. 39, [pls. 34]*).—Deli tobacco diseases due to bacteria, fungi, viruses, and nonparasitic agents, as well as abnormalities, are systematically considered.

Parasitic stem burn of tobacco in Deli [trans. title], S. C. J. Jochems (*Meded. Deli Proefsta. Medan, 2. ser., No. 49 (1927), pp. 35, pls. 4, fig. 1; Eng. abs., pp. 34, 35*).—Tobacco stem burn, which may in some cases or forms be caused by such chemical agents as artificial manures, is here dealt with chiefly as due to fungi of the genus Pythium, probably *P. debaryanum* and *P. aphanidermatum* and possibly also other species of Pythium. Various species appear to be spread all over the tobacco-growing area, apparently without any strict regard to soil type or elevation, though certain sandy clay soils are often mentioned in this connection. Air humidity and soil moisture are important.

The planting of *Leucaena glauca* to protect the secondary bush on fallow lands against fire appears to favor the Pythium disease locally. *Phytolacca octandra* is another wild host plant. Inundation favors stem burn.

Chemical agents give little protection. Development of resistance yields satisfactory results.

Tobacco wildfire [trans. title], C. STAPP (*Nachrichtenbl. Deut. Pflanzenschutzdienst, 7 (1927), No. 12, pp. 115–118*).—This account deals with the appearance, more particularly in the summer of 1927, of a tobacco disease said to have been noted in southwest Germany in 1924 and in Hungary in 1926. This is thought to be identical with wildfire reported by Wolf and Foster in the United States (E. S. R., 38, p. 852).

Cucumber fruit and leaf disease, A. C. B. PFÄLTZER (*Het Vrucht- en Bladvuur van de Komkommer. Proefschr., Rijks-Univ., Utrecht, 1927, pp. X+73, figs. 6*).—Tests showed formalin to give good results against *Cladosporium cucumerinum* and *Corynespora melonis* when used in comparison with two other preparations named.

Nettlehead in hops, C. A. W. DUFFIELD (*Ann. Appl. Biol., 12 (1925), No. 4, pp. 536–543*).—Hop nettle head, known for at least 25 years and credited with rapid and serious increase in certain places, was in 1914 brought under investigation.

It is stated that under the name nettle head two diseases, considered quite distinct and designated as true and false, have been observed. These diseases are described. The beet nematode, *Heterodera schachtii*, may be found in all hop gardens, but its presence is not correlated with nettle head, the so-called true form of which has been noted as more common during the year following a severe outbreak of aphids.

Hop Peronospora in 1926 [trans. title], W. LANG and H. ARKER (*Nachrichtenbl. Deut. Pflanzenschutzdienst, 7 (1927), Nos. 2, pp. 13–15; 3, pp. 27, 28*).—This account includes treatments with Bordeaux mixture at from 1 to 1.5 per cent strength, applied in most cases from three to five times. Amounts and phases of the resulting attack are detailed.

Notes on soft rot of radish, E. F. ROLDAN (*Philippine Agr., 14 (1925), No. 3, pp. 185–188, pl. 1*).—The radish soft rot organism (*Bacillus carotovorus*) in the Philippines is pathogenic on radish, pechay, mustard, lettuce, tomato, and pepper. Measures recommended for control include rotation, running nonsusceptible plants for a few years; desiccation, allowing root surfaces to dry thoroughly before storage; insolation of harvested roots, lasting as long as practicable; and low temperature (but not freezing).

Transmission of tomato yellows, or curly top of the sugar beet, by Eutettix tenellus (Baker), H. H. P. SEVERIN (*Hilgardia [California Sta.], 3 (1928), No. 10, pp. 251–274, pls. 2, figs. 8*).—Data are presented which show that the beet leafhopper, *E. tenellus*, transmits tomato yellows or curly top to tomatoes. In his experiments, the author found that tomatoes developed typical symptoms of yellows in the field when inoculated with curly top virus from beets through the transfer of leafhoppers. Noninfective leafhoppers, after feeding on the infected tomato plants, were able to cause curly top of sugar beets. They also transmitted the disease from naturally infected tomato plants to sugar beets.

The symptoms of tomato yellows in the field and greenhouse are described in detail. An incubation period of the disease in the field is said to have varied from 16 to 26 days during the spring of the year.

The author's studies indicate that curly top was also transmitted from tomatoes showing symptoms only of mosaic in a field in which both diseases

were present, and this is considered to indicate that the tomatoes were also naturally infected with the causal agent of curly top.

Pear blight control, F. C. Reimer (*Better Fruit, 22 (1928), No. 11, pp. 9 10, 28*).—A brief popular account of the present status of knowledge concerning pear blight and of the work of the Southern Oregon Substation in the development of methods of control. The inspection of the roots and the cleaning out of old cankers on the roots are deemed of major importance. The application of Bordeaux mixture during the pink bud stage and again at the petal fall was found to reduce blight infection significantly, but it is pointed out that, particularly in humid climates, considerable russeting may be expected to follow the use of Bordeaux mixture and that at the best it should be considered a supplementary treatment to follow canker cleaning and the cutting of blighted twigs.

The false blossom situation, N. E. Stevens (*Amer. Cranberry Growers' Assoc. Proc., 57 (1926–1927), pp. 20–26*).—Results, chiefly of field studies during eight years, lead to the conclusion that false blossom is an infectious disease, which spreads slowly from plant to plant and is usually carried from bog to bog mainly in diseased vines. The spread of false blossom on individual bogs, supposedly by insects, is indicated as being more rapid in case of the newer bogs. As regards preventive measures, leafhopper control is supposed to be of prime importance. Water management is also discussed.

Further experiments on the control of American gooseberry mildew, R. M. Nattrass (*Jour. Bath and West and South. Counties Soc., 6. ser., 1 (1926–27), pp. 162–167*).—The promising results obtained from the spraying experiments carried out in 1925 (E. S. R., 57, p. 651) encouraged their continuation in 1926. In these tests advantage accrued from an early application of the spray fluid before the mildew appeared.

Burgundy mixture applied once (April 22) gave better control of American gooseberry mildew (only 4.3 per cent appearing) than did ammonium polysulfide, though further experiments are thought desirable to show whether the high efficiency of the Burgundy mixture can be retained under reduction of strength sufficient to avoid leaf damage. Under weather or other conditions favorable to the disease, a second application of a hitting spray containing soap is recommended. In tests comparing ammonium polysulfide, a proprietary soda-sulfur compound, and washing soda, each with soft soap, the degree of control was lower than with Burgundy mixture, the maximum control being obtained with the sulfur and soap spray fluid. This appears to act mainly by direct contact.

Gooseberry rust (*Scot. Jour. Agr., 9 (1926), No. 3, p. 308, pl. 1*).—An epidemic of gooseberry rust (*Puccinia pringsheimiana*) occurred suddenly in an upland Highland village on all the gooseberry bushes in the cottage gardens. A thatch of sedges brought up from the lowland was found to be covered with the brown resting (teleutospore) stage of the fungus, and this was thought to be the source of the sudden attack. The disease can usually be kept in check by picking off and burning the diseased parts of the gooseberry bushes.

Fruitstalk rots of banana in French Guinea [trans. title], A. Chevalier (*Rev. Bot. Appl. et Agr. Colon., 6 (1926), No. 62, pp. 598–601*).—This summarizes notes by the author and observations by E. Butler and J. Dufrénoy.

"Collar crack" of cacao (Armillaria mellea (Vahl.) Fr.), H. A. Dade (*Gold Coast Dept. Agr. Bul. 5 (1927), pp. 21, pls. 17, figs. 3; abs. in West India Com. Circ., 42 (1927), No. 751, pp. 269–271, pl. 1*).—Cacao collar crack, a destructive and rapidly extending disease, is already widely distributed throughout the forest belt of the Gold Coast and Togoland. The causative organism, a variety of *A. mellea*, is described as to the sporophores. It has a wide range

as regards cultivated and wild hosts, and it lives also on deadwood as a saprophyte. No wounding or previous infections are required for invasion, but actual root contact is required for transmission. The only significant environmental factor required is excessive humidity, the lowering of which permits control when combined with destruction of its proper nutritive media and isolation of affected areas. Therapeutic measures are occasionally effective.

[Black rot of the castor-oil plant], R. G. ARCHIBALD (*Trop. Agr. [Trinidad], 4 (1927), No. 7, pp. 124, 125, pl. 1*).—A descriptive account is given of a black rot attacking the castor-oil plant (*Ricinus communis*) in the Gezira. Its causation has been ascribed to an associated organism, which is briefly described and for which the name *Phytomonas ricini* n. sp. is proposed.

Fungi of citrus gummosis and of fruit rots [trans. title], J. DUFRÉNOY (*Rev. Bot. Appl. et Agr. Colon., 6 (1926), No. 64, pp. 747–754, figs. 4*).—A brief account is given mainly of relations between parasitic Phytophthoras and parasitized tissues and of Phytophthora rots of citrus fruits, with a brief discussion of Phytophthora soil and tree infections and the problem of protection against them.

Pests and diseases of coconuts in the North-Western Province, C. N. E. J. DE MEL (*Trop. Agr. [Ceylon], 68 (1927), No. 4, pp. 252–256*).—Besides three chief insect pests, which are discussed, the North-Western Province suffers serious losses to its coconut interests through bleeding disease, gray blight, bud rot, nut fall, leaf break, and root disease. These are briefly discussed.

Anthracnose disease of mango in the Philippines, F. M. CLARA (*Philippine Agr. Rev., 20 (1927), No. 2, pp. 271–273*).—A mango anthracnose found on practically all parts of the plant is described as due principally to *Glomerella cingulata*, though some cases of rotting were associated with species of Rhizopus, Aspergillus, and Penicillium. Other plants are listed as affected in the Philippines.

Some diseases of the tea bush, C. H. GADD (*Trop. Agr. [Ceylon], 68 (1927), No. 4, pp. 213–219*).—This account is followed by a brief discussion.

A disease of tulips and Iris reticulata, F. T. BROOKS (*Gard. Chron., 3. ser., 79 (1926), No. 2050, pp. 271, 272*).—A disease of tulips known as fire, and said to occur commonly in England as the result of infection by *Botrytis tulipae*, is described as occurring on tulips only. It is here distinguished from a disease showing somewhat similar symptoms, of tulips and of *I. reticulata*, which is said to be due to *Sclerotium (Rhizoctonia) tuliparum*.

The control of the common bulb diseases, C. E. SCOTT (*Calif. Dept. Agr. Mo. Bul., 16 (1927), No. 11, pp. 553–562, figs. 7*).—Accounts are given of a number of diseases which are common, with references.

The parasitism of Armillaria mellea in relation to conifers, W. R. DAY (*Quart. Jour. Forestry, 21 (1927), No. 1, pp. 9–21, figs. 11*).—In this paper, which was intended to show, from observations made on trees, how the honey fungus punctures the host, with discussion of the susceptibility of different conifer species important to forestry in England and the reasons for such a susceptibility, details are given as to the mode of penetration.

It is concluded that while some species or genera may be inherently more susceptible to attack than others and while it may perhaps be shown that even within a single species one race is more susceptible than other races, other and external factors often or always have much greater influence in determining the intensity of infection and the general susceptibility of species. Such factors are discussed.

Coryneum canker of cypress, W. W. WAGENER (*Science, 67 (1928), No. 1745, p. 584*).—A preliminary account is given of a canker of the Monterey cypress

(*Cupressus macrocarpa*) that recently has been observed in the San Francisco Bay region of California. The affected trees are said to become conspicuous through the dying of individual parts of the crown, either branches or portions of the top. This continues until the tree is either killed or rendered so unsightly that its removal becomes necessary. An inspection of infected trees showed that the dying was due to the girdling action of bark cankers caused by a fungus, which is apparently an undescribed species of Coryneum. Inoculations on young Monterey cypress with spores of the fungus are said to have resulted in positive infections, both on wounded and unwounded bark and on unwounded foliage.

The disease is said to be confined mainly to the Monterey cypress, but the Italian cypress (*C. sempervirens*) is also severely attacked.

A leaf-cast of the Douglas fir due to Rhabdocline pseudotsugae Syd., W. R. Day (*Quart. Jour. Forestry, 21 (1927), No. 3, pp. 193–199, figs. 5*).—In a statement regarding the Douglas fir leaf-cast disease and referring to the reports by Weir (E. S. R., 37, p. 658) and the Wilsons (E. S. R.,'57, p. 354), the present author outlines observations, chiefly by Weir, with illustrations and brief notes of the associated organism, *R. pseudotsugae*. It has not yet been proved that the presence of *Chermes cooleyi* favors this disease in Britain (as elsewhere).

The elm disease [trans. title], H. W. Wollenweber (*Nachrichtenbl. Deut. Pflanzenschutzdienst, 7 (1927), No. 10, pp. 97–100, figs. 2*).—The so-called Dutch elm disease, ascribed to the organism designated by Brussoff (E. S. R., 55, p. 656) as *Micrococcus ulmi* and elsewhere indicated as *Graphium ulmi*, is here noted as attacking 1- to 3-year-old elm, maple, linden, hawthorn, and poplar.

Protect white pine from blister rust, J. F. Martin (*U. S. Dept. Agr., Misc. Pub. 22 (1928), folder, figs. 8*).—The life cycle of blister rust is popularly described, and the elimination of the black currant in States where white pines are important forest trees is recommended.

Protect western white pine and sugar pine from blister rust, J. F. Martin (*U. S. Dept. Agr., Misc. Pub. 23 (1928), folder, figs. 8*).—This is a western edition of the publication noted above, and deals with the protection of the western white pine and the sugar pine from blister rust.

Brown bast of rubber and its treatment, J. Mitchell (*Trop. Agr. [Ceylon], 68 (1927), No. 4, pp. 239–244, pls. 4*).—An account, with discussion, is given of rubber brown bast as regards the history, symptoms, and treatment.

The method involving isolation and scraping is thought to promise best results until it may be found safe to depend upon isolation alone.

Hevea plantations and diseases [trans. title], É. De Wildeman (*Rev. Bot. Appl. et Agr. Colon., 6 (1926), No. 53, pp. 18–22*).—Of the problems connected with the establishment of Hevea plantations, that of disease, including its control, is here chiefly dealt with.

ECONOMIC ZOOLOGY—ENTOMOLOGY

A study of the beaver in the Yancey region of Yellowstone National Park, E. R. Warren (*Roosevelt Wild Life Ann., 1 (1926), No. 1–2, pp. 5–10, 11, 13–191, pls. 12, figs. 133*).—The studies here reported are presented under the headings of general description of the Yancey region and problem; detailed description of the beaver colonies studied; relations of the beaver to topography and stream flow; the engineering work of the beaver; notes on habits and behavior of the beavers; relations of the beaver to other animals; food and feeding habits of the Yellowstone beaver; size, age, and growth of food trees; and the numbers of beaver in relation to the food supply.

Injurious field rats in lower Sind and their extermination, I, II, P. V. WAGLE and G. MAHOMED (*Bombay Dept. Agr. Bul. 138 (1927), pp. [2]+34, pls. 5, fig. 1*).—The rats causing damage in Sind here considered are *Gunomys sindicus*, *Nesokia huttoni*, and *Meriones hurrianae*.

A contribution to the study of the crows of France (Corvus, Coloeus, Pyrrhocorax) [trans. title], A. CHAPPELLIER (*Min. Agr. [France], Ann. Epiphytics, 13 (1927), No. 5, pp. 283–380, pls. 3, figs. 9*).—This is a report of a study of the biology of *Corvus corax*, *C. cornix*, *C. corone*, *C. frugilegus*, *Coleus monedula*, *Pyrrhocorax pyrrhocorax*, and *P. graculus*, the seven species occurring in France. Particular attention is given to migration and the variation in abundance.

A study of the economic status of the common woodpeckers in relation to Oregon horticulture, J. A. NEFF (*Marionville, Mo.: Free Press Print, 1928, pp. VIII+68+[28], [figs. 26]*).—The author briefly reviews the literature relating to the birds in Oregon in connection with a list of 37 titles, and deals with the woodpeckers found in the State. It was found that the flickers, more than any other woodpeckers, show a fondness for boring holes into buildings, into the walls or eaves, and into steeples.

Polyembryony in animals, J. T. PATTERSON (*Quart. Rev. Biol., 2 (1927), No. 3, pp. 399–426, figs. 48*).—Following the introduction, the subject is dealt with under the headings of embryonic fission in cyclostomatous Bryozoa, twinning in the earthworm, polyembryony in the parasitic Hymenoptera, quadruplets in the Texas armadillo, and discussion. The author presents a table that lists the hymenopterous parasite, host, brood, and observer for 16 forms, which includes all of the undoubted polyembryonic species thus far known. A 4-page list of the literature referred to is included.

The biology of insects, G. H. CARPENTER (*London: Sidgwick & Jackson, 1928, pp. XV+473, pls. 16, figs. 88; rev. in Science, 67 (1928), No. 1740, pp. 467, 468*).—The several chapters of this work deal with the subject as follows: Feeding and breathing; movement; sensation and reaction; behavior, instinctive and intelligent; reproduction and heredity; growth and transformation; family life; social life; adaptations to haunts and seasons; classification; evolution; insects and other organisms; and insects and mankind. A 16-page list of references to the literature is included. The review is by L. O. Howard.

Further experiments on the influence of certain specific substances on development and weight of insects: Influence of vitamins [trans. title], S. KOPEĆ (*Pam. Pánst. Inst. Nauk. Gosp. Wiejsk. Puławach (Mém. Inst. Natl. Polon. Écon. Rurale Puławy), 8 (1927), A, pp. 225–238; Eng. abs., pp. 236–238*).—A report of experiments (E. S. R., 50, p. 452) conducted on two lots of gipsy moths. The account includes a bibliography of 34 titles.

The effects of temperature on the development of an insect (Popillia japonica Newman), D. LUDWIG (*Physiol. Zool., 1 (1928), No. 3, pp. 358–389, figs 9*).—The subject is taken up under the headings of material and methods and results, followed by a discussion. A list of 33 references to the literature is included.

Some general remarks on the influence of climatic conditions on the prevalence of economic insects in Malaya, G. H. CORBETT and C. DOVER (*Malayan Agr. Jour., 16 (1928), No. 1, pp. 1–7, pls. 3*).—A general discussion of the subject, which includes a table showing monthly reports of the occurrence of some insects of economic importance based on records obtained between 1920 and 1926, inclusive.

The biological control of insect pests, L. D. CLEARE, JR. (*Agr. Jour. Brit. Guiana, 1 (1928), No. 1, pp. 26–33*).—This subject is considered under the headings of the balance of life, the origin of insect pests, and biological control.

Some properties of oil emulsions influencing insecticidal efficiency, L. L. English (*Ill. Nat. Hist. Survey, 17 (1928), Art. 5, pp. 231–259, figs. 8*).—In this account the author discusses the subject under the headings of theory of wetting, angle-of-contact measurements, relation between wetting ability and toxicity to aphids, relation of chemical property of oil and stability of emulsion to effectiveness against aphids, relation between wetting ability and toxicity to San Jose and oyster-shell scale (in the dormant stage), relation of volatility and viscosity of oil to effectiveness against scale insects, relation of chemical property of oil and stability of emulsion to effectiveness against scale insects, and injury to plants.

It is pointed out that the emulsifying agents used in making oil emulsions for spray purposes vary in wetting ability, as measured by Stellwaag's angle-of-contact method (E. S. R., 52, p. 554), and consequently cause variations in the effectiveness of the emulsions, this being especially important in the control of aphids.

"The stability of oil emulsions, which is indicated to some extent by the size of the globules, is one of the principal factors in insecticidal efficiency. The type of oil emulsified, the kind and amount of emulsifying agent, the quality of water used for dilution, and other factors commonly considered unimportant are capable of causing changes in stability and consequent fluctuations in efficiency. Increased effectiveness may or may not be accompanied by an increase in the size of globules. Increased size of globules is the result of desirable qualities in an emulsion rather than the cause of effectiveness.

"For use against aphids, the most effective emulsion is one that has high wetting ability coupled with instability. Either of these factors may vary so as to be dominant. A relatively 'poor-wetting,' unstable emulsion may be more effective on aphids than a 'good-wetting,' stable emulsion. If the stability of two emulsions is about the same, then the one with the greater wetting ability is the more effective on aphids.

"In the control of scale insects, the instability of the emulsion is the primary consideration. The less stable the emulsion the greater its efficiency. High wetting abiltiy is not necessary for the control of San Jose scale and oyster-shell scale, because of the comparative ease with which their host plants are wetted. The emulsions used for the control of these insects should release quickly an oil of sufficiently high viscosity and low volatility to give a persistent residue. A saturated oil, because of its influence in some cases on the stability of the emulsion, may be more effective than an unsaturated oil.

"The amount of oil adhering and taking proper effect on the insect is dependent upon both the wetting ability and the instability of the emulsion. Inadequate wetting is a common cause of inefficiency, but excessive wetting, which results in some of the emulsion running off from objects that are easily wetted, is also a possible cause of inefficiency. These conditions are dependent on the kind of emulsion and the insect involved. In order to be innocuous to plant foliage, an emulsion should be as inert chemically as possible. Soaps and unsaturated oils tend to injure foliage. Each oil emulsion should be considered as a particular individual insecticide, having properties peculiar to itself and giving results that other emulsions may not."

Insecticidal action of some esters of halogenated fatty acids in the vapor phase, R. C. Roark and R. T. Cotton (*Indus. and Engin. Chem., 20 (1928), No. 5, pp. 512–514*).—This is a contribution from the U. S. D. A. Bureaus of Chemistry and Soils and Entomology.

It is concluded that "from the standpoints of toxicity to insects, availability, cost, and freedom from fire hazard, methyl, isopropyl, and ethyl monochloroace-

tates appear to be the most promising of the lower alkyl esters of chloroformic (chlorocarbonic), monochloro-, dichloro-, and trichloroacetic, monobromoacetic, α-bromo- and β-bromopropionic, and β-chloropropionic acids tested. Dosages of 1 lb. of methyl monochloroacetate, 1.5 lbs. of isopropyl monochloroacetate, and 2 lbs. of ethyl monochloroacetate per 1,000 cu. ft. are effective against stored-product insects in fumigation vaults of the commercial type." Since the monochloroacetates injure the germination of wheat, they offer little promise for the fumigation of grain intended for seed.

Research work in fumigation, A. F. CAMP (*Fla. State Plant Bd. Mo. Bul., 12 (1928), No. 11, pp. 217–231, figs. 7*).—This is a contribution from the Florida Experiment Station, presented at the annual meeting of the Florida State Horticultural Society held at Winter Haven, Fla., in April, 1928.

Some fumigation tests with ethylene dichloride-carbon tetrachloride mixture, L. F. HOYT (*Indus. and Engin. Chem., 20 (1928), No. 5, pp. 460, 461*).—The author has found that the mixture of ethylene dichloride and carbon tetrachloride recommended by Cotton and Roark (E. S. R., 58, p. 255) gives a 100 per cent kill of all insects present when used in a gas-tight vault at the rate of 14 lbs. per 1,000 cu. ft. for 24 hours at 82° F.

"Tests made in an 8,000-cu. ft. room on feed infested with flour beetles and moths using a dosage of 14 and 16.5 lbs. per 1,000 cu. ft. for 24-hour periods gave satisfactory results. Owing to diffusion of the fumigant and to the difficulty of raising the temperature of the feed during the 24-hour fumigation, a 100 per cent kill was not immediately obtained, but the insects which survived were so poisoned by the fumigant that they all died within the following 3 days.

"Owing to its low cost, ease, and comparative safety of application, and easy removal following fumigation, coupled with its satisfactory killing effect on insects when used in a dosage of 14 lbs. per 1,000 cu. ft. for 24 hours at 70° or higher, this new nonburnable, ethylene dichloride-carbon tetrachloride mixture appears to be a valuable, safe fumigant."

Fumigation with calcium cyanide dust, H. J. QUAYLE (*Hilgardia [California Sta.], 3 (1928), No. 8, pp. 207–232, figs. 12*).—Following a brief introduction, the author discusses the methods of fumigation, particularly the use of "A" calcium cyanide and of "C" calcium cyanide, rate of evolution of HCN gas, diffusion of gas under the tent when generated from calcium cyanide, and method of applying calcium cyanide dust under the tented tree.

The investigation of "A" calcium cyanide for citrus fumigation in California was terminated in 1924 because of injury to the tree. In 1925 the "C" calcium cyanide was first tried for citrus fumigation in California, and the injury resulting from the residue of "A" calcium cyanide was practically entirely eliminated through the use of this material. The "C" calcium cyanide was also used in a considerable amount of commercial citrus fumigation in the State during 1926.

Comparisons of dosage between "C" calcium cyanide and liquid HCN are given, the determinations being based on the effects on insects and on the actual gas concentration under the tent at different intervals. About 25 per cent less HCN is required in the calcium cyanide dust than in liquid HCN to effect the same mean concentration of gas under a canvas cover. In the case of a gas-tight fumigatorium the same amount of HCN must be carried in the dust as in the liquid to give the same mean concentration within.

These facts led to the conclusion that there is less escape of gas through canvas covers where the source of the gas is the dust than where the source of gas is the liquid HCN. The data given indicate that 1.75 oz. of "C" calcium cyanide dust is equivalent to 20 cc. of liquid HCN. The evolution of

gas from "C" calcium cyanide was not greatly retarded when the relative humidity was as low as 20 to 22 per cent, but this humidity did markedly retard the evolution of gas from "A" calcium cyanide. The evolution of gas from both cyanides seemed to be independent of temperature within ordinary fumigation limits (40 to 80° F.).

A list of 21 references to the literature is included.

The use of hydrocyanic acid gas for the fumigation of American cotton on import into India, A. J. Turner and D. L. Sen (*India Dept. Agr. Mem., Ent. Ser., 10 (1928), No. 5, pp. VI+69–166, pls. 6, figs. 7*).—This account deals with experiments on the lethal power of hydrocyanic acid gas for the boll weevil and the grain weevil *Sitophilus oryzae;* on the extent to which it is absorbed by cotton and jute, respectively; and on a practical method for satisfactory fumigation on a large scale.

Leaf-mining insects, J. G. Needham, S. W. Frost, and B. H. Tothill (*Baltimore: Williams & Wilkins Co., 1928, pp. VIII+351, pls. 3, figs. 91*).—The first chapter of this work (pp. 1–35), introductory in nature, is entitled A General Acquaintance with Leaf-mining Insects, and the second chapter (pp. 36-40), which supplements the first, deals with the extent of the leaf-mining habit. Chapters 3 to 11 (pp. 41-180), inclusive, deal with the various leaf miners of the order Lepidoptera, arranged in systematic order. Chapter 12 (pp. 181-209) deals with the Coleoptera of the families Buprestidae, Chrysomelidae, and Curculionidae. Chapter 13 (pp. 210-230) takes up the leaf miners of the order Hymenoptera, and chapter 14 (pp. 231-278) those belonging to the order Diptera. Chapter 15 (pp. 279-301) consists of a list of the leaf-mining insects arranged in systematic order, and chapter 16 (pp. 302-323) a list of the host plants of leaf-mining insects, both compiled by Frost. A bibliography of 17 pages, arranged systematicaly by order and family, and a general index are included.

Manual for conducting investigations of insect fauna of the soil [trans. title], A. V. Znamenskiĭ (*Trudy Poltavsk. Selsk. Khoz. Opytn. Sta., No. 51 (1927), pp. 57, figs. 72*).—A guide for use in the study of soil-infesting insects.

The biological control of cotton pests, J. G. Myers (*Empire Cotton Growing Rev., 5 (1928), No. 2, pp. 113–127*).—A general discussion of the subject is followed by more specific accounts of the biological control of the pink bollworm, other bollworms, the boll weevil, the green plant bug officially known as the Southern green stink bug, the cotton jassid (*Chlorita (Empoasca) facialis*), scale insects, and the cotton aphid.

Paddy notes (III).—b, The effect of attack by paddy moth and paddy weevil on the germination of rice seeds, L. Lord (*Trop. Agr. [Ceylon], 70 (1928), No. 4, pp. 214, 215*).—This is a discussion of the infestation of rice by the Angoumois grain moth and the rice weevil.

Cape Cod cranberry insects, I, H. J. Franklin (*Massachusetts Sta. Bul. 239 (1928), pp. 67, pls. 4, figs. 68*).—This, the first of an account in six parts on Cape Cod cranberry insects, deals with worms or wormlike forms attacking the foliage, buds, flowers, or fruit. It includes tables for the general classification of cranberry insects, the separation of four kinds of fireworms that caused injury in Cape Cod, the separation of cutworms, and miscellaneous pests. Accounts are given of the more important insects, their distribution and food plants, character of injury, description and seasonal history, and methods of control. Many of the important pests are illustrated in colored plates.

Forest entomology, P. Z. Caverhill (*Brit. Columbia Dept. Lands, Forest Branch Rpt. 1927, pp. 15, 16*).—This is a brief account of the injury caused by insects to the forests of British Columbia in 1927.

Insect problems in the home, J. J. Davis (*Indiana Sta. Circ. 150 (1928), pp. 24, figs. 13*).—This is a practical account of household insects and their control.

Entomology [at the Alabama Station], J. M. Robinson (*Alabama Sta. Rpt. 1926, pp. 21, 22*).—In studies of boll weevil hibernation, 1.3 per cent of the 2,700 boll weevils placed in the hibernation cage in the fall of 1925 emerged the following spring.

The results obtained in control work with the cabbage webworm are given in tabular form. Four applications of sodium fluosilicate made at weekly intervals reduced the larvae from 28 to 15 per 10 plants. There was only slight burning of the foliage after the fourth application. The applications resulted in the reduction to 5 larvae per 10 plants and then to 2 larvae for the following 2 weeks against an advance of from 51 to 100 larvae per 10 plants on the undusted plat. Similar control was obtained when calcium arsenate was diluted with equal parts of lime as when calcium arsenate was used at commercial strength.

Control work with the boll weevil was continued in 1925 (E. S. R., 59, p. 55) on Norfolk sandy loam, Cecil red clay, and Houston clay soil. No dusting was needed to control the boll weevil on the sandy loam plats at Auburn under severe drought conditions. However, on the heavy red clay land 2 series of 3 dustings were necessary to protect the cotton, the gain obtained being 260 lbs. of seed cotton per acre. Under black belt conditions 7 applications were necessary to protect the young squares and bolls, there being 2 distinct series of dusting, each consisting of 3 applications of 6 lbs. of calcium arsenate per acre at 4- to 5-day intervals. A seventh application was made to protect the young bolls. The gain obtained from the dusting was 420 lbs. of seed cotton per acre.

[Economic insects in Illinois] (*Ill. State Acad. Sci. Trans., 19 (1926), pp. 191–196, 353–371, pl. 1, figs. 7*).—The papers presented at the annual meeting of the Illinois State Academy of Science, held at Harrisburg April 30 and May 1, 1926, include the following: Life History Studies of the Peach Borer in Southern Illinois, by S. C. Chandler (pp. 191–194); Some New Insect Galls, by C. F. Groneman (pp. 195, 196); and Mosquito and Malaria Control in Illinois, by A. F. Dappert and J. L. Clarke (pp. 353–371).

Insect control work of the natural history survey for 1927, W. P. Flint (*Ill. State Hort. Soc. Trans., 61 (1927), pp. 99–109*).—This is a brief summary of the work of the year under the headings of dormant sprays, codling moth, plum curculio, catfacing, spray residues, and oriental fruit moth.

Report of the Government entomologist [of Jamaica], C. C. Gowdey (*Jamaica Dept. Agr. Ann. Rpt. 1927, pp. 20, 21*).—This is a brief account of the most important insect pests of the year.

Entomological report, E. R. Speyer (*Expt. and Research Sta., Cheshunt, Herts, Ann. Rpt., 12 (1926), pp. 46–65*).—The several pests dealt with include the red spider (*Tetranychus telarius* L.), with notes on its life history and control by fumigation and spraying; the greenhouse whitefly; mushroom pests; and other animals of interest found in greenhouses.

[Economic insects in France], R. Regnier (*Actes Mus. Hist. Nat. Rouen, 2. ser., 2 (1925), pp. 141, pls. 4, figs. 33*).—The author deals with the rôle of insects in the destruction of the tree and the insect fauna of the poplar.

[Report on entomology] (*Punjab Dept. Agr. Rpt. 1926–27, pt. 1, pp. 23–28*).—This is a brief account of work conducted, particularly with the pink bollworm, the red cotton bug (*Dysdercus cingulatus*), sugar cane borer, rice stem borer (*Scripophaga gilviberts*), sericulture, and locusts.

The control of cotton stainers in Southern Nigeria, F. D. Golding (*Empire Cotton Growing Rev., 5 (1928), No. 2, pp. 128–133*).—An account of abandoned control methods, followed by present lines of research.

The Crotalaria bug [trans. title], P. VAN DER GOOT (*Dept. Landb., Nijv. en Handel [Dutch East Indies], Korte Meded. Inst. Plantenziekten., No. 6 (1927), pp. 17, pls. 3; Eng. abs., pp. 16, 17*).—The small capsid *Ragmus importunitas* is becoming a serious pest of *C. anagyroides* and *C. juncea*, both of which are important green manure crops in Java.

Treehopper injury in Utah orchards, C. J. SORENSON (*Utah Sta. Bul. 206 (1928), pp. 18, figs. 8*).—A survey of the orchard districts in Utah has shown that tree hopper injury occurs to a greater or lesser extent in all of the districts, and that this type of damage is most serious in orchards, particularly young ones, in which alfalfa, sweet clover, or weeds grow. Under the latter conditions, young fruit trees are often seriously damaged. The trees suffer loss of sap, become scarred, deformed, and stunted, and are made more susceptible to the attacks of other insect pests and plant diseases.

The buffalo tree hopper was found to be responsible for most of the damage, with *Stictocephala gillettei* Godg. found in approximately one-third the number. In addition to these two species, both of which oviposit in the bark of trees, six other species of tree hoppers were taken in the various districts, although up to the present time none has become of economic importance in the State.

It is pointed out that tree hopper damage in orchards may be prevented by clean cultivation or by growing between the trees crops which do not serve as attractive food for tree hoppers. An important measure of control may be obtained with dormant miscible oil sprays such as are used in the control of the fruit tree leaf roller and San Jose scale, or when the tree hopper infestation alone is serious enough to justify the expense of an oil spray. Egg parasites appears to have been of minor importance in the control of tree hoppers in the State.

The beet leafhopper in Utah: A study of its distribution and the occurrence of curly-top, G. F. KNOWLTON (*Utah Sta. Bul. 205 (1928), pp. 23, figs. 11*).—This account includes tabular data on the seasonal abundance of the beet leafhoppers and the occurrence of curly top on sugar beets. A list is given of the localities in which the beet leafhopper has been collected. It was found to be commonly present in all of the sugar beet growing areas of the State, at least in the summer months, and curly top was also observed in nearly all of these areas.

The California curly top of the beet [trans. title], K. BÖNING (*Centbl. Bakt. [etc.], 2. Abt., 72 (1927), No. 15–24, pp. 379–398*).—This is a review of the more important literature on the beet leafhopper and curly top in the United States, in connection with a list of 53 references.

The apple sucker (Psylla mali Schmidberger).—II, Development and biology [trans. title], S. MINKIEWICZ (*Pam. Pánst. Inst. Nauk. Gosp. Wiejsk. Puławach (Mem. Inst. Natl. Polon. Écon. Rurale Puławy), 8 (1927), A, pp. 457–528, pls. 5; Eng. abs., pp. 518–527*).—A report of further studies (E. S. R., 57, p. 163) of the biology and control of this insect, in connection with a list of 29 references to the literature.

The green peach aphid, Myzus persicae (Sulzer), E. H. ZECK (*Agr. Gaz. N. S. Wales, 39 (1928), No. 2, pp. 147–154, figs. 11*).—A summary of information on this pest, the first recorded outbreak of which in Australia took place in the Glen Innes district in New South Wales in 1910. It has never become a serious pest in New South Wales, aside from occasionally causing considerable damage to peach trees in the Murrumbidgee irrigation areas.

The citrus aphid situation, J. R. WATSON (*Fla. State Hort. Soc. Proc., 40 (1927), pp. 73–77*).—This is a brief discussion presented at the annual meeting of the Florida State Horticultural Society, held at Bradenton in April, 1927.

The use of tetrachlorethane for commercial glasshouse fumigation, T. PARKER (*Ann. Appl. Biol., 15 (1928), No. 2, pp. 251–257*).—This account deals with various methods of application of tetrachlorethane for control of the greenhouse white fly. It was found that a commercial control of the adult fly can be obtained by using 2.5 to 5 fluid oz. per 1,000 cu. ft., provided the temperature is maintained at 65 to 70° F. and the house is reasonably tight and the fumigation proceeds for 12 hours. High concentrations must be used to destroy the nymphal stage, but it is considered that three fumigations at 5 fluid oz. concentration, given at intervals of a week or 10 days, should be sufficient to keep in check an ordinary infestation. Some growers fumigate once a fortnight as a precautionary measure, using 2 to 2.5 fluid oz. in the early part of the season. Care must be exercised when using this material, owing to the possibility of decomposition during storage, with the formation of free hydrochloric acid.

It is pointed out that this fumigant appears to be selective in its action upon the greenhouse white fly and mealy bug, since certain plants show a varietal susceptibility to the action of the fumigant.

Biological observations of Vanessa io and its parasites [trans. title], P. VOUKASSOVITCH (*Bul. Soc. Ent. France, No. 18 (1927), pp. 277, 278*).—Observations of three tachinid parasites of *V. io* are presented, particularly *Compsilura concinnata* Meig., a high parasitism by which has been found to occur late in July in the vicinity of Belgrade, Serbia.

Instructions on silk-worm rearing, C. C. GHOSH (*Burma Dept. Agr. Bul. 21, [2. ed.], 1926, pp. [3]+20, pls. 11*).—This is the second edition of a handbook previously noted (E. S. R., 54, p. 457).

On the life cycle of Nosema bombycis, the cause of pebrine in the silkworm [trans. title], A. PAILLOT (*Compt. Rend. Soc. Biol. [Paris], 99 (1928), No. 19, pp. 81–83, fig. 1*).—The author's findings in studies of the life cycle of *N. bombycis* have been quite different from those of W. Stempell[1] and others.

A bacterial disease of the red tail moth, Dasychira pudibunda L. [trans. title], E. HUBAULT (*Compt. Rend. Acad. Sci. [Paris], 186 (1928), No. 17, pp. 1157–1159*).—This is a brief report of the study of a bacterial disease of *D. pudibunda*, made during the course of an outbreak of this pest in 1926 and 1927 in the beech forests of eastern France. The characteristics of the organism isolated are described. The organism was found to be very pathogenic for divers species of insects.

The known parasites of the American species of Diatraea (Lepidoptera, Pyralidae) [trans. title], H. E. BOX (*Rev. Indus. y Agr. Tucumán, 18 (1927), No. 5–6, pp. 53–61*).—Thirty-seven forms, representing the Proctotrypoidea, Chalcidoidea, Ichneumonidae, Braconidae, Sarcophagidae, and Tachinidae, are noted.

Submergence as a control measure for the rice-borer, Chilo simplex Butler, C. HARUKAWA (*Ber. Ōhara Inst. Landw. Forsch., 3 (1926), No. 2, pp. 177–184*).—The investigations reported have shown that various factors such as the weather, the depth and temperature of the flooded water, etc., will so affect the efficacy of submergence that it is not possible to draw a conclusion that is valid in every case. It is apparent, however, that submergence is fairly effective in combating the pest under the conditions prevailing in Okayama Prefecture. If this method is satisfactorily carried out toward the middle or the end of July, it is possible to kill 50 to 60 per cent by a submergence of 24 hours. Eighty to 90 per cent can be killed if the rice field

[1] Arch. Protistenk., 16 (1909), No. 3, pp. 281–358, pls. 7, fig. 1.

is submerged and at the same time the rice plants are bent down and brought completely under the water surface.

Orange worms in relation to Valencia oranges, A. J. Basinger (*Citrus Leaves, 8 (1928), No. 2, pp. 1, 2, 30, figs. 6*).—This contribution from the Citrus Experiment Station, Riverside, Calif., reports upon *Tortrix citrana* and *Holcocera iceryaeella*, chiefly responsible for worm damage to oranges in southern California.

Fumigation and spraying as now practiced for insect pest control are said to be ineffective against the orange worms, and no new material has yet been found that may be used with success against these pests. It is important that all doubles and clusters be separated at the first picking in April or May, and if many Tortrix larvae are found in the grove during May or June it might be advisable to remove the entire crop rather than hold it through the summer.

Parasitism is usually low in Holcocera, and not much help can be expected from natural enemies. The orange tortrix is attacked by six or more parasites, the more important of which is a species of Apanteles. At times the parasites of the tortrix entirely destroy an infestation so that scarcely a wormy orange is found the following season.

Preliminary notes on Brachartona catoxantha Hamps. with instructions for combating this pest [trans. title], S. Leefmans (*Landbouw [Buitenzorg], 3 (1928), No. 10, pp. 654–672, figs. 6; Eng. abs., pp. 664, 665; also Dept. Landb., Nijv. en Handel [Dutch East Indies], Korte Meded. Inst. Plantenziekten, No. 7 (1928), pp. 19, figs. 6; Eng. abs., pp. 11, 12*).—This is a brief account of a lepidopterous pest in Java which becomes most serious where coconuts are grown over large areas, not in isolated plats, particularly in the central part of Java. Of some 13 parasites and a few hyperparasites reared from larvae and pupae, the most important are *Degeeria albiceps, Apanteles brachartonae, Ptychomya remota, Euplectrus* sp., and an undetermined ichneumonid.

[Reports of European corn borer conferences] (*Internatl. European Corn Borer Organ. Ann. Conf. [Rpts.], [1] (1925), pp. [13]; [2] (1926), pp. [37], pl. 1; 3 (1927), pp. [47]; Field Guide and Mem. Inform., 1927, pp. [30]*).—These reports, in mimeographed form, are of conferences held September 29 and 30 and October 1, 1925, and in September, 1926 and 1927.

The European corn borer, L. Caesar (*Ontario Dept. Agr. Bul. 334 (1928), pp. 16, figs. 14*).—This is a practical account.

An experimental investigation of the relations of the codling moth to weather and climate, V. E. Shelford (*Ill. Nat. Hist. Survey Bul., 16 (1927), Art. 5, pp. 307–440, figs. 34*).—Part 1 (pp. 315–327) deals with prediction procedure, part 2 (pp. 328–356) with a basis for the measurement of development, and part 3 (pp. 357–435) with methods of experimentation and calculation.

It is concluded that "temperatures can not be summed correctly for biological purposes unless readings are taken at intervals of one or two hours instead of daily and corrected for the effects of other conditions besides temperature so as to fit the true curve for velocity of development. Such correction, here called the temperature substitution method, is possible only through preliminary experimentation or observation affording temperature and humidity data for the defining of standard conditions. The temperature-substitution method, when correctly used, translates the observed conditions into terms of the response of the organism, that is, into developmental units, which can be summed for biological purposes. The use of a normal total of developmental units for a stage in the life cycle of an organism makes possible the calculation of standard average time for the stage. This permits estimation of the amount of individual variation in any given case and the effects of factors

other than temperature and humidity which make the developmental total larger or smaller than normal.

"Autumn and winter rainfall influence the time of first pupation in spring and the length of the pupal stage. Ball-Taylor rainfall-temperature diagrams (hythergraphs) show characteristic differences between years when the codling moth is abundant and years when it is scarce. Rainfall influences the time which the larva spends in the apple and propably the length of other stages.

"The falling of the mean temperature from day to day in late summer is correlated with increased rate of development; the rising of the mean temperature from day to day in spring is correlated with decreased rate of development. The falling of mean temperatures, or at least minimum temperatures, has no apparent effect on the initiation of hibernation. The explanation of hibernation phenomena is probably to be sought in the activity of enzymes. There is no reliable basis for predicting the time of the first spring pupation."

Codling moth clean-up campaign (*Indiana Sta. Circ. 152 (1928), pp. 9, 10, fig. 1*).—The serious situation which developed in orchards in southern Indiana led to the location of a field laboratory at Bedford early in 1927. Overwintering moths were destroyed by scraping the loose bark from the trunks and main branches of the trees and by screening the packing and storage house so that no adult moths might escape. A thorough spray application was made for the first brood worms, and trees which bloomed were given spray and dust applications at the time of the petal fall. This is said to have resulted in almost eliminating the first brood worms. Continual spraying for the second brood served to complete the clean-up, which is said to have been nearly perfect at harvest time.

Successful codlin moth control in Western Australia, G. W. WICKENS (*Jour. Dept. Agr. West. Aust., 2. ser., 5 (1928), No. 1, pp. 52–57*).—It is pointed out that the apple and pear area of Western Australia, aggregating 11,022 acres, is unique among the apple and pear producing countries of the world in the freedom of its orchards from the codling moth. The article is prepared with a view to showing that this freedom is attained only by constant vigilance and effective action.

Optimum feeding temperatures for the dark-sided cutworm, Euxoa messoria Harris, A. V. MITCHENER (*Sci. Agr., 8 (1928), No. 6, pp. 370–375*).—This is a contribution from the University of Manitoba. It is pointed out that in a normal year such as 1926 the maximum damage done by the dark-sided cutworm occurs about the first week of June, but that feeding continues until near the close of the month.

It was found that Paris green kills slightly quicker than calcium arsenate. The maximum deaths from Paris green occurred on the fourth and fifth days, while for calcium arsenate they occurred on the fifth and sixth days. Cutworms which have eaten poisoned bait stop feeding, although they do not die for several days.

Light traps as indicators of cutworm moth population, W. C. COOK (*Canad. Ent., 60 (1928), No. 5, pp. 103–109, fig. 1*).—This is a contribution from the Montana Experiment Station.

Combating the enemies of tobacco [trans. title], A. OSMAN (*Rev. Tech. Monop. Tabacs Turquie, 1 (1928), No. 2, pp. 47–55*).—This contribution deals with the several cutworms of the genus Agrotis which attack tobacco in Turkey, and means for their control.

Dengue fever: Transmission by Aedes aegypti, P. A. SCHULE (*Amer. Jour. Trop. Med., 8 (1928), No. 3, pp. 203–213*).—In experiments conducted by the U. S. Army Medical Department Research Board and the Philippine

Bureau of Science, seven men proved to be susceptible to dengue fever when bitten by the yellow fever mosquito at varying intervals of time after the mosquitoes had taken the virus by feeding on a known experimental case of the disease. Dengue fever was not transmitted by interrupted feeding, nor unless the interval between the infectious feed and the subsequent biting was 8 or 10 days or more.

Algae and the food of anopheline larvae, R. SENIOR-WHITE (*Indian Jour. Med. Research, 15 (1928), No. 4, pp. 969–988, pl. 1*).—A comparison of plankton with gut contents is said to indicate that anophelines are, in general, feeders on whatever organism occurs in greatest abundance in their medium, although there is evidence that diatoms, and perhaps fungal spores, are preferred foods; further, that copper sulfate is not effective against certain species of algae in much greater concentrations than are permissible in field work. Anopheline larvae are found to have a filtration capacity of from about 200 to 1,000 cu. mm. of water per diem, according to the age of the larva. It is concluded that the greatest concentration of plankton in temporary rain pool breeding places is not at the actual surface, but at some milimeters lower down, this greatest concentration being out of the reach of anopheline larvae, but available to culicines.

Mosquito control in Canada, E. HEARLE and C. R. TWINN (*Canada Dept. Agr., Ent. Branch Circ. 62 (1928), pp. 4, fig. 1*).—This is a brief practical account.

Report of Bureau of Malaria Control, 1926–27.—Paper IV, Observations on the blood feeding habits of A. albimanus and grabhamii (*Porto Rico Rev. Pub. Health and Trop. Med., 3 (1928), No. 9, pp. 376–385*).—This is a report on the blood-feeding habits of *Anopheles albimanus* and *A. grabhamii*.

The presence of Chrysomyia albiceps Wied. on the coast of Calvados [trans. title], L. MERCIER (*Compt. Rend. Acad. Sci. [Paris], 185 (1927), No. 16, pp. 795–797*).—This is a brief account of a sheep maggot fly or hair maggot which has been introduced into France, perhaps as larvae or pupae in hides from Australia and Africa, emerging and escaping as adults from the warehouses. The species is shown to be widely distributed in Africa, Asia, and Australia. It has been recorded from Spain and now occurs along the Mediterranean Coast in France. An account of this pest by Patton has been noted (E. S. R., 48, p. 254).

The wheat bulb fly (Hylemyia coarctata Fallen) and frit fly (Oscinis frit Fab.) [trans. title], N. VAN POLETEREN (*Verslag. en Meded. Plantenziektenkund. Dienst Wageningen, No. 45 (1926), pp. 22, pl. 1, fig. 1*).—An account of two important grain pests in the Netherlands.

Observations on Elachiptera cornuta Fall [trans. title], E. A. KREĬTER (KREYTER) (*Izv. Gosud. Inst. Opytn. Agron. (Ann. State Inst. Expt. Agron. [Leningrad]), 5 (1927), No. 4, pp. 287–292, figs. 3*).—A report of studies of the life history and habits of a dipteran which attacks the stem of barley, causing it to decay.

Comparative experiments on the transmission of plague by fleas of the genus Xenopsylla (cheopis and astia) with a discussion on the flea-species distribution in its relation to the incidence of plague, A. N. GOYLE (*Indian Jour. Med. Research, 15 (1928), No. 4, pp. 837–860, fig. 1*).—The results of two series of experiments here reported are considered to demonstrate the superior efficiency of the oriental rat flea as a vector of plague as compared with *X. astia*. Brief discussions of the longevity of unfed adults and of the geographical distribution of the fleas in their relation to the incidence of plague are included.

A garden chafer attack, T. H. Taylor and H. W. Thompson (*Ann. Appl. Biol., 15 (1928), No. 2, pp. 258–262, pl. 1, figs. 2*).—An account of an attack by *Phyllopertha horticola* L. observed in 1919–20.

The wheat root grub (Anodontonyx tetricus), T. McCarthy (*Agr. Gaz. N. S. Wales, 39 (1928), No. 4, pp. 306–313, figs. 2*).—This is an account of the biology, natural enemies, and means of control of a pest which first appeared in New South Wales as an enemy of young wheat in the Tamworth and Billimari districts in 1925.

Paradichlorobenzene for combating cane grubs: Introduction and past history, E. Jarvis (*Queensland Agr. Jour., 29 (1928), No. 2, pp. 97–113, figs. 8*).—This article gives a brief review of past experiments conducted in the Cairns district with paradichlorobenzene against the cane beetle (*Lepidoderma albohirtum* Waterh.) and directions for the use of this fumigant.

The Mexican bean beetle, M. P. Jones (*Ohio Agr. Col. Ext. Bul. 75 [1928], pp. 16, figs. 13*).—A practical summary of information on this pest, which was first found in Ohio in 1923.

Viviparity in Phytodecta rufipes For. (Coleopt. Chrysomelid.) [trans. title], B. Henneberg (*Ber. Oberhess. Gesell. Nat. u. Heilk. Giessen, Naturw. Abt., 11 (1926–27), pp. 17–20*).—In reporting upon observations of viviparity in this chrysomelid beetle the author points out that it is of rare occurrence in Coleoptera, having thus far been recorded only in the families Staphylinidae and Chrysomelidae.

The sweet potato weevil on the islands in the Mississippi Sound, K. L. Cockerham (*Miss. State Plant Bd. Quart. Bul., 7 (1928), No. 4, pp. 3, 4*).—On a trip in September, 1927, to a chain of islands in the Gulf of Mexico which forms the outer border of the Mississippi Sound, the sweet potato weevil was found attacking three species of morning-glory that occur there. It is pointed out that such infestation will always prove to be a source of danger to the mainland, since high winds and storm tides will undoubtedly break off parts of the infested vines and deposit them on the mainland.

Baiting for banana weevil borer control, J. L. Froggatt (*Queensland Agr. Jour., 29 (1928), No. 4, pp. 282, 283*).—The methods of preparing baits for the control of this pest are briefly described.

Shot-hole borer (Xylion gibbicollis), L. J. Newman (*Jour. Dept. Agr. West. Aust., 2. ser., 5 (1928), No. 1, pp. 132–136, figs. 3*).—An account of injury caused to grapevine canes by the small boring beetle *X. gibbicollis*.

The bionomics of the spruce bark-beetle (Dendroctonus piceaperda Hopk.), E. B. Watson (*Sci. Agr., 8 (1928), No. 10, pp. 613–635, pls. 4, figs. 2*).—This is a contribution from the division of forest insects, Entomological Branch, Department of Agriculture, Ottawa, which reports the result of observations carried out in the Algoma district of Ontario.

The bionomics of Apion ulicis Först. (gorse weevil), with special reference to its rôle in the control of Ulex europaeus in New Zealand, W. M. Davies (*Ann. Appl. Biol., 15 (1928), No. 2, pp. 263–286, pls. 3, figs. 3*).—This is a contribution from the Rothamsted Experimental Station on *A. ulicis* with reference to the use of this weevil for the control of *U. europaeus* (the common gorse or furze), which is scheduled as a noxious weed by the New Zealand Government. A parasite identified as *Splintherus leguminum* Ratz. has been reared, 4 per cent parasitism being estimated. A list is given of 21 references to the literature.

Tree selection by the western pine beetle, H. L. Person (*Jour. Forestry, 26 (1928), No. 5, pp. 564–578, figs. 4*).—It was found that in general the poorer sites with open pure yellow pine stands along ridges or on any exposed location

are preferred by the western pine beetle. A study on the Cascadel area of the Sierra National Forest, Calif., showed that the loss from this beetle per unit area varied inversely with the quality of the site, the heaviest losses being found on the poorest sites.

"A decided preference is shown by this beetle for trees between 20 and 30 in. in diameter. A comparison of increment cores from more than 1,000 trees killed by *Dendroctonus brevicomis* with cores from an almost equal number of living check trees of the same site and size indicates that this beetle manifests a definite selection of the slower-growing trees; that in about 75 per cent of the cases the killed tree was growing slower than the living check tree; that the average rate of growth of the killed trees was about 40 per cent less than the rate of growth of the living check trees; that the beetles' preference for the slower-growing trees is definitely shown in the case of trees of all diameters, though this preference is more pronounced at some diameters than at others; that while nearly 45 per cent of the killed trees showed a growth in diameter of less than 0.4 mm. a year, only 17 per cent of the checks were growing that slowly, and 91 per cent of the killed trees showed an increase of diameter of less than 2 mm. annually."

It is stated that preliminary data on the mountain pine beetle, the Black Hills beetle, and an engraver beetle indicate that other important bark beetles found in the western forests probably do not show this definite selection of the slow-growing trees.

The two weevil pests of plantains (Musa sapientum L.), Cosmopolites sordidus Germ. and Odoiporus longicollis Oliv., M. P. D. Pinto (*Trop. Agr. [Ceylon], 70 (1928), No. 4, pp. 216–224, pl. 1*).—Two weevil pests of plantains, the banana root borer and the stem weevil (*O. longicollis*), are considered.

The muscles of the adult honey-bee (Apis mellifera L.), I, II, G. D. Morison (*Quart. Jour. Micros. Sci. [London], n. ser., 71 (1927), No. 283, pp. 395–463, figs. 12; 71 (1928), No. 284, pp. 563–651, figs. 41*).—This work deals with the healthy muscles of the adult honeybee, part 1 taking up the somatic musculature, and part 2 the muscles of the alimentary canal, heart, diaphragms, and the reproductive organs, and the indirect muscles of the wings. A bibliography of five pages is included in each part.

Bee diseases in California, F. E. Todd (*Calif. Dept. Agr. Mo. Bul., 17 (1928), No. 3, pp. 191–204, figs. 5*).—A discussion of bee diseases in California, particularly American foulbrood, and means for their control.

[Apicultural work at the Canadian experimental stations] (*Canada Expt. Farms, Rpts. Supts. 1926, Agassiz (B. C.) Farm, pp. 43–45; Charlottetown (P. E. I.) Sta., pp. 59, 60; Invermere (B. C.) Sta., pp. 31, 32; Kapuskasing (Ont.) Sta., pp. 60–64; Lacombe (Alta.) Sta., pp. 69–71; Lennoxville (Que.) Sta., pp. 63–67, fig. 1; Lethbridge (Alta.) Sta., pp. 59–64; Morden (Man.) Sta., pp. 1, 57–63, fig. 1; Nappan (N. S.) Farm, p. 64; Ste. Anne de la Pocatiere (Que.) Sta., pp. 60–67, fig. 1; Beaverlodge (Alta.) Substa., Rpts. Supt. 1925, pp. 1, 67, 68, fig. 1; 1926, pp. 91–94, fig. 1*).—These reports deal with the work of the year in beekeeping, respectively prepared by W. H. Hicks, J. A. Clark, R. G. Newton, S. Ballantyne, F. H. Reed, J. A. McClary, W. H. Fairfield, W. R. Leslie, W. W. Baird, J. A. Ste. Marie; and W. D. Albright.

Bacillus pluton among wasps (*Amer. Bee Jour., 68 (1928), No. 2, p. 64*).—Reference is made to the finding in a wasp's nest in Russia of larvae that had been killed by *B. pluton*. Feeding experiments indicated that it may be transmitted from the wasps to bees through ingestion.

Studies in arthropod hibernation.—II, The hibernation of the ant Formica ulkei Emery, A. M. Holmquist (*Physiol. Zool., 1 (1928), No. 3, pp*

325–357, figs. 5).—This second contribution (E. S. R., 59, p. 160) deals with the subject under the headings of general methods, hibernation, moisture conditions in the nest in winter, temperature conditions in the nest in winter, relation to other animals in winter, activity during the winter, water content of workers during the winter, respiration, temperature of ant aggregations, and discussion. A list of 47 references to the literature referred to is included.

Biological and taxonomic investigations on the mutillid wasps, C. E. MICKEL (*U. S. Natl. Mus. Bul. 143 (1928), pp. IX+351, pls. 5, figs. 30*).—Part 1 of this work (pp. 1–28) deals with the biology of the mutillid wasps, and part 2 (pp. 29–38) with type species of the genera of the family Mutillidae, including a list of generic names. Part 3 (pp. 39–303) is a monograph of the mutillid wasps of the genus Dasymutilla occurring in America, north of Mexico, and part 4 (pp. 305–338) an annotated bibliography.

Life history notes on two species of sawfly injurious to the fruit of the choke cherry, R. D. BIRD (*Sci. Agr., 8 (1928), No. 8, pp. 497–501*).—This is an account of *Hoplocampa xantha* Roh. and *H. lacteipennis* Roh., which, in turn for their services in fertilizing the flowers, are said to exact a heavy toll from the cherry. The adults not only eat large quantities of nectar and pollen, but the females deposit their eggs in the calyx of the flower and the larvae destroy the developing fruit.

Contributions to the biology of the rose sawfly, Hylotoma rosae D. G. [trans. title], G. N. FINTZESCOU (*Bul. Soc. Ent. France, No. 11 (1927), pp. 180–183*).—An account of observations of this sawfly in the region of Jassy, Rumania.

On the life-histories and economic status of certain cynipid parasites of dipterous larvae, with descriptions of some new larval forms, H. C. JAMES (*Ann. Appl. Biol., 15 (1928), No. 2, pp. 287–316, figs. 12*).—*Cothonaspis rapae* (Westd.) has been found by the author to be an effective parasite of the cabbage maggot in the Cambridge district, 25 per cent of the total of host maggots and puparia being parasitized by this cynipid. The average duration of a life cycle of *C. rapae* was found to be 92 days and the length of the larval stage about 55 days. There are two generations in a season, the first appearing in May and the second in August and September.

The life histories of *Figites anthomyiarum* Bouché, *Kleidotoma marshalli* (Marshall), and an undetermined Kleidotoma are described. They are all said to be effective parasites during the early larval stages of carrion-feeding Diptera, such as the *Calliphora erythrocephala, Sarcophaga carnaria, Lucilia sericata*, etc. It is estimated by the author that saprophagous maggots are reduced in numbers by 30 per cent owing to parasitization by various cynipid parasites during the early larval stages.

A list is given of 22 references to the literature.

A contribution to our knowledge of south Indian Braconidae.—Part I, Vipioninae, T. V. RAMAKRISHNA AYYAR (*India Dept. Agr. Mem., Ent. Ser., 10 (1928), No. 3, pp. [3]+29–60f, pls. 10*).—This first part deals with the Vipioninae.

The overwintering in Massachusetts of Ixodiphagus caucurtei, F. LABROUSSE, A. G. KING, and S. B. WOLBACH (*Science, 67 (1928), No. 1735, pp. 351–353*).—The authors record the apparently successful introduction of *I. caucurtei* from France into the United States on the island of Naushon, Mass., and its establishment. Work is being conducted with a view of controlling the common dog tick (*Dermacentor variabilis*).

On the parasites of aphids and their hyperparasites [trans. title], C. FERRIÈRE and P. VOUKASSOVITCH (*Bul. Soc. Ent. France, No. 2 (1928), pp.*

26–29).—Eleven forms representing the genera Ephedrus, Praon, Aphidius, Lysiphlebus, and Trioxys are noted.

A preliminary report on the insect parasites of the black scale Saissetia oleae (Bernard), H. S. Smith and H. Compere (*Calif. Univ. Pubs. Ent., 4 (1928), No. 9 pp. 231–334, figs. 63*).—The geographical distribution of black scale and ecological and economic considerations are first dealt with. The parasites, 36 in number, three of which are described as new, are considered at length (pp. 244–334).

Termites, or white ants, in Hawaii, D. T. Fullaway (*Hawaii. Forester and Agr., 23 (1926), No. 3, pp. 68–88, figs. 13*).—A discussion of the injury caused by white ants and means for their control by proper construction of buildings.

ANIMAL PRODUCTION

Factors affecting the vitamin B content of plant products, W. D. Salmon (*Alabama Sta. Rpt. 1926, pp. 15, 16*).—In experiments with pigeons it has been found that it required 0.79 gm. of velvet beans fed within a few months of harvesting per 100 gm. of live weight to protect the birds against the onset of polyneuritis. The maintenance dose for 1-year-old beans was 1.1 gm. and for 3-year-old beans 1.5 gm. per 100 gm. of live weight.

Similar tests with rats again showed that as the beans became older the larger were the amounts required to protect against vitamin B deficiency. Soy beans tested in a similar manner showed no significant differences in vitamin B content at different ages.

The leaves of velvet beans and rape were more efficient than the velvet bean seed in promoting growth in rats, but less efficient than the seed in preventing beriberi in pigeons. This indicated to the author that the factor controlling gains in weight in rats and pigeons differed from the factor controlling neuritis symptoms in either animal.

Some outstanding forage grasses of western cattle ranges, W. A. Dayton (*Producer, 9 (1928), No. 10, pp. 3–7, figs. 8*).—In this article the author gives the characteristics, the distribution, and the value of some of the outstanding forage grasses found on western cattle ranges.

The nutritive and manurial values of sugar beet tops, H. E. Woodman and J. W. Bee (*Jour. Agr. Sci. [England], 17 (1927), No. 4, pp. 477–488*).—A digestion trial of two separate periods of feeding was carried out at the School of Agriculture, Cambridge University, England, with Suffolk wethers to determine the nutritive value of sugar beet tops. During the initial period a daily ration of 4,000 gm. of sugar beet tops and 600 gm. of chaffed meadow hay, to which was added 4 gm. of precipitated chalk to minimize any danger arising from the presence of oxalic acid in the beet leaves, was fed to the animals. In the second period the daily ration consisted of 1,100 gm. of chaffed meadow hay. The experimental periods were of 14 days' duration.

The fresh tops were spread in a thin layer on a stone floor in a cool room and allowed to wilt for from 3 to 6 days before feeding in order to reduce the amount of oxalic acid in the leaves. Before weighing out the ration the tops were freed from adhering soil and ground. It was found that the crowns of the beets made up 25 per cent of the tops.

On a dry-matter basis 100 lbs. contained 61.8 lbs. of digestible organic matter, including 8.8 lbs. of digestible protein, 1.7 lbs. of digestible ether extract, 44.2 lbs. of digestible carbohydrate, and 7 lbs. of digestible fiber. The digestibility of lime in the ration did not increase when the amount offered daily rose from 8 gm. CaO in the hay ration to nearly 18 gm. in the beet-top ration. This led the authors to believe that the oxalic acid present made the lime of the tops

unavailable and possibly had some effect on the other lime present in the ration. On a basis of digestibility it was calculated that 25 lbs. of sugar beet tops could replace 40 lbs. of mangels in the rations of livestock. The beet tops proved to be quite palatable.

Growing and feeding field roots, E. S. HOPKINS, G. B. ROTHWELL, F. C. ELFORD, and F. T. SHUTT (*Canada Dept. Agr. Bul. 94, n. ser. (1927), pp. 35, figs. 9*).—A popular bulletin on the production and feeding of the various root crops to livestock. The value of the different roots for each class of stock is pointed out.

Fifth annual report [of the National Live Stock and Meat Board] for fiscal year 1927–28, R. C. POLLOCK (*Natl. Livestock and Meat Bd. Ann. Rpt., 5 (1928), pp. 107, figs. 94*).—The fifth annual report of the board (E. S. R., 57, p. 660) contains brief results of research dealing with meat in anemia, meat iron, meat in the rearing of young, and studies of quality. A brief report is also made of the educational program of the board.

Winter feeding and time of marketing steers, J. C. GRIMES (*Alabama Sta. Ann. Rpt. 1926, p. 13*).—Experiments indicated that it was more profitable to limit the winter ration and finish steers on grass alone than to full feed during the winter and market in the spring or to limit the winter ration and feed cottonseed meal on grass during the summer. Supplementing a ration of cottonseed meal and Johnson grass hay with blackstrap molasses for steers to be marketed in the spring was not profitable. The steers receiving molasses made larger daily gains and carried more finish than steers not receiving molasses, but the cost of gain and the difference in selling price did not justify the extra expense. Feeding cottonseed meal to steers being finished on grass did not prove profitable.

The native cattle of Southern Rhodesia, E. A. NOBBS (*So. African Jour. Sci., 24 (1927), pp. 328–342*).—An interesting article giving the history, description, and some of the outstanding characteristics of the breeds of native cattle of Southern Rhodesia.

Brahman or Zebu cattle, W. C. BARNES (*Producer, 9 (1928), Nos. 11, pp. 3–6, figs. 2; 12, pp. 3–6, figs. 2*).—The author describes the characteristics of the Brahman cattle, together with a history of their early importation and development in this country.

The kosher beef trade (*Cattleman, 14 (1928), Nos. 8, pp. 21–23; 9, pp. 14–18; 10, pp. 79, 81*).—A series of popular articles dealing with the origin and practices in the preparation of kosher beef. The principal object of the articles is to show the effect of kosher beef upon the regular beef trade.

Evolution in the fleece of sheep, J. E. DUERDEN (*So. African Jour. Sci., 24 (1927), pp. 388–415, pls. 2, fig. 1*).—In this article the author traces the evolution of the covering of sheep from the coarse, stiff, overlapping fibers with the fine intertwining woolly fibers of the wild and primitive species to the wool covering of the varying types of present-day breeds of sheep.

The primitive coat of the blackhead Persian, E. BOYD (*So. African Jour. Sci., 24 (1927), pp. 416, 417*).—In a study of the covering of blackhead Persian sheep in South Africa, the author found it to resemble that of wild sheep. The kemp fibers, which were uniformly distributed over the whole body, were about 40 mm. long and varied from 75 to 235 μ in their greatest diameter. They were stiffly wavy in one plane, brittle, and overlapping and inclined backward and downward, being shorter over the extremities. The wool fibers occurred in irregular masses of wavy fibers around the lower part of the kemp. The individual wool fibers varied from 22 to 34 mm. in length and from 11.8 to 13.5 μ in diameter. They were approximately circular in cross section in

contrast to the oval form of kemp. Most of the wool fibers were non-medullated.

Lambs were born with the coat well developed, though in utero the kemp fibers appeared before the wool and at birth the latter was scant. On first emerging from the skin, all fibers had long tapering points, which began within two or three months of birth to break off in short fragments, leaving the fibers truncated. The coat underwent complete seasonal shedding at about the end of winter. The kemp fibers were thrown off freely, while the wool fibers were massed into a dense mat filled with large quantities of yolk, indicating an increased metabolic activity in the skin. The old wool fibers were shed slowly, and the new coat was rather well established before the old was completely lost.

Progress report of livestock feeding experiments, 1928.—I, Feedlot fattening rations for lambs, E. J. MAYNARD (*Colorado Sta. Press Bul. 64 (1928), pp. 7*).—In a study of feeds best suited for fattening lambs (E. S. R., 58, p. 167), grade range lambs were divided into 11 lots of 25 head each, averaging approximately 58 lbs. with the exception of lot 3 which averaged 41 lbs. Lots 1 to 9 received long alfalfa hay in self-feeders, lot 10 cut alfalfa self-fed, and lot 11 alfalfa hay through panels. In addition to the hay, lots 1, 3, and 11 received shelled corn, lot 2 whole Trebi barley, lot 4 steamed rolled Trebi barley, lot 5 whole Coast barley, lot 6 whole Trebi barley and cottonseed meal, lot 7 whole Trebi barley, cut corn fodder, and cottonseed meal, lot 8 whole Trebi barley, crushed beet pulp, and cottonseed meal, lot 9 whole Trebi barley, corn silage, and cottonseed meal, and lot 10 ground Trebi barley, beet molasses, and cottonseed meal.

Shelled corn produced better gains and a higher finish than barley. The Trebi barley was 83.4 per cent and Coast barley 73.4 per cent as valuable as corn in this test. One ton of corn replaced 2,204.4 lbs. of Trebi barley and 374.3 lbs. of alfalfa and 2,354.3 lbs. of Coast barley and 628.6 lbs. of alfalfa. The steamed rolled barley was 84.4 per cent as efficient as corn, a difference that is not significant when compared with whole barley. Cottonseed meal proved unprofitable when fed with barley and alfalfa, as although it increased the rate of gain the increased cost did not justify its use. When fed with corn fodder, corn silage, beet pulp, or molasses it did prove profitable. In this test corn silage proved to be 34.9 per cent as efficient as cut corn fodder, pound for pound. The ration fed to lot 8 was the most efficient and cheapest, while the ration in lot 10 produced the quickest gains. The lambs in these 2 lots were ready for market 3 weeks earlier than the other lots. The light lambs made smaller gains, but the cost of gains was only 89.1 per cent as much as with the heavier lambs. Feeding hay through panels proved more efficient than feeding in self-feeders. The average daily gains in the respective lots were 0.29, 0.24, 0.28, 0.27, 0.24, 0.28, 0.29, 0.38, 0.29, 0.38, and 0.33 lb. per head.

[Swine feeding tests at the Alabama Station] (*Alabama Sta. Rpt. 1926, pp. 13, 14, 17, 18*).—The results of four experiments are noted.

Forage crops for fattening hogs, J. C. Grimes.—Three lots of 10 pigs each, averaging approximately 80 lbs., were fed as follows: Lot 1 dry lot, corn and tankage self-fed, lot 2 oat and vetch pasture and corn and tankage self-fed, and lot 3 oat and vetch pasture and 9 parts of corn and 1 part of tankage hand-fed at the rate of 3 per cent of the live weight. Lots 2 and 3 had the run of 0.75 acre each during a 56-day period. The average daily gains in the respective lots were 1.65, 2.13, and 1.9 lbs. per pig. The costs of gains were greatest in lot 1 and least in lot 2, and the average profit per pig was in the reverse order to the cost.

Soft pork, J. C. Grimes and W. D. Salmon.—Twenty pigs averaging 111 lbs. per head were used in hogging down corn and soy beans planted in

alternate rows 3 ft. apart. During a 46-day period the pigs made an average daily gain of 2.15 lbs. per head, and the yield of pork per acre was 235 lbs. At the close of the feeding period the hogs were slaughtered, and all carcasses were graded. With the exception of one carcass that graded medium soft, all carcasses graded hard or medium hard.

Velvet bean ration for brood sows, E. R. Miller and J. C. Grimes.—Continuing this study (E. S. R., 59, p. 67), a Duroc-Jersey sow farrowed as her eighth litter on a velvet bean ration of cooked velvet beans with sodium chloride, calcium carbonate, yeast, and cod-liver oil 10 live and 6 dead pigs averaging 1.93 lbs. at birth. She raised 7 pigs to an average weight of 19.75 lbs. at 8 weeks of age. The same sow on the same ration except that 10 per cent of casein replaced the yeast farrowed as her ninth litter 10 live and 2 dead pigs averaging 2.05 lbs. at birth. This was the healthiest and thriftiest litter that had been raised on a ration containing such a large proportion of velvet beans. Nine of the pigs were raised and at 8 weeks of age averaged 25.5 lbs. During the fourth week of the suckling period the pigs made an average weekly gain of 2.54 lbs. and during the fifth week 1.4 lbs. At this point 10 per cent of yeast replaced the casein in the sow's ration and during the sixth week the pigs gained 3.07 lbs. The following week 15 per cent of casein replaced the yeast and the pigs gained 4.87 lbs. The eighth week 15 per cent of yeast replaced the casein and the pigs gained 3.15 lbs. The casein used in the tests had been heated to 130° C. to destroy the growth-promoting factor.

Velvet bean ration for pigs, E. R. Miller and J. C. Grimes.—The pigs in the above experiment were weaned at 8 weeks of age and placed on the following rations: Two on normal ration, 2 on cooked velvet beans and normal ration, equal parts, 2 on the same ration as above with the addition of skim milk, 2 on normal ration plus skim milk, and 1 on cooked velvet beans plus 15 per cent of casein. In this latter lot the velvet beans had to be reduced to 50 per cent by the addition of normal ration. During a 5 months' period the pigs in the respective lots made 130.6, 134, 141.9, 154.6, and 155.6 lbs. of total gain per head.

Raising hogs in North Dakota (*N. Dak. Agr. Col. Ext. Circ. 80 (1928), pp. 8, figs. 3*).—A popular publication on the care, feeding, and management of hogs.

Variations in carcase type for pork and bacon, H. R. Davidson (*Scot. Jour. Agr., 10 (1927), No. 4, pp. 394–403, pls. 4*).—An experiment at the School of Agriculture, Cambridge, Eng., was conducted to determine how far it was possible to use bacon-type pigs for the production of small carcasses and whether barrows were better for pork and gilts for bacon. A lot of purebred Large Whites, consisting of 6 barrows and 6 gilts sired by the same boar, was selected from the litters of 2 sows. Three of each sex were fed for pork and killed at an average weight of 100 lbs., and the remaining 3 of each sex fed for bacon and killed at 200 lbs. The nutritive ratio of the rations fed was slightly wider than the usual pork standard, but all animals were fed as for pork from the start.

The animals to be used for pork were ready for market at 4 months of age, at which time the barrows averaged 110 lbs. and the gilts 106.3 lbs. The carcasses were of such quality as to confirm the belief that good bacon-type pigs are suitable for the production of the finest type of pork. The bacon hogs were ready for market at 6 months of age, at which time the barrows averaged 216.5 lbs. and the gilts 203.8 lbs. None of the barrow carcasses graded above No. 2, while 2 of the gilt carcasses graded No. 1. Of the 6 carcasses, however, only 2 were too fat to receive the bonus paid for high quality, and this in spite of the

fattening nature of the ration fed. The author suggests that the barrows be killed for pork and the gilts retained for producing bacon carcasses.

Poultry feeding experiment: Dried milk v. meat meal, W. O. Pederick and A. G. Clark (*Jour. Dept. Agr. Victoria, 26 (1928), No. 2, pp. 99–106*).—Tests to compare the value of dried milk and meat meal for laying hens were conducted at the State Research Farm, Victoria, Australia. The tests extended over 2 laying seasons, using 2 pens of Black Orpington and 2 pens of White Leghorn hens. The first 2 pens were fed by the free-choice method, the only difference being that 1 pen had access to dried milk and the other to meat meal. The last 2 pens were fed wet mash with the same difference as in the above pens.

The pens fed meat meal showed a greater net profit than those fed dried milk. However, the birds receiving the dried milk laid better during the fall and winter than the other lots and passed through the molting season much easier than those fed meat meal. The test indicates the value of dried milk during the months from February to August, but for the remainder of the year dried milk had little or no advantage over the cheaper meat meal. The advantage of retaining reasonably good layers for egg production for 2 seasons was also demonstrated in this work.

Electric lights for increasing egg production, G. W. Kable, F. E. Fox, and A. G. Lunn (*Oregon Sta. Bul. 231 (1928), pp. 37, figs. 23*).—The results of a 2-year study to determine the returns from lighted and unlighted pens of pullets and hens are reported. March-hatched White Leghorns were used in the trials. The 400 yearling hens used had trap nest records of 150 or more eggs in 11 months and were divided into 2 uniform lots, 1 of which was lighted and the other not lighted. Two hundred and thirty early maturing pullets and 230 slow maturing pullets were divided into 2 uniform pens each, 1 being lighted and the other unlighted. The lights were turned on October 1 and were used to March 31. A uniform light day of about 13 hours was maintained throughout the experiment.

The response to lighting was almost immediate, and the lighted lots produced at a higher level from October to February than the unlighted lots. The unlighted lots, however, passed the lighted lots in production in February and March. Lighting leveled off annual production by increasing fall and winter and decreasing spring and summer production. Pullets in the lighted lots showed an increase in production from 0.6 to 6.6 per cent, but yearling hens that had been lighted the previous year produced fewer eggs under lights than yearling hens without lights. The increase in feeding time from the use of the lights was apparently not the entire cause of increased production.

It was found that the number of hours of light per day did not govern the amount of feed consumed. Birds producing the most eggs consumed the most feed. The total mortality in the lighted pens ranged from 6.9 to 15.6 per cent and in the unlighted pens from 3.4 to 15.5 per cent per year. Lighting materially increased the returns from lighted pens during the period when lights were used. In this test less than two-fifths of an egg per hen per month paid for the electricity used. The results indicate that a flock of 400 average pullets would yield an excess profit of $81.07 in 11 months over the cost of lighting.

Pertinent suggestions on lighting and wiring for poultry houses are also given.

Effects of sunlight on the hatching quality of eggs, F. M. Fronda and J. A. Belo (*Philippine Agr., 16 (1928), No. 8, pp. 477–493, fig. 1*).—Experiments were conducted at the University of the Philippines to determine the effect of exposure to the sun on hatchability of eggs and how much exposure would produce the best results. Duck eggs were divided into 2 lots of 57 eggs each,

1 a check lot and the other exposed to the sunlight for 15 to 30 minutes daily during the first 14 days of incubation. Also, a total of 1,267 chicken eggs was divided into 6 settings of 5 lots each. The first lot of each setting was used as the check or unsunned group, and the other lots in the settings were treated as follows: Lot 2 sunned 30 minutes before placing in the incubator trays, lot 3 sunned as in lot 2 and 30 minutes every 6 days thereafter to the eighteenth day, lot 4 sunned as in lot 2 and 30 minutes every 3 days thereafter until the eighteenth day, and lot 5 sunned as in lot 2 and 30 minutes every day until the eighteenth day of incubation.

The percentage of fertile duck eggs hatched in the unsunned group was 39.28 and in the sunned group 50.91. The average hatchability of all hen's eggs set was 56.78, 64.41, 62.86, 74.11, and 73.1 per cent in the respective lots. The differences between the check lots and lots 4 and 5 were significant and in the other lots insignificant. The embryonic mortality for the respective lots of hen's eggs was 43.21, 35.6, 37.15, 25.89, and 26.89 per cent. The beneficial effect derived from sunning eggs was especially marked during the first 2 weeks of embryonic development. Sunning eggs every 3 days was considered to be more practical than sunning every day, due to the saving in labor.

Artificial incubation of eggs, J. E. Dougherty (*Calif. Agr. Col. Ext. Circ. 19 (1928), pp. 18, figs. 2*).—A popular publication dealing with all the factors involved in the artificial incubation of eggs.

Rabbit raising, H. M. Butterfield and W. E. Lloyd (*Calif. Agr. Col. Ext. Circ. 9, rev. ed. (1928), pp. 72, figs. 17*).—This is a revision of the publication previously noted (E. S. R., 57, p. 665) under this title.

Chinchilla rabbits for food and fur, D. M. Green (*U. S. Dept. Agr. Leaflet 22 (1928), pp. II+6, figs. 3*).—A popular publication describing the origin and popularity of Chinchilla rabbits, their economic value, food and fur qualities, breeding, standard requirements, and future development.

DAIRY FARMING—DAIRYING

Dairy cattle feeding and management, C. W. Larson and F. S. Putney, revised by H. O. Henderson (*New York: John Wiley & Sons; London: Chapman & Hall, 1928, 2. ed., rev., pp. XXIII+450, pl. 1, figs. 102*).—This is a second and revised edition of this work, previously noted (E. S. R., 37, p. 172).

Comparison of cane and kafir silage for milk production, R. B. Becker and W. D. Gallup (*Oklahoma Sta. Bul. 177 (1928), pp. 8*).—During the winter of 1925 and for the two subsequent winters 8 cows were divided into 2 uniform groups and fed by the reversal method to determine the feeding value of Early Sunrise kafir and Kansas Orange cane silages for milk production. The feeding trials of 90 days' duration were divided into 3 30-day periods, 10 days preliminary and 20 days experimental. About the middle of each experimental period a 5-day composite sample of milk from each cow was tested for butterfat content. The silages were fed in alternate 30-day periods, with a basal ration consisting of wheat bran, ground oats, corn meal, and cottonseed meal, 4:3:2:1. For each 1,000 lbs. live weight, 10 lbs. of alfalfa hay and 30 lbs. of silage were fed. During the day the cows were in outside lots in which they had access to special bone meal, salt, and water. Data secured on losses of whole grain which occur when cane and kafir silages are fed to dairy cows have been noted (E. S. R., 58, p. 269).

The kafir and cane silages were approximately equal pound for pound in feeding value, although chemical analyses showed the kafir silage to be slightly superior to the cane silage. On an acre basis, the cane silage produced more total feed nutrients than the kafir silage. The cows produced more milk and

maintained their body weight better on kafir silage, and produced more butterfat on cane silage. However, the differences were within the range of experimental error and could not be regarded as significant. The cows consumed an average of 2.3 lbs. of salt and 0.86 lb. of bone meal per head per month while on these rations. The calcium and phosphorus content of these silages are noted for the first time.

The value of silage in the experimental ration, H. T. Converse (*Jour. Dairy Sci., 11 (1928), No. 3, pp. 179–188, fig. 1*).—The U. S. D. A. Bureau of Dairying fed 9 cows during alternate periods rations of alfalfa hay and grain and alfalfa hay, grain, and corn silage. In most cases the experimental periods were for 2 months, and the cows were all tested for 6 to 10 months. The hay and grain were fed in as nearly equal parts as possible in all periods, being reduced in quantity when silage was added. Eight kg. (17.6 lbs.) of silage per day was fed to Jersey and Guernsey cows and 14 kg. to Holstein cows. The milk was weighed regularly and the butterfat content determined from 2-day samples collected on the fifth, fifteenth, and twenty-fifth of each month.

On the nonsilage ration the cows produced an average of 2.8 per cent more milk and 4.2 per cent more butterfat than on the silage ration. These results were obtained when only a small amount of silage was added to the ration, and do not take into account a ration in which the hay is largely or entirely replaced by silage. The author concludes from the results obtained that while feeding silage or no silage made practically no difference in the milk and butterfat yields the factor of succulence in silage did not enhance the value of the ration. It seems justifiable, therefore, for experimental purposes, to simplify the basal ration by leaving out the silage.

Minerals in the dairy ration, W. D. Salmon and W. H. Eaton (*Alabama Sta. Rpt. 1926, pp. 14, 15*).—Continuing this study (E. S. R., 56, p. 73), the cows receiving no minerals in addition to the regular ration dropped 5 calves averaging 63.8 lbs. at birth, those in the bone meal group 5 calves averaging 61.2 lbs., and those in the marble dust group 3 calves averaging 65 lbs. The minerals had no apparent effect upon the rate of growth of the calves in the different lots during the first 3 to 8 months. The average milk production for the year per cow in the respective lots was 4,915, 6,194, and 5,685 lbs.

The activity of the mammary gland as determined by analysis of mammary blood before and after milking, E. A. Cockefair (*Jour. Dairy Sci., 11 (1928), No. 3, pp. 230–239*).—In this study the author took 100 cc. samples of blood from the mammary vein just before and immediately after milking. A check sample of jugular blood was also taken immediately after the mammary sample. The blood was kept from clotting by means of a saturated solution of sodium citrate, and was analyzed for inorganic and organic phosphorus. Two Holstein, 1 Ayrshire, and 3 Guernsey cows, representing high, medium, and low production, were used in the work. From 10 to 20 samples of blood were taken from each cow.

The analyses with few exceptions showed that the mammary blood before milking is higher in both forms of phosphorus than systemic blood. On the other hand, both forms of phosphorus are lower after milking. The author interprets these results to mean that just previous to milking the synthesis of milk is nil, which allows the blood to retain its lipoids. At the same time inorganic phosphorus liberated during the time of secretion is being absorbed by the blood. After milking, the lipoids are being used for fat synthesis, and the inorganic phosphorus liberated in this process is not at once reabsorbed because the main osmotic current is toward the alveolar cells. During milking and from 4 to 6 hours later the lipoids are being utilized, while after this time the

inorganic phosphorus in the mammary blood increases probably because the osmotic interchange is sufficiently equalized to allow its return.

The author believes that milk secretion is most active just after milking, and that it proceeds in diminishing rate as the pressure and presence of accumulating synthesized milk interferes with cellular activity.

Direct microscopic examination of milk.—Impressive demonstration to milk producers where milk was obtained from diseased cows, L. FORMAN and I. H. SHAW (*Creamery and Milk Plant Mo., 17 (1928), No. 4, pp. 36, 38, 40, figs. 3*).—A preliminary report by the New Jersey Department of Health, explaining the method used in the direct microscopic examination of milk.

It was found that the long chain streptococci which occur in many cases of mastitis could be detected by this method. Milk from an infected quarter of one cow mixed with the milk from an ordinary sized herd contaminates the whole and can easily be determined. The authors believe that the most significant result of the examination so far is that it enables milk inspectors to give suggestions to the dairyman for the improvement of the quality of market milk.

An investigation into the effect of pasteurisation on the bovine tubercle bacillus in naturally infected tuberculous milk, L. J. MEANWELL (*Jour. Hyg. [London], 26 (1927), No. 4, pp. 392–402, fig. 1*).—Four series of experiments were conducted by the author at the National Institute for Research in Dairying, England, to determine the effect of pasteurizing temperature upon the tubercle bacillus. In the first series 39 tests were made of the milk of 3 cows affected with tuberculosis of the udder. The milk was heated to 62.8° C. (145° F.) for 30 minutes, and 118 guinea pigs were inoculated with the centrifugalized deposit and cream of the heated milk. One animal developed generalized tuberculosis, and the remainder gave negative results. Out of 38 guinea pigs inoculated with coagulated material from the cooler after pasteurization, 1 gave positive results. In the second series the milk was heated to 60° C. for 30 minutes; 100 guinea pigs were inoculated with the centrifugalized deposit and cream, and no positive results were obtained. In the third series 66 guinea pigs were inoculated as in series 2 with milk heated to 60° for 20 minutes and 1 developed tuberculosis. Of 6 guinea pigs inoculated with material from the cooler, 1 gave a positive result. Milk heated to 59.3° for 20 minutes was used in the fourth series, and of 12 guinea pigs inoculated 10 developed tuberculosis, while of 6 animals inoculated with material from the cooler all gave negative results.

The author concludes that while the pasteurizing temperature of 62.8° for 30 minutes does not always kill all the tubercle bacilli in naturally infected milk, it is an effective temperature in most cases. At a temperature of 60° for 20 minutes the tubercle bacilli are in many cases killed, but this combination allows no margin of safety.

Physical factors influencing the formation and fat content of gravity cream, H. C. TROY and P. F. SHARP (*Jour. Dairy Sci., 11 (1928), No. 3, pp. 189–226, pls. 3, figs. 2*).—In this study at the New York Cornell Experiment Station, the determinations were made in an insulated room where the average temperature was 24° C., although it varied at times as much as 1.5° above or below this temperature. A microscopic slide, having three trenches each 5 mm. wide, 0.5 mm. deep, and 70 mm. long cut in it lengthwise and fitted with a cover glass, was used in observing the fat globules. Samples of skim milk or skim milk to which a drop of whole milk had been added were drawn into the trenches and the ends sealed. The slide was mounted in a perpendicular position, and the rate of rise of globules was measured by timing

the passage of globules through distances as indicated by an eye piece micrometer with a stop watch. Since the fat globules were moving it was impossible to measure them accurately, but they were estimated to within a few tenths of a micron. Large-size globules were obtained by mixing heated cream with the skim milk.

The rate of rise of individual fat globules varying in size from 1.8 to 41μ through the milk plasma is presented in tabular form. It was found that the individual globules rise so slowly that it would require many times the normal creaming time for them to reach the cream layer. The rate of rise of fat clumps varying in size from 10 to 800μ is also given in tabular form. These clusters were estimated to contain slightly less than 50 per cent of fat by volume, but their rate of rise is rapid enough to account for normal creaming time in both raw and carefully pasteurized milk. The low fat content of gravity cream was explained when it was found that the fat globules pack into clusters and the clusters into the cream layer with volumes free from fat between them. Large irregular clusters form deep cream layers, while compact clusters and especially weak clusters form shallow cream layers with a high fat content.

As the creaming temperature increases the rigidity of clusters lessens, allowing closer packing. This explains the deeper cream layers obtained at low temperatures. At high creaming temperatures the clusters do not form at all, or if formed at a colder temperature tend to disintegrate on warming. The stability of clusters varied in many cases with the milk and with its treatment. Mechanical agitation broke up clusters, especially near room temperatures. Unclustered fat globules packed tightly in the cream layer, but required days to form a cream.

Creaming time is divided into two parts, first the time required to form the clusters and second the time required for the clusters to rise. The thickness of the absorbed layer on fat globules of raw milk and milk that had been heated to a temperature which destroyed its clustering and normal creaming power was found to be the same as determined by the maximum packing of globules by means of a centrifuge. This thickness was about 19 millimicrons.

The heat stability and feathering of sweet cream, as affected by different homogenization pressures and different temperatures of forewarming, B. H. Webb and G. E. Holm (*Jour. Dairy Sci., 11 (1928), No. 3, pp. 243–257, figs. 4*).—In a study of feathering of sweet cream the U. S. D. A. Bureau of Dairying subjected cream to the required forewarming temperature, after which it was, in most cases, immediately homogenized and the coagulation time was determined in tins heated to 120° C. until the first signs of coagulation appeared. The creams used were separated from fresh milk and standardized to the desired butterfat content. The quality of the creams was excellent, the titratable acidity generally being less than 0.15 per cent lactic acid and with a pH value of 6.7 to 6.6. In some instances preheating was not done until after homogenization. Preheating temperatures of 60, 80, and 90° were used. The homogenizing pressures were varied from 1,000 to 3,000 lbs. and the fat content of the cream from 5 to 30 per cent.

It was found that at every pressure of homogenization and for any percentage of butterfat as high as 30 per cent the maximum heat stability of cream is attained by preheating to 80°. For creams of low fat content and at low homogenization pressures the stability was slightly increased at 90°. The minimum stability occurred when the preheating temperature was 60°, except for the low fat content creams, when the minimum was reached at 70°. An increase in fat content lowered the heat stability of homogenized creams. For

pasteurized creams the maximum heat stability was found at approximately 70 to 74°, and the usual pasteurizing time of 30 minutes was partially successful in preventing feathering. An increase in viscosity of preheated homogenized cream was accompanied by a decrease in heat stability.

Quality was the basic criterion for determining whether or not a cream would feather. Pure fresh 20 per cent cream with an acidity of 0.15 per cent could generally be pasteurized from 65 to 85° and homogenized at any pressure up to 3,000 lbs., without danger of feathering. An acidity of 0.165 per cent was usually the danger line for feathering.

In the preparation of sterile cream for market purposes, maximum stability during sterilization was obtained by preheating to approximately 80° before homogenizing.

Whipping cream profits depend on yield, W. H. E. Reid (*Ice Cream Rev., 11(1928), No. 9, pp. 88, 130, 132, 134, 136*).—In a study of the whipping qualities of cream the Missouri Experiment Station used cream that was representative of the average commercial market milk plant. Both raw and pasteurized cream was tested. The cream was separated and held at 40° F. during different aging periods. At the time of whipping it was tempered to 42° and whipped with a double-action whipper. The overrun, firmness of body, flavor, luster, condition of body, texture, and time required to whip were recorded in each instance. The percentage of butterfat was adjusted in all cases to 31 per cent, and 2, 4, and 6 per cent solids-not-fat were added to both raw and pasteurized cream. Samples were also homogenized at pressures of 300, 500, and 1,000 lbs., and the effect of freezing on the whipping qualities was noted.

The results indicated that whipping cream should contain 32 per cent butterfat, be aged for 24 to 48 hours at 42°, and whipped at this temperature. Adding limited amounts of solids-not-fat increased the overrun and shortened the time required to whip. Cream from aged milk did not give as high an overrun as cream separated from fresh milk and then aged. Homogenization even at low pressures failed to increase the overrun, and each increase in pressure lowered the overrun, increased the time required to whip, and produced a less stable product. The freezing of either milk or cream decreased the overrun of the whipped product and made it less stable. Adding solids-not-fat to frozen cream materially increased the overrun. Solids-not-fat improved the luster, body, texture, and flavor of the finished product when added to cream to be whipped. The maximum amount of solids-not-fat was found to lie between 4 and 6 per cent, since adding 4 per cent increased the overrun while in most cases 6 per cent decreased the overrun.

Gassy fermentations in reheated or processed cheese products containing pimentos, W. R. Albus and S. H. Ayers (*Jour. Dairy Sci., 11 (1928), No. 3, pp. 175–178*).—In tests by the U. S. D. A. Bureau of Dairying pimiento peppers that were to be used in processed cheese were washed in double their weight of tap water three times in 30 minutes, allowed to stand in fresh water for about 18 hours, rinsed in fresh water, ground, and sterilized. Plain cheese spread was heated to a semifluid state and divided into two equal portions. To one portion was added 10 per cent of the sterilized washed pimientos and to the other 10 per cent of ground, sterile unwashed pimientos. The cheese was then placed in small glass jars, capped, and allowed to stand in a warm place. No gas formed in the jars containing the washed pimientos, but it did develop in the other jars.

Gas formation in cheeses containing pimientos is due to certain anaerobic spore-forming bacteria. The authors conclude that washing the pimientos to

remove the fermentable sugar, as was done in this test, prevents the development of gas fermentation in reheated or processed cheese products containing pimientos.

VETERINARY MEDICINE

Contagious diseases of animals [of Jamaica], S. Lockett (*Jamaica Dept. Agr. Ann. Rpt. 1927, pp. 14–17*).—This report (E. S. R., 57, p. 871) gives an account of the diseases met with at the Government Stock Farm at Hope, including tuberculosis of cattle, tick fever (piroplasmosis of cattle), wounds by penetrating objects such as nails, staples, stakes, etc., fowl cholera (hemorrhagic septicemia of poultry), and blackleg; animal diseases listed under the law; other animal diseases; and tick eradication and control.

Annual report of the Civil Veterinary Department of Bihar and Orissa for the year 1926–27, D. Quinlan (*Bihar and Orissa Civ. Vet. Dept. Ann. Rpt. 1926–27, pp. [5]+21+XXVI+4, pl. 1*).—This, the usual annual report (E. S. R., 56, p. 876), includes an account of the occurrence and treatment of infectious diseases of livestock and numerous tables showing the loss of animals from these diseases and the results of preventive inoculations.

Stock poisoning plants, A. A. Hansen (*North Amer. Vet., 9 (1928), No. 4, pp. 46–49, figs. 2*).—This is a contribution from the Indiana Experiment Station.

Further notes on spontaneous agglutination of bacteria, P. B. White (*Jour. Path. and Bact., 31 (1928), No. 2, pp. 423–433*).—This is a report of work conducted in continuation of that previously noted (E. S. R., 57, p. 670).

Experiments on the visibility of the polyhedral viruses, R. W. Glaser and E. V. Cowdry (*Jour. Expt. Med., 47 (1928), No. 6, pp. 829–834*).—The experiments reported in this contribution from the Rockefeller Institute for Medical Research have led the authors to conclude that the virus of wilt disease is probably invisible and the virus of grasserie almost certainly so when studied with the optical equipment used, and that further evidence is necessary before the Chlamydozoa or the Borrellina can be accepted as the active etiological agents. It is pointed out that while these two polyhedral viruses do not appear to be visibly particulate it does not follow that other filtrable viruses are not organized in this way.

An account of the preparation of vaccines and serums for swine erysipelas and fowl cholera by the modified method of Ramon [trans. title], P. Żochowski (*Pam. Pánst. Inst. Nauk. Gosp. Wiejsk Puławach (Mém. Inst. Natl. Polon. Écon. Rurale Pulawy), 8 (1927), A. pp. 319–346; Fr. abs., pp. 344–346*).—An account of the method employed by Ramon.

Cutaneous spirochaetosis due to Treponema cuniculi in British rabbits, D. K. Adams, D. F. Cappell, and J. A. W. McCluskie (*Jour. Path. and Bact., 31 (1928), No. 2, pp. 157–161, pl. 1*).—The authors point out that cutaneous spirochetosis has been frequently found in British wild and hutch rabbits and is readily transmitted to healthy animals by various methods of inoculation. The lesions are due to a spirochete, *T. cuniculi*, which in its microscopical characters resembles closely *T. pallidum*. The lesions produced by *T. cuniculi* are confined to the superficial layers of the skin. The affected parts contain very large numbers of the organisms, which do not appear to invade the tissues deeply. The infection may constitute an important source of fallacy in work on human syphilis in the rabbit where superficial inoculation is practiced.

The intradermal reaction in actinomycosis: Specific reaction of the skin to the culture filtrate of Actinomyces bovis [trans. title], A. E. de Area Leao (*Compt. Rend. Soc. Biol. [Paris], 98 (1928), No. 17, pp. 1575, 1576*).—The author finds in experiments with Actinomyces that a specific substance develops

which, injected into the skin of animals infected with actinomycosis, gives a specific reaction. This reaction is of considerable value in diagnosing the disease in internal localized cases where its determination is difficult or impracticable by the usual method.

Enquiry and report into conditions affecting African coast fever, R. W. DIXON (*Rhodesia Agr. Jour., 25 (1928), No. 5, pp. 522–536*).—This account is based upon an inspection trip, and includes a survey of outbreaks by districts since 1904, dipping and supervision, fencing in relation to coast fever, the stamping-out policy by slaughter, cattle inspectors and cattle inspection, cattle inspectors' transport, and police assistance.

Anaplasmosis in cattle, or a similar disease, A. H. GISH (*Vet. Med., 23 (1928), No. 3, pp. 106–109, fig. 1*).—The author reports upon symptoms, lesions, occurrence, and treatment of this disease, with illustrative cases. For several years he has met with cases of anaplasmosis in his practice in the vicinity of Eldorado, Kans. Sodium cacodylate was found of equal value to Soamin in the treatment of the disease. It should be given in doses of 25 to 30 grains per hundredweight, and in exceptional cases somewhat larger doses are indicated.

The period of consecutive immunity following a single intradermal vaccination against blackleg [trans. title], H. VELU and VAYSSE (*Bul. Soc. Path. Exot., 21 (1928), No. 4, pp. 294, 295*).—The authors found the immunity to blackleg produced through a single intradermal vaccination to be 11 months and 20 days.

On the neuritis caused by the virus of enzootic encephalo-myelitis or Borna disease [trans. title], S. NICOLAU, MRS. O. DIMANCESCO-NICOLAU, and I. A. GALLOWAY (*Compt. Rend. Soc. Biol. [Paris], 98 (1928), No. 13, pp. 1119–1121*).—In this report of studies it was found that peripheral nerves, including the brachial and sciatic, of monkeys dead from experimental Borna disease may contain sufficient of the virus to be transmitted to rabbits through cerebral inoculation.

Brucella abortus in milk and dairy products, C. M. CARPENTER and R. BOAK (*Amer. Jour. Pub. Health, 18 (1928), No. 6, pp. 743–751*).—In investigations conducted at the New York State Veterinary College, cream from samples of milk from 378 cows injected into guinea pigs showed that 23 cows were elminating *B. abortus* in their milk. Two bovine strains of *B. abortus*, artificially inoculated into cream and stored at 8° C. (46.4°F.), remained viable for 8 days. Two other strains, one bovine and one human, more pathogenic for guinea pigs than the two bovine strains above mentioned, infected guinea pigs for a period of 10 days after being inoculated into cream. Two strains of *B. abortus* artificially inoculated into butter and stored at 8° remained viable and infected guinea pigs for periods of 81 and 32 days, respectively. The other bovine strain and the culture isolated from the blood of man were viable at 142 days after being inoculated into the butter, but not after 192 days.

Guinea pigs injected with 17 samples of market creamery butter showed no evidence of *B. abortus* infection at necropsy. Guinea pigs injected with 82 samples of cheeses, mostly imported varieties, failed to show any evidence of *B. abortus* or *B. melitensis* infection.

Brucella abortus infection in man: Report of seven cases, R. L. SENSENICH and A. S. GIORDANO (*Jour. Amer. Med. Assoc., 90 (1928), No. 22, pp. 1782–1786*).—Seven cases of *B. abortus* infection in man are reported, with 11 references to the literature.

Report of Foot-and-mouth Disease Commission of the United States Department of Agriculture, P. K. OLITSKY, J. TRAUM, and H. W. SCHOENING (*U. S. Dept. Agr., Tech. Bul. 76 (1928), pp. 172, figs. 4*).—Following the brief

introduction, by J. R. Mohler, this report deals with the subject under the major headings of epizoology and control of epizootics (pp. 3-33), experimental studies (pp. 33-137), and regulations for the control of foot-and-mouth disease in European countries (pp. 137-167), with a list of 84 references to the literature.

The experimental studies are dealt with under the headings of physical and chemical properties of the virus; strain of virus employed; the disease in the guinea pig; titration of the virus; centrifugation of the virus; cataphoresis and filtration; experiments on cultivation; miscellaneous experiments; the particulate and living character of the virus; summary of physical and chemical properties; plurality of types of foot-and-mouth disease virus; cross-immunity tests in cattle, swine, and guinea pigs; plurality of viruses determined by serum tests; typing viruses; immunity—immune and hyperimmune serum; period of infectiousness in cattle and in hogs; survival of the virus outside the animal; carriers of foot-and-mouth disease virus; foot-and-mouth disease in the horse; and comparative studies on vesicular stomatitis and foot-and-mouth disease.

Trypanblue and certain dithio-aniline derivatives: Their efficacy in the treatment of piroplasmosis and other affections in the Central Provinces, R. F. Stirling (*India Dept. Agr. Mem., Vet. Ser., 4 (1928), No. 3, pp. 129–137*).—This is a brief account of experimental work with trypanblue and intramine.

Zoological contributions to the surra problem, I, V, VIII, IX, XI, XV, XVIII, XIX (*Dept. Landb., Nijv. en Handel Nederland. Indië, Veeartsenijk. Meded., 1925, No. 53, pp. 7, pl. 1, Ger. abs. p. 7; 1926, Nos. 57, pp. 10, fig. 1, Ger. abs. pp. 8, 9; 58, pp. 46, pls. 6, figs. 2, Ger. abs. pp. 41–45; 1927, Nos. 60, pp. 11, figs. 2, Ger. abs. pp. 10, 11; 61, pp. 13, figs. 3, Ger. abs. pp. 11, 12; 62, pp. 14, fig. 1, Ger. abs. pp. 13, 14; 63, pp. 8, Ger. abs. p. 7; 64, pp. 20, Ger. abs. pp. 18, 19*).—These parts of the series previously noted (E. S. R., 56, p. 461; 58, pp. 262, 560; 59, pp. 274, 472) deal, respectively, with the Experimental Transmission of *Trypanosoma evansi* by *Tabanus stantoni* Ric. and *T. ceylonicus* Schiner, Transmission Experiments with *Haematopota cingulata* Wied., and Tabanid Breeding Places in Java and Sumatra, all by O. Nieschulz; Transmission Experiments with *Tabanus flavivittatus* Schuurm. Stekh. and *Haematopota pungens* Dol., by O. Nieschulz and S. A. S. Ponto; Some Experiments with *Haematopota truncata* Schuurm. Stekh., *H. irrorata* Macq., and *Tabanus brunnipes* Schuurm. Stekh., by O. Nieschulz; Some Transmission Experiments with *Chrysops flaviventris* Macq. and *C. dispar* Fab., and On Manifold Infections through *Tabanus striatus* Fab., both by O. Nieschulz and S. A. S. Ponto; and Transmission Experiments with Stomoxys, Lyperosia, Musca, and Stegomyia, by O. Nieschulz.

The chemotherapy of surra (Trypanosoma evansi infections) of horses and cattle in India, J. T. Edwards (*India Dept. Agr. Mem., Vet. Ser., 4 (1928), No. 1, pp. [3]+100, pls. 28*).—Following a brief introduction, the subject is dealt with under the headings of treatment of equine surra with "Bayer 205" (pp. 10–29), treatment of surra with tartar emetic (pp. 29–41), tryparsamide (pp. 41–47), and bismuth compounds (pp. 47–50), and summary and conclusions (bovines and equines) (pp. 50–54). A list of references, tabulated data, protocols, and numerous clinical charts are appended.

Undulant fever also known as Mediterranean or Malta fever, A. V. Bernard, G. and P. P. Debono, and G. Hyzler (*Indian Vet. Jour., 4 (1928), No. 4, pp. 359–362; also in U. S. Naval Med. Bul., 26 (1928), No. 2, pp. 374–376*).—The recommendation is made by the members of the "Camera Medica" of Malta and of the Malta branch of the British Medical Association that the term "undulant fever" be adopted in place of Malta fever or Mediterranean fever, "undulant fever (Bruce)" to be used to indicate the *melitensis* form and "undulant fever (Bang)" the *abortus* form.

The principles and practice of meat inspection, G. LEIGHTON (*Edinburgh and London: William Hodge & Co., 1927, pp. XV+465, figs. 120*).—This work, by a medical officer of the division of foods of the Scottish Board of Health, consists of two parts. Part 1 (pp. 1–211) is devoted to a discussion of the general principles of meat inspection, and part 2 (pp. 213–432) to special and regional meat inspection.

Infection in abattoir animals by Bacillus aertrycke [trans. title], I. GHEORGHIU and G. COSTIN (*Compt. Rend. Soc. Biol. [Paris], 97 (1927), No. 26, pp. 1025, 1026*).—This is a note on examinations made of 385 animals slaughtered during the summer of 1926. Nineteen were found infected, *B. aertrycke* having been isolated.

A survey of the developments of research into bovine contagious abortion during the period 1895–1928, I, II, A. W. HOLTUM (*Vet. Jour., 84 (1928), Nos. 635, pp. 217–224; 636, pp. 287–295*).—This is a digest presented in connection with a list of 25 references to the literature.

The control of bovine contagious abortion, F. B. HADLEY (*Vet. Med., 23 (1928), No. 3, pp. 122–127*).—This is an address presented by the author before the Illinois Veterinary Conference in February, 1928.

On the treatment of streptococcic mastitis of cattle [trans. title], J. RICHTER and M. DEMMEL (*Berlin. Tierärztl. Wchnschr., 44 (1928), No. 17, pp. 277–283*).—This discussion includes a list of 39 references to the literature.

Udder infection with streptococci of the scarlet fever type, I–III, F. S. JONES and R. B. LITTLE (*Jour. Expt. Med., 47 (1928), No. 6, pp. 945–956, figs. 3; pp. 957–963; pp. 965–975, pl. 1*).—Three papers are presented.

I. *Spontaneous and experimental udder infection,* F. S. Jones and R. B. Little.—"The clinical and bacteriological findings in two cows the udders of which became infected under natural conditions with hemolytic streptococci of the scarlet fever type are discussed. One of the cows was found in a herd supplying raw milk to a small town where a milk-borne outbreak of scarlet fever had occurred a short time before. When small numbers of the streptococcus obtained from this case were injected into the udder of a normal cow, severe mastitis accompanied by a well-marked general reaction resulted. Evidence leads to the conclusion that a severe attack of mastitis due to this organism in one quarter does not sufficiently immunize the other quarters to protect them completely, since the streptococcus can be readily implanted in them. The secondary infections were much milder than the original process."

II. *A study of the scarlet fever type of streptococci isolated from the udder of the cow,* F. S. Jones and R. B. Little.—"The streptococcus isolated from the udder of a cow on a farm where an outbreak of scarlet fever originated has been correlated wtih known scarlet fever strains. This streptococcus and another also isolated from the udder of a cow are indistinguishable in cultural characters and certain antigen affinities from *S[treptococcus] scarlatinae.* Skin tests indicate that the strain isolated from the milk of the cow in a herd to which the scarlet fever epidemic was attributed produced a toxin which was neutralized with scarlet fever antitoxin."

III. *The influence of milk on the growth of scarlet fever streptococci,* F. S. Jones.—A third contribution.

The cattle tick pest in Australia, R. P. M. SHORT (*Jour. Council Sci. and Indus. Research [Aust.], 1 (1928), No. 3, pp. 163–167*).—An account is given of the operations of the Cattle Tick Control Commission, investigations of the Cattle Tick Dip Committee in Queensland, the scheme of investigations as already conducted, results of investigations, and present and projected activities of the Cattle Tick Dip Committee.

The prevention of tuberculosis in cattle: An investigation to determine the value of the B. C. G. vaccine for the prevention of tuberculosis, H. A. WOODRUFF and T. S. GREGORY (*Jour. Council Sci. and Indus. Research [Aust.],*

1 (1928), No. 3, pp. 158–162).—A general discussion of the subject is followed by a report of experiments conducted to determine the degree of virulence possessed by B. C. G. and others to discover whether B. C. G. increases in virulence after passage through animals susceptible to tuberculosis.

The experiments are in agreement with the claims of Calmette and Guérin (E. S. R., 52, p. 282) that B. C. G. is quite innocuous for cattle, sheep, rabbits, guinea pigs, and other small animals, even when introduced in relatively enormous doses. It is said to have been estimated that less than 50 virulent tubercle bacilli will set up progressive fatal tuberculosis when injected subcutaneously in a guinea pig, whereas in the experiments here reported guinea pigs were inoculated with 200,000,000 living B. C. G. organisms without the production of any progressive lesions. The experiments indicate that there is no increase in the virulence of B. C. G. reinoculated into susceptible animals after having existed in cattle for periods up to 6 months.

A contribution to the study of the value of B. C. G. vaccine for tuberculosis [trans. title], J. Lignières (*Bul. Acad. Méd. [Paris], 3. ser., 98 (1927), No. 30, pp. 127–145; abs. in North Amer. Vet., 9 (1928), No. 2, pp. 39, 40*).—The author finds that the bile-cultured tubercle bacilli of Calmette and Guérin (E. S. R., 52, p. 282) are actually attenuated and fixed, and that their passage through guinea pigs or calves does not increase the capacity to cause tubercular lesions. The permanency of the bile-cultured bacilli in the body and their threatened action appears to be longer than formerly supposed. The absence of lesions and the impossibility of detecting the bacilli in the organs of experimental animals are considered to show that they have disappeared from the body. Negative reactions followed the monthly subcutaneous injection of tuberculin in cattle, although there were living and active bacilli in local lesions of the dewlap where the vaccine was injected.

Is the vaccination of cattle against tuberculosis a practical possibility? E. R. Long (*Ill. State Acad. Sci. Trans., 19 (1926), pp. 325–331*).—This is a contribution from the University of Chicago.

A segregation method for eliminating tuberculosis from cattle, C. R. W. Adeane and J. F. Gaskell (*Jour. Hyg. [London], 27 (1928), No. 3, pp. 248–256*).—Studies conducted by the authors, the details of which are here presented, show that the tuberlin reaction properly applied is a reliable test of the presence of tuberculosis in cattle. A method of segregation is described by which any herd can be rendered tuberculin negative in from 3 to 4 years without diminution of the herd, as evidenced by the use of two farms separated from each other by a distance of 150 yards, nonreactors being placed in one and reactors in the other. Separate help was kept for each herd, and every precaution was taken to prevent transmission of the infection.

Evidence has been obtained that recovery from a tuberculous infection can take place in cattle. It is pointed out that calves can only be infected with tuberculosis after birth, although such infection may take place extremely rapidly within the first few days of life. Artificial feeding of calves with sterilized milk must be supplemented by some vitamin-containing food, otherwise joint ill, corresponding to rickets in human beings, will develop at about the third or fourth month. Bull calves are more susceptible to joint ill than heifers.

Investigations on hog cholera and methods of combating it [trans. title], P. Zochowski (*Pam. Pánst. Inst. Nauk. Gosp. Wiejsk. Puławach (Mém. Inst. Natl. Polon. Écon. Rurale Puławy), 8 (1927), A, pp. 417–456; Fr. abs., pp. 453–456*).—This discussion is presented in connection with 30 references to the literature.

Hyostrongylosis in the hog [trans. title], H. J. M. Hoogland and S. M. Seijffers (*Tijdschr. Diergeneesk., 55 (1928), No. 8, pp. 377–387, fig. 1; Ger.,*

Eng., Fr. abs., pp. 385, 386).—The first case in the Netherlands of hyostrongylosis of the hog due to *Hyostrongylus rubidus* was reported in 1926, since which time the affection has been found to be of common occurrence, 18 cases being reported from the surrounding districts of Utrecht.

Fowl tuberculosis in swine, R. GRAHAM and E. A. TUNNICLIFF (*Ill. State Acad. Sci. Trans., 19 (1926), pp. 138–143).*—A brief discussion which calls attention to the importance of this form of tuberculosis in swine, of which infected flocks are considered the principal sources. At Chicago and East Saint Louis it is one of the most important sources of swine retentions. The virus of fowl tuberculosis is said to be commonly found in swine in some districts of Illinois.

The treatment of equine pleuropneumonia by intravenous injection of quinosol [trans. title], W. PRIEWE (*Deut. Tierärztl. Wchnschr., 36 (1928), No. 10, pp. 179–182, fig. 1).*—The author has found the intravenous injection of from 3 to 5 gm. of quinosol to influence very favorably the course of pleuropneumonia in the horse. No adverse symptoms were observed to follow its administration. The fall in temperature that occurs some 3 hours after the injection is said to be characteristic.

Effect of formalin on the virus of vesicular stomatitis of horses, P. K. OLITSKY and P. H. LONG (*Jour. Expt. Med., 47 (1928), No. 6, pp. 835–841).*—The experiments reported in this contribution from the Rockefeller Institute for Medical Research led to the following summary and conclusions:

"The virus of vesicular stomatitis is not readily killed by formalin. This chemical is one of a group which coagulates the proteins of the medium in which the virus is usually contained. It has already been found [E. S. R., 57, p. 877] that other reagents of the protein-coagulating group are not actively virucidal, and the effect of formalin in this instance is therefore characteristic of the group.

"The so-called formalinized vaccines which give rise to immunity can be shown to have done so because of the presence of living virus. A single injection of such so-called 'vaccine,' or of other material containing living virus, is capable of inducing immunity in guinea pigs. No protection, however, follows a single injection of dead virus. Furthermore, repeated inoculations of virus killed by formalin likewise fail to induce resistance against subsequent injections of the living virus.

"It is concluded, with respect to the virus of vesicular stomatitis, that the use of formalin has failed to solve the problem of active immunization with dead virus."

"Walkabout," or Kimberley horse disease, D. MURNANE (*Jour. Council Sci. and Indus. Research [Aust.], 1 (1928), No. 3, pp. 168–173).*—This is an account of a disease that has been prevalent in northwest Australia for the last 40 years, the actual cause of which is said to have remained a mystery until quite recently. Previously thought to have been caused by stomach worms, it is now known to be due to a poisonous plant of the genus Atalaya, commonly known as "whitewood."

Studies in dog distemper.—IV, The immunisation of ferrets against dog distemper, P. P. LAIDLAW and G. W. DUNKIN (*Jour. Compar. Path. and Ther., 41 (1928), No. 1, pp. 1–17).*—In further studies (E. S. R., 56, p. 477), the authors have found it to be possible to immunize ferrets against dog distemper by means of suitable vaccines.

"Crude distemper virus inactivated by storage, heat, phenol, or formaldehyde will, under defined conditions, form a suitable vaccine. With formalized virus, which has, in our hands, proved to be the most convenient, it is possible to immunize about 90 per cent of ferrets at will. The evidence indicated that the effective antigen is dead virus, and that a large dose of this is required to

induce immunity. To consolidate the immunity induced by such vaccines, living virus must be administered. The solid immunity thus resulting is of long duration, and lasts possibly for life. The central nervous system partakes in the general immunity. Formalized virus is an adequate vaccine after the lapse of months. Immunity to distemper is probably cellular and not humoral. The recovered animal may carry the infective agent for a time and act as a carrier of the disease."

Diseases in poultry [at the Rhode Island Station] (*Rhode Island Sta. Rpt. 1927, pp. 50, 51*).—The application of the rotation method for controlling blackhead in turkeys, moving the poults to new ground about every week during the year, again proved effective (E. S. R., 57, p. 472), the mortality record from this disease having been below 10 per cent. A higher percentage of turkeys succumbed, however, to avian diphtheria. Fowl paralysis is said to be decreasing among the station flock, the mortality having been less than 1 per cent against 15 per cent the preceding year. Further studies on the use of hypochlorites in drinking water for chicks as a means of reducing their mortality due to bacillary white diarrhea and fowl typhoid are said to have given negative results, although the disinfecting action on the water is thought to have reduced quite materially the probability of transmission of the disease to noninfected birds.

A contribution to the study of the cell inclusions of avian epithelioma contagiosum [trans. title], O. Sossich (*Bol. Ist. Sieroterap. Milan., 6 (1927), No. 3, pp. 201–205, pls. 2*).—The author here reports upon studies made of the changes which take place in pigeons affected with this disease.

Occurrence of trichomonad flagellates in the blood stream of fowls, H. Cooper and A. N. Gulati (*Agr. Research Inst., Pusa, Bul. 173 (1927), pp. [3]+9, pl. 1*).—The authors report upon two cases of invasion of the blood stream by trichomonads, with observations on the incidence of Trichomonas infection in fowls and a description of the parasite.

Notes on trematode parasites of birds, E. Linton (*U. S. Natl. Mus. Proc., 73 (1928), Art. 1, pp. 1–36, pls. 11*).—The author reports upon 22 species of trematodes, of which 9 are described as new, and erects a new genus.

AGRICULTURAL ENGINEERING

[Agricultural engineering studies at the Alabama Station], M. L. Nichols, E. P. McDonald, and J. W. Randolph (*Alabama Sta. Rpt. 1926, pp. 19–21*).—The progress results of the soil dynamics studies are reported, indicating tentatively certain fundamental laws for sliding friction between a metal surface and the soil. The details of these were presented in a previous report (E. S. R., 53, p. 588).

Data are also given on the sterilization of dairy utensils by electricity and on the artificial cooling of milk.

The data reported on the fundamental factors influencing the traction of wheel tractors were presented in detail in a previous statement (E. S. R., 59, p 84).

The ground-water resources of Mississippi, L. W. Stephenson, W. N. Logan, and G. A. Waring (*U. S. Geol. Survey, Water-Supply Paper 576 (1928), pp. VII+515, pls. 12, figs. 3*).—This report, prepared in cooperation with the Mississippi State Geological Survey, deals with the physiography, geology, and quality of the surface and ground waters of Mississippi by counties. The discussions of the chemical character of the waters are by C. S. Howard.

Surface water supply of South Atlantic slope and eastern Gulf of Mexico drainage basins, 1924 (*U. S. Geol. Survey, Water-Supply Paper 582 (1928),*

pp. IV+66, fig. 1).—This report, prepared in cooperation with the State of North Carolina, presents the results of measurements of flow made on streams in the South Atlantic slope and eastern Gulf of Mexico drainage basins during the year ended September 30, 1924.

Surface water supply of Hudson Bay and upper Mississippi River basins, 1924 (*U. S. Geol. Survey, Water-Supply Paper 585 (1928), pp. V+185, fig. 1*).—This report, prepared in cooperation with the States of North Dakota, Minnesota, Wisconsin, Iowa, Illinois, and Missouri, presents the results of measurements of flow made on streams in the Hudson Bay and upper Mississippi River basins during the year ended September 30, 1924.

Surface water supply of Pacific slope basins in California, 1923 (*U. S. Geol. Survey, Water-Supply Paper 571 (1928), pp. VIII+431, fig. 1*).—This report, prepared in cooperation with the States of California and Oregon, presents the results of measurements of flow made on streams in the Pacific slope basins in California during the year ended September 30, 1923.

Pump irrigation results, H. E. Weakly and L. L. Zook (*Nebraska Sta. Bul. 227 (1928), pp. 12, figs. 3*).—This bulletin reports certain results secured by pump irrigation at the North Platte Substation. The chief crops irrigated were corn, potatoes, alfalfa, Sudan grass pasture, and forage sorghum. These crops were grown in fields from 1 or 2 up to 10 acres in size. The work was conducted on $\frac{1}{10}$-acre plats. The data are reported in tabular form.

Irrigation west of the Cascades, L. J. Smith and H. L. Garver (*Washington Col. Sta. Pop. Bul. 140 (1928), pp. 52, figs. 34*).—This is the fifth of a series of bulletins dealing with the use of electricity on the farm, and reports the results of studies conducted by the station in cooperation with the Washington Committee on the Relation of Electricity to Agriculture. It gives practical information on irrigation west of the Cascade Mountains, describing water supplies, methods of pumping, well digging, piping and friction losses, methods of applying water, planning an irrigation system, and costs.

Irrigation of small grain, W. W. McLaughlin (*U. S. Dept. Agr., Farmers' Bul. 1556 (1928), pp. II+14, figs. 5*).—This is a revision of and supersedes Farmers' Bulletin 863 (E. S. R., 38, p. 186).

Resistance of Portland cement concrete to the action of sulphate waters as influenced by the cement, D. G. Miller (*U. S. Dept. Agr., Public Roads. 9 (1928), No. 4, pp. 82–87, 92, figs. 7*).—This is a progress report of studies being conducted in cooperation with the Minnesota Experiment Station.

It was found that standard Portland cements from different manufacturing plants may vary greatly in resistance to the action of sulfate waters. Under the same exposure conditions the more resistant cements have outlived those of least resistance by as much as eight times. Portland cements that failed quickly in the laboratory in pure solutions of sodium sulfate ordinarily displayed low resistance in the field to the action of mixed salts. The most desirable Portland cements for concrete were found to be those that proved most resistant to the action of both pure salts and mixed salts. The results of standard physical tests and of standard chemical analyses of Portland cements gave no indications of resistance to sulfate waters. It is thought that the geological differences of the raw materials of different cements may possibly be one factor that must be considered in attempting to account for differences in resistance to sulfate waters.

Public Roads, [June, 1928] (*U. S. Dept. Agr., Public Roads, 9 (1928), No. 4, pp. 73–92, figs. 25*).—This number of this periodical contains the following articles: The Virginia Demonstration Road, by A. C. Benkelman (pp. 73–81); Resistance of Portland Cement Concrete to the Action of Sulphate Waters as Influenced by the Cement, by D. G. Miller (pp. 82–87, 92) (see above); Deter-

mination of Proportions of Constituents in Concrete, by L. G. Carmick (pp. 88, 89); and A New Moist-Closet and Storage Tank Apparatus, by D. O. Woolf (pp. 90–92).

The value of inert gas as a preventive of dust explosions in grinding equipment, H. R. Brown (*U. S. Dept. Agr., Tech. Bul. 74 (1928), pp. 24, figs. 6*).—As a result of the experimental work and the observations made during actual operation of inert gas systems in industrial plants, the value of inert gas as a means of preventing dust explosions has been so well demonstrated that its use should be seriously considered wherever an explosion hazard exists which can not be controlled through the elimination of the dust cloud or the source of ignition. The use of inert gas is particularly recommended in grinding, bolting, or any phase of a manufacturing process where an explosive dust is produced or handled within an inclosed piece of equipment. In the experiments two fires were extinguished by flooding the inclosure with flue gas. Inert gas, especially carbon dioxide, was found to have many advantages over other fire-fighting mediums, since it will not injure metals, fabrics, food products, or other perishable materials.

RURAL ECONOMICS AND SOCIOLOGY

The law of diminishing returns in agricultural experiment, J. A. Prescott (*Econ. Rec., 4 (1928), No. 6, pp. 85–89, figs. 2*).—The data of a number of Australian experiments to determine the effects upon yields of applying different quantities of superphosphate on wheat and water on lucerne are analyzed, using the Mitscherlich equation previously noted (E. S. R., 22, p. 223).

It was found that from a purely statistical point of view it is unnecessary to make the assumption made by Mitscherlich, as given a sufficient number of experimental points, a curve drawn using the known laws of errors will represent the mean relationship between the yield and the variable factor. Special experiments with possibly smaller than customary variations of the variable factor are deemed necessary.

[Investigations in agricultural and home economics at the Rhode Island Station, 1927] (*Rhode Island Sta. Rpt. 1927, pp. 48, 49*).—It is noted that nearly 40 per cent of the food received in Providence, as previously noted (E. S. R., 58, p. 490), was fresh fruits and vegetables. The receipts of lettuce increased 800 per cent from 1921 to 1925 and of grapes nearly 400 per cent, while the receipts of apples decreased approximately 50 per cent from 1922 to 1925.

A study of the use of time in home making showed that about one-sixth of the time spent by home makers was in activities other than work for the home or farm. Of this time nearly one-third was spent on informal social life, about one-fourth on reading, and about one-fifteenth on telephoning and correspondence.

[Agriculture and the cotton industry in the Union of Socialistic Soviet Republics] (*Glav. Khlopkov. Kom. S. S. S. R., Bibliot. Khlopkov. Dela, 3 (1926), pp. 10–30, 41–65, 92–106, 175–201, fig. 1, pp. 223–244; 4 (1926), pp. 3–37, fig. 1; 5 (1927), pp. 296, figs. 7*).—These volumes include articles the translated titles of which are as follows:

Vol. 3.—The General Character of Agriculture in Turkestan (pp. 10–24), General Character of Land Ownership and Land Utilization in Turkestan (pp. 25–30), A Short History of Development of Cotton Culture in Turkestan (pp. 41–45), The General Conditions of the Development of Cotton Culture in Turkestan (pp. 46–57), Cotton Culture in Turkestan (pp. 58–65), The Dynamics of the World Cotton Market and Turkestan Cotton Culture (pp. 92–106); Cottonseed Oil Industry (pp. 175–201), and The Cotton Industry in Turkestan Since the Revolution (pp. 223–244), all by A. P. Demidov.

Vol. 4.—The Problem of Determining the Optimum Size of a Cotton Farm in Turkestan, by V. I. Iuferev (Uferef) (pp. 3–37).

Vol. 5.—On the Problem of Cost of Raw Cotton on the Plantations of Central Asia, by A. V. Chaĭanov (pp. 5–31, Eng. abs., p. 291); The Nutrition of the Cotton-Growing Population in Ferghana, by V. I. Iuferev (Uferef) (pp. 32–70, Eng. abs., p. 292); Cotton Farming in Ferghana According to the 1924 Survey, by V. P. Solov'ev (Solovief) (pp. 71–118, Eng. abs., pp. 293–295); An Outline of the Origin and Development of Cotton Growing in Central Asia, by A. M. Kurilov (pp. 119–175); and The Prospects of Cotton Consumption in the Union of Socialistic Soviet Republics, by T. I. Shepovalov and N. V. Mastitskiĭ (pp. 176–287).

The economic position of the farmer in New Zealand, H. Belshaw (*Econ. Rec., 4 (1928), No. 6, pp. 53–70, figs. 3*).—The changes in agricultural net income, the exchange value of agricultural commodities in terms of goods bought retail, and the movement of agricultural charges—taxation, wages, producer's material, capital charges in respect to land, and rural credit—in New Zealand are analyzed.

The conclusions reached are that (1) the exchange value of agricultural and pastoral products in terms of consumer's goods bought retail is considerably less than in 1914; (2) local rates borne by farmers and agricultural wages have increased considerably more than export prices; (3) the disparity between agricultural and the wholesale prices of agricultural producer's goods has been beneficial to farmers in general, but not necessarily to particular groups; (4) the heaviest burden on the farmers is the inflation of capital charges in respect to lands, mortgage charges, and interest on loans; and (5) most farmers have too little free capital, and credit on moderate terms is difficult to obtain.

Farm adjustments in market hay areas of Pennsylvania, F. P. Weaver and R. S. Washburn (*Pennsylvania Sta. Bul. 223 (1928), pp. 19, figs. 2*).—This bulletin presents the results of a study made in cooperation with the Bureau of Agricultural Economics, U. S. D. A., of the farming and marketing practices in portions of Bradford, Luzerne, Center, Clearfield, and Crawford Counties, Pa. Data for the crop year 1925 relative to receipts, expenses, practices, costs, and returns in the production, utilization, and sale of hay were obtained from 8 to 27 farmers in each county, the farms chosen being those upon which one of the main sources of income had been selling hay.

Hay production increased in each of the counties from 1910 to 1925, but sales declined. The averages by counties in 1925 for the chief sources of income of the farms studied were as follows: Hay from $109 to $686, wheat 0 to $862, potatoes $142 to $1,047, fruit 0 to $1,297, milk $609 to $1,569, eggs $159 to $484, poultry $45 to $169, cattle $222 to $532, and hogs from $36 to $243. Total milk production and production per cow and egg production in each of the 5 counties increased materially from 1909 to 1924.

Costs of producing sugar beets.—Part VI, Idaho, E. B. Brossard et al. (*Washington: U. S. Tariff Comm., 1928, pt. 6, rev. ed., pp. VII+80, figs. 10*).—This is a revised edition of the bulletin previously noted (E. S. R., 57, p. 84).

An economic study of tomato production for canning in Arkansas, C. E. Campbell (*Arkansas Sta. Bul. 225 (1928), pp. 27, figs. 10*).—A general description is given of the tomato-growing industry and marketing. Tables are included showing the man labor and horse work per acre required and the costs per acre and ton for different operations in producing tomatoes in 1927 in the gravelly loam and in the silt and sandy loam districts of Arkansas. The factors affecting production and costs and the labor requirements are discussed.

The labor income for the 70 farms surveyed in 1927 averaged 16.9 cts. per hour for actual working time. Nine of the farms showed negative labor incomes.

Livestock production costs in Greene County, Ohio, J. F. DOWLER (*Ohio Sta. Bul. 419 (1928), pp. 52, figs. 5*).—This bulletin gives the results of a study of cost data obtained by the route method from 11 farms for the 5-year period, 1920–1924, 6 for 4 years, 2 for 3 years, 2 for 2 years, and 4 for 1 year during this period. Approximately 72 per cent of the total receipts of the farms reporting were from swine, cattle, sheep, and poultry.

Tables are given and discussed showing for hogs, cattle, sheep, and poultry the farm-to-farm variations in returns; the averages by farms for the period of the items in the cost of production of 100 lbs. of pork, butterfat, sheep, wool and mutton, and 100 chickens; and the average quantity and value of cost items for the 5 years in the production of 100 lbs. of pork, of keeping a sheep, and of keeping 100 chickens. Other tables given and discussed show the average farm and family labor incomes by years; the variations by farms for the period in the annual family labor income, the percentage of income from different sources, and the returns per dollar's worth of feed consumed by different kinds of livestock; the variations by years in the averages of the items of cost of producing 100 lbs. of pork; the average feed requirements by farms for the period to produce 100 lbs. of pork, and to keep a sow, a cow, a bull, a heifer, and 100 chickens, and the monthly feed requirements and feed costs for calves; and the effects on costs of various factors, such as the number of pigs raised per litter, the production of butterfat per cow, and the volume of receipts of eggs and the percentage produced from October to January, inclusive.

The more important factors affecting the cost of producing pork, sheep, and chickens are summarized in tables. Methods are suggested for bringing about more efficient production.

A study of egg and poultry consumption in Pennsylvania, F. F. LININGER and T. B. CHARLES (*Pennsylvania Sta. Bul. 222 (1928), pp. 23, figs. 4*).—Part 1 reports the results of a consumer demand survey made in 1926 and includes records from 2,404 families as follows; Pittsburgh 1,004, Erie 254, York 326, Williamsport 258, Pottsville 276, and Uniontown 286. Tables are included showing for each city by income groups—wealthy, middle, and poor—the size of family, weekly food cost per capita, and annual per capita consumption of eggs and poultry; eggs used per capita in cooking and baking; preferences for white or brown eggs, for eggs in cartons, and as to weight of poultry; and agencies supplying families with eggs and poultry.

The consumption and preferences varied considerably in the several cities. The average annual per capita consumption in the six cities was as follows: As to eggs, wealthy class 34.66 doz., middle class 29.60 doz., and poor class 24.56 doz.; and as to poultry 39.7, 20.1, and 21.7 lbs., respectively. Except in York, the color of eggs was not a material factor. Preference for cartons varied from 2 per cent in York to 79 per cent in Pittsburgh. Except in Pottsville, where 51 per cent of the families preferred from 4- to 6-lb. birds, 59 to 70 per cent of the families preferred from 2- to 4-lb. birds. A survey in York in 1926 showed that the consumption of eggs was 28 per cent higher in April than in December, being 11 per cent higher in the high-income group, 26 per cent in the middle group, and 53 per cent in the poor-income group.

Part 2 considers the sources of supply of eggs and poultry in the Philadelphia market, 1922–1926, and the quality of supply at Philadelphia and Pittsburgh. From 53 to 58 per cent of the egg receipts and from 65 to 76 per cent of the dressed-poultry receipts in Philadelphia originated in 7 States of the Middle West, and from 7 to 10 and from 3 to 6 per cent, respectively, came from

Pennsylvania. Eggs of more uniform quality were received in both cities from the Middle West than from Pennsylvania and near-by States.

Land tenure in Walnut Grove Township, Knox County, Illinois, W. TEN HAKEN (*Jour. Land and Pub. Utility Econ., 4 (1928), Nos. 1, pp. 13–24, figs. 8; 2, pp. 189–198, figs. 2*).—This study is based chiefly upon schedules obtained by personal interviews with present operators of farms in 34 sections of the township and with former and present owners now retired. Knox County is typical of a corn-raising area in which much of the corn is fed to hogs and beef cattle. In 1925, 46.4 per cent of the farms were operated by tenants, chiefly relatives of the owners.

The first article analyzes the percentage of tenancy, nativity of the farmers, size of the farms, and the stages through which different tenure groups have passed. The second article analyzes in more detail the stages in achieving ownership and the time spent by each tenure group on each rung of the "agricultural ladder."

Tendencies in State and local finance and their relation to State and local functions, M. NEWCOMER (*Polit. Sci. Quart., 43 (1928), No. 1, pp. 1–31*).—The tendencies during the past 25 years in State and local finances, the problems arising, and possible solutions of some of the difficulties are discussed.

Agriculture and the tariff, compiled by J. E. JOHNSEN (*New York: H. W. Wilson Co., 1927, pp. 142*).—A brief, a bibliography, and reprints of selected articles on the question of agriculture and the tariff are included.

Report of proceedings under the Agricultural Wages (Regulation) Act, 1924 ([*Gt. Brit.*] *Min. Agr. and Fisheries, Rpt. Proc. Agr. Wages (Regulat.) Act, 1926–27, pp. 84*).—This report, which covers the year ended September 30, 1927, is the third of the series previously noted (E. S. R., 57, p. 480).

Factors affecting the price of Gravenstein apples at Sebastopol, E. RAUCHENSTEIN (*Hilgardia [California Sta.], 3 (1928), No. 12, pp. 325–338, figs. 4*).—A table is given showing by years from 1912 to 1927, inclusive, the July 1 and final estimates of apple production in the United States, the production of Gravenstein apples in the Sebastopol district of California, the price per box at packing plants in the Sebastopol district, the price adjusted to the 1927 price level, and the July index numbers of all commodities.

Using the method of Wallace and Snedecor (E. S. R., 56, p. 330), multiple regression equations were obtained based on the periods 1914–1927 and 1919–1927. The equation for the 1914–1927 period was $\overline{X}=3.3741-0.01179A-0.000402B$, and the multiple correlation coefficient ($R_{X.AB}$) 0.8298, in which $\overline{X}$ is the estimated price per box in dollars, A the July 1 estimates of United States apple production in millions of bushels, and B the Sebastopol production of Gravenstein apples in thousands of boxes. This equation gave price estimates within 25 cts. per box of the actual price in 10 out of the 14 years. The coefficients of determination indicate that 61 per cent of the variations in price was due to United States production and 8 per cent to production of Gravenstein apples in the Sebastopol district.

The multiple regression equation for the 1919–1927 period was $\overline{X}=3.10901-0.00832A-0.000839B$. The estimated price obtained by this formula differed from the actual price by from 4 to 48 cts. per box, the difference being 17 cts. or less in 6 of the 9 years. The coefficients of determination indicate that 38.5 per cent of the variations in price was associated with variations in the July 1 estimates of total United States apple production, and 40.7 per cent with variations in the production of Gravenstein apples in the Sebastopol district.

A table and graph are included showing the estimated prices with different combinations of the two factors.

Factors affecting the price of watermelons at Los Angeles, E. RAUCHENSTEIN (*Hilgardia [California Sta.], 3 (1928), No. 12, pp. 305–323, figs. 6*).—A table is given showing for Los Angeles by weekly periods during the shipping seasons 1922–1927 (1) the average number of car lots per day of watermelons arriving (*A*) and on track (*B*); maximum temperature (3-day lag) (*C*); seasonal index of prices (*D*); and actual price of watermelons per pound (*X*); (2) the average number of car lots per day of cantaloupes arriving (*E*) and on track (*F*); (3) the average number of car lots per day of important fruits, including apricots, peaches, pears, plums, and miscellaneous melons, arriving (*G*) and on track (*H*); and (4) the estimated price of watermelons per pound found by the equation derived ($\overline{X}$). These data were analyzed by simple and multiple correlations, using the method of Wallace and Snedecor (E. S. R., 56, p. 330).

Practically no net correlation was found to exist between watermelon prices and cantaloupe arrivals and car lots on track. The multiple correlation index $R_{\log X.ABCDG}$ was found to equal 0.8896. The net regression equation obtained was $\log \overline{X} = -0.3558 - 0.00136A - 0.00206B + 0.00939C + 0.00063D - 0.00686G$. This equation gave estimated prices approximately 50 per cent of which were within 15 per cent of the actual prices. The coefficients of determination for the several factors were *A* +6.83 per cent, *B* +47.95, *C* −1.44, *D* +8.66, and *G* +17.13 per cent, total 79.13 per cent.

The approximate average net effect of changes in the different factors on price of watermelons was found to be that (1) each increase of 10 car lots in arrivals of watermelons reduced the price 3 per cent, (2) each increase of 10 car lots of watermelons on track reduced the price 4.5 per cent, (3) each increase of 4° F. in temperature increased the price 9 per cent, and (4) each increase of 10 car lots in arrivals of important fruits reduced the price 14.6 per cent. The average prices of watermelons declined until after the fourth week of the season, followed by some recovery in the fifth, seventh, and eighth weeks.

A sample is given of the method of applying the results of the study.

Some factors affecting the demand for milk and cream in the metropolitan area of New York, H. A. Ross (*U. S. Dept. Agr., Tech. Bul. 73 (1928), pp. 68, figs. 38*).—This bulletin, with the exception of minor changes, is the same as a bulletin previously noted (E. S. R., 58, p. 786).

The Detroit milk market, J. T. HORNER (*Michigan Sta. Spec. Bul. 170 (1928), pp. 61, figs. 18*).—The origin, transportation, and distribution of the Detroit milk supply are described. The Michigan Milk Producers' Association and the Detroit plan of production control are described and their operations discussed.

Tables and charts are included showing (1) by months the milk sales and surplus in the Detroit market, 1924–1926, the percentages of purchases in the Detroit market and at butterfat stations, condensaries, and cheese factories, 1924 and 1925, and the daily averages of purchases, sales, and surpluses in the Detroit market, 1924–1926; (2) by 4-month periods the percentages of fluid milk receipts in the Detroit market, 1924–1926, and of butterfat receipts at stations in southern Michigan, 1924 and 1925; (3) variations in sales by days of the week of two distributors in 1926; (4) monthly variations, 1926, in the percentage of yearly receipts at two country stations; (5) monthly variations, 1926, in the percentages of yearly sales and receipts of 18 Detroit distributors; and (6) the total per capita consumption of fluid milk by children and by families with and without children in different income groups.

The weaknesses of the present Detroit market are listed and recommendations made for bringing about improvement in conditions.

Report on the pork and bacon trades in England and Wales ([*Gt. Brit.*] *Min. Agr. and Fisheries, Econ. Ser. 17 (1928), pp. 202, pls. 31, figs. 3*).—This report discusses the home and imported supplies of, and the demand for, and the prices, preparation for market, transportation, distribution, and conservation of fresh and processed pig meats and their by-products. It is complementary to the report previously noted (E. S. R., 56, p. 387).

Crops and Markets, [June, 1928] (*U. S. Dept. Agr., Crops and Markets, 5 (1928), No. 6, pp. 185–224, figs. 3*).—Tables, graphs, notes, reports, and summaries on the usual subjects are included, together with special tables and reports on the acreage and production of grain sorghums by States, 1919–1927; the condition of cotton by States on August 1, September 1, and October 1, 1917–1927; the itemized costs of producing corn, wheat, oats, and potatoes in different States in 1927; the cost of producing cotton in 1927 by yield groups; the unloads of 18 fruits and vegetables in 66 cities during 1927; and the refrigerated space of cold storage and meat-packing establishments by States and class of business on October 1, 1927.

Collective irrigation societies in Spain, L. Jordana (*Ann. Collect. Econ., 3 (1927), No. 3, pp. 250–269*).—A brief description is given of irrigation in Spain; of the principles and laws pertaining to the use of water for irrigation, power, and other purposes; and of the organization and functions of councils of irrigators and the conditions leading up to the Royal Decree-Laws of March 5, 1926, creating the confederations of water supply unions. The provisions of these latter laws and the operations under them are discussed.

The bread of our forefathers, W. Ashley (*New York: Oxford Univ. Press, Amer. Branch, 1928, pp. XII+206, pls. 4, figs. 4*).—This inquiry in economic history consists of a series of lectures which were intended to be presented by the author as Ford's Lecturer in English History at Oxford University.

Population, food supply, and American agriculture, O. E. Baker (*Geogr. Rev., 18 (1928), No. 3, pp. 353–373, figs. 13*).—This paper, delivered before the joint session of the American Farm Economic Association and the rural section of the American Sociological Society, December 29, 1927, discusses the progress of population in the Orient, Europe, and North America, and the progress of, amount of, and changes in agricultural production in the United States. The agricultural production data have been brought up to May 1, 1928.

The recent recession of farm population and farm land, J. Perlman (*Jour. Land and Pub. Utility Econ., 4 (1928), No. 1, pp. 45–58*).—This article discusses the recent changes in farm land and farm population in the United States, and how these changes correlate with the trend in agricultural production and with the natural surplus of farm population.

Rural recreation in two Ohio counties, C. E. Lively (*Ohio State Univ. Studies, Grad. School Ser., Contrib. Rural Econ. No. 1 (1927), pp. IX+99, figs. 13*).—The results of a study made in Gallia and Paulding Counties in 1924 are presented. Part 1 deals with the recreational functions of the public institutions and public agencies, organizations, and collective recreational activities on a neighborhood and community basis. Part 2, which is based on a house-to-house canvass of 100 families each in the sample area in each county, deals with the range of participation of individuals and families in the activities noted in part 1, and analyzes the individual participation according to significant groupings.

The family budget as a tool for sociological analysis, C. C. Zimmerman (*Amer. Jour. Sociol., 33 (1928), No. 6, pp. 901–911*).—The relationships of budgetary studies to sociology and the types of analysis desirable are discussed, and some principles or social laws are suggested.

The author believes that a modified version of LePlay's method will make valuable contributions in rural sociology. The principle of Engel's law has been found to apply to the farm laborer or rural wage earner and to the salaried classes in cities. Studies made by the Minnesota Experiment Station, however, have shown that the primary competition in farmers' budgets is between investment expenditures (mainly land) and living, and that the physiological and nonphysiological type of competition is secondary. The characteristics of living or budgetary behavior indicate that the value of such studies is increased by the use of intercorrelations of many fields of behavior.

Footnotes include a bibliography of the more important studies and the chief articles on methodology in this field.

An attitude on attitude research, R. Bain (*Amer. Jour. Sociol., 33 (1928), No. 6, pp. 940–957*).—The author examines the term "attitude" as used by different sociologists, social psychologists, and writers on education.

The general confusion existing in the meaning of the term, he finds, arises from the emphasis placed upon hypothetical subjective factors, from attempting to differentiate attitudes and values, and from identifying opinions with attitudes. He defines an attitude as "the relatively stable overt behavior of a person which affects his status," and states that "the only way to determine attitudes is by observation and statistical treatment of behavior in social situations." The best general method for attitude research is the statistical treatment of indirect evidences of overt behavior in carefully defined or experimentally controlled situations. In his opinion, the questionnaire is of doubtful value in such research, and the case method, life history, and interview are but little better, although they have some advantages over the questionnaire.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

The tenure of agricultural teachers in Mississippi, V. G. Martin (*Fed. Bd. Vocat. Ed. Monog. 4 (1928), pp. III+9*).—This monograph "consists of a summary of a study of the factors affecting tenure of vocational teachers of agriculture in Mississippi, and the problems involved in prolonging the tenure of such teachers." The information used was obtained from the State department of education, the supervisors of agricultural education, the registrar's records of the Mississippi Agricultural and Mechanical College, and replies to questionnaires from 125 of 180 agricultural teachers in the State.

Grain, S. J. Duly (*New York: Oxford Univ. Press, Amer. Branch, 1928, pp. VIII+164, pls. 6, figs. 3*).—This is a text used in the City of London College and deals with the problems importers must meet, such as establishment of standards, effects of moisture on grain, characteristics of varieties, losses of weight in storage, pests, storage conditions, and food value of cereals.

[Livestock short courses] (*U. S. Dept. Agr., U. S. Radio Farm School, Livestock Short Course Nos. 1 (1926), pp. II+22; 2, pp. II+18; 3 (1927), pp. II+20; 4, pp. II+16; 5, pp. II+18; 6, pp. II+30; 7, pp. II+17; 8, pp. II+14*).—These pamphlets consist of groups of lessons prepared by specialists of the Bureaus of Animal Industry, Public Roads, Home Ecoonmics, Agricultural Economics, and Chemistry, supplementing talks on livestock broadcasted by the Office of Information between October 4, 1926, and May 9, 1927. The courses are as follows: Livestock Breeding; Livestock Feeding; Animal Health and Sanitation; Livestock Barns and Shelters; Meats—Production, Curing, Selection, and Use; Hides, Wool, and Mohair; Livestock Equipment; and Work Horses and Mules.

[Poultry short courses] (*U. S. Dept. Agr., U. S. Radio Farm School, Poultry Short Course Nos. 1 (1926), pp. II+16; 2, pp. II+17; 3 (1927), pp. II+28; 4,*

pp. II+22; 5, pp. II+25; 6, pp. II+14; 7, pp. II+22; 8, pp. II+20).—These pamphlets consist of groups of lessons prepared by specialists of the Bureau of Animal Industry, supplementing talks on poultry broadcasted by the Office of Information between October 6, 1926, and May 11, 1927. The courses are as follows: Fall Poultry Management Problems; Poultry Houses; Management of Poultry Breeding Stock; Exhibiting Fowls [and] Lice and Mites; Incubation; Common Poultry Diseases and Worms; Brooding and Rearing; and Spring Problems in Poultry Management.

[Dairy short courses] (*U. S. Dept. Agr., U. S. Radio Farm School, Dairy Short Course Nos. 1 (1926), pp. II+22; 2, pp. II+28; 3 (1927), pp. II+24; 4, pp. II+26; 5, pp. II+32; 6, pp. II+28; 7, pp. II+25; 8, pp. II+24*).—These pamphlets consist of groups of lessons prepared by specialists of the Bureaus of Dairy Industry, Animal Industry, and Entomology, supplementing talks on dairying broadcasted by the Office of Information between October 8, 1926, and May 13, 1927. The courses are as follows: Dairy Herd Improvement, Better Milk Production, Feeding Dairy Cattle, Dairy Herd Management, Engineering, Breeding, Diseases of Cattle, and Dairy Products.

[Farm economics courses] (*U. S. Dept. Agr., U. S. Radio Farm School, Farm Econ. Ser. 1 (1928), pp. 28; 2, pp. 31; 3, pp. 19*).—These circulars consist of courses of 10 lessons each on The Business of Farming (Series 1), Marketing (Series 2), and Cooperative Marketing (Series 3), prepared by specialists of the Bureau of Agricultural Economics and broadcasted by the Office of Information between October 6, 1927, and April 25, 1928.

A course in farm shop work for teachers of vocational agriculture (*Fed. Bd. Vocat. Ed. Monog. 5 (1928), pp. III+10*).—The course outlined is designed to prepare students to teach farm shop work.

FOODS—HUMAN NUTRITION

Relation between the nature of the carbohydrate in the diet and refection in rats, S. K. Kon and E. Watchorn (*Jour. Hyg. [London], 27 (1928), No. 3, pp. 321–327, figs. 3*).—The phenomenon of refection first described by Fridericia et al. (E. S. R., 58, p. 792) and confirmed by Roscoe (E. S. R., 58, p. 793) has also been observed independently by the authors of the present paper, in which the earlier work is confirmed and other features are noted.

In the authors' experience, refection has not occurred spontaneously in rats fed rice starch, but the substitution of potato starch for the rice starch has led after a short period of time to resumption of growth and a change in the appearance of the feces. Both albino and piebald rats have become refected, and the phenomenon has occurred in rats receiving inadequate amounts of vitamin B preparations, such as Harris yeast vitamin concentrate and an alcoholic extract of yeast. Refection has not been as marked on washed potato starch, but the washings were without effect. Rats fed the starch-containing diet steamed for three minutes in a double boiler grew slowly for about 10 days and then declined in weight with symptoms of vitamin B deficiency. Arrowroot starch seemed to lie between rice and potato starch in bringing about refection.

An experiment with a single rat is noted in which there was evidence that potato starch is capable of curing a pellagra-like condition brought on by the use of Harris yeast vitamin concentrate as the sole source of vitamin B. After the symptoms had appeared the rice starch was changed to potato starch, following which there was some imporvement in four days and a complete cure in two weeks. In connection with this, attention is called to certain observations in the paper of Boas (E. S. R., 57, p. 788) which suggest that refection was present in her rats receiving potato starch.

A bacterial examination of the intestines of refected rats showed the presence of Gram-positive bacilli in excess of Gram-negative. It is considered of significance that Heller, McElroy, and Garlock (E. S. R., 54, p. 594) reported the ability of Gram-positive bacilli in the intestines to synthesize vitamin B.

Does the amount of food consumed influence the growth of an animal? W. C. Rose (*Science, 67 (1928), No. 1741, pp. 488, 489*).—A reply to the paper of Mitchell previously noted (E. S. R., 58, p. 790).

A study of the possible rôle of aluminum compounds in animal and plant physiology, E. V. McCollum, O. S. Rask, and J. E. Becker (*Jour. Biol. Chem., 77 (1928), No. 2, pp. 753–768, pl. 1, figs. 5*).—The conflicting literature on the biological and dietary significance of aluminum is reviewed briefly, and a reinvestigation of the question is reported which differs from previous studies in that the determinations of aluminum were conducted by the spectrographic method, this method being selected on account of its sensitiveness, specificity, simplicity, and freedom from all chances of aluminum contamination. The technique is described in detail, and characteristic spectra obtained with different materials are reproduced.

The plant products tested included wheat germ, yeast, navy beans, Lima beans, potatoes, carrots, and cottonseed meal, and the animal products hens' eggs and various tissues and organs of rats. With the exception of rat skin, intestinal walls, and lungs, which showed the presence of aluminum in a concentration of about 0.5 part per million, all of the materials gave entirely negative tests. The presence of the small amount of aluminum in the materials mentioned is attributed to contamination of the dust of the air.

The biological tests consisted in feeding rats from weaning to maturity on diets containing in one series 0.6 per cent of aluminum chloride and in the other 0.3 per cent of a commercial brand of sodium aluminum sulfate, calcium acid phosphate baking powder artificially decomposed by heating in distilled water at 100° for from 30 to 45 minutes. The aluminum in these compounds comprised 0.067 and 0.063 per cent, respectively, of the diet. The behavior of the rats was entirely normal and the organs of four of the first generation which had been on the diet for 8 months showed the presence of aluminum in amounts less than 0.5 part per million.

The authors' conclusions are as follows: "Aluminum is not a constituent of either plant or animal matter. Aluminum compounds are not absorbed out of the stomach or intestinal tract when present in the diet. Aluminum compounds, when present in the alimentary tract, do not form any union or compound with the stomach or intestinal walls. Aluminum compounds in the diet in concentrations as high as 600 parts per million of the element aluminum exert no noticeably deleterious action on growth, reproduction, or general well-being as judged by external appearance and autopsy. These conclusions can probably not be regarded as final until after additional and confirming data have been obtained on a larger variety of materials and other animals. But until then there seems to be no other alternative than to accept them as tentative."

The iron content of plant and animal foods, W. H. Peterson and C. A. Elvehjem (*Jour. Biol. Chem., 78 (1928). No. 1, pp. 215–223*).—Previous studies on the iron content of certain tissues (E. S. R., 58, p. 191) have been extended to about 150 samples of common food materials, chiefly of plant origin, but including a number of samples of fish and poultry.

The values ranged from 0.00015 per cent (calculated on the basis of undried material) for lemon juice to 0.0192 per cent for parsley. Arranged by groups according to decreasing iron content, dried legumes came first, followed by green leafy vegetables, dried fruits, nuts, cereals, poultry, green legumes, roots

and tubers, nonleafy vegetables, fish, and fruits. Different samples of the same food material showed wide variations in their iron content. The minimum and maximum figures obtained for 20 samples of cabbage were 0.00017 and 0.00059 per cent. Vegetables containing very little chlorophyll, such as cabbage, celery, and head lettuce, were low in iron. The juice of oranges and tomatoes contained less of the total iron than is proportional to the weight of the expressed juice. For this reason it is suggested that infants should be fed both juice and pulp of these materials as early as possible.

Salt-water fish contained about 40 per cent more iron than the fresh-water species, and the dark meat of fish and poultry more than the corresponding light meat.

Biological values of certain types of sea foods.—III, Vitamins in clams, D. B. Jones, E. M. Nelson, and J. C. Murphy (*Indus. and Engin. Chem., 20 (1928), No. 6, pp. 648–652, figs. 3*).—In continuation of the series of studies previously noted (E. S. R., 59, p. 95), the authors, with the cooperation of J. P. Devine, have studied the vitamin content of hard-shell clams or quahaugs, *Venus mercenaria*, and soft-shell clams, *Mya arenaria*. Both varieties were found to contain little, if any, of the vitamin B complex and to be somewhat inferior as a source of vitamin A to oysters, but to be a better source of vitamin D and of the factor or factors essential for reproduction and rearing of the young.

Soft-shell clams appeared to be a little richer in vitamin A than the hard-shell variety. Five gm. daily of the fresh material, equivalent to 1 gm. of dry material, sufficed for the cure and prevention of xerophthalmia. Slightly larger amounts were necessary of the hard-shell variety. In the vitamin D tests, 5 gm. of either variety sufficed for complete calcification in 15 days. That this was not due to the phosphorus content of the clams was demonstrated by the practically negative results obtained when the rachitic diet was supplemented by the ash from the same amount of clams.

Following the same methods as in the previous study, 61 per cent of the young of the first generation and 82 per cent of the second were reared, as compared with only 14 per cent in the first generation and none in the second in the experiment with oysters.

The effects of inadequate vitamin A on the sexual physiology of the female, H. M. Evans (*Jour. Biol. Chem., 77 (1928), No. 2, pp. 651–654*).—This is a further discussion of the effect of a deficiency of vitamin A upon reproduction (E. S. R., 50, p. 163), as demonstrated by the constant appearance of cornified cells either predominantly or exclusively in the vaginal smear. Data are presented showing that this phenomenon is due to lack of A rather than of D. As stated in the earlier paper, lack of vitamin A, unlike that of E, injures the reproductive system of the female so that fertilization and implantation often fail. If, as in the case of about one-fifth of the copulations, implantation does occur, gestation is completed and normal litters are born. The character of the cells, as shown in the vaginal smear, is thought to afford another proof of impaired or inadequate internal secretion in vitamin A deficiency.

Vitamin B, C. H. Hunt (*Science, 67 (1928), No. 1744, p. 556*).—This brief note suggests the possibility of a third factor in the vitamin B complex. The evidence on which this is based is that extracts of the two known fractions prepared from yeast did not promote growth to a degree comparable with an equivalent amount of the original yeast, but that when the yeast residue left from the removal of the two fractions was added to the fractions excellent growth resulted. The new factor is thought to be thermostable and insoluble in water.

The complex nature of vitamin B as found in wheat and corn, C. H. HUNT (*Jour. Biol. Chem., 78 (1928), No. 1, pp. 83–90, figs. 4*).—As an outcome of the extensive investigation of the effect of fertilizers on the vitamin B content of wheat (E. S. R., 58, p. 534), the author has made a more detailed study of the relative proportions of vitamins F and G in the vitamin B complex of wheat, and has extended the study to corn.

The data reported confirm the previous conclusions of Sherman and Axtmayer (E. S. R., 58, p. 295) that wheat is much richer in vitamin F than in G, and show that the same ratio between the two factors exists in corn. With vitamin G supplied by autoclaved yeast, 15 per cent of either wheat or corn appeared to furnish about the minimum amount of vitamin F for growth.

Vitamin B—a question of nomenclature, S. L. SMITH (*Science, 67 (1928), No. 1741, pp. 494–496*).—This is a more complete summary and discussion than in the paper previously noted (E. S. R., 59, p. 92) of the various terms which have been proposed in recent literature for the heat-labile and heat-stable factors of vitamin B. A list of 14 references to literature on the subject is included.

A method of assay of the antirachitic vitamin D, K. H. COWARD (*Quart. Jour. Pharm., 1 (1928), No. 1, pp. 27–33, figs. 2*).—A description is given of the technique which has been adopted at the Pharmacological Laboratory, Pharmaceutical Society of Great Britain, for the quantitative determination of vitamin D. In the opinion of the author the only method of overcoming the difficulties involved in expressing results obtained in different laboratories by the same unit is the adoption of a standard preparation of the vitamin in question. The standard recommended for the assay of vitamin D is a standardized preparation of irradiated ergosterol of such potency that a daily dose of not more than 0.0001 mg. will, under the conditions of the test as described, cause complete healing of the induced rickets.

The technique of the test is that described by Steenbock, Black, et al. (E. S. R., 54, p. 489), based on the line test of McCollum, Simmonds, Shipley, and Park (E. S. R., 47, p. 566). During the preparatory period the rats of one litter are kept together in one cage, but during the experimental period of 10 days each rat is kept in a separate cage and its food intake is measured. One rat is continued on the basal diet, 2 or 3 are given graduated doses of the standard irradiated ergosterol, and the others graduated doses of the material being tested. By equating, by means of the line test, the dosage of the material with the dosage of irradiated ergosterol required for complete healing, it is possible to calculate the amount equivalent to the dose of 0.0001 mg. which has been adopted as the standard. The amount may then be expressed as the number of units of antirachitic potency contained in a convenient measure of the substance tested.

A typical assay of a sample of cod-liver oil is summarized, and attention is called to special precautions that must be taken if the material being tested contains sufficient phosphorus to alter materially the ratio of calcium to phosphorus.

The growth-promoting properties of vitamin D, A. L. BACHARACH (*Quart. Jour. Pharm., 1 (1928), No. 1, pp. 49–60, figs. 4*).—Unhardened and hardened soy bean oils were tested for their content of vitamin A, with vitamin D supplied by ostelin, and of vitamin D by the fecal pH test as described by Jephcott and Bacharach (E. S. R., 59, p. 293). The two samples of oil were found to be devoid of vitamin D, but to contain vitamin A. There was evidence of slight destruction of vitamin A in the hardened oil. The superior growth of the rats receiving the ostelin over those receiving the soy bean oil alone is thought to demonstrate the growth-promoting properties of vitamin D.

Cholesterol and vitamin D, I. M. Heilbron, R. A. Morton, and W. A. Sexton (*Nature [London], 121 (1928), No. 3047, pp. 452, 453*).—In a brief note the authors confirm the observation of Bills, Honeywell, and MacNair (E. S. R., 58, p. 795) of a faint band at 260$\mu\mu$ in ergosterol, but state that this is detected with certainty only when a continuous light source is used. Attention is called to a previous observation that cholesterilene is characterized by selective absorption with maxima at 294, 304, and 321$\mu\mu$, that the first of these lines coincides with the 293.5$\mu\mu$ band of ergosterol, and that the other two are in close agreement with the 304 and 315$\mu\mu$ lines observed by Bills, Honeywell, and MacNair in their specially purified cholesterol. It is suggested that these bands as observed in cholesterol may be due to traces of cholesterilene formed during the purification process.

The activation of cholesterol at liquid oxygen temperature, C. E. Bills and F. G. Brickwedde (*Nature [London], 121 (1928), No. 3047, p. 452*).—The authors announce that a sample of cholesterol containing 1.2 parts per thousand of ergosterol irradiated at the temperature of liquid oxygen induced advanced healing of rickets in rats when fed at a level of 0.1 per cent of the diet, but failed at a level of 0.01 per cent. A similar sample irradiated at room temperature was active at both levels of feeding. The ability to become antirachitic at the extremely low temperature noted is thought to afford strong confirmation of the recent evidence of Rosenheim and Webster (E. S. R., 56, p. 202), Windaus and Hess, and Bills and McDonald (E. S. R., 57, p .197) that the activation of a cholesterol or ergosterol consists not in an oxidation but in an isomerization, a rearrangement at the double bond.

"In the activation of sterols by ultra-violet rays, it is important to consider the temperature coefficients of both the vitamin formation and accompanying destruction. For the formation the coefficient is evidently low. We find, however, that the spontaneous deterioration of (unactivated) ergosterol has a high temperature coefficient. If activated ergosterol also exhibits a high coefficient in its decomposition, then the way is clear for the preparation of a vitamin D of greater potency than has hitherto been attained."

Human milk studies.—V, A quantitative comparison of the antiricketic factor in human milk and cow's milk, J. Outhouse, I. G. Macy, and V. Brekke (*Jour. Biol. Chem., 78 (1928), No. 1, pp. 129–144, fig. 1*).—Continuing the series of studies previously noted (E. S. R., 57, p. 390), the authors have compared the vitamin D content of human milk and certified cow's milk by a technique differing from the methods commonly employed in that the salt composition of the basal diet was altered with each experiment to make the proportion of calcium to phosphorus always fall between the ratios of 5:1 and 4:1. The diagnosis of rickets was confirmed by three different methods—histological, line test, and X-ray examinations—with additional evidence in the percentages of calcium, phosphorus, and ash of the bones. It is thought that these chemical analyses are of considerable value in determining the degree of calcification of bones, but should not be relied upon alone for the diagnosis of rickets in rats.

Under these carefully controlled conditions, the human milk was found to have no antirachitic effect when fed to rats in amounts of 25, 30, or 40 cc. daily, while the cow's milk in 30-cc. daily doses induced marked healing of rickets in seven days.

Treatment of rickets, I, II, H. M. M. Mackay (*Lancet [London], 1928, I, Nos. 18, pp. 923, 924; 19, pp. 979, 980*).—These papers, which form a part of a series of articles on modern technique in treatment, contain practical directions for the diagnosis of rickets and general and specific measures for its prophylaxis and cure.

I. *Prophylactic measures.*—The general prophylactic measures recommended are out-of-door life as much as possible throughout the year, with exposure to the available sunlight, the encouragement of breast feeding, and the inclusion in the ordinary diet of children after weaning of foodstuffs containing vitamin D. It is thought that specific prophylactic treatment should be given to "all artificially fed infants throughout the winter, and throughout the year if sufficient outdoor life can not be insured; breast-fed infants who are little out of doors; all premature infants throughout the year; all infants of dark-skinned races living in this country [England]—throughout the year."

Cod-liver oil is thought to be a much safer source of vitamin D than concentrated extracts or irradiated ergosterol, chiefly on account of lack of knowledge concerning the keeping qualities of various concentrates and the possible danger of overdosage with irradiated ergosterol. It is noted that the curative dose of irradiated ergosterol recommended in a recent report of the Medical Research Council is apparently equivalent in vitamin D to nearly half a liter of cod-liver oil daily.

II. *Curative measures.*—Adjustment of the diet is included among the curative measures discussed. The diet recommended for children after weaning includes 1 pint of milk daily, 3 to 5 eggs weekly, and, from the age of 12 months, meat from 3 to 7 times a week.

The pre-beriberi condition, with special reference to its existence in Japan, E. C. Grey (*Jour. Hyg.* [*London*], *27 (1928), No. 3, pp. 257–267, pls. 3*).—This general discussion is based upon observations made by the author in the course of an examination of women workers in the central telephone exchange in Tokyo in June, 1927, and upon statistics of illness among recruits and regular soldiers in the Japanese army. It is thought that a pre-beriberi condition which, in its relation to beriberi, may be likened to a pre-scorbutic condition in its relation to scurvy is fairly common in Japan. This is considered to be due to the inadequacy of the Japanese diet as a whole in quality and not merely to an insufficiency of vitamin B. "There is too much starch, and too little of nearly everything else, for example, protein, fat, lipoid, extractives, and of mineral constituents, phosphorus, lime, iron, potash, are lacking, while magnesium may be in excess. There is very little animal fat in the country, so that there must be an inadequacy of vitamin A. Moreover, the artificial treatment to which most of the food is submitted robs the food according to the writer's calculations of about 90 per cent of vitamins before it reaches the consumer."

The condition, which is characterized by general weakness of the body, varying degrees of affection of the heart, anemia, loss of appetite, and sometimes constipation, readily passes into beriberi as the result of extra fatigue or heat or even with a sudden improvement in the quality of the diet. As a prophylactic measure, diminishing the quantity of food and improving its quality are recommended, particularly the more liberal use of eggs, milk, and meat.

Studies in the nutrition of birds, E. C. Grey (*Jour. Hyg.* [*London*], *27 (1928), No. 3, pp. 268–294, figs. 9*).—These studies are reported as follows:

I. *Observations on the nutrition of tame and wild Egyptian pigeons* (pp. 269–275).—This section consists chiefly of a comparison of the behavior of tame and wild Egyptian pigeons toward deficient diets, particularly one of polished rice, and a discussion of these differences with reference to the two types of response to malnutrition in Japan as represented by beriberi and the form of general exhaustion noted in the previous paper.

The wild pigeons on polished rice developed the characteristic polyneuritic symptoms corresponding to beriberi, while the tame ones succumbed more often to general exhaustion. Loss in weight was much more rapid in the tame than

in the wild pigeons. This was thought to indicate the presence of more active protoplasm in the latter, as would be the case with the active type of individual who is more apt to develop typical beriberi.

II. *Observations on the rate of growth and changes in the organs of wild Egyptian pigeons, fed with various diets* (pp. 276–283).—The experimental work in this section consisted in a study of the weights of various organs of wild pigeons on diets of varying degrees of deficiency from polished rice to the common Egyptian bean on which the birds thrive and make the best growth. Compared with the organs of the bean-fed pigeons as standards, the principal changes in the organs of the cereal-fed pigeons were an increase in weight and total solids of the liver; practically no change in the heart, lungs, and brain; loss in weight of all the other tissues, particularly the muscular and glandular tissues; and, on the very deficient diets, an almost complete dissolution of the pancreas.

III. *A consideration of various factors which protect pigeons against the harmful effects of an exclusively cereal diet, and especially of polished rice* (pp. 283–293).—The various protective and harmful factors which in the opinion of the author must be taken into consideration in endeavoring to explain the harmful effects of cereal diets on pigeons are classified and discussed.

The protective factors are divided into fixed factors, depending on the breed and history of the pigeons, and mobile factors, the latter including the various known chemical constituents of food, certain nonprotein nitrogenous substances not definitely known, the vitamin B complex, vitamin A, vitamin D, and heat. The factors considered to have a harmful effect are excessive energy exchange in the tissues, inadequate aeration of the tissues, inadequate excretion, and excessive humidity in the atmosphere.

The general hypothesis is advanced that on a diet of overmilled cereals the tissues are called upon to do excessive metabolic work, while at the same time they are not supplied with the nitrogenous repair material requisite for tissue repair. The action of the vitamin B complex is attributed to two factors, (1) a factor which catalyzes enzyme actions in the tissues, especially of the oxidative type and is, therefore, concerned with the energy production in the tissues of carbohydrate, fat, or protein, and (2) a factor which maintains the integrity of the tissues and in the absence of which the cell structures become autolyzed and finally disintegrate.

"The various signs and symptoms of polished rice disease may be explained in terms of the factors and accessory factors postulated above. Thus in the absence of the first factor of the vitamin B complex, energy can not be produced without an abnormal destruction of the machinery, i. e., the tissues of the body. The disintegration of the tissues is resisted by the second factor, which maintains tone, but when this gives out there is a rapidly increasing permeability of the tissues, with consequent softening of the organs, inflammatory and catarrhal conditions, edema, congestion, hemorrhage, diarrhea, increased liability to infection, and so forth."

The nature of the material in liver effective in pernicious anemia, II, E. J. Cohn, G. R. Minot, G. A. Alles, and W. T. Salter (*Jour. Biol. Chem., 77 (1928), No. 2, pp. 325–358, figs. 7*).—This paper reports in detail the various steps in the fractionation of liver to obtain the extract active in pernicious anemia (E. S. R., 58, p. 92), and discusses the physical and chemical properties and possible physiological action of the extract as thus far determined. It is thought that the active principle must be either a nitrogenous base or a polypeptide, of which only 0.6 gm. daily has sufficed to bring about a pronounced response of reticulated red blood corpuscles in a patient with pernicious anemia.

TEXTILES AND CLOTHING

Textile microscopy, L. G. Lawrie (*London: Ernest Benn, 1928, pp. 144, pls. 3, figs. 44*).—This book provides a concise account of the microscope and its accessories and describes the different operations involved in preparing textile fibers for microscopic examination. The successive chapters deal with the microscope, illumination and illuminating apparatus, light filters, microscopes for textile use, micrometry, reproduction of observations, reagents, stains and staining, the preparation of fibers for microscopic examination, and sectionizing.

Survey of textile industries: Cotton, wool, artificial silk, A. Balfour et al. (*London: [Gt. Brit.] Com. Indus. and Trade, 1928, pp. VI+328*).—The history, development, organization, and economic conditions in the wool, cotton, and rayon industries in Great Britain are reviewed, and accounts and statistics are supplied in regard to the domestic, foreign, and international commercial movements of the raw materials and finished products.

Transmission of ultra-violet radiation by various fabrics, H. R. Hirst, P. E. King, and P. N. Lambert (*Jour. Soc. Dyers and Colourists, 44 (1928), No. 4, pp. 109–113, figs. 2*).—Studies on a wide range of materials, including fabrics of wool, silk, rayon, cotton, linen, felt, and mixtures demonstrated that all fabrics cut off a large proportion of ultra-violet radiation. The main factor controlling the transmission appeared to be the weave and texture of the fabric and not the kind of component fibers. For equal thickness of material, wool in general showed a higher transmissive power than other fibers examined. All dyes produced a considerable decrease in transmission, absorption increasing with depth of color, whereas in the case of wool, bleaching and extraction with alcohol appreciably increased transmission.

Report of the sub-committee on light fastness.—II, The fading of dyed textiles in the light transmitted by various glasses, W. D. Appel and W. C. Smith (*Amer. Dyestuff Rptr., 17 (1928), No. 11, pp. 410–422, figs. 10*).—In further studies (E. S. R., 58, p. 393), 20 selected dyeings were exposed to sunlight without glass cover and under window glass, Corex, Vita, and six other special glasses of known transmission. The fading was recorded in the form of quantitative reflection measurements, and the spectral distribution of the radiation and the extent to which fading of the dyeings is affected by changes in distribution and intensity produced by passage through the glasses are reported.

An increase in ultra-violet radiation did not necessarily result in increased fading. The visible and the long wave length ultra-violet radiation in sunlight were found to be relatively more important in comparison with the short wave length ultra-violet than has been commonly supposed. Window glass is considered satisfactory for covering the samples in the standard sunlight exposure test.

Technological reports on standard Indian cottons, 1928, A. J. Turner (*Indian Cent. Cotton Com. [Bombay] Bul. 16 (1928), pp. VI+118, figs. 21*).—The results of extensive tests on 18 standard Indian cottons and 3 American cottons of the 1927–28 season are described, together with those of earlier crops (E. S. R., 58, p. 596). This report resembles the previous note in its general scope.

The cottons were grouped as to suitability for different counts of yarn. The hand stapling method of the grader appeared to exaggerate differences between the staple lengths of fine and coarse cottons. Three cottons showed a maximum seasonal variation between 15 and 25 per cent in fiber length, and five cottons showed a maximum seasonal variation of more than 20 per cent in highest suitable counts. There was no evidence that any of the cottons had undergone

deterioration in any way. When the cottons were arranged in the order of highest suitable counts there was evident for all properties except fiber strength a fairly well marked general trend more or less parallel to that of the counts. Such a trend was not discernible for the ratio fiber strength : fiber weight per inch. As to the ratio fiber rigidity : the square of the fiber weight per inch, there seems to be a fundamental specific distinction, the 14 values for hirsutum cottons clustering around 0.5 and the 10 values for herbaceum cottons around 0.3. The many individual exceptions to each general trend led to the conclusion that no single fiber property could serve as a universal criterion to indicate the highest suitable counts into which a cotton can be spun.

While the standard cottons of the 1927–28 season gave much the same spinning-test results as in previous seasons, some differences were observed in fiber properties. The greatly increased fiber weights of all the Punjab cottons and the greatly reduced fiber weights of two Wagad cottons in 1927–28, as compared with 1926–27, were notable. These changes were accompanied by similar changes of greater or less degree in fiber strengths and fiber rigidities. All of these changes are believed to be associated with a diminished water supply in the Punjab and the occurrence of floods in the Dholleras tract in 1927–28.

Neppiness in cotton (*Empire Cotton Growing Rev., 5 (1928), No. 2, pp. 97–99, pl. 1*).—The cause of neppiness in cotton and means for its detection are discussed briefly.

[Report of the Linen Industry Research Association, 1927] (*Linen Indus. Research Assoc. [Lambeg, Co. Antrim], Rpt. Council, 1927, pp. 36*).—Research reported on in continuation of previous studies (E. S. R., 57, p. 597) embraced agronomic and breeding investigations with flax, and retting, spinning, weaving, bleaching, and finishing tests.

The isoelectric points of wool and silk [trans. title], L. Meunier and G. Rey (*Compt. Rend. Acad. Sci. [Paris], 184 (1927), No. 5, pp. 285–287, fig. 1; trans. in Amer. Dyestuff Rptr., 17 (1928), No. 10, pp. 374, 375, by C. F. Mullin and M. C. D'Amour*).—For samples of scoured and sulfur-bleached wool there was a distinct minimum of swelling at about pH 3.6 to 3.8 and for silk fibroin (degummed silk) at about pH 4.2. The curves indicated that while wool possesses a distinctly amphoteric character, silk is much less active and combines with both acids and bases to a considerably smaller extent, especially between pH 3 and 7. The fact that fibroin is less sensitive to changes in H-ion concentration indicated that there are less free amino and carboxyl groups than in keratin. The curve for wool indicates that the minimum of felting and shrinkage occurs in baths of a pH corresponding to the isoelectric point of the wool. The translators suggest that the bleaching, scouring, and long water washing of the wool may have had some effect on the results.

The action of acids on wool, S. R. and E. R. Trotman and J. Brown (*Jour. Soc. Chem. Indus., Trans., 47 (1928), No. 8, pp. 45T–49T, fig. 1*).—Studies wherein knitted Botany woolen fabric was subjected to dilute hydrochloric and acetic acids and dilute and concentrated surfuric acid suggested that the action of acids on wool depends on the taking up of the acid by the fiber, while chemical reactions occur later between the acids and the reactive groups of the wool substance. In the more dilute concentrations the rapidity of reaction depends on the rate of taking up, and when this rate attains the degree of the rate of chemical reaction the latter apparently becomes the governing factor in the process, which ultimately results in the degradation of the protein molecule. The effect of agitation and of H-ion concentration in the taking up of the acids and the action of acids on the physical properties of wool are dealt with briefly.

Chrome and vegetable tanned sheep leathers (*U. S. Dept. Com., Bur. Standards Tech. News Bul. 135 (1928), p. 106*).—Sheep leather was observed to be much stronger in the lengthwise direction than in the crosswise direction,

regardless of the type of tannage, and the percentage of stretch was approximately double in the crosswise direction. It seemed that the finishing methods may have an influence on these properties. The vegetable tanned leathers were stronger and stretched less than the chrome tanned leathers.

HOME MANAGEMENT AND EQUIPMENT

Electric cooking [trans. title], F. MARTI (*Schweiz. Elektrotech. Ver. Bul., 19 (1928), No. 1, pp. 1–30, figs. 18; abs. in Sci. Abs., Sect. B—Elect. Engin., 31 (1928), No. 364, p. 204*).—Data are first presented on electric cooking from the standpoint of the load factor on the central station. Load diagrams show that a heavy peak occurs between 11 and 12 a. m., with smaller peaks of about one-quarter of the magnitude between 6 and 7 a. m. and 5.30 and 8 p. m. A load diagram for a household of six persons having apparatus capable of utilizing 5.5 kw. per hour shows a daily consumption of about 1 kw. hour per day per person. Detailed figures for Norway and Sweden are given, showing that in many towns from 40 to 70 per cent of the houses are equipped for electric cooking, the average consumption varying from 1.25 kw. hours for households of five to 0.75 kw. hour for households of 12 per person per day. Switzerland has about 20 per cent of its total houses electrically equipped, each consuming an average of 5.5 kw. hours per day.

Several Swedish makes of electric cookers are described and illustrated, including a special type in which a hot water accumulator is included which reduces the current peaks.

A comparison of prices shows that on this basis electric cooking apparatus is from three to four times as expensive as gas cooking apparatus, and that the cost of electricity is about three times that of gas for an equivalent number of calories, although in the former there is very little heat wasted.

Household refrigeration: A partial list of references, compiled by S. C. CLARK, M. B. PORTER, and L. W. REYNOLDS (*U. S. Dept. Agr., Bur. Home Econ., Home Econ. Bibliog. 5 (1928), pp. 24*).—This is a partial list of references on household refrigeration restricted to articles and publications in English, nearly all of which were published in the United States.

MISCELLANEOUS

Thirty-seventh Annual Report [of Alabama Station, 1926], M. J. FUNCHESS ET AL. (*Alabama Sta. Rpt. 1926, pp. 24*).—This contains the organization list and a report on the work and publications of the station for the fiscal year ended June 30, 1926. The experimental work not previously reported is for the most part abstracted elsewhere in this issue.

Report of the Hawaii Agricultural Experiment Station, 1927, J. M. WESTGATE ET AL. (*Hawaii Sta. Rpt. 1927, pp. [2]+27, pls. 3, figs. 6*).—This contains the organization list, a summary by the director as to the work of the year, and reports of the divisions of horticulture, agronomy, and chemistry, the extension and demonstration work on the Island of Hawaii, boys' and girls' club work, and the Haleakala Substation and Demonstration Farm. The experimental work recorded is for the most part abstracted elsewhere in this issue.

Report of Moses Fell Annex Farm, Bedford, Indiana, June, 1928, H. J. REED and H. G. HALL (*Indiana Sta. Circ. 152 (1928), pp. 18, figs. 11*).—The experimental work summarized in this report is for the most part abstracted elsewhere in this issue.

Fortieth Annual Report of [Rhode Island Station, 1927], B. L. HARTWELL (*Rhode Island Sta. Rpt. 1927, pp. 35–52*).—This report includes experimental work and meteorological data, for the most part abstracted elswhere in this issue.

NOTES

Arizona University and Station.—J. J. Thornber has resigned as dean of the College of Agriculture and director of the station, but is continuing as professor of botany and botanist. Dr. E. D. Ball, associate entomologist of the Florida Station and in charge of celery insect investigations for the State Plant Board of Florida, has been appointed dean and director, beginning about October 1.

California University and Station.—Two additional greenhouses, together with a head house, have been completed at Davis at a cost of approximately $15,000.

C. B. Hutchison has been appointed director of the Giannini Foundation of Agricultural Economics, professor of agriculture, and associate director of research in the station. At Davis, Russell Lawrence Perry, instructor in agricultural engineering in the Oregon College, has succeeded E. G. McKibben as assistant professor of agricultural engineering and assistant agricultural engineer.

Dr. Joseph T. Rosa, associate professor of truck crops and associate plant breeder at Davis, died August 8 at the age of 33 years. Dr. Rosa was a native of South Carolina and a graduate of Clemson College in 1915. He had subsequently received the M. S. degree from the Iowa College in 1917 and the Ph. D. degree from the University of Missouri in 1922. He had served at the Iowa College and Station, the Virginia Truck Station, and Missouri University and Station, going to California in 1922. Much of his work had been with vegetable culture and breeding, and he was regarded as an investigator of unusual promise.

Connecticut College and Storrs Station.—*New England Homestead* notes the appointment of A. W. Manchester, professor of farm management, as assistant director of the extension service. George H. Lamson, head of the zoological department, has been appointed dean of the division of agricultural science vice Dr. E. W. Sinnott, whose resignation has been previously noted. Dr. Wayne N. Plastridge of the department of general bacteriology at Yale University has been appointed assistant bacteriologist in animal diseases.

Idaho University and Station.—A new degree course in agricultural engineering has been established. This course will be directed jointly by the deans of the Colleges of Agriculture and Engineering and will lead to the degree of bachelor of science in agricultural engineering, conferred by the College of Engineering.

A double wool caliper, with which a sample of wool ½ in. square can be obtained from a sheep's back with considerable accuracy, has been devised by the department of animal husbandry. It is expected that this caliper will be of special value to sheep breeders in inheritance studies and calculation of fleece density.

Kansas College and Station.—The total enrollment in the college on September 18 was 2,844 as compared with 2,843 on the corresponding date of the previous year. The most striking change was an increase of 56 per cent in the number of freshmen in the division of agriculture. There was also an increase from 18 to 28 in the number of freshman veterinary students and a 50 per cent increase in both agricultural and flour mill engineering.

Another practice house has been opened by the division of home economics to be operated as nearly as possible on an income of $1,800 for a family of five. The older practice house is being maintained at an income level of $3,600 per year.

H. R. Sumner, extension associate professor of farm crops, has resigned to become director of the Northwestern Crop Improvement Association.

Leave of absence has been granted to Dr. Roger C. Smith for investigational work in Haiti and to J. A. Hodges, R. H. Lush, and Dr. J. P. Scott for graduate work to be taken, respectively, at Harvard University, the University of Wisconsin, and the School of Medicine of the University of Colorado. In their stead, Donald A. Wilbur has been appointed assistant professor of entomology; R. D. Nichols, instructor in agricultural economics; T. R. Warren, assistant in dairy husbandry; and Karl W. Niemann, instructor in veterinary medicine. Iva Larson has been appointed assistant in genetics (zoology) vice Carrie I. Potter, resigned; Benjamin L. Smits, associate food chemist, vice F. H. Collins, resigned; and Carl Bower, field agent in the Office of Cereal Investigations, U. S. D. A., vice J. G. Willier, resigned. Mary F. Taylor has been appointed assistant professor of home economics for investigational work.

Michigan College and Station.—A farm of over 700 acres, located near Kalamazoo and established in 1927 by W. K. Kellogg of Battle Creek, has been formally dedicated for the use of the college for experimental work. Among other features the farm contains a wild life park, which it is hoped to develop considerably. The farm will be conducted jointly by a manager representing Mr. Kellogg and the agricultural division of the college.

Ernest L. Anthony, head of the department of dairy husbandry of the West Virginia University and Station, has been appointed head of the division of dairy husbandry, effective September 1, vice O. E. Reed, who has become head of the U. S. D. A. Bureau of Dairy Industry. Miss Edith G. Grundmeier has been appointed research assistant in home economics, effective September 1. According to a note in *Science*, Dr. C. W. Bennett, instructor and research assistant in plant pathology, has accepted an appointment as associate in plant pathology at the Ohio Station, where he will continue his studies on raspberry virus diseases and peach yellows.

Missouri University and Station.—Dr. Samuel D. Gromer, associate professor of agricultural economics and associate agricultural economist, died August 26 at the age of 63 years. Dr. Gromer was a graduate of the university and served as instructor in history and economics from 1906 to 1908. He then filled a succession of posts in Porto Rico until 1912 and rejoined the university staff in 1913.

Cornell University.—Bids for the completion of the plant industry building, for which a State appropriation of $1,100,000 is available, have been opened, the lowest being for a total of $924,255. It is now expected that the new structure will house the departments of botany, plant pathology, plant breeding, floriculture and ornamental horticulture, and pomology, while the department of vegetable gardening will be quartered elsewhere.

Oklahoma College and Station.—C. E. Sanborn, head of the department of entomology, has been appointed acting dean of the School of Agriculture and acting director of the station. A number of other vacancies have been filled by the following appointments:

Dr. J. C. Ireland as professor of plant breeding and plant breeder vice Dr. Fred Griffee, who has accepted a position in the Maine Station; Burton F. Kiltz as assistant professor and assistant in forage crops and pastures vice Dr. K. H. Klages; Dr. Daniel Ludwig as assistant professor of entomology and assistant entomologist vice George E. King; Laurence Morris as assistant professor of

poultry husbandry and assistant poultry husbandman vice C. W. Upp; and O. W. Herrmann and P. H. Stephens as professor of agricultural economics in charge of marketing and associate professor of agricultural economics and associate in farm management vice, respectively, Drs. W. W. Fetrow and J. O. Ellsworth. Henry F. Murphy has been designated acting head of the department of field crops and soils vice Adrian Daane, who has been given sabbatical leave for graduate work at the University of Minnesota.

The dairy department has recently occupied a modern well-equipped three-story brick dairy building.

Pennsylvania College and Station.—A veterinary hospital and a new brooder house, 400 by 26 ft., with accommodations for 5,400 chicks from incubation to laying pens, have recently been built.

Charles A. Burge has been appointed beef cattle and horse specialist and George L. Zundel, extension plant pathologist. Dr. H. B. Pierce has resigned as associate professor of food and dairy chemistry to become assistant professor of vital economics in the Medical School of the University of Rochester. His work in foods will be taken over by H. O. Triebold and that in dairy chemistry by Philip D. Adams. E. M. Funk, instructor in poultry husbandry at the University of Missouri, has succeeded T. B. Charles, resigned as associate professor of poultry husbandry. Miss Ina Padgett has been appointed instructor and director of work in nutrition.

Rhode Island Station.—The station has purchased 45 acres of upland farm land to be used in extending the work in pomology and poultry husbandry. Waldo L. Adams, assistant chemist for some years, has been appointed associate chemist.

Clemson College and South Carolina Station.—Dr. George M. Armstrong, in charge of the Boll Weevil Control Station at Florence, has been transferred to Clemson College as botanist and plant pathologist vice Director H. W. Barre, who will now devote his entire time to administrative affairs. R. A. McGinty has been appointed horticulturist in charge of research, teaching, and extension.

Utah College and Station.—Dr. H. J. Pack, who has been station entomologist for several years, has also been appointed acting head of the department of zoology and entomology in the college. Dr. W. W. Henderson, the former head, has been given leave of absence for one year.

Dr. Kathleen L. Hull has been appointed assistant professor of botany and plant pathology vice H. L. Blood, who has been given leave of absence for advanced work in the University of Wisconsin. A. L. Wilson, superintendent of the Davis County Experimental Farm, has been granted a year's leave of absence for graduate work at Cornell University. Appointments made July 1 include B. F. Hulme, C. A. Hymas, and I. D. Zobell, superintendents, respectively, of the Panguitch Livestock Farm, the sheep experiment farm, and the Carbon County Experimental Farm.

Virginia College and Station.—J. R. Horsley of Stapleton has been appointed a member of the board of visitors vice T. Judson Wright. Other appointments include Percival B. Potter as assistant professor of agricultural engineering; Allen H. Reid as assistant professor of landscape design; and Dr. R. L. Bryant as professor of poultry husbandry. D. C. Heitshu, assistant agricultural engineer, was assigned to full time station duties July 1, and V. R. Hillman, associate professor of agricultural engineering and investigator in rural electrification, was transferred to teaching.

C. R. Nobles, assistant animal husbandman since 1923, died August 13 at the age of 34 years. He was a graduate of the University of Illinois, receiving the M. S. degree from the same institution in 1926.

Storm Damage to the Experiment Stations in the West Indies and Florida.—The tropical storm which swept the West Indies and Florida from September 10 to 17 caused much damage to both the Porto Rico and Virgin Islands Experiment Stations. No lives were lost, and none of the station employees or their families were injured, but the damage to crops, experimental orchards, buildings, and fences was very severe.

The storm struck the island of St. Croix during the night and early morning of September 12 and was accompanied with heavy rain that continued for three days. There was general damage all over the island, but fortunately comparatively few lives were lost. At the station a number of buildings, mostly residences of the employees, were partly unroofed, but little damage was done to the office and laboratory building. The plant house, poultry house, implement shed, and fumigating house were destroyed completely, as was a large galvanized iron shed used as a catchment area for the water system. The damage done to the buildings and fences is estimated at about $5,000.

In Porto Rico the hurricane swept the island on September 14, doing enormous damage to buildings, crops, and trees. There was a large loss of life, more than 1,000 fatalities being reported. The damage to the island is estimated at from $60,000,000 to $100,000,000. The citrus and coffee crops, both of which were very promising, were almost totally lost and the plantings so severely damaged that four or five years will elapse before conditions are again normal.

At the station, which is located at Mayaguez, a portion of the island where the storm was somewhat less severe than in other parts, the damage to the property was still very great. A number of the buildings were unroofed, and some of the laborers' houses were so badly wrecked that they will have to be rebuilt. The office and laboratory building was not damaged to any considerable extent. The heavy rain accompanying and following the storm caused considerable injury to the contents of the unroofed buildings. Several of the smaller station buildings were utterly demolished, and the loss to the station property is estimated at $10,000. The experimental crops and orchards of tropical fruits, forestry plantings, etc., were destroyed to a large extent, necessitating beginning them anew.

At both stations temporary repairs have been effected, and work is proceeding, although it will be some time before some projects can be resumed.

The principal damage to the station property in Florida was at the Everglades Experiment Station, situated near Belle Glade. Here, likewise, there was no loss of life, but the damage to buildings and equipment is estimated at nearly $35,000, irrespective of breaks in the levees. On September 16 and 17 the station lands were flooded by water from Lake Okeechobee to a maximum depth of about 43 in., destroying all field plats, a citrus planting, all meteorological instruments, many supplies, etc. Many of the buildings were unroofed, twisted, and moved from their foundations, and several were demolished completely. Among these was the greenhouse, aside from the service room which is practically intact. There was also extensive damage to books and laboratory equipment. Although the flood waters receded very slowly, salvage work was taken up promptly, and it is expected that the operation of the station will be continued.

New Journals.—*The Journal of Nutrition* is being issued bimonthly by the American Institute of Nutrition with an editorial board consisting of J. R. Murlin as managing editor and E. F. DuBois, H. M. Evans, E. B. Forbes, G. Lusk, E. V. McCollum, L. B. Mendel, H. H. Mitchell, M. S. Rose, H. C. Sherman, and H. Steenbock. The initial number contains an editorial review by Dr. Murlin entitled Vital Economy in Human Food Production, and six original articles as follows: The Effect of Inadequate Vitamin B upon Sexual Physiology in the Male, and Relation of Vitamin E to Growth and Vigor, both by

H. M. Evans; Supplementary Values among Foods.—II, Growth and Reproduction on White Bread with Various Supplements, by M. S. Rose and G. MacLeod; The Distribution of Vitamin E, by N. Simmonds, J. E. Becker, and E. V. McCollum; A Detailed Study of the Role of Vitamin B in Anorexia in the Albino Rat, by B. Sure; and The Character of Energy Metabolism during Work, by M. E. Marsh.

Bureau of Standards Journal of Research is being published monthly, superseding and continuing the two series of research publications heretofore issued, (1) Scientific Papers of the Bureau of Standards and (2) Technologic Papers of the Bureau of Standards. It will contain the results of the bureau's researches, both theoretical and experimental, and the initial number includes five original papers, one of which is entitled Measurement of the Tread Movement of Pneumatic Tires and a Discussion of the Probable Relation to Tread Wear, by W. L. Holt and C. M. Cook.

Die Gartenbauwissenschaft is being published from time to time through the cooperation of the National Union of German Horticulturists. The initial number consists partly of abstracts, with the following original articles: Profiting by Abnormalities and Disease in the Growing of Plants, by H. Molisch; The Pollinization of Cherry and Pear Varieties, by H. Kamlah; Seed Selection, by L. Linsbauer; Larch-Killing and the Theory of Canker Formation.—I, Larch-Killing and Stem Canker Formation, by R. Falck; and The Physiological Significance of Iodine for Plants and Its Influence on Yields in Field and Garden Culture, by O. Engels.

Recueil de Médecine Vétérinaire Exotique is being published quarterly by the faculty of the School of Alfort. The initial number consists mostly of abstracts of current veterinary literature and theses, but also contains three original articles as follows: The Principal Contagious Diseases of Cattle in Indo-China, by H. Schein; Algerian Stock Raising and the Principal Microbial Diseases in Algeria, by Donatien and Lestoquard; and The Castration of the Ostrich, by Godard.

La Nuova Agricoltura is being issued as a monthly review by the National Movable Schools of Agriculture in Italy. The initial number contains the text of recent decrees, communications, news notes, etc., and several original articles, one of which deals with Soil Analysis by the Determination of Assimilable Substances, by A. Manozzi, and another with The Improvement of the Quality of Grain, by E. Pantanelli.

International Review of Poultry Science is being published quarterly at Rotterdam as the official organ of the International Association of Poultry Instructors and Investigators. It is projected as "a concise review of all possible scientific data referring to poultry," with other items of interest concerning the association. The initial number contains about 60 abstracts and title references divided among sections of breeding, diseases, nutrition, extension, and general.

Abstracts of Publications on British Vegetation.—According to a note in *Science*, arrangements have been completed whereby *The Journal of Ecology* is to publish semiannual supplements to its regular issues made up of abstracts of publications pertaining to the vegetation of the British dominions and colonies. It is hoped to include all publications issued since January, 1927, utilizing author abstracts so far as possible. The project was recommended by the Imperial Botanical Conference of 1924.

EXPERIMENT STATION RECORD

VOL. 59 DECEMBER, 1928 No. 8

The sixtieth volume of *Experiment Station Record* begins with the January, 1929, issue, and it is the expectation that at that time a change of more or less importance will become effective. This change will consist in the omission of the detailed table of contents and of the list of station and Department publications reviewed. Some rearrangement of cover pages will also be involved. The list of the *Record* staff and an abbreviated table of contents showing the location of each of the 20 sections will appear on page 2 of the cover, while the address list of the experiment stations and their executives will be shifted to page 3.

The object sought in these changes is entirely that of economy. For some time the steadily advancing cost of printing has worked havoc with publications operating on fixed budget allowances, since a dollar no longer possesses its former purchasing power. In the case of the *Record* the discrepancy has amounted of late to something like 5 per cent.

Various remedies for this situation have been considered. Some of these would achieve their object by the printing of proportionately less material, abstracts, editorials, or notes, as the case might be. Others would print as many and as long abstracts and cover the same ground as formerly, but would effect their savings by closer spacing.

The present space limits of 1,800 printed pages per annum of abstracts, editorials, and notes were adopted in 1911. The compressing into this space of the steadily increasing volume of the literature to be abstracted has been for several years a serious problem, and any curtailment has seemed well-nigh impossible. The alternative of dispensing with the 10 to 12 pages of prefatory material has therefore been resorted to as the least objectionable expedient.

This decision was reached the more readily when the more or less ephemeral usefulness of the table of contents was considered. Once the subject index for a volume is available it becomes for most purposes the best guide to the abstracts, and the table of contents is

relegated to a position of comparatively slight utility. Ultimately the several numbers of the volume are bound by most users, and it is customary when binding to eliminate the table of contents entirely.

The list of station and Department publications will continue to be printed in the index number for each volume. No change of any sort is contemplated in this index number, so that the bound volumes will be precisely the same as at present in content, appearance, and arrangement.

It is recognized that there will be some inconvenience and loss of time in working with the current issues. This, it is hoped, will not be unduly burdensome in case of most of the sections. With about 400 abstracts per issue, the average number of abstracts per section is only 20, although it is true that in a number of the longer sections this figure is greatly exceeded. Special efforts will be made in the case of this material to secure its systematic arrangement and classification. It may also be helpful if certain principles governing the classification are explained at this stage.

The section of Agricultural and Biological Chemistry, like most of the remaining sections, is usually prefaced by abstracts of more or less general scope. Following these come abstracts dealing with the constitution and properties of the various chemical groups and substances, methods and apparatus for the analysis of inorganic and organic materials, and the utilization of agricultural products and wastes in such ways as sugar manufacture, paper making, and the like.

In Soils—Fertilizers, abstracts dealing with soil chemistry, physics, and bacteriology are succeeded by those on soil fertility. These in turn are followed by the distinctively fertilizer abstracts, usually in the sequence of nitrogen, phosphoric acid, potash, lime, and the less common soil amendments, and ending with station analyses of mixed fertilizers and similar material.

Abstracts dealing with several crops usually open the sections of Field Crops, Horticulture, and Diseases of Plants. For those abstracts dealing with a single crop the order varies considerably. In field crops it is entirely alphabetical, with abstracts pertaining to seeds and weeds appended. In horticulture the order is vegetable crops, tree fruits, small fruits, tropical fruits, and ornamentals. In plant diseases, those pertaining to cereals are first presented, followed by other field crops, the various horticultural crops in the same order as under that subject, and the diseases of forest crops, including rubber.

In Economic Zoology—Entomology, an entirely different procedure has been adopted. Zoological abstracts naturally lead off, and after the more general entomological abstracts and those on

insecticides the abstracts involving a single species of insects follow under an arrangement by orders.

Abstracts dealing with animal physiology, breeding and feeding, and similar topics from a generalized standpoint are followed in the section on Animal Production by the corresponding material for the several domestic animals in turn. The order arbitrarily adopted is cattle, sheep, goats, swine, horses, dogs and cats, poultry, and fur-bearing animals. The same order is followed for the diseases of these animals in Veterinary Medicine, where the abstracts involving single hosts are preceded by general articles, studies on poisonous plants, remedies, immunity and related topics, and the diseases affecting several animals, including man.

The section of Agricultural Engineering deals successively with such matters as water resources, irrigation and drainage, soil erosion and land reclamation, road construction and maintenance, materials, power sources, farm machinery, buildings, water supply, and disposal of wastes. Partly because of its recent origin and rapid development, the section of Agricultural Economics—Rural Sociology is still less stabilized than most sections, but abstracts may usually be found in the approximate order of cost of production and other farm management studies, land tenure, farm finance, taxation, labor, prices, marketing, historical development, sociological relationships, and statistics.

In the section of Foods—Human Nutrition the material pertaining to foods is first presented. This is followed by the abstracts of general nutrition studies, dietary standards, the feeding of children and other special groups, and the studies with various nutrients, mineral matter, and, especially in recent years, with the vitamins. The section is usually terminated with abstracts of work dealing with malnutrition and with such diseases as rickets, scurvy, diabetes, and goiter in their relations to nutrition.

Similar principles govern the arrangement of abstracts in the sections not specifically dealt with in this discussion. In most cases the arrangement is more or less obvious, while in others the small number of abstracts makes it a matter governed largely by the individual circumstances, as well as one of comparatively little practical significance.

The discontinuance of the table of contents is admittedly an expedient and one whose importance can not be fully evaluated in advance. Comments by users of the *Record* as to the extent of inconvenience, if any, resulting after a thorough trial, are invited as a guide to future policy.

The recent issuance by the Office of Experiment Stations of the Classified List of Projects of the Agricultural Experiment Stations for 1927 affords opportunity for another visualization of the large and varied programs under way at these institutions. When the compilation of this list was first attempted as of the year 1919, the total number of projects recorded was about 3,750, and this number was probably larger than had been generally realized. The new compilation, however, lists as active during 1927 no fewer than 6,628 projects at the State experiment stations and 155 at the stations in Alaska, Guam, Hawaii, Porto Rico, and the Virgin Islands. This brings the new total to 6,783, which is greater by over 3,000, or about 80 per cent, than that existing less than a decade ago.

As an indicator of progress a mere enumeration of projects is obviously more or less unsatisfactory. The question was raised in these columns in 1921 as to whether the earlier average of nearly 65 projects per institution was not too large for the resources then available, and it may still be pertinent with the new average of 140. During the interval which has elapsed, however, much critical scrutiny has been given to project lists, and in many cases a somewhat drastic revision has resulted, notably within the past two years. Unusual care has also been given to the formulation of new projects, and their approval, especially when the expenditure of Federal funds has been involved, has been given only after careful consideration from many points of view. For these and other reasons, therefore, it appears likely that the latest of these lists affords a conservative as well as a convenient basis of comparison.

It is of interest to note that the increase in the number of projects was substantially in proportion to the expansion of funds. The total revenue of the stations for the fiscal year 1919 was $7,192,912.41 and for the fiscal year 1927 $13,101,747.32. This is an increase in funds of approximately 82 per cent.

One of the leading items of increase has been, of course, from the Purnell Act, for which $1,440,000 was available in 1927. This amount was divided among 788 projects, which is nearly 18 per station. This is substantially in proportion to the allotments under the Adams Act, the funds for which totaled $720,000. The Adams projects numbered 465, which is slightly more than 9 per station.

The increase in number of projects is divided among the various departments of agricultural inquiry, but as would be expected it has been much greater in some lines than in others. Thus in agricultural economics the list has grown from about 75 to 491 projects, in agricultural engineering from about 100 to 268 projects, in rural sociology from 2 to 60 projects, and in home economics from perhaps a dozen to 124 projects.

In 1919 it was estimated that about 2,300 projects, or some 60 per cent of the total number, dealt with the general subject of plant production. The number has now been increased to nearly 4,600, which is about 100 per cent of the former total. This figure includes 1,758 projects listed under the head of field crops, 1,197 under horticulture, 614 under plant physiology and pathology, about 450 on insects affecting crops, and 538 under soils and fertilizers.

Animal husbandry and dairying comprise nearly 1,100 projects and the diseases of animals 217 more, so that these subjects still constitute approximately only 20 per cent of the list. This is exclusive of the 181 projects on genetics, a large proportion of which deal with animals.

The seemingly wide disparity in quantity of research in plant and animal production has been hitherto commented upon in these columns, with the suggestion that it may be attributable to the higher cost of animal experimentation. However this may be, a similar condition has recently been attested for Great Britain by Dr. J. S. Gordon in his presidential address before section M (agriculture) of the British Association. In this address, entitled The Livestock Industry and Its Developments, Dr. Gordon declares that "as progress is made in grading up our stock by breeding methods, it is imperative that there should be corresponding developments in our knowledge of nutrition, disease resistance and elimination, and in animal genetics. Research in these branches of agricultural science has in the past been starved. The funds devoted to such work are quite inadequate when viewed in the light of the importance of the livestock industry, which in England and Wales alone is worth approximately £154,000,000 per annum."

In accordance with the general expectation, one striking development has been the large use of the Purnell funds in agricultural economics, home economics, and rural sociology. No fewer than 268 of the 491 projects in agricultural economics, 91 of the 124 in home economics, and 43 of the 60 rural sociology projects are designated under the Purnell label. This indicates the great influence of the Federal legislation in these directions, an influence largely attributable, it may be conjectured, to the previous lack of available funds for these purposes.

Many other details of interest may be gleaned from the project list, but for several reasons extended generalizations are probably not justified. What is quite positively revealed, however, is the existence of a comprehensive system of research, broadly organized and extending its searching inquiry over the problems pertaining to agriculture and rural life with a completeness never before approximated. This is truly encouraging and an incentive to further progress.

Little attention seems to have been given in either academic or agricultural circles to the announcement of the death in Seattle, Wash., last spring of Edward Mason Shelton. This is not altogether surprising, for his connection with the land-grant colleges in this country ceased in 1889 with his appointment to a post in Queensland and was not resumed upon his return to the United States in 1897. To the present generation, therefore, his work is little more than a tradition. None the less, the fact deserves mention that for a quarter of a century he served as professor of agriculture in the Kansas State Agricultural College and was the first director of the Kansas Experiment Station.

Prof. Shelton was born in Huntingdonshire, England, on August 7, 1846, coming to the State of New York in 1855. Sixteen years later he was graduated at the Michigan State Agricultural College, and subsequently served for a year as superintendent of the experiment farm at Tokyo, Japan. In 1874 he was appointed professor of agriculture in the Kansas College, resigning in 1889 to become agricultural adviser to the Government of Queensland, Australia. Here he was one of a group which was mainly instrumental in laying the foundations of the present Department of Agriculture, and in 1897 he became the first principal of the newly established Queensland Agricultural College. Since 1898 he had made his home in the State of Washington.

Under Prof. Shelton's direction considerable field experimentation had been carried on in Kansas prior to the organization of the experiment station under the Hatch Act. The work included tests of varieties of wheat, corn, barley, oats, millet, sorghum, alfalfa, and many kinds of grasses; experiments in harrowing wheat, deep and shallow plowing, manuring, subsoiling, thorough cultivation and thick seeding of corn, and shrinkage of wheat and corn in the bin. There were also experiments in feeding pigs in cold weather in warm v. open-air pens, on milk, corn-and-cob meal, cooked v. raw corn, or alfalfa pasture; steers on corn meal v. corn-and-cob meal; and milch cows on warm v. cold drinking water.

The Hatch Act was accepted by the Kansas Legislature on March 3, 1887. The board of regents organized the station as a department of the college and adopted a unique plan of organization, under which its management was intrusted to a council consisting of "the president of the college, the professors of agriculture, horticulture and entomology, chemistry, botany, and veterinary science, and such other officers of the college as the board may designate." The professor of agriculture, however, was given the title ex officio of director of the station, "the duties being to keep the records of all

meetings, receive and maintain all general correspondence with the station, attend to the publication and distribution of all reports and bulletins under direction of the council, certify to all bills, and act as general superintendent in executing the plans of the council."

These duties were carried on by Prof. Shelton until his resignation the following year. During this period he was a frequent contributor to the publications of the station, his final bulletin, Experiments with Wheat, appearing in 1889.

Prof. Shelton's work, both in Kansas and Queensland, was largely of a pioneer nature, but it appears to have been well-planned and capably executed. The steady growth and substantial progress of the several institutions with which he was connected is perhaps the most effective tribute which could be desired for the man to whom they were so directly indebted in their early days.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

Mechanochemistry and the colloid mill, P. M. Travis (*New York: Chem. Catalog Co., 1928, pp. 191, figs. 17*).—The author announces that "this new science of mechanical dispersion, involving the principles of physical chemistry, I am calling 'Mechanochemistry,' because it involves dispersion or deflocculation by mechanical means rather than by chemical. . . . It is with the hope of eliminating the guess method in such operations that this book on the elementary theories of fine dispersion, or what we might call mechanical chemistry, was written." The contents are as follows:

Introduction, the colloidal state of matter from the physical-chemical viewpoint, the elementary structure of matter, the relation of viscosity and plasticity to the colloidal state, adsorption, electrical concepts and their importance in colloidal dispersion, the meaning of hydrogen-ion concentration and its importance in colloidal dispersion, orientation, gel structure and the Donnan theory of membrane equilibrium, the protective action of colloids in dispersion, the dispersion of solids and liquids in gas, the theory of emulsions and emulsification, dispersion of solids and liquids in liquids, the colloid mill and some of its applications, and laboratory methods and physical testing of properties.

Agricultural chemistry (*California Sta. Rpt. 1927, pp. 52, 53*).—In a study of boron as a toxic soil constituent in citrus orchards, as little as 2 parts per million of boron in the irrigation water proved definitely injurious to lemons; and several large irrigation supplies were found to contain excessive quantities of boron. Citrus trees absorbed this element readily and accumulated it in their leaves to an amount, when the boron was supplied in toxic concentrations, of 1,000 parts per million or more.

From an investigation of base exchange phenomena and the theory of the soil acidity and soil alkalinity, the conclusion has been reached that neutral soil is saturated with respect to its base exchange complex with calcium. In alkali soils this calcium has been replaced by sodium, while in acid soils the hydrogen ion has replaced the calcium ion.

Variations in the manganese content of certain vegetables, W. H. Peterson and C. W. Lindow (*Soil Sci., 26 (1928), No. 2, pp. 149–153*).—This contribution from the Wisconsin Experiment Station is summarized as follows:

"The maganese in 22 samples of cabbage, 13 samples of green peas, 18 samples of string beans, and 4 samples of tomatoes has been determined. On the fresh basis the average is as follows: Cabbage 0.000076 per cent, green peas 0.00032 per cent, string beans 0.00034 per cent, and tomatoes 0.000091 per cent. Variations of from 200 to 300 per cent were found among the samples of each class of vegetable. These variations do not appear to be correlated with the type of soil on which the samples were grown. They are probably related to the amount of available manganese in the soil rather than to the type of soil. No clearly defined relation seems to exist between the manganese content and the variety, size, or date of harvest of the vegetable."

Studies of hydrogen ion concentration measurements.—I, Methods of measurements, C. E. DAVIS and G. M. DAVIDSON (*Jour. Amer. Chem. Soc., 50 (1928), No. 8, pp. 2053–2065, figs. 7*).—This is a study of the condenser and ballistic galvanometer method for measuring the potentials of high resistance solutions against the hydrogen, or other hydrogen ion-measuring electrode.

It was found that the important errors of the method "are due to the accumulation of errors on the plates of the condenser, the throw of the galvanometer, humidity, and the formula used in the calculation of the unknown electromotive force." Calculated values of the important errors are given, together with graphs showing the significance of such errors in the titration of sulfuric acid and of orthophosphoric acid.

It is concluded that the cumulative error may sometimes approximate from 3 to 4 millivolts, and that the condenser system of potential measurements can not be used where such precision is required as in the titration of solutions or in the determination of equilibrium constants.

The application of the antimony electrode to the determination of the pH values of soils, E. F. SNYDER (*Soil Sci., 26 (1928), No. 2, pp. 107–111*).—The antimony electrode proposed by Uhl and Kestranek for analytical neutralizations (E. S. R., 49, p. 803) and later studied by other investigators, was compared in the experiments here reported by the U. S. D. A. Bureau of Chemistry and Soils with the hydrogen electrode for the examination of soils ranging in pH value from about 3.6 to 9.2.

In the preparation of the electrodes themselves, of which a number were used, rods of antimony, either obtained as such or cast by pouring the molten metal into pyrex test tubes imbedded in a heated sand bath, were filed smooth and polished on a buffing wheel, soldered to copper wires, and suitably mounted. Solutions for the measurements were prepared by shaking 15 gm. of the air-dried soil with 30 cc. of water in a pyrex test tube for about one minute, after which the suspensions were allowed to stand a short time for sedimentation and the measurements made on the supernatant liquid connected through a saturated potassium chloride solution to a saturated calomel electrode. The electrode vessel was shaken from one to two or more minutes, and the potential was read while still shaking. It was found that in most cases potentials read while the vessel was at rest drifted rapidly.

Values obtained after shaking for 1, 3, 5, 10, and 15 minutes are given for 8 soil types. Values read after 5 minutes with the vessel at rest are also included. The values found at various intervals during shaking are for the most part very consistent, while most of the figures quoted for the 5-minute period with the vessel at rest are higher. In a comparison with the hydrogen electrode, results varying from very close agreement to differences of about 0.3 pH were obtained.

It is concluded that "the reproducibility and constancy of measurements may be considered very good for soils. It is quite apparent, however, that the potentials should be read during agitation."

Though it is noted that further work will be necessary to determine the applicability of the antimony electrode to soils generally, the rapidity and the simplicity of the method are emphasized.

An accurate method for the determination of iodine in mineral mixtures, M. D. KNAPHEIDE and A. R. LAMB (*Jour. Amer. Chem. Soc., 50 (1928), No. 8, pp. 2121–2125*).—Following a summary and a description of several procedures, tests of which convinced the authors that all were either unreliable, excessively laborious, or both, a modification of the Kendall method (E. S. R., 44, p. 113), considered to be suitable for the determination of small quantities

of iodine in mixtures of mineral salts, charcoal, spent bone black, etc., is given. "The method is still rather laborious, but 6 or 8 determinations can easily be completed each day, the entire procedure extending most conveniently over 3 days." The procedure is as follows:

Fuse together in a 100-cc. nickel crucible 20 gm. of sodium hydroxide and 10 gm. of potassium nitrate, cool, place a 10-gm. sample of the mineral mixture evenly over the fused alkali, moisten the sample thoroughly with 5 cc. of saturated sodium hydroxide solution and 10 cc. of 80 per cent alcohol. Evaporate the alcohol cautiously at the low heat on an electric hot plate. After one-half hour carefully increase the heat, finally subjecting the crucible to the highest temperature of the hot plate for from 1.5 to 2 hours. "Thorough heating at this time prevents most of the trouble from effervescence of the material during the fusion." Place the crucible in a furnace capable of heating evenly both the sides and bottom of the crucible, and fuse cautiously, cooling the crucible from time to time by lifting from the furnace or by dipping the bottom of the crucible in water if necessary to prevent overviolent reaction.

After securing quiet fusion, tip the crucible on all sides in an open flame to wash down the sides with the fusion mixture, add a few small crystals of potassium nitrate and again wash down as described, repeating the addition of nitrate, and wash down until further additions liberate no additional gas. Then cool the melt, either after pouring out into the clean crucible cover or while so turning the crucible that the material will solidify on its walls. Place the crucible and contents in a 600-cc. beaker, cover with water heated below the boiling point for a short time, let stand over night at room temperature, and rinse off and remove the crucible and cover. Add 10 cc. of sirupy phosphoric acid to neutralize part of the alkali and to facilitate filtering, and place the beaker on a steam bath for from 3 to 4 hours, stirring occasionally to break up the mass and insure complete solution of the iodine. Filter into a 800-cc. beaker, washing the residue with cold water and bring the volume to about 550 to 600 cc. The solution should be clear and colorless. Destroy nitrites by adding 10 cc. of 20 per cent sodium bisulfite solution, bring the mixture just to boiling point, and then cool. Run in about 30 cc. of 85 per cent phosphoric acid from a burette, add a few drops of methyl orange solution, continue adding phosphoric acid to neutrality of the indicator, and add the excess of 1.5 cc. of the phosphoric acid. "Care must be taken not to run appreciably over the end-point, since excess acid gives low results. However, the addition of the acid must be fairly rapid, as the color of the methyl orange has a tendency to fade, due to incomplete destruction of the nitrites."

After neutralizing, add a lump of anthracite coal about 0.5 cm. in diameter and boil the solution at least 20 minutes, reducing the volume to from 400 to 500 cc. This boiling must be sufficient to remove all traces of sulfurous acid. Cool, add bromine to a distinct and permanent yellow color, boil until colorless and for exactly 5 minutes longer, add a few crystals of salicylic acid to insure removal of the bromine, cool, and add 5 cc. of 20 per cent phosphoric acid, all oxidizing impurities in which have been reduced by boiling the acid some time with aluminum strips. Finally add from 0.5 to 1 gm. of chemically pure potassium iodide and titrate in the usual way with 0.005 N sodium thiosulfate. The volume of the solution should be from 400 to 500 cc. for the final titration.

Satisfactory recoveries of 1 and 2 mg. additions of iodine to 25 mineral mixture samples are shown.

Theory of fat separation in emulsions, G. GRINDROD (*Canning Age, 8 (1927), No. 11, pp. 822–826*).—The theoretical aspects of the separation of fats from emulsions are developed with reference to Stokes's law of separation of

particles acted upon by a constant force, and to Perrin's law of distribution of colloidal particles.

It is shown that the best obtainable homogenization would not alone be sufficient even to retard separation for any great length of time; and stabilizations actually obtained are shown to depend upon the subdivision of the fat only to a point at which the surface presented is adequate to adsorb protein enough to prevent separation. Such a condition is said to be generally obtainable with fat globules fully 100 times as large as would show appreciable stabilization in the absence of the protein.

The determination of butyric and caproic acids in butterfat [trans. title], A. I. VIRTANEN (*Ztschr. Analyt. Chem., 74 (1928), No. 9, pp. 321–330*).—Following a discussion of the behavior of caproic, caprylic, capric, and butyric acids with respect to the distillation of aqueous solutions of the individual acids and of mixtures of these, in connection with which are stated experimental figures for the proportions of these acids passing over in the distillation of 50 out of 100 cc. of filtered Reichert-Meissl distillate, details are given of an analytical method essentially as follows:

Place 100 cc. of the filtered Reichert-Meissl distillate in a 150-cc. Erlenmeyer flask connected by a singly bent glass tube to a condenser, placing pomace in the flask to secure even volume. Distill exactly 50 cc., so regulating the rate of distillation that the required distillate is collected in 30 minutes. Titrate the distillate thus obtained with 0.05 N sodium hydroxide, using phenophthalein as indicator after first adding the washings from the condenser to the distillate as collected.

"From the results of the titration one can now calculate the quantities of butyric and caproic acids with the assistance of the . . . equation given. It is here to be observed, however, that the Reichert-Meissl distillate (110 cc.) regularly contains caprylic acid equivalent to 3.5 cc., 100 cc. of it 3.2 cc., of 0.05 N sodium hydroxide. This is to be deducted from the titration value. Also to be deducted from the titration value of the 50 cc. distillate . . . is its content of caprylic acid. This quantity is given in experiments carried out with pure caprylic acid as 3.05 cc. of the 0.05 N acid.

"According to the formula:

$$\frac{\log 3.2 - \log x}{\log 100 - \log 50} = 4.27.$$

the quantity of caprylic acid corresponding to that remaining in the residue is 0.17 cc., so that the quantity distilled over is 3.03 cc. The value obtained by calculation is thus practically the same as that experimentally obtained."

Estimation of fat content of flour and milling stocks, C. W. HERD (*Cereal Chem., 4 (1927), No. 5, pp. 370–376*).—From a brief review of the literature it is shown that a number of investigators have found less fat extractable from flour after complete drying than when the sample is extracted in its natural moist condition, this effect having been variously explained as the result of a loss by steam distillation in drying the flour, as the result of a partial oxidation, etc.

From his own experiments the author confirms previous observations with respect to the diminished fat yield resulting from drying of the sample, but finds that there is no decrease in the quantity of extractable fat associated with the removal by heating in a water oven of 80 per cent of the total moisture content of the flour. He concludes that since steam distillation loss would be proportional to the water driven off, the steam distillation theory is not the correct explanation. As no gain in weight was observed in heating

the extracted fat until it was partially converted into a form insoluble in ether, it was further concluded that the decrease in extractable fat produced by drying is probably not due to oxidation. The fat rendered insoluble in ether was also found insoluble in petroleum spirit, carbon tetrachloride, 90 per cent ethyl alcohol, and other organic solvents.

The refractive indexes of wheat oil not heated to a high temperature and of wheat oil "completely changed at 98° C." are given as 1.4830 and 1.4890, respectively. The following method for fat determination is suggested:

Dry the flour or milling stock for 1 hour in a water oven, transferring the sample to a Soxhlet thimble and extract for 8 hours in a Soxhlet apparatus with anhydrous ether. Filter the ether solution into a tared flask and wash the paper carefully three times with fresh ether. Evaporate the ether solution and washings on the water bath and finally heat for 2 hours at the temperature of boiling water.

Observations on the estimation of the neutralizing value of acid calcium phosphate, C. W. Herd (*Cereal Chem., 4 (1927), No. 5 pp. 347–369, figs. 8*).—Comparing results, given in detail, of electrometric and colorimetric titrations of two acid phosphate baking powders, the author concludes that both in the normal cold titration and in the method of direct hot titration the result is dependent on the rate of addition of the alkali and is therefore not satisfactory. In hot inverse titration it was found possible to effect agreement of the colorimetric end-point with the electrometric inflection when (1) thymol blue was used as indicator, and (2) the mixture was heated until equilibrium was reached. "The result of this method gives a figure which is too high for commercial practice, but is characteristic of that particular phosphate powder."

It is considered that Bailey's pH method is of use for checking the correctness of the mixture in a raising powder, and that it can be used with advantage for the correlation of the above titration figure with a ratio of superphosphate (acid phosphate) to sodium bicarbonate most satisfactory in baking practice. It is further noted that satisfactory baked scones have a pH value of from 6.55 to 6.85. The following method is proposed:

"Weigh out 0.84 gm. of phosphate and place in a conical flask. Add 25 cc. of cold water, mixing thoroughly by rotating the flask, and then add 90.0 cc. of 0.1 N sodium hydroxide. Bring the solution to the boil and boil for 10 minutes. Add a few drops of thymol blue 0.04 per cent solution (or not more than 5 drops (0.1 cc.) of a 0.2 per cent phenolphthalein solution) and titrate with 0.1 N hydrochloric acid until the indicator change is observed, keeping the solution boiling. Subtract the amount of acid used (cc.) from 90, and the difference is the limiting neutralizing value of 100 parts of the acid phosphate in terms of parts of sodium bicarbonate.

"In order to obtain the baking value of the acid phosphate, mix the two ingredients in the above proportions; take 1 gm. of this mixture and add 100 cc. of water. Boil till CO_2 free, cool, and take pH of the supernatant liquid. Then adjust the mixture until the residual supernatant liquid gives a pH of 7.0. This then gives the best ratio of acid phosphate: sodium bicarbonate for satisfactory baking."

The role of phosphates in bread making, R. A. Barackman and C. H. Bailey (*Cereal Chem., 4 (1927), No. 5, pp. 400–410, fig. 1*).—This contribution from the Minnesota Experiment Station is a more or less general discussion. It is considered that ordinary quantities of phosphates may produce two types of effects (1) upon the colloidal properties of the dough, and (2) upon the activity and reproduction of the yeast as indicated by the rate of alcoholic fermentation. These two phases of the possible action of phosphates are discussed in some detail.

Interpretation of baking tests, L. W. Haas (*Cereal Chem., 4 (1927), No. 5, pp. 389–394*).—Numerous forms of baking tests are classified into four general types: (1) In which "a so-called expansion loaf is produced;" (2) in which all flours are baked under identical conditions, the flour being the only variable; (3) in which an attempt is made to produce the best loaf of which the particular flour is capable; and (4) in which are included not only the best possible loaf tests, with a determination of the conditions under which such a loaf is produced, but also tests of the ability of the flour to withstand abuse and to give good results under more or less widely varying conditions.

The criteria by which the loaves produced in these various forms of baking tests are to be judged are then discussed in some detail.

Milling studies, E. S. Miller (*Chicago: Natl. Miller, 1928, pp. 224, pls. 2, figs. 45*).—The book is a more or less popular account of flour milling processes and methods.

The clarification and filtration of fruit juices, M. R. Daughters (*Canning Age, 8 (1927), No. 6, pp. 503–505, figs. 3*).—Successful clarification and filtration of fruit juices and extracts are said to depend upon the use of solubilizing enzymes for the conversion of starch and other undesired substances present in such material into permanently soluble compounds, a chemical solution of mixed enzymes adapted to this purpose, made by extracting suitable cultures of certain molds and having diastatic, proteolytic, milk-coagulating, and lipatic properties, being described. Diagrams and graphs illustrate the type of apparatus used and the progress of filtration with respect to time for pectin extract and for sweet apple cider.

Determination of weight per gallon of blackstrap molasses, C. F. Snyder and L. D. Hammond (*U. S. Dept. Com., Bur. Standards Technol. Paper 345 (1927), pp. 409–412*).—Report is made of a study of a new direct-reading torsion balance, the values obtained by the use of this balance having been compared with those secured by means of an analytical balance and standard molasses pyknometers. The comparative values for two stock samples of blackstrap molasses are given.

It is concluded that the new balance is apparently quite satisfactory for most determinations of weight per gallon, provided the usual precautions necessary in any direct method for density determination, such as allowing for subsidence of foam and for the escape of occluded gases, be observed.

Color in the sugar industry, H. H. Peters and F. P. Phelps (*U. S. Dept. Com., Bur. Standards Technol. Paper 338 (1927), pp. 261–308, pl. 1, figs. 2*).—Two papers are included under this title.

I. *Color nomenclature in the sugar industry* (pp. 263–267).—This is a brief discussion of the theory of light transmission and absorption, with an explanation of the computation of the values desired, including spectrophotometric data and definitions of terms and symbols, etc.

II. *Colorimetric clarification of turbid sugar solutions* (pp. 268–308).—This is a detailed account of the technical color measurements of practical importance in the sugar industry, containing in addition to an introduction sections on the preparation of auxiliary material, standardized processes of colorimetric clarification, photometric observations and the calculation of results to a unit basis, a summary of the procedure, a section on the optical effect of different methods of clarification, together with two appendixes containing (1) a table of the densities of sugar solutions, and (2) a method of obtaining the negative logarithm of the transmittancy.

Industrial catalysis, S. J. Green (*London: Ernest Benn, 1928, pp. XI+507, figs. 19*).—This is a comprehensive monograph, giving in its first chapter a

historical review in which the subject is divided into three periods of (1) the instances, isolated and unexplained, of catalysis observed and recorded previous to the definition and systematic study of the phenomenon by Berzelius, (2) the period of research and growing scientific understanding, initiated principally by Berzelius's work, and (3) the period of rapid development of industrially applied catalytic reactions. The three chapters next following are devoted, respectively, to the phenomena of catalysis, its physicochemical theory, and theories of the nature of catalysis itself. The remaining eight chapters, the titles of which serve to indicate the wide range of specific industrial applications of catalytic reactions covered, are as follows: Oxidation and combustion, nitric acid, hydrogen and hydrogenation, development of processes of hydrogenation from the time of Sabatier and Senderens, ammonia, dehydrogenation, dehydration, and the utilization of coal.

METEOROLOGY

American meteorology during the past quarter-century, A. H. Palmer (*Tycos, 18 (1928), No. 2, pp. 45–48, 75, 76*).—Progress in meteorology applicable to agriculture and in other lines is briefly reviewed. Reference is made especially to snow surveys for determining water available for irrigation, relation of weather to crop insurance, short period and long period forecasts, relation of weather to forest fires, and orchard heating as a protection against frost.

The agricultural value of rainfall in the Tropics, H. M. Leake (*Roy. Soc. [London], Proc., Ser. B, 103 (1928), No. B722, pp. 82–96, fig. 1*).—The author defines effective rainfall as "a daily measure of the soil moisture which originates in rain and is available for plant growth. It is derived from the rainfall data in the following manner:

$$E_n = r_n + kr_{n-1} + k^2 r_{n-2} \ldots + k^{n-1} r_1$$

where r_n is the rainfall of the 24 hours ending 8 a. m. on day n.

"The amount of rain written off between successive days is

$$(1-k)r_{n-1} + (1-k^2)r_{n-2} \ldots + (1-k^{n-1})r_1, \text{ or } (1-k)E_{n-1}.$$

It includes the loss from run-off, percolation, evaporation, and transpiration as well as the moisture held in the soil in the 'un-free' condition. k, therefore, is a function of temperature, air humidity, and soil conditions.

"In part, these sources of loss counterbalance each other, and, for a large range of soils in the Tropics, k has a value approximating to 19/20.

"Under tropical conditions, k becomes a measure of the 'free,' or physiological, water remaining in the soil.

"For agricultural plants it is possible to draw two curves giving the upper and lower limits of their water requirements at each stage of their growth, and the dual curve so obtained has a varietal significance.

"As a consequence of that variability of k which arises from soil conditions, it becomes possible to employ the effective rainfall for the estimation of crop areas in a given tract, and an analysis has been made in the case of the wheat and cotton areas of the Cawnpore District, India," which showed that the use of the regression equation would result in forecasts of the wheat area and of the unirrigated cotton area which would be more accurate than the present estimates. The two analyses "indicate that the effective rainfall constitutes a significant measure of the agricultural value of rain, and is a measure which possesses distinct advantages."

"Under conditions which permit the adoption of a constant value for k, the effective rainfall becomes a means of estimating crop yields, and an analysis

has been made, in the case of the cane crop, of an estate in Barbados and, in the case of the cotton crop, of the Dhulia Farm, Bombay Presidency." The correlation between the aggregate effective rainfall of June and December and the yield of sugar cane was found to be

$$r = +0.67 \pm 0.09.$$

"All attempts to trace an effect injurious to yield of excessive moisture have led to negative results, and it is only in the lower limits that moisture exercises a controlling influence." Because of the more complex nature of the problem the estimates of cotton yields were subject to greater qualification and are less convincing than those of crop areas.

Forest-fire weather in central Massachusetts, P. W. Stickel (*U. S. Mo. Weather Rev., 56 (1928), No. 4, pp. 134–136, figs. 4*).—This paper reports a study of the relation between weather and forest fires in the so-called white pine region of central Massachusetts, covering an area of approximately 1,750,000 acres, based on conditions prevailing during the spring of 1927.

The results indicate that "the maximum forest fire hazard exists between rainy periods, when the relative humidity is 40 per cent or less or when the depression of the dew point is greater than 14° F. Under such conditions, the vapor pressure is generally low—less than 0.3 in., the duff in fully exposed areas contains less than 10 per cent of moisture at the surface and less than 20 per cent of moisture at 1 in. depth."

Climatological data for the United States by sections, [March–April, 1928] (*U. S. Dept. Agr., Weather Bur. Climat. Data, 15 (1928), Nos. 3, pp. [208], pls. 3, figs. 7; 4, pp. [195], pls. 3, figs. 2*).—These numbers contain brief summaries and detailed tabular statements of climatological data for each State for March and April, 1928.

Monthly Weather Review, [March–April, 1928] (*U. S. Mo. Weather Rev., 56 (1928), Nos. 3, pp. 79–124, pls. 12, figs. 3; 4, pp. 125–165, pls. 11, figs. 14*).—In addition to detailed summaries of meteorological and climatological data and weather conditions for March and April, 1928, and bibliographical information and notes, these numbers contain the following contributions:

No. 3.—Second Phase of Streamflow Experiment at Wagon Wheel Gap, Colo. (illus.), by C. G. Bates and A. J. Henry (pp. 79–97) (E. S. R., 59, p. 477); Notes on Estimating Run-Off (illus.), by A. Streiff (pp. 98, 99); The Floods of March, 1928, in the Sacramento Valley, by N. R. Taylor (pp. 100–102); Weather and Probability of Outbreaks of the Pale Western Cutworm in Montana and Near-by States (illus.), by W. C. Cook (pp. 103–106) (see p. 760); On the Measure of Correlation: A Rejoinder, by G. T. Walker (pp. 106, 107); Meteorological Summary for Southern South America, February, 1928, by J. B. Navarrete, trans. by W. W. Reed (p. 107); and Meteorological Summary for Brazil, February, 1928, by F. de Souza, trans. by W. W. Reed (p. 108).

No. 4.—The Winter Anticyclone of the Great Basin (illus.), by A. J. Henry (pp. 125–128); The Frequency and Persistence of Low Relative Humidity in the State of Washington (illus.), by G. W. Alexander (pp. 129–134); Forest-Fire Weather in Central Massachusetts (illus.), by P. W. Stickel (pp. 134–136) (see above); Protecting Oil Reservoirs Against Lightning (illus), by M. E. Dice (pp. 137, 138); A Comparison of Air and Soil Temperatures, by H. G. Carter (pp. 138, 139); Diurnal Variation of Rainfall at San Juan, P. R. (illus.), by C. L. Ray (pp. 140, 141); Meteorological Problems of Rigid Airships, by F. W. Reichelderfer (p. 142); Whence Come Cold Waves? by A. J. Henry (pp. 142–144); Unusually Dry "Low" of March 28 and 29, 1928, by L. T. Samuels

(p. 145); Meteorological Summary for Southern South America, March, 1928, by J. B. Navarrete, trans. by W. W. Reed (p. 145); and Meteorological Summary for Brazil, March, 1928, by F. de Souza, trans. by W. W. Reed (p. 145).

SOILS—FERTILIZERS

Colloidal behavior of soils and soil fertility.—IV, Anion effect on the precipitation reactions and degree of dispersion of aluminum and iron hydroxides, J. S. Joffe and H. C. McLean (*Soil Sci., 26 (1928), No. 1, pp. 47–59, figs. 8*).—This is an extension of work of the New Jersey Experiment Stations previously noted (E. S. R., 59, p. 315). Conditions influencing the state of aggregation of aluminum and iron, and the effects of sulfate, nitrate, and chloride anions on the transition state of iron and sesquioxide colloids were some of the points investigated. From among a number of experimental findings and conclusions the following may be cited:

In the presence of the sulfate anion all of the aluminum from a 0.0075 M solution was transformed into the gel at pH 4.7 to 4.8. The complete precipitation of iron of the same molecular concentration took place at the range of pH 3.2 to 3.8. The sol state of iron, but not that of aluminum, was observed in the presence of the sulfate anion. In the presence of the chloride anion complete precipitation of aluminum from a 0.0075 M concentration took place at pH 5.4. "Molecularly dispersed aluminum may persist almost up to the point of complete precipitation."

Similar results with respect to complete precipitation were obtained with the iron colloid in the presence of the chloride anion, molecularly dispersed iron disappearing, as soon as the gel began to form. Removal of the electrolytes did not convert the sol into gel as in the case with iron colloids in the presence of the sulfate anion. "Apparently the differential adsorption of the sulfate and chloride anions and their electrostatic behavior is responsible for the phenomena observed."

In the presence of the nitrate anion, aluminum is completely precipitated at pH 5.8 to 6.0, and iron at pH 5.4. As in the case of the chloride anion the formation of the gel precluded the existence of the condition of molecular dispersion. Removal of the electrolytes did not readily induce gel formation, prolonged standing, heating, or in some cases shaking being apparently necessary to the formation of any gel. In mixtures of anions the properties of the divalent or trivalent anions controlled the states of aggregation of both the aluminum and the iron colloids.

It is concluded that normal soil conditions will preclude the presence of iron and aluminum in solution, but that there is a possibility of the presence of aluminum in solution from the dissociation of certain aluminum silicate complexes in the soil. It is considered that iron is probably supplied to plants by the solvent action of organic acids and of other organic solvents.

The perpetually frozen subsoil of Siberia, C. Nikiforoff (*Soil Sci., 26 (1928), No. 1, pp. 61–81, pls. 2, figs. 5*).—This descriptive account of the perpetually frozen subsoil and its attendant phenomena, which is concerned with an area of nearly 3,000,000 square miles in northern Asia, is here presented as a contribution from the Minnesota Experiment Station.

The perpetually frozen subsoil is found at a depth of from a few inches to 10 ft., and varies in thickness from 50 ft. or less near its southern limit to 500 or 600 ft. Various phenomena associated with the perpetually frozen subsoil and with its effect upon the surface soil, together with two theories to account for its existence, the one climatic and the other geological, are presented.

[The effect of paper mulches on soil temperature, soil moisture, and crop growth] (*California Sta. Rpt. 1927, pp. 88–90, 91*).—In this continuation of paper mulch experiments by Smith (E. S. R., 57, p. 211), only black perforated and black unperforated papers were used, both partial and complete cover having been tried with both types of mulch paper. The uncovered check plats being taken as 100, the ratio of the yields was as follows: Unperforated paper plats fully covered, 126.8; unperforated paper plats partially covered, 90.2; perforated paper plats completely covered, 110.7; perforated paper plats partially covered, 105.8.

An effect on soil moisture was noted only to a depth of 4 in., and was most marked during the early stages of the growth of the crop. At this stage of growth the soil temperatures were highest in the plats covered with unperforated paper. The temperature difference was not marked after the crop had made growth enough to shade the ground, however.

The decomposition of cellulose by aerobic bacteria, R. J. Dubos (*Jour. Bact., 15 (1928), No. 4, pp. 223–234*).—A rapid and abundant growth of aerobic cellulose-decomposing bacteria was obtained in the experiments here reported, from the New Jersey Experiment Stations, on a medium consisting of strips of filter paper immersed in 5-cc. portions of a solution made up of sodium nitrate 0.5 gm., di-potassium hydrogen phosphate 1.0 gm., magnesium sulfate (heptahydrate) 0.5 gm., potassium chloride 0.5 gm., and ferrous sulfate (heptahydrate) 0.01 gm., dissolved in distilled water 1,000 gm.

It is noted that the slightly alkaline reaction of the medium favored the growth of the bacteria while retarding the growth of fungi. Cellulose decomposition could be noted in almost all cases after from 36 to 72 hours at 28° C., and growth was obtained even when only one or but very few cells were used for the inoculation; so that the dilution method could be used both for number determinations and for isolations in pure culture. By the use of this method there were isolated (1) strict aerobes unable to utilize any of the carbon compounds tested except cellulose; (2) strict aerobes decomposing cellulose but also growing well on starch agar, though not on the usual nutrient agar; and (3) facultative anaerobes, decomposing cellulose, but also growing well in all ordinary media.

Contribution to the chemical composition of peat.—I, Chemical nature of organic complexes in peat and methods of analysis, S. A. Waksman and K. R. Stevens (*Soil Sci., 26 (1928), No. 2, pp. 113–137*).—A method of proximate analysis considered capable of accounting for about 90 per cent of the chemical constituents of peat and of making possible the differentiation of various kinds of peat materials is described in the present contribution from the New Jersey Experiment Stations. The authors found it possible by means of this method to determine the processes which had taken place in the formation of peats. In lowmoor peats the celluloses were found to have decomposed completely, while a part of the hemicelluloses, largely of a hexosan nature, was left. The protein content was found higher than in the original plant material, this difference being attributed to the synthetic activities of the bacteria causing decomposition of the plant residues.

In highmoor peat, according to the results here reported, considerable quantities, both of celluloses and hemicelluloses, were left, showing that much less decomposition had taken place in these than in the lowmoor peats. The proteins were found to be low, the explanation offered being that decomposition of the nitrogenous substances of the sphagnum plants had been more rapid than that of the carbohydrates. Ether-soluble substances, considered to be waxes, had accumulated in the highmoor but not in the lowmoor peats.

Special crop adaptations to different soil types and their significance, C. B. Williams (*North Carolina Sta. Rpt. 1927, pp. 17, 18*).—A brief general discussion with some specific examples is presented.

[**Coniferous timber soils**] (*Idaho Sta. Bul. 160 (1928), p. 19*).—In continued work on this subject (E. S. R., 57, p. 709), a virgin forest soil and a similar soil under cultivation for 15 years were studied with respect to ammonifying and nitrifying power, tests on both soils having been made without treatment and with applications of calcium carbonate, rotted manure, fresh manure, sodium nitrate, ammonium sulfate, and mixtures of these. The virgin forest soil showed no toxic effect on ammonification, but a distinct toxic effect on nitrification was noted. This latter effect was not lessened by any of the treatments with salts or manures.

[**Soil and fertilizer experiments of the Indiana Station**] (*Indiana Sta. Rpt. 1927, pp. 62, 63*).—Fertilizer experiments of the usual type are reported from two fields on Vigo silt loam and Gibson silt loam, respectively, at the Vincennes Farm. Costs and returns for various fertilizer treatments and a number of crops are stated. On the Gibson silt loam with a rotation of corn, wheat, and clover, all fertilizer applications paid good profits, nitrogen having shown itself the most profitable addition. The addition of nitrogen costing $2 to phosphate and potash treatment of limed soil returned $10.64 in crop increases.

[**Fertilizer experiments at the North Carolina Station**], C. B. Williams (*North Carolina Sta. Rpt. 1927, pp. 18–22, 23, 24–27*).—At the Piedmont Substation superphosphate (acid phosphate) was found a more efficient phosphoric acid carrier than rock phosphate when each was used in quantities sufficient for the normal requirements of corn, wheat, and red clover. A comparison of sodium nitrate, ammonium sulfate, ammonium nitrate, calcium cyanamid, sludge, cottonseed meal, Leunasalpeter, and urea as nitrogen carriers for a rotation of corn and cotton placed sodium nitrate, ammonium nitrate, and ammonium sulfate as of about equal value, the sodium nitrate showing a very slight advantage.

At the Mountain Substation, phosphoric acid was found the first and nitrogen the second limiting factor in the production of corn, wheat, and potatoes on Toxaway loam. In a comparison of sources of phosphoric acid, the superphosphate was found superior to rock phosphate on both limed and unlimed plats, but on the unlimed plats basic slag gave a yield of red clover 36.7 per cent better than that given by superphosphate. On the limed plats corn produced a yield 34.1 per cent better with superphosphate than with basic slag. Wheat gave larger yields, however, on both limed and unlimed plats with basic slag than with superphosphate, the difference being greater on the unlimed plats.

Results are also reported from the Coastal Plain, Blackland, and Upper Coastal Plain Substations, with farmers in Bertie, Wayne, and Davie Counties, and with soil fertility experiments conducted cooperatively with the U. S. Department of Agriculture in Currituck, Northampton, Wilson, and Davidson, Counties.

Rotation, fertilizer, and soil improvement investigations (*Texas Sta. Rpt. 1927, pp. 44–46, 78*).—Rotation and fertilizer experiments at the main station indicate that the soil needs nitrogen and phosphoric acid in the order named, but that the fertilizers used have not been profitable. At the Angleton and Beeville Substations phosphoric acid was the first limiting element in 1925 and 1926. At Nacogdoches a fertilizer containing 8 per cent of phosphoric acid, 4 per cent of nitrogen, and 4 per cent of potash was most profitable for cotton.

Soil fertility and moisture conservation studies at Lubbock for a 12-year period indicate that fallow is not necessary in the region, and green manure has not been profitable. The most practicable cropping system is the alternate cropping of cotton and the grain sorghums, using such manure and crop residues as may be available.

[Soil fertility work at the Nacogdoches, Texas, Substation] (*Texas Sta. Rpt. 1927, pp. 104, 105*).—The importance of terracing for the conservation of fertility and the prevention of loss of soil by erosion is noted, together with the recommendation that organic matter be incorporated at every possible opportunity, and that as frequent a rotation of crops as possible be made. Fertilizer experiments mostly of the usual type included applications of 250 and 500 lbs. per acre of sulfur, resulting in an apparent slight gain in the yield of cowpeas. This gain was not sufficient, however, to pay for the sulfur used

A summary of the work carried out by the commission on mineral fertilizers [trans. title], V. G. Kotel'nikov (Kotelnikov) (*Izv. Gosud. Inst. Opytn. Agron.* (*Ann. State Inst. Expt. Agron.* [*Leningrad*]), *5* (*1927*), *No. 4, pp. 274–283*).—The work conducted by the commission on mineral fertilizers showed that in the Union of Socialistic Soviet Republics the problem of phosphate fertilization is the most important one; nitrogen comes next, and potassium last. For the best interest of agriculture and rational utilization of fertilizers the abolition of the fallow system is recommended. The low prices of grain in Russia on the one hand, and the high prices of fertilizers on the other, prevent a wider use of fertilizers.

Composition of natural organic materials and their decomposition in the soil.—III, The influence of nature of plant upon the rapidity of its decomposition, S. A. Waksman and F. G. Tenney (*Soil Sci., 26* (*1928*), *No. 2, pp. 155–171, figs. 4*).—Having dealt in a preceding paper of this series of contributions from the New Jersey Experiment Stations (E. S. R., 58, p. 516) with the influence of the age of plants of an individual species upon the rate of decomposition of the plant in the soil, the authors here present a comparative study of the composition and rate of decomposition of rye straw, corn stalks, dead oak leaves, alfalfa tops, sphagnum, and dead needles of pine (*Pinus strobus*).

For the original materials the examination made included the ash content, ether extract, organic soluble matter in cold and hot water and in alcohol, hemicellulose, cellulose, lignin, and crude protein. For the decomposed material the figures given cover cold-water-soluble organic matter, water-insoluble organic matter, cellulose, hemicellulose, lignin, carbon dioxide liberated during decomposition, and ammonia nitrogen utilized in the decomposition. The course of decomposition, with and without the addition of nutrients (ammonium and potassium phosphates), and the influence, in the case of the pine needles and of the sphagnum, of removing before decomposition the ether extract, the ether and alcohol extracts, and the ether, alcohol, and hydrochloric acid extracts, were investigated and the results shown both in tabular and graphic form.

It is considered that the rapidity of decomposition of plant residues has been shown conclusively to be dependent upon at least the following factors: (1) The nature of the plant, since specific differences in composition will markedly influence the processes of decomposition; (2) the age of the plant of any particular species, since the authors have found that the younger and less mature the plant, the more rapid will be its decomposition in the soil; (3) the available inorganic nutrients, some of the experiments reported in the present paper having indicated a marked increase in the decomposition rate of especially the maturer plants, in which the authors found the available carbohydrates in excess of equilibrium with the available nitrogen and mineral nutrients avail-

able for the requirements of the bacterial growth necessary to the decomposition of the plant residues; (4) a group of such other factors as the nature of the microorganisms active in the decomposition, the aeration, and the soil reaction, all of which were found to modify the rate and nature of the decomposition of plant materials; and (5) factors influencing the rate of carbon dioxide evolution, the quantity of humus formed, and the rate of liberation of nitrogen and of mineral plant constituents.

Field experiments on the availability of nitrogenous fertilizers, 1923–1927, J. G. LIPMAN, A. W. BLAIR, and A. L. PRINCE (*Soil Sci., 26 (1928) No. 1, pp. 1–25, pls. 2*).—Report is made of the fourth 5-year period of a series of nitrogenous fertilizer experiments (E. S. R., 53, p. 219) conducted by the New Jersey Experiment Stations on a field of 40 $\frac{1}{20}$-acre plats. Of these plats, 20 were treated with ground limestone at the rate of 2 tons per acre every 5 years, the remaining 20 plats being given manures, sodium nitrate, calcium nitrate, ammonium sulfate, calcium cyanamide, dried blood, fish, and tankage as sources of nitrogen. Some plats, also, were treated with combinations including wheat and rye straws and alfalfa hay.

Rather comprehensive numerical data and qualitative observations are recorded, and it is noted that the work has emphasized especially the following points: (1) The great difficulty in maintaining the nitrogen supply of the soil when nonlegume crops only are grown; (2) the small percentage of the applied nitrogen that is recovered in the crop under field conditions, and therefore the great loss of nitrogen from soils that are constantly under cultivation; (3) the imperative need of lime in connection with fertilizers that are physiologically acid; (4) the effect of lime in depleting the nitrogen supply of the soil when no legume crops are grown, and the slight gain in yield of general farm crops under this condition; (5) the ease with which clover may be grown if the conditions are made favorable by the use of lime, phosphate, and potash; and (6) the superiority of mineral nitrogenous materials over the organic forms.

Oxidation of sulfur in limed and unlimed soils, O. M. SHEDD (*Soil Sci., 26 (1928), No. 2, pp. 93–105*).—Having observed in a previously noted investigation of the Kentucky Experiment Station that in 6 of the 7 soil samples compared more sulfur was oxidized in the limed than in the unlimed samples (E. S. R., 56, p. 422), the author was led to the conclusion that, if possible, a more general confirmation of the earlier results should be secured. He presents in some detail the data obtained and observations made in a test of the sulfur-oxidizing capacity, with and without lime, of 31 surface soils representing the principal soil areas of Kentucky when treated with 250 parts per million of sulfur and examined to determine the extent of oxidation at the end of 30 and 120 days. The quantities of sulfur oxidized were ascertained by determining at stated intervals the sulfate soluble in weak hydrochloric acid from 40-gm. portions (basis of the air-dried soil) of the sample. The liming treatment consisted in the addition of 4,000 parts per million of commercially pure calcium carbonate. The pH values and acidity of sulfuric acid or alkalinity as calcium carbonate were also determined, and for some of the samples the relative effectiveness of stirring once each day and of stirring once each week is shown.

In the unlimed soils the proportion of the added sulfur oxidized varied in the 30-day incubation from 8.8 to 36 per cent. In the limed samples the corresponding variation was from 6 to 37.2 per cent. After 120 days' incubation, the proportions of the added sulfur oxidized were from 20.8 to 61.6 per cent and from 17.2 to 64 per cent in the unlimed and limed samples, respectively.

It is considered probable that in every case sufficient sulfur was oxidized even after 30 days' incubation to supply the sulfur requirements of almost any

crop under maximum production without considering the sulfur normally present in the soil and in the rainfall, the minimum oxidation in 30 days having been 30 lbs. of sulfur per acre.

The variations in the sulfate content of limed and unlimed samples to which no sulfur had been added are also included among the reported data.

Magnesium deficiency of sandy soil types, C. B. Williams (*North Carolina Sta. Rpt. 1927, pp. 15, 16*).—Dolomitic limestones have shown an apparent superiority in the eastern part of the State over forms of limestone lower in magnesium, leading to the belief that a widespread magnesium deficiency, accentuated by the use of high calcic limes, exists in these soils. The experiments here noted have indicated during the past year, however, that manganese deficiency is quite prevalent, and that the superiority of dolomites and some local marl deposits may be due to their small content of manganese.

A "deficiency disease": The lack of available manganese in a lime-induced chlorosis, B. E. Gilbert and F. T. McLean (*Soil Sci., 26 (1928), No. 1, pp. 27–31*).—The correction of a lime-induced chlorosis is discussed, and, with a brief review of the recent publications on the subject, experimental data from the Rhode Island Experiment Station are presented. Reference is made to the experiments of 1925,[1] and those of 1926 and 1927 are discussed in detail.

Freedom from chlorosis and increased yields of tilled crops of corn, lettuce, onions, and mangels were secured when manganous sulfate was applied. In the 1925 experiments it is noted that 8 lbs. per acre of manganous sulfate eliminated chlorosis of spinach and increased the yield 215 per cent, and in the new experiments, in which 30 lbs. per acre of manganous sulfate was added to the fertilizer treatment and supplemented, in some cases, with from 10 to 20 lbs. per acre of manganous sulfate applied as a spray, large increases in yield as well as elimination of the chlorosis were obtained. The better results were produced when the manganous salt was applied in solution form.

AGRICULTURAL BOTANY

Department of botany, college research (*North Carolina Sta. Rpt. 1927, pp. 105–107*).—Brief accounts are given of a number of investigations, among them An Ecological Study of the Sand Ridge Vegetation and Habitat (Coarse Sandy Uplands), by B. W. Wells; Microbiological Activities in the Soil of a Southern Upland Grass-Sedge Bog, by I. V. Shunk; and A Microchemical Study of Cotton Fiber Cell Walls, by D. B. Anderson.

Plant physiology [studies at the Citrus Experiment Station] (*California Sta. Rpt. 1927, pp. 65, 66*).—Studies on the absorption of ions by citrus and walnut seedlings indicated that differential absorption of ions by the roots may bring about such marked changes of reaction of the culture solutions as to be injurious to the plants.

Traces of elements not ordinarily considered as being of importance for the growth of citrus have been found very necessary in maintaining normal growth. Very small amounts of certain elements proved essential for the growth of citrus, but in large amounts, although in relatively low concentration, some of these elements were quite toxic. Desiccating winds are said to have brought about a temporary accumulation of salts in the leaves of citrus, largely due to the increase in calcium. The excess salt content of leaves which survived the accumulation disappeared during subsequent calm weather.

The growth of alfalfa seedlings was reported to be greatest when solution cultures were slightly alkaline, and neither approximate neutrality nor moderate alkalinity appeared to be unfavorable for growth.

[1] Soil Sci., 22 (1926), No. 6, pp. 437–446.

In studying the percentage loss of moisture from young oranges and grapefruit, it was found that the loss decreased rapidly as the fruits increased in size. Stomatal regulation or the nature of the rind was not found to be an important factor in determining the rate of water loss from detached fruits of different sizes. Detached citrus fruits of approximately the same size are said to lose their moisture at similar rates.

From a study of the water-conducting system of orange fruits, it is claimed that the layers of pectic material in the walls of the cells have an important function in water transport with reference to the ability of fruit to withstand conditions of extreme aridity.

Physiological studies on the nitrogen fixing bacteria of the genus Rhizobium, R. H. WALKER (*Iowa Sta. Research Bul. 113 (1928), pp. 369–406, figs. 7*).—Studies were made of the agglutination, gelatin liquefaction, and fermentation of sugars, etc., by nitrogen-fixing organisms isolated from alfalfa, sweet clover, soy bean, pea, red clover, and Dalea groups, and also for comparative purposes of *Bacillus radiobacter*.

The results are said to indicate that the agglutination properties of the legume bacteria are promising as being of service in characterizing and differentiating members of different cross-inoculation groups. As a means of differentiating species within the genus Rhizobium, gelatin liquefaction is considered of little value. The fermentative characters of the legume bacteria are said to have some promise as a valuable diagnostic test in the differentiation of cross-inoculation groups.

The physiological characters of *B. radiobacter*, so far as they were tested, were not considered sufficiently different from those of the legume bacteria to permit their separation by the tests described.

[Isolation of species of bacteria by the use of dyes] (*Idaho Sta. Bul. 160 (1928), p. 19*).—It is claimed that strains of legume bacteria can be isolated through the use of various dyes. Triphenylmethane dyes were found to have a selective action in eliminating *Bacillus radiobacter*, a common contaminant of legume cultures. Certain concentrations of a number of other dyes were found to eliminate contaminating forms in studies of nitrifying bacteria.

The application of the Manoilov reaction to fungi [trans. title], P. G. RUZINOV (RUSINOV) (*Izv. Gosud. Inst. Opytn. Agron. (Ann. State Inst. Expt. Agron. [Leningrad]), 5 (1927), No. 4, pp. 303–305*).—Tests regarding the sexuality of fungi by the Manoilov reaction were made on *Phycomyces nitens*, *Thieghemella glauca*, and *Sclerotinia libertiana*. The methods used were those of Satina and Blakeslee (E. S. R., 57, pp. 621, 622), slightly modified. In addition, Manoilov himself tested out a new solution (composition not given) on the same fungi, from which it appears that both the sex and race reactions worked out by him are applicable to fungi, although the race reaction and its application to fungi require further study.

The structural organization of plant protoplasm in the light of micrurgy, G. W. SCARTH (*Protoplasma, 2 (1927), No. 2, pp. 189–205*).—"Microsurgery of plant cells shows that the impression of fluidity which one gets from mere microscopic observation is illusory. The cytoplasm in fact is always more or less elastic, even when 'streaming.' Moreover only a portion of its substance moves, so that there is no inherent difficulty in assuming a structural basis of organization.

"The resting nucleus, also, is not devoid of structure, as is claimed to be the case in animal cells. Sometimes a gelatinous framework is conspicuous, and such a condition grades into cases where there appears to be only a flimsy structure permeating a liquid medium. There thus seems to be no reason, as

far as plant cells are concerned, for denying the existence of a persistent framework which might account for the genetic continuity of the chromosomes.

"In the architectural organization of the cell the most important element, apart from the immobile gelatinous matrix, is the active film- and fibril-forming differentiation which Strasburger termed the 'kinoplasm.' Its behavior and metamorphoses, as observed by the writer, support and amplify Strasburger's conception [E. S. R., 8, p. 957], and indicate that the analogy it presents with the myelin forms of lecithin may rest on chemical and structural similarity."

The permeability of protoplasm to ions, M. M. Brooks (*Amer. Jour. Physiol., 76 (1926), No. 1, pp. 116–120*).—Studies on penetration of arsenic into the sap and protoplasm of Valonia do not support the hypothesis that only undissociated molecules enter living protoplasm.

[Injuries to protoplasm, and protection], W. W. Lepeschkin (*Protoplasma, 2 (1927), No. 2, pp. 239–270*).—This account of the relation between mechanical or chemical injuries to protoplasm and the mode of operation of some protective materials deals with the disperse phases of protoplasm and the disperse medium, and with the effects of agents, as mechanical relations, acids, alkalies, salts, and narcotics.

The activities of a constructed colloidal cell, D. T. MacDougal and V. Moravek (*Protoplasma, 2 (1927), No. 2, pp. 161–188, figs. 10*).—A brief summing up is given of earlier measurements of the swelling of colloids by means of the auxograph and of the results of experiments with a colloidal cell constructed from materials similar to those in the living cell. The results recently obtained are described.

By a new method it was possible to dissolve cholesterol in lecithin and incorporate the mixture in water-hydratable gels. Constructed cells with lecithin-cholesterol incorporated in the gelatin and agar display differential action in endosmosis, permeability, and pH strikingly similar to those of living cells.

Constructed cells with lecithin-cholesterol containing 1 part in 1,000 of the material of the layers and with contents of 20 per cent sugar solution showed an increasing endosmotic series in Na < K < Ca, this fact implying a decreasing series in permeability under the influence of these cations in the presence of chlorine. Other results from experimentation are detailed, with comments.

"Interferences between Na and Ca resulted in swellings of the layers of the complete cell greater than those in Na alone, but no greater than the changes in Ca alone."

Contribution to the theory of permeability of membranes for electrolytes, L. Michaelis (*Jour. Gen. Physiol., 8 (1925), No. 2, pp. 33–59, figs. 2*).—From experimentation with such membranes as apple skin, parchment paper membrane, and a completely dry collodion membrane, results have been obtained which could be interpreted on the assumption that these membranes are less permeable for anions than for cations. In parchment paper there is only a relative diminution of the mobility of the anions, and in the apple skin and in the dry collodion membrane there is practically no permeability for anions. A theory is developed which is said to explain how the decrease or complete lack of mobility of anions influences the electromotive effects of the membrane and the diffusibility of electrolytes across a membrane. The results of the theory are compared with the experimental results.

"In membranes impermeable for anions the permeability for cations gives the same order of cations as for the mobilities in a free aqueous solution. But the differences of the mobilities are enormously magnified, e. g., the mobilities of H· and L., which are in the proportion of about 1 : 10 in aqueous solution, are

in proportion of about 1:900 in the collodion membrane. The general cause for the retardation of ionic mobility within the membrane may be supposed to be the increased friction of the water envelope dragged along by the ion in the capillary canals of the membrane. The difference of the effect on the cations and on the anions may be attributed to the electric charge of the walls of the canals."

Physicochemical analyses of the turgor mechanism in plant fission cells [trans. title], H. PFEIFFER (*Protoplasma, 2 (1927), No. 2, pp. 206–238*).—The two parts of this account deal respectively with turgor pressure increase in separated cells and the mechanism of turgor pressure change.

Giant cells [trans. title], A. FREY (*Rev. Gén. Bot., 39 (1927), No. 461, pp. 277–305, figs. 7*).—The formation of giant cells in *Sterigmatocystis nigra* is described. It is stated that giant cells in *S. nigra* were caused by deprivation of potassium, and that this result was due specifically to the absence of potassium ions.

Fixators of chondriomes [trans. title], Y. OZAWA (*Rev. Gén. Bot., 39 (1927), No. 460, pp. 218–233, pls. 4*).—In this preliminary note methods are indicated, with an account of the results obtained and a bibliography.

Measurement of pH [trans. title], L. MICHAELIS (In *Handbuch der Biologischen Arbeitsmethoden, herausg. von* E. ABDERHALDEN. *Abt. III, Physikalisch-chemische Methoden. Teil A, Methoden zur Untersunchung des Verhaltens Gelöster Stoffe. Berlin: Urban & Schwarzenberg, 1922, pt. A, No. 3, pp. 487–506, figs. 5*).—An account is given of methods, and their employment, for measuring the pH of solutions.

Relations between plant cell sap reaction and disease immunity [trans. title], F. WILLE (*Ztschr. Pflanzenkrank. u. Pflanzenschutz, 37 (1927), No. 5–6, pp. 129–158, figs. 3*).—Utilizing colorimetric procedures and materials similar to those employed by Michaelis as noted above and previously (E. S. R., 56, p. 13), the author investigated the H-ion concentration of aqueous extracts of colored fir needles and of reddened grape leaves. The data from these studies are particularized, with discussion.

Action of high temperatures on seeds and resulting plants [trans. title], E. GAIN (*Rev. Gén. Bot., 39 (1927), Nos. 460, pp. 234–253, figs. 4; 461, pp. 306–329, figs. 21*).—Seeds of various plants withstand temperatures for prolonged periods at 60° and even above 100° C. without losing their ability to germinate and to develop as far as the flowering period. *Helianthus annuus* furnishes a striking example in this respect. Details are given regarding other plants.

GENETICS

Mutation, chromosome non-disjunction and the gene, J. W. GOWEN (*Science, 68 (1928), No. 1757, pp. 211, 212*).—The author briefly discusses the sporadic appearance of abnormal flies in particular strains of Drosophila. He found that the causative agent was a third chromosome recessive factor which is inactive in the male, while the exceptions occur freely in homozygous females, making the case appear like one of maternal inheritance. The location has been identified as near the point of the V-shaped chromosome where the spindle fiber attaches.

On the chromosome number and the unequal pair of chromosomes in some dioecious plants, Y. SINOTÔ (*Imp. Acad. [Japan] Proc., 4 (1928), No. 4, pp. 175–177, figs. 21*).—The unequal pair of chromosomes is indicated and illustrated in the male of *Morus bombycis, Cannabis sativa, Cudrania triloba, Datisca cannabina, Daphniphyllum macropodum, Trichosanthes japonica, Salix* spp., and *Trachycarpus excelsa fortunei.*

The chromosomes of the rat, O. Swezy (*Science, 66 (1927), No. 1720, pp. 601, 602, figs. 3*).—Studies of the chromosome numbers in a mixed strain of laboratory rats at the University of California showed that the diploid count in some was 42 and in others 62. Individuals showing either count produced secondary spermatocytes having both 21 and 31 chromosomes. The absence of individuals with 52 chromosomes led to the conclusion that sperm with 21 and ova with 31 could not unite. Matings between a strain having but 42 for the diploid number and 21 haploid chromosomes with individuals from the colony showing both counts produced 24 embryos, all of which showed 42 chromosomes. Albinous Norway and local wild gray Norway rats have been found to have 42 as the diploid number, while the hybrid rat colony produced by crossing these two types showed both diploid counts of 42 and 62, with possibility of normal union only between the gametes having like numbers of chromosomes.

The albino rat, O. Swezy (*Science, 68 (1928), No. 1751, p. 60*).—In continuing the studies of the chromosomes of rats as above noted, it has been found that the wild gray rats (*Rattus norvegicus*) have a diploid count of 42 chromosomes with both 21 and 31 chromosomes in the secondary spermatocytes, the dimorphism in the haploid number being the common characteristic of the colony studied, while albino rats from the University of California and other sources have shown chromosome counts of 42 and 62 with both 21 and 31 chromosomes in the secondary spermatocytes. It is suggested that the primitive diploid count is 42, and that the dimorphism in the haploid number is a late acquisition in the evolution of a new species which will ultimately have 62 in the diploid and 31 chromosomes for the haploid number.

Observations on the teratology of the genus Cuscuta, T. G. Yuncker (*Ind. Acad. Sci. Proc., 43 (1927), pp. 335–338, figs. 25*).—This contribution from DePauw University describes some irregularities of structure observed in an extensive examination of specimens of the genus.

Burbank's results with plums, D. F. Jones (*Jour. Heredity, 19 (1928), No. 8, pp. 358–371, figs. 7*).—A brief popular discussion pointing out Luther Burbank's notable contribution in the way of new plum varieties and presenting a general survey of his breeding methods and activities. The value of Burbank's work is said to lie in the production of new varieties rather than in the laying of scientific foundations for future progress.

The "wiry" tomato, J. W. and M. M. Lesley (*Jour. Heredity, 19 (1928), No. 8, pp. 337–344, figs. 7*).—A brief account concerning a recessive mutant form of tomato found in the course of breeding studies at the Citrus Experiment Station, Riverside, Calif., and which, although resembling a plant afflicted with mosaic disease, was apparently hereditary in nature and due to a gene mutation. This "wiry" mutant was completely sterile, the flowers producing no pollen and the ovaries being malformed. The chromosome number in the root tips was 24, the same as in normal plants.

Genetic relations of chocolate brown plumage color in the domestic pigeon, D. G. Steele (*Soc. Expt. Biol. and Med. Proc., 25 (1928), No. 9, pp. 777, 778*).—In studies at Yale University the author concludes that the three basic color types in pigeons, black, chocolate, and red, may be interpreted on a two-factor hypothesis, B for black, b for chocolate, E for extension of black or chocolate, and e for nonextension, the former factor being sex-linked. It has been further found that the pigment obtained by chemical extraction from chocolate feathers closely resembles black in general appearance but seems more like red in solubility.

Genetic studies on the chinchilla rabbit [trans. title], J. Marcq and O. Laurent (*Ztschr. Induktive Abstam. u. Vererbungslehre, 47 (1928), No. 1, pp.*

75–79).—Preliminary studies on the chinchilla rabbit have been in general accord with the findings of Castle (E. S. R., 52, p. 825), but no whites have yet developed.

Inheritance of the ridgeling character in Angora goats (*Texas Sta. Rpt. 1927, pp. 27, 28*).—Eleven years' results showed that there were 23.2 per cent of ridgelings among the 311 male kids sired by ridgelings and only 6.1 per cent of ridgelings among the 890 male kids whose sires were not ridgelings, indicating clearly that the defect is hereditary. More than one pair of Mendelian factors appear to be concerned.

Is a zebu-carabao hybrid possible? B. M. Gonzalez and J. P. Esguerra (*Jour. Heredity, 18 (1927), No. 12, pp. 544–547, figs. 2*).—In an effort to determine the possibility of crossing with the water buffalo, a male zebu calf was allowed to run with water buffalo heifers until he was three years and three months of age, with entire negative results though frequent matings were observed.

Heredity and internal secretion on origin of mammary cancer in mice, L. Loeb and I. T. Genther (*Soc. Expt. Biol. and Med. Proc., 25 (1928), No. 9, pp. 809–811*).—Since different strains of mice have shown different degrees of incidence of mammary tumors, indicating a heredity of this tendency, and since the incidence of cancer has been definitely related to reproduction, a study was made of the oestrous cycle in different strains, one showing a cancer rate of over 80 per cent. The results, however, indicated no definite relation between the length of the sexual cycle and the hereditary tendency to cancer.

Effect of placental extract on mammary glands of male guinea pigs, H. O. Haterius (*Soc. Expt. Biol. and Med. Proc., 25 (1928), No. 6, pp. 471, 472*).—The injection twice daily of 0.5 cc. doses of human placental extract into four castrated adult guinea pigs produced after eight days a swelling of the mammary region, with increased size of the nipples and areolar areas. This continued for some three weeks, after which continued injections produced no further effect. Histological studies showed evidence of active secretion and the presence of colostrum corpuscles and something which appeared to be milk.

Extraction of ovarian hormone from urine, C. D. Veler and E. A. Doisy (*Soc. Expt. Biol. and Med. Proc., 25 (1928), No. 9, pp. 806, 807*).—The extraction of the ovarian hormone from urine of pregnant women has been successfully accomplished in relatively large amounts through liquid extraction in chloroform, with the evaporation of the chloroform and dissolving the residue in alcohol, from which aqueous solutions are prepared or purified by the use of organic solvents. The amount of hormone recovered decreased soon after parturition from 640 rat units per liter at 8½ hours after parturition to less than 5 at 144 hours after parturition.

Castration and ovariectomy on spontaneous activity and ability to learn, W. W. Tuttle and S. Dykshorn (*Soc. Expt. Biol. and Med. Proc., 25 (1928), No. 6, pp. 469, 470*).—The results of this investigation, based on 15 castrated rats and 20 control rats under 50 days of age, showed that castration had no effect upon the learning or the activity under the age of puberty, though activity and learning appeared to be closely allied.

FIELD CROPS

[Agronomic work in California] (*California Sta. Rpt. 1927, pp. 40, 41, 42–46, 77, 78*).—Continued investigations (E. S. R., 57, p. 225) included observations by P. B. Kennedy on *Phalaris* spp., *P. coerulescens, Bassia hyssopifolia* (E. S. R., 57, p. 830), kikuyu grass, and *Erodium* spp. Treatment with sulfuric

acid improved the germination of Erodium seed. Seed 25 years old of *E. gruinum* germinated 100 per cent, and seed 22 years old of *E. cicutarium* germinated 28 per cent.

Investigations by V. H. Florell in cooperation with the U. S. Department of Agriculture showed the merits of an Atlas barley selection (E. S. R., 57, p. 728) and Vaughn barley. The progress of a study to determine the practicability of back crossing as a means of factorial analysis in wheat breeding is also noted. Progress is reported by G. W. Hendry in the improvement of grain sorghum varieties and the isolation of an alkali-tolerant strain of barley.

In rice investigations in the Imperial Valley W. W. Mackie found that more than half of the alkali is removed from the first 6 ft. of soil by one rice crop and that the soil is much improved in physical condition, with the beneficial effects lasting for several years.

When grain sorghum roots had been pruned from 7 to 10 days before harvesting with a combine in studies by J. P. Conrad and E. J. Stirniman (E. S. R., 56, p. 683) the moisture content of the grain, from 13.5 to 14 per cent, was low enough to permit safe storage. This harvesting method also cost substantially less than hand harvesting.

With Yolo sorghum J. W. Gilmore and A. Smith found that the soil at a 3-in. depth was warmer during the day under solid black paper for nearly 9 weeks and under perforated paper for about 7 weeks than when left bare, whereas fluctuating and reduced temperatures, respectively, prevailed later in the season. Covered soil was generally warmer than bare soil at night, although that under perforated paper was warmer up to the eighth week and cooler or fluctuating thereafter. The respective percentages by which the Yolo with the solid and perforated paper exceeded those on bare soil were for total production per plant of oven-dry matter 28.4 and 19.3; culm height 21.1 and 15.2; and weight of grain per plant 10.3 and 3.1 per cent. The higher temperature of the soil early in the season evidently had a stimulating effect on growth and yield.

The percentage of total cotton picked at first picking on a plat cut 14 in. deep between the rows was 46.5 and uncut rows 42, second picking 27.4 and 37.6, third picking 15.5 and 11.3, and fourth picking 10.8 and 9.1 per cent. Root cutting thus seemed to hasten maturity, permitting more of a crop to be picked earlier in the season. No data are given on the effect of root cutting on total yields.

According to a survey by B. A. Madson, short life of stands, the most serious alfalfa problem, especially in southern California and the San Joaquin Valley, seems to be related to the quantity of water applied and time of cutting. The presence of the bacterial wilt caused by *Aplanobacter insidiosum* was also observed, apparently confined to the Delhi region. Fenugreek, because of its ability to grow at low temperatures, seemed better adapted in the Sacramento Valley for cover crops where late planting is necessary than any other available legume, whereas for the San Joaquin Valley and southern California it did not appear to surpass Melilotus and other common winter legumes. Mat bean (*Phaseolus aconitifolius*) and hyacinth bean (*Dolichos lablab*) were found quite drought tolerant and capable of being grown over a wide area without irrigation.

Studies of range improvement showed that the practice of deferred grazing on foothills has given good results generally and is liked best in the northern counties where succession is much more rapid than in the drier south. The highest grazing capacity and the most desirable cover occurred where the climax grasses are conspicuous. Stipa, Aristida, and to a lesser extent Elymus appeared to be important genera of perennial grasses that may constitute the

climax cover on certain foothill range lands. Generally the foothill grasslands will not support a cover of perennial grasses, even under the most favorable conditions, the association being intermixed with annual grasses and broad-leaved herbs. St. John's wort apparently can be readily eradicated with sodium chlorate. Range improvement by burning, the nutritive value of forage types, and the food plants of deer are also commented on briefly.

[Agronomic work in Idaho in 1927] (*Idaho Sta. Bul. 160 (1928), pp. 15, 16, 28, 29, 30*).—Variety tests with winter and spring wheats, oats, barley, field and garden peas, and annual hay crops, and planting tests with alfalfa, oats, winter wheat, and potatoes are reported on from the station and substations as heretofore (E. S. R., 57, p. 726).

Thin stands and use of first growth seemed necessary for satisfactory alfalfa seed yields. Early seeding without a nurse crop 10 lbs. of seed per acre gave proper stands. While 200 lbs. of gypsum was essential for maximum alfalfa yields in cut-over sections, gypsum gave no increase at the station.

Barnyard manure has been effective in maintaining wheat yields, whereas sodium nitrate gave no increases. The use of sweet clover increased the yield of spring wheat at the High Altitude Substation. Rolling produced increases with both spring and fall sown wheat at the Sandpoint Substation. At this place seed potatoes treated with hot formalin yielded 13,145 lbs. per acre, with corrosive sublimate 11,935, with cold formalin 11,100, and untreated 8,360 lbs.

[Crop experiments in Indiana] (*Indiana Sta. Rpt. 1927, pp. 8, 22–24, 60, 61, 62, fig. 1*).—Application of superphosphate (acid phosphate) and of commercial fertilizer in the rotation corn, wheat, and mixed clover and timothy on slightly acid Crosby silt loam on the Herbert Davis Forestry Farm resulted in profitable increases, whereas liming gave small, unprofitable increases. Manure alone at the rate of 5.2 tons per acre produced crop increases worth $2.25 per ton of manure applied. On the Purdue-Vincennes Farm wheat receiving complete fertilizer or superphosphate and manure gave substantial increases over no treatment, and further increases resulted from additional spring dressings of 100 lbs. of ammonium sulfate or sodium nitrate.

Nationality tests with red clover recommended for Indiana only seed grown in the northern central States and Canada. Purkoff and Purdue Hybrid SA321 led the wheat varieties.

[Field crops investigations in North Carolina, 1926–27], C. B. Williams and C. D. Matthews (*North Carolina Sta. Rpt. 1927, pp. 18, 22, 33–36, 80–86*).—Crop rotation experiments, variety tests with wheat, corn, oats, rye, barley, soy beans, and vetch, comparison of potato sources, and breeding work with corn and soy beans are reported on briefly.

In tests of small grains for winter cover and spring hay, Abruzzi rye produced more green material and was ready to turn under earlier than any other small grain seeded at the same time. Early seedings made much heavier growth to turn under and also produced larger hay yields than later seedings. Oats and a barley-oats-wheat mixture yielded more hay than either wheat or barley sown alone.

On land plowed 8 in. deep or disked 4 in. deep, level or ridged, and rolled or not in preparation for corn and for soy beans in rotation at the Blackland Substation the same preparation usually gave best results for both corn and soy beans. Corn did best on the 8-in. plowing, while soy beans gave better returns on the 4-in. disking. With both crops flat cultivation gave decidedly larger yields than planting and cultivating on a ridge. The unrolled plats slightly outyielded the rolled.

Selection work for high oil content in soy beans showed that larger acre yields of oil could be obtained by selecting for higher total acre yields than for increased oil content. A high percentage of oil was found associated with low protein, and vice versa. No correlation was observed between the percentage of seed in individual plants and their progeny. No strain was consistently high or low in oil percentage during the 7 years grown, the seed yield from the different strains varying much more than the oil percentage. Certain pedigreed strains appeared to mottle worse than other strains of the same variety. Environmental and physiological conditions seemed responsible for certain variations in mottling. Plants grown from seed produced at Raleigh (390 ft. elevation) bloomed and ripened from 5 to 10 days later at both places than did plants from seed grown at Swannanoa (2,250 ft. elevation and about the same latitude).

Potatoes stored June 29 in crates in a sweet potato storage house showed 1.2 per cent loss from decay on September 10, and the sound tubers were smooth, firm, and just beginning to sprout, indicating again that sweet potato storage houses in eastern North Carolina can be used to keep early crop potatoes through the summer. The closer spacings again gave the higher yields, and whole seed decidedly outyielded cut seed.

Storage tests with sweet potatoes at the Coastal Plain Substations showed heavy storage losses due to late digging. Although immature sweet potatoes do not keep so well as mature roots, the loss from digging too early was small in comparison with the loss from cold. During a dry season mineral nitrogen gave better yields than organic nitrogen when used as the sole nitrogen source. A high percentage of potash gave increased yields at the Upper Coastal Plain Substation, but was not outstanding at the Lower Coastal Plain Substation. Close spacing seemed preferable, particularly in seasons with plentiful rainfall.

[Field crops experiments in Texas] (*Texas Sta. Rpt. 1927, pp. 43, 44, 49–51, 52–55, 56–58, 78, 79, 85, 86, 87–89, 90, 91, 94–96, 98–100, 101, 103, 104, 105, 107, 113, 114, 115*).—Agronomic studies reported on from the station and substations included variety tests with corn, oats, wheat, grain sorghum, broomcorn, barley, sugar beets, alfalfa, cowpeas, and miscellaneous grasses and legumes; cultural, including planting tests, with corn, grain sorghum, sorgo, and Sudan grass; fertilizer tests with crops in rotations and rice; a curing test with broomcorn; breeding work with oats, wheat, corn, grain sorghum, rice, and alfalfa; inheritance studies with corn and grain sorghums; and crop rotations. Outstanding among new varieties were Nortex and Frazier oats, Denton wheat, Texas Blackhull kafir, Chiltex and Premo grain sorghums, and Texas Fortuna rice.

Crosses among 11 genetically distinct types of prematurely germinating seeds of corn indicated that complementary and multiple factors are involved. The ratios 45:19 and 135:121, obtained among other ratios, seemed to be the result of interaction of one pair of complementary factors with two and three pairs, respectively, of multiple factors, and are possibly reported for the first time. Studies with plants of an F_1 of sugary endosperm×rice pop corn, which regularly produces a 10 per cent deficiency of sugary seeds, indicated further that differential pollen tube growth is an underlying cause of the deficiency of recessives always found in this cross. Another study bearing on the differential reaction of the sugary gene in corn is described briefly.

Preliminary analysis of yields from protracted variety-date tests with corn indicated that the early plantings always average higher than the later ones over a period of years, although the medium and late plantings excel in some seasons. The loss in yield due to late planting varies with the locality, season,

and variety. It has ranged from 24 per cent at Angleton to 33 at Nacogdoches when all varieties are averaged. Surcropper showed the smallest reduction on this account.

Sulfur as a fertilizer did not significantly affect yields of cotton, corn, and oats when used up to 1,500 to 2,000 lbs., whereas larger quantities reduced the yields, indicating that sulfur is not needed on the soils tested. Used at Troup for cowpeas, either 250 or 500 lbs. of sulfur per acre did not increase the seed yield, and like amounts were unprofitable at Nacogdoches.

Fertilizer tests with rice at Beaumont since 1915 indicated that 100 lbs. of ammonium sulfate per acre is the most profitable treatment. Addition of superphosphate (acid phosphate) did not increase yields, and heavier rates of ammonium sulfate did not seem to raise the yield proportionately. Ammonium sulfate appeared to be particularly effective and to result in the largest increase where rice is grown continuously. Application of fertilizer about 6 weeks after planting rice will generally give slightly larger yields but not enough to offset the increased cost. Intertillage of rice land for weed control has resulted in larger yields.

Study of the inheritance of chlorophyll deficiency in a kafir hybrid showed virescent yellow recessive to normal chlorophyll development. The segregation could not be explained on any single factor hypothesis but may indicate linked duplicate factors with approximately 25 per cent crossing-over. A number of correlations between pairs of head and plant characters in Standard Blackhull kafir are recorded. Crosses between two lines of kafir inbred for eight generations showed no heterosis, and reduction in vigor was not perceptible after ten generations of inbreeding. Crosses between milo and feterita, both in the durra group, displayed much more marked heterosis than crosses between kafir and feterita, assigned to different groups in the present sorghum classification. Investigation of hybrid vigor in sorghum has been noted (E. S. R., 57, p. 432).

Kafir made its best yields at Lubbock when spaced from 3 to 6 in. apart in 3-ft. rows and milo when spaced from 24 to 36 in. Its ability to sucker permits milo to adjust itself to available plant food and moisture at wide spacing, whereas kafir does not have this faculty to compensate for thin stands. Yields, as well as forage quality, favored spacing Sumac sorgo from 3 to 6 in. apart in the row. Grain sorghum yielded better from the later planting dates, largely because the fruiting period occurred during milder temperatures than in the case of early plantings.

Cultural experiments at Lubbock with cotton and grain sorghums showed that on the sandy loam soil in the area, which tends to drift during periods of high winds, and where only about 15 per cent of the total annual precipitation falls during winter, spring seed bed preparation by listing or plowing is as profitable as early preparation. Plowing or listing to a depth of 7 in. made higher yields of both crops than either shallow listing or shallow plowing. Deep plowing averaged about 2 bu. more milo per acre than deep listing, and deep listing about 1.5 bu. more than disking. Cotton on plowed land averaged 211 lbs. of lint per acre and on listed land 196 lbs. Late preparation, either by listing, or plowing, outyielded early preparation. Disking in preparing the seed bed for cotton averaged about 50 lbs. less lint than preparation by listing or plowing. Results with both crops at this substation and at Chillicothe, Spur, and Beeville demonstrated that when weed growth is suppressed, either by hoeing or by ordinary cultivation methods, the important phase of cultivation is accomplished. Cotton and milo hoed to keep down weed growth yielded about double the quantity of lint and grain, respectively, as on untreated plats where weeds were allowed to grow. Additional cultivation by cultivators with sweeps

resulted in a yield from 15 to 20 per cent larger than that obtained from hoeing only.

Corn production in New Mexico, J. C. Overpeck (*New Mexico Sta. Bul. 166 (1928), pp. 31*).—This is largely a revision of Bulletin 132 (E. S. R., 48, p. 133).

A southeastern Ohio silage problem, J. S. Cutler and W. Mahan (*Ohio Sta. Bimo. Bul., 13 (1928), No. 4, pp. 152, 153*).—It is desirable in southeastern Ohio to have silage cornfields near the barn, especially in the hilly section where distance greatly increases the labor involved in hauling. When, to meet this requirement, silage is grown continuously on a field, the nutrient needs of the crop and the supply of organic matter in the soil should be maintained by liberal manuring with both broadcast and hill or row applications of fertilizer for corn and the growing of a cover crop over winter. The silage yields of corn grown continuously during 11 years at the Belmont County Experiment Farm are tabulated.

[Cotton research in North Carolina], C. B. Williams (*North Carolina Sta. Rpt. 1927, pp. 23, 30–33, 36–39, fig. 1*).—Inheritance studies with cotton have thus far indicated that the fuzzy tip is a pattern character, is produced by a pair or pairs of characters distinct from those for naked and fuzzy seed, and evidently is not an intermediate stage between fuzzy and naked. In many variety tests pedigreed strains of Mexican Big Boll being improved at the station and substations had a greater money value per acre than other cottons with the same or a shorter staple, and in spinning tests these strains equaled and in some cases surpassed cottons of the same staple grown in the Delta and other areas reputed for cotton of superior spinning quality.

A method outlined for measuring drag (friction encountered when adjacent fibers are pulled apart) in lint cotton showed promise when tested on strains of Mexican Big Boll and Acala cotton. Preliminary drag tests showing decided differences between two bales of about the same staple were corroborated by drag tests made during the spinning trials. Studies in cooperation with the U. S. D. A. Office of Cotton Marketing on yarns spun from cotton varieties grown under similar and different conditions in North Carolina suggested that differences in the size of yarn studied have been largely responsible for the differences in strength noted in comparisons of varieties of the same strength.

Seed weighing 0.12 to 0.13 gm. each germinated almost as well as seed weighing 0.15 to 0.16 gm. and produced vigorous plants, whereas seed weighing 0.08 to 0.1 gm. germinated 40 per cent less than the heavy seed, 45 per cent more of the seedlings died, and the plants were much smaller on June 30. Seed of a Mexican Big Boll strain grown at Oxford under late summer drought and on defoliated plants were much lighter, gave 25 per cent less germination, and 20 per cent more plants died than from seed of the same strain grown under about normal conditions at Fayetteville.

Acid-delinted seed germinated quicker than machine-delinted seed, and both surpassed heat treated seed and untreated seed, which were about equal. Acid delinting seemed to cause a greater liability to rot during a cold, wet spell, especially when planting is early. The best advantage is had from delinting seed when the planting is medium to late. Planting to a stand with acid-delinted seed with corn and peanut planters was found quite satisfactory, about 1 pk. being used per acre. Delinting with acid and the heat treatment reduced the seed-borne disease, seedlings on the heat-treated plats showing slightly less disease.

April 30 plantings have outyielded earlier and later plantings at the Upper Coastal Plain Substation. Spacing experiments at the station and substations

showed that cotton can adapt itself to a wide range of conditions. The closer spacings, from 8 to 10 in. in the row on poor soils and from 10 to 12 in. on more fertile soils, averaging 2 plants per hill, have slightly outyielded the wider spacings and also fruited earlier. For maximum yields from 15,000 to 20,000 plants per acre uniformly distributed is generally recommended.

Cotton on Norfolk sandy loam at the Edgecombe Farm receiving complete fertilizer made 907 lbs. of seed cotton per acre and unfertilized 258 lbs. and at respective costs of 5.25 and 13.8 cts. per lb. On Cecil clay loam at Iredell Farm the respective yields were 925 and 171 lbs. and at costs per pound of 5.18 and 20.81 cts. Varying the phophoric acid percentage from 6 to 12 in a complete fertilizer did not materially alter cotton yields at the Upper Coastal Plain Substation, although the higher percentages of phosphoric acid markedly hastened maturity. As in previous years, varying the percentage of potash from 2 to 6 in a complete mixture did not affect yields materially. Contrary to previous results maximum yields came from the lowest nitrogen application, and yields decreased as the nitrogen rose from 3 to 7 per cent. The largest yield from a 10–4–3 mixture was obtained from a 1,200 lb. acre application. See also a previous note (E. S. R., 56, p. 435).

[Cotton investigations in Texas] (*Texas Sta. Rpt. 1927, pp. 46–49, 51, 52, 56, 78, 79, 87, 91, 96, 100, 101, 103, 105, 107, 113, 114*).—Studies with cotton at the station and substations embraced variety, cultural, and fertilizer tests, breeding work, inheritance studies, and ginning experiments.

Extensive varietal trials showed that such cottons as Mebane, Lone Star, Truitt, and Acala are widely adapted and generally suited to Texas. Certain cottons have more or less local adaptation, e. g., strains of the Rowden type are well adapted to east and north Texas but not to northwest Texas where strains of the Mebane type have excelled. The latter are also well suited to conditions in the humid part of the Gulf Coastal Plains. Cotton varieties originated in eastern cotton growing States generally have not been profitable in Texas, except where rainfall is abundant or under irrigation.

Promising pedigreed lines isolated by self-fertilization are characterized by high lint yields, high percentage of large 5-lock bolls, 45 to 50 per pound, early maturity, lint percentage ranging from 40 to 44, and lint from 1 to 1⅛ in. long.

In a study of certain characters in Belton cotton the percentages of vegetative branches and of 5-lock bolls varied considerably and the percentage and length of lint relatively little. Fairly significant positive correlations were observed between plant height and (1) number of vegetative branches, and (2) percentage of 5-lock bolls, and between lint length and percentage of 5-lock bolls. It did not seem possible to select in the variety for lint longer than 1⅛ in. without decreasing the lint percentage. The percentage of 5-lock bolls and of lint appeared to be inherited.

Noticeable decrease in the vigor of hybrid cotton plants was not evident after 6 years of inbreeding. A single factor appeared to be involved in the expression of lint percentage, lint color, plant color, and cluster type of boll formation, and two or more factors in the expression of fuzziness of seed, pubescence, and petal spotting. Linkage was observed between fuzziness and lint percentage. In hybridization studies normal green leaf was completely dominant to virescent yellow leaf, red leaf to virescent yellow leaf, and normal green leaf to leaf with plastid chlorophyll deficiency.

A study at Spur of the relation between the time of blooming and the maturity of cotton showed that much of the crop was set early in July and cotton blooming thereafter formed little of the total crop.

Spinning and fiber tests on cotton lint from different conditions of ginning showed that where optimum ginning conditions are provided the market value of the lint is increased from $5 to $7 per bale.

Cleaning low-grade cotton (Texas, crop of 1926), H. H. Willis (*U. S. Dept. Agr., Bur. Agr. Econ., 1928, pp. 15, pls. 3*).—The relative spinning value of cotton harvested by the picking, snapping, and sledding methods was tested in cooperation with Clemson Agricultural College, using the Harper strain of Mebane cotton grown under like conditions in 1926 at Lubbock, Tex. The snapped and sledded cottons had been passed through a boll extractor. See also an earlier note (E. S. R., 55, p. 896).

An average difference of less than one full grade was observed among the picked, snapped, and sledded cottons. The quantity of total visible waste removed from picked cotton and from snapped differed little, although the regular sledded cotton was lower in grade and averaged 4.05 lbs. more waste per 100 lbs. than the picked cotton. In spite of the extra cleaning, the average total visible waste removed from the sledded checks was slightly less than that from the regular sledded lots.

Yarns produced from picked, snapped, and sledded cottons averaged in strength from high to low in the order named, the differences being slight. Picked and snapped lots produced 22s yarn averaging above the new Draper standards, and the regular sledded lots averaged about the same as the standard, whereas the 28s, 36s, and 44s yarn averaged below the standards in strength. The sledded check lots averaged below the regular sledded lots in all cases, indicating that the fibers had been weakened or broken by the extra process of picking.

Outstanding irregularities were not noticeable in the strength or size of the skein lengths of yarn from any lot. Less trash was thrown out of the picked than out of the snapped on the fly frame roller beams and spinning frame guide boards, whereas more trash was ejected here from the sledded cotton. With the exception of 22s yarn, where end breakage during spinning was comparatively low for all yarns spun, the sledded cottons of both regular and check lots showed higher average rates of end breakage than did the picked or snapped cottons. Yarns of picked and snapped cottons were very similar in appearance when woven into a filling flush sateen as filling. The appearance of cloths with filling of yarns from regular sledded lots and check lots of sledded cotton was also similar, but all sledded lots showed consideraby more trash than lots of picked or snapped cottons.

Report of Tobacco Station at Windsor, 1927, P. J. Anderson, N. T. Nelson, and T. R. Swanback (*Connecticut State Sta., Tobacco Substa. Bul. 10 (1928), pp. 13–82, figs. 3*).—Burn tests, involving the strip and the cigar methods, on cigar tobacco grown in 1925 and 1926 on variously fertilized plats (E. S. R., 57, p. 333) showed that ammonium sulfate seriously lowered the fire-holding capacity, and that dark muddy ash, uneven burn, and coaling also characterized the cigar test. To a lesser extent large quantities of dry ground fish in the fertilizer mixture also lowered fire-holding capacity, whereas the effect of tankage was not pronounced. Results with sodium nitrate not entirely conclusive did not indicate impairment of burn seriously if at all. Urea did not affect fire-holding capacity, but increased the whiteness of ash. Much phosphorus lowered fire-holding capacity in the strip test, but made no difference in the cigar test. Potassium chloride almost destroyed the fire-holding capacity, and potassium-magnesium sulfate lowered it when compared with high-grade potassium sulfate. In tests of potassium salts the differences in fire-holding capacity were not large, the results ranking the carbonate first, nitrate second, and sulfate

third, and ash characters in the same order. According to the strip test, heavy liming reduced the fire-holding capacity, whereas in the cigar test the fire-holding capacity was good. Considering whiteness of ash and closeness and evenness of burn, the cigars from the limed plats ranked highest. Factors influencing burn, the judging of burn, and methods of testing the burn are discussed briefly.

Chemical analyses reported by E. M. Bailey and Anderson indicated that different sources of fertilizer nitrogen have not substantially affected the quantity of total nitrogen, ammonia nitrogen, nitrate nitrogen, or nicotine in the leaf, nor the ratios between them. The percentages of total nitrogen, of ammonia nitrogen, and of nicotine are invariably higher in the upper than in the lower leaves, while nitrate nitrogen is more abundant in the lower leaves. The several fertilizer treatments evidently did not alter appreciably the percentages of total ash, soluble silica, iron, calcium, magnesium, phosphorus, or potassium in the leaf. Increased percentages of manganese, sulfur, and, to a less degree, alumina in the leaves were found in tobacco from plats treated with ammonium sulfate. The lower leaves (seconds and lights) had larger percentages of total (crude) ash, potash, and calcium, and smaller percentages of phosphorus, nitrogen, and chlorine than the upper leaves (darks).

According to M. F. Morgan and Anderson, ammonium sulfate was the most effective of the nitrogen sources in changing the soil reaction, consistently making the soil more acid, while sodium nitrate had an opposite although lesser effect. A slightly more acid condition followed urea after the initial period of rapid ammonia formation ended, and also dry ground fish and tankage, whereas no appreciable change followed cottonseed meal or, in limited trials, potassium nitrate or calcium nitrate.

Yields and gradings over 3 years suggested that urea may be used advantageously to furnish part, probably up to one-half, of the fertilizer nitrogen.

In tests of single sources of nitrogen, plats receiving cottonseed meal, castor pomace, and urea maintained a normal green color throughout a very wet season, whereas growth disorders, e. g., magnesium hunger, were noted on mineral plats. Sorting records indicated that good quality tobacco was produced by cottonseed meal and castor pomace. Sodium nitrate tended to produce harsh, dry, nonelastic, yellow tobacco, tobacco receiving urea was of fair to good quality, while ammonium sulfate produced coarse, veiny (white and prominent veins), dark, heavy tobacco in all grades, although it led the nitrogen sources in yields. Calcium nitrate decidedly surpassed sodium nitrate for the year.

Fractional application tests again demonstrated that no advantage is to be gained by applying the same quantity and kind of fertilizer in several applications instead of one. A serious decrease in yield and quality appeared when the total ammonia applied fell below 126 lbs. per acre, and improvement was noted when it rose to 216 lbs. The low yields due to nitrogen deficiency in the soil seemed also to be correlated with poor quality. The results supported the view that to most crops nitrogen should be applied early.

When manure supplemented commercial fertilizer the yield and grade indexes were generally higher than where no manure was added. Stable manure and Adco manure used as supplements were about equally efficient in increasing the yield and improving the quality of the tobacco, both in a dry year and a wet year.

Studies by Morgan showed that the amount of organic matter in all Connecticut soils is evidently much higher than in similar soils in States farther south along the Atlantic seaboard, probably because of climatic differences. Compared to the somewhat heavier upland soils in the State, the tobacco soils

are significantly lower in organic content, and within the tobacco district the excessively sandy soils are the more deficient in organic matter. Study of the plats in the nitrogen series at the Windsor Substation on Merrimac sandy loam gave indications that neither in 1925, after 3 years of various treatments with combinations of organic and mineral forms of nitrogen, nor in 1927, after 5 years of such treatments, nor between 1925 and 1927 was there any appreciable effect upon the amount of organic matter in the various plats. Comparison between 130 tobacco fields cropped for various periods showed that there is no significant decrease or increase in the organic content of soils under tobacco culture of the type usual in Connecticut, except in the excessively sandy soils, indicating that the decomposition of organic matter must be constantly offset by the return of organic matter to the soil.

In the 1927 experiments all winter cover crops except timothy resulted in increased tobacco yields. The grade index was higher after all crops except vetch, which seems to have resulted in heavier and darker tobacco. The best results followed oats, barley, rye, and wheat.

A brief discussion by G. P. Clinton and F. A. McCormick deals with the history, effects, probable causes, characteristics, and preventive measures for tobacco mosaic.

[Tobacco investigations in North Carolina], C. B. Williams (*North Carolina Sta. Rpt. 1927, pp. 27–30*).—Experiments with tobacco in cooperation with the U. S. D. A. Tobacco Investigations were carried out on Durham sandy loam at the Tobacco Substation. Cottonseed meal has been one of the best nitrogen sources, with sodium nitrate next in efficiency and ammonium sulfate giving good results on limed plats. A combination of organic and inorganic nitrogen surpassed any single source. Superphosphate (acid phosphate) was the best source of phosphoric acid. Among new nitrogen sources tested urea and Leunasalpeter of the synthetic forms and ground fish of the organics showed promise.

Potassium chloride produced better yields and acre value than potassium sulfate, although the burning quality of the cured leaf was inferior when the larger quantities of potash were used in the form of the chloride. The regular increase in yield and quality accompanying increase of potash indicated the use of a minimum of from 40 to 60 lbs. of potash per acre, of which not more than 20 lbs. should be derived from potassium chloride. Indications were, however, that a very small quantity of chlorine is desirable for tobacco. When different potash carriers were added on plats receiving magnesium limestone, calcite, or no lime, the plats with magnesium limestone gave the best yields and quality with no sand drown, whereas the disorder occurred on all plats of the other two series except where potassium-magnesium sulfate was applied. Kainit plats gave a large tobacco yield, but the leaf quality was poor.

Quantitative tests showed that comparatively small amounts of available magnesia in the soil will prevent sand drown. It can be supplied from magnesium limestones or from potash salts carrying considerable magnesia, e. g., potassium-magnesium sulfate.

Investigations concerned with the effects of crops on following crops showed that cotton and corn do well after all the legumes but yield more after vetch and clover than after soy beans and cowpeas, whereas tobacco did better after fallow and grasses than after any of the legumes. It was observed that tobacco fair in quality and yield may be grown after cowpeas or soy beans plowed under if phosphoric acid and potash be added liberally and the tobacco spaced reasonably close in the drill, topped high, and harvested by priming. Tobacco plants 18 in. apart in the row gave better yields per acre and quality than at wider spacings.

Testing of New Zealand-grown wheats, I, II (*New Zeal. Jour. Agr., 35 (1927), Nos. 3, pp. 150–153; 5, pp. 289–294*).—Samples of wheat from the 1926 and 1927 crops were subjected to milling and baking tests similar to those noted earlier (E. S. R., 55, p. 437).

I. *Milling qualities*, L. D. Foster and F. J. A. Brogan.—Queen Fair led the varieties of the 1926 harvest, with 77.4 per cent of flour. Other leading varieties included Yeoman, White-straw Tuscan, Dreadnought, Jumbuck, College Hunters, Goldberry, and Major, with from 76.8 to 75.2 per cent of flour. College Hunters, the leader of the 1927 harvest, with 77.7 per cent, was closely followed by Goldberry, Major, XI/27, Queen Fair, Trifolium 14, and Yeoman II. The 1927 wheats tended to give the higher flour yields.

II. *Quality of flours*, F. J. A. Brogan.—Analyses showed the average protein content of flour from the 1926 series to be 9 per cent and from the 1927 series 7.7 per cent. The quality of the flour from the latter group was also considerably lower. Data for five varieties showed wheat from one district to be consistently better than that from another district.

[Weed control investigations in California] (*California Sta. Rpt. 1927, pp. 41, 42*).—In field and laboratory studies by P. B. Kennedy, after intensive cultivation lasting for 2 and 3 years had ended, much morning-glory (*Convolvulus arvensis*) appeared on the surface within a few months. The ordinary cultivation practiced in orchards tended to increase the infested area. A morphological study showed that when a root or a rhizome is severed numerous leaf buds are formed at or near the cut end. It was demonstrated that arsenical sprays may be absorbed and carried down into the roots 5 or 6 ft. deep under favorable conditions. Roots not represented by leaves at the surface at the time of spraying are not injured. Certain plants will be killed outright, while others near by may not be affected much beyond the soil surface. With plants growing on dry soil arsenic kills the roots deeper than plants grown on soil with enough moisture. For maximum penetration of the arsenic the leaves should be kept moist for some time after spraying. The quantity of arsenic used in the spray did not detrimentally affect crops grown on land sprayed for morning-glory eradication.

When planted on the surface of sandy soil, 40 per cent of the burs on puncture vine (*Tribulus terrestris*) germinated, and maximum germination, 55 per cent, was had in garden soil with burs planted 0.5 in. deep, whereas no germination occurred with burs planted 2 in. deep or more in sand or garden soil. A 50 per cent oil emulsion was more effective than a 25 per cent emulsion in destroying seed in matured burs. From 3 to 5 seeds and several nonfunctional seeds were found firmly imbedded in each bur, with not more than 3 germinating from a single bur. *Oxalis corniculata*, a pernicious lawn weed in the Bay region and spreading widely, was not controlled by chemical sprays.

HORTICULTURE

[Horticultural investigations at the California Station] (*California Sta. Rpt. 1927, pp. 51, 52, 57–60, 64, 65, 85, 86, 91–95, 99, 100*).—The usual annual report (E. S. R., 57, p. 234), including the results of studies in lettuce germination. Work on the storage of the garden pea indicated that very rapid changes in the amounts of the various chemical constituents occur at temperatures above 8° C. (46.4° F.).

Progress is noted in orchard management studies with citrus at Riverside (E. S. R., 59, p. 335). Among various citrus forms being studied relative to their value as rootstocks are selected strains of sweet orange, mandarin orange,

grapefruit, sour orange, rough lemon, and two hybrid types. Observations to date suggest that the sweet orange is probably the best stock to use in California for lemon varieties, with the rough lemon and the grapefruit as second choices. The sour orange has in many cases given poor results. Varieties of orange and grapefruit grew rather slowly but were healthy on sour orange roots. Sour orange, however, because of its resistance to gummosis and its adaptability to heavy soils, proved to be satisfactory as a stock for sweet orange on heavy soils in the coastal region and on heavy adobe soils in Tulare County.

As determined by H. B. Frost, six of the thick-leaved forms among the apogamic citrus progeny under study, in addition to the four previously reported, were found to have the tetraploid number of chromosomes. Two triploid hybrids were found with 27 unreduced chromosomes. In Matthiola breeding additional evidence was obtained for the monohybrid segregation of long and short first-metaphase chromosome shape. The gene for the compact growth habit characteristic of certain races was found to be associated quite closely with one of the pairs of genes determining pubescence.

Studies in propagation indicated that twig cuttings of orange, lemon, and pomelo may be successfully rooted, and that an exposure to low temperature (33° F.) for two days before placing in the bed increases the percentage of success. Root cuttings were induced to form rootlets by grafting a leafy scion thereon.

A new method of obtaining sap from the conducting vessels of trees is reported by J. P. Bennett. The Burton and Stuart prunes were found to be partly self-fertile.

In studies of the chemical composition of citrus trees, S. H. Cameron reached the preliminary conclusions that free reducing substances and sucrose are very low in amount and nearly constant; that starch is present in greatest amount during midwinter and declines to a minimum in late summer, after which it gradually increases; that starch fluctuations are greatest in the root system, especially in the root bark; and that moisture content is lowest in midwinter and highest in late summer.

Observations are given on various fig varieties and species. It was noted that the Brown Turkey fig possessed the desirable characteristics of closing the eye or ostiolum, thus preventing the entrance of harmful insects. I. J. Condit records the number of chromosomes in the root tip cells of *Ficus carica* as approximately 26. Pruning studies with the Sevillano olive led to the conclusion that heavy pruning of olives materially decreases yields. Moderate winter pruning or thinning of fruit is deemed necessary, however, to prevent overproduction. As noted by R. W. Hodgson and Cameron, the Deglet Noor date appears particularly sensitive to abnormal weather conditions.

Muskmelons developed by two generations of inbreeding were observed to differ significantly from each other in various fruit characters. Storage for 4 days or longer at 4° C. (39.2° F.) caused the breakdown of green picked tomatoes. Temperatures between 12 and 15° are believed most suitable for tomato storage. Male asparagus plants outyielded female plants by approximately 35, 50, and 50 per cent during the first, second, and third cutting seasons, respectively. The storage of Ebenezer onion bulbs at 7.5 and 12° for several months prior to replanting greatly stimulated seed production.

A. J. Winkler, working with 11 varieties of table grapes, found further evidence that severe pruning decreases the germinability of the pollen and the set of the berries. Selection of grape cuttings by the iodine-starch test and the use of oxidizing chemicals to stimulate rooting are again discussed (E. S. R., 57, p. 240.). The dipping of callused grape grafts in a 0.001 M manganese

sulfate solution instead of ordinary tap water increased the percentage of rooting in certain Phylloxera-resistant rootstocks. Field studies by H. E. Jacob upon the cause of the death of grapevines in the Imperial Valley indicated that chlorine is the toxic ion in certain cases. Soil and moisture were contributory factors in their bearing on root growth and soil conditions.

[Horticultural investigations at the Idaho Station] (*Idaho Sta. Bul. 160 (1928), pp. 25, 26*).—In measurements taken on apple trees under clean culture comprising a fertilizer study at Dalton Gardens relatively little difference was found in average terminal growth that could be attributed to fertilizers. Early Jersey Wakefield and Copenhagen Market cabbages failed to respond to fertilizer. Records taken on 70 different varieties and strains of tomatoes showed yields ranging from 5,172 to 34,025 lbs. per acre.

The pressure test was found the most reliable index to proper picking maturity of prunes for storage. Skin color was also a fair index to maturity. The hydrometer and acidity tests were too variable in result to prove practical. Early-picked fruits held up longest in storage but failed to develop satisfactory quality. Shriveling was a cause of heavy loss of prunes in storage. Sunshine was found an important factor in determining the ripening rate.

[Horticultural investigations at the Indiana Station] (*Indiana Sta. Rpt. 1927, pp. 9, 44–46, fig. 1*).—This is the customary annual report (E. S. R., 57, p. 634).

In pruning studies with 9-year-old Grimes apple trees light pruning continued to give the best results. Pruning out the tops of previously nonpruned trees did not give any apparent increase in yield. With young peach trees at La Fayette, thinning out of branches with a light heading back gave better results in growth than did severe heading back. The Rochester, Gold Drop, Belle, Champion, and Heath Cling peaches were found quite hardy in the bud. Observations on 4-year-old Rome, Stayman, Winesap, Delicious, and Grimes trees pruned in various amounts showed the lightly pruned trees to be larger in all cases. Peach pruning studies at Vincennes showed thinning out to be better than a general heading back, except in the case of old trees. Summer pruning of bearing peach trees that had been kept open by pruning was found profitable.

Shredded oiled paper protected Grimes apples from scald while in cold storage. Observations on apples stored in the new storage chambers at La Fayette showed more scald at 36° than at 31° F. In the cool autumn of 1926 the use of ice in ordinary cool storage did not give marked results, leading to the question whether the use of ice is profitable under such conditions.

Tomato selection work was continued with good results. Analyses of tomato fruits showed that the several parts of a fruit have different chemical composition. The outer and inner wall portions may carry more high quality characteristics than other portions. An association was observed between soil moisture and the quality and yield of tomatoes. A decrease in soil moisture increased color and certain solids, while an increase in moisture increased yields. Observations on tomato plants fertilized in several ways showed the distinct effect of fertilizers. Nitrogen-starved plants were stunted and light green, phosphorus-starved plants were stunted and dark green, and potash-hungry plants showed a characteristic spotting of the foliage and a dropping of the lower leaves.

[Horticultural investigations at the North Carolina Station], C. D. MATTHEWS (*North Carolina Sta. Rpt. 1927, pp. 16, 72–80, 87–89, fig. 1*).—The usual annual report (E. S. R., 57, p. 236).

That nitrates are rapidly leached from the soil in the sand hill section of the State was indicated in analyses made, under the direction of C. B. Williams, of samples taken to a 4-ft. depth. It is suggested that frequent small applica-

tions of nitrate of soda in addition to the regular spring treatment of complete fertilizer are advisable for peach trees. Appreciable quantities of arsenic were found in trees apparently killed by winter injury.

Studies at the Coastal Plain Branch Station with strawberries indicated that cottonseed meal and fish scrap may be satisfactory sources of nitrogen for this crop. Ground dolomitic limestone applied at the rate of 1 ton per acre decreased the size and the quantity of berries. The unlimed plats not only outyielded the limed plats in almost every case, but also produced larger berries. Of the various early ripening apples tested at the Coastal Plain Station, the Livland Raspberry, Williams, Eckel, Red Astrachan, Early Harvest, and the Yellow Transparent gave the best results.

Pruning investigations conducted at the Mountain Station since 1919 showed a material reduction in diameter growth of heavily pruned Rome, Winesap, Stayman Winesap, and Delicious apple trees as compared with lightly pruned trees of the same varieties. The lightly pruned trees also came into bearing earlier and produced more fruit than the heavily pruned trees. Records are given on the trunk diameter of Bonum and Delicious trees planted in 1924 and given differential fertilizer treatment, but no definite conclusions are drawn.

Preliminary storage studies in an air-cooled house at the Mountain Station indicated the value of such structures. Very little difference was found in peaches tested for bud hardiness in the Mountain region, but the Crosby, Engle, and Kalamazoo were outstanding with respect to hardiness of trees. Nitrate of soda applied to peaches just before blooming, at the rate of 1 lb. per tree, significantly increased yields but reduced color in some cases due to the heavy foliage. The nitrated trees were also larger. Records taken at the Piedmont Station on the growth and yield of heavily and lightly pruned peach trees planted in 1923 showed the lightly pruned to be larger and more productive.

In a study of the nature and causes of winter killing of the peach, records were taken on trunk diameter, twig growth, foliage color, time of fruit bud differentiation, and foliage abscission of trees subjected to various cultural treatments. Apparently the healthy growth, promoted by added nitrogen, encouraged greater food storage and higher sap concentration during the dormant season, greater initial vigor in spring, a better set of fruit buds, and later defoliation in the autumn. Spectroscopic examination of alcohol extracts of the leaves indicated a slightly higher chlorophyll content in the nitrated trees.

Of 32 varieties of pecans tested, the Stuart and Schley proved most desirable from the standpoint of yield and quality. Pecans grew slowly and produced poorly in the Mountain and Upper Piedmont sections. Pecan breeding (male parent unknown) resulted in the production of some promising seedlings. The Schley and Alley pecans rated highest in cracking tests.

Breeding resulted in the production of several *Vitis rotundifolia* grape seedlings, most of which were self-fertile. Cultural treatment was observed to have as much if not more effect than inheritance on the size and compactness of the clusters. In general, self-fertile vines tended to set larger and less compact clusters. Shattering had the redeeming feature that the berries were less liable to tearing. Crosses between *V. rotundifolia* and other species generally resulted in sterile hybrids. One Malaga × *V. rotundifolia* seedling bore a few single-seeded fruits of excellent quality.

Physiological studies with the dewberry, although incomplete, suggested that nitrate of soda tended to increase yields, but with spring applications to soften the berries. Potash, on the other hand, apparently decreased the number of soft berries. It is suggested that nitrogen fertilizers may be best used after harvest.

[Horticultural investigations at the Texas Station] (*Texas Sta. Rpt. 1927, pp. 18–24, 86, 87, 89, 90, 91, 92, 110, 111, 112, 116*).—Studies with figs at Angleton indicated the fertilizing value of lime, the complete fertilizer plats being second in yield. In all instances phosphoric acid gave slightly increased yields of figs, but no appreciable results were secured with either nitrogen or potash. Sulfur in all instances decreased growth, and in large quantities, 750 lbs. and more per acre, killed the trees. Comments are made on various varieties of figs as grown at Angleton, Beaumont, and College Station.

Studies of the effect of potash fertilizers on the carrying quality of tomatoes are again reviewed (E. S. R., 57, p. 534).

At Weslaco grapefruit trees without cultivation yielded the heaviest crop and the largest fruits. It was found that approximately 50 per cent more water was required to irrigate these plats than the clean cultivated areas. Peaches at College Station suffered from a lack of a dormant period during the mild winter. The degree of pruning had but little influence on the subsequent growth of young peach trees. A record is given of various horticultural plants, including dates, introduced during the year.

In tomato fertilizer work at Troup, plats receiving 450 lbs. of superphosphate (acid phosphate) and 160 lbs. of nitrate of soda per acre produced the most marketable tomatoes. Potash in varying amounts had but little effect. At Angleton the Ischia, Brunswick, Lemon, Magnolia, and Black California varieties of figs proved promising. At Beaumont and Angleton, Bordeaux mixture applied during the summer season was effective in controlling rust on figs. At Beaumont the Magnolia and Brunswick figs gave good yields, but the former was found the better adapted. The Meyer lemon was promising at Beaumont, being apparently quite as resistant to cold as was the Satsuma orange. This lemon also showed promise at Weslaco.

Results of variety and strain tests with vegetables at Weslaco are cited. Marked variations were recorded between strains of the same variety of cabbage and other crops. The use of a 4–8–4 (N–P–K) fertilizer failed to increase significantly the yields of tomatoes and cantaloupes. Variety and yield tests with vegetables at Iowa Park are discussed.

Paper mulch for the garden, R. Magruder (*Ohio Sta. Bimo. Bul., 13 (1928), No. 4, pp. 144–147, fig. 1*).—A test in 1924 and 1925 of asphalt impregnated paper as a mulch for various garden vegetables failed to show consistent yield increases from its use. In 1924, a wet and cool season, tomatoes and beans were alone benefited. In 1925, a contrasting season, all crops except tomatoes were aided by paper mulch. In 1924 maturity was hastened in all crops except tomatoes, peppers, and early cabbage. The temperature of the upper 3 in. of soil under paper was higher during the night and early morning. Germination was from 2 to 3 days earlier on the mulched plats both years. Suggestions are given on the use of paper mulch.

Idaho recommendation chart for plant disease and insect control, C. Wakeland and C. W. Hungerford (*Idaho Sta. Bul. 159 (1928), pp. 55, figs. 4*).—Arranged alphabetically according to crops, information is presented on the manner and the time of control of various insect and fungus pests, supplemented by a discussion of the preparation and use of the more important control materials.

Early cabbage resistant to the yellows disease, R. C. Thomas and R. Magruder (*Ohio Sta. Bimo. Bul., 13 (1928), No. 4, pp. 142–144, figs. 2*).—By selection of resistant plants from badly diseased fields the authors succeeded in developing a strain of early cabbage showing marked resistance to yellows

disease. Sufficient time had not elapsed for selection to type, the heads being variable in shape. The strain was somewhat later in maturing than Golden Acre.

Sweet corn seed studies, A. T. Erwin and E. S. Haber (*Iowa Sta. Bul. 250 (1928), pp. 251–279, figs. 5*).—Records taken on the moisture content of maturing field and sweet corn showed the sweet corn to dry more slowly. The removal of the portion of the stalk above the ear failed in the case of Stowell Evergreen, Country Gentleman, and Crosby to influence significantly the rate of drying of the kernels, but did slightly lessen the average weight of 100 representative ears taken from topped Stowell Evergreen plants. Husking at the early denting stage, without detaching the ears, hastened the drying of the seed in the 1925 crop of Stowell Evergreen, and also in the case of Country Gentleman in 1927. Partial husking was not effective, since the covered kernels failed to dry with equal rapidity. Husking had the disadvantage of exposing the ears to bird injury. Corn in the shock failed to dry as quickly as that left on standing plants.

In kiln drying experiments, corn with an initial moisture content of approximately 25 per cent, carried at a temperature of 80° F., was reduced to 14 per cent moisture in 48 hours; corn containing from 40 to 45 per cent moisture was reduced at 95° to a 15 per cent moisture content in 72 hours; corn in the early denting stage with moisture 55 to 65 per cent was dried in 96 hours.

It is concluded that air warmed to 100° can be used without impairment of vigor provided a forced circulation and a relatively low humidity are maintained. Corn placed in drying ovens the temperature of which was 130° declined in 72 hours from 14.4 per cent moisture and 96 per cent germination to 3 per cent moisture and 77 per cent germination. At 140° there was a very decided loss in viability. It is advised that a 15 per cent moisture content is both safe and practical.

Comparative records on the behavior of seed harvested while in the dough stage and when matured on the stalk showed average germinations over a 5-year period of 92 and 96 per cent, respectively. In general, the seedlings from immature seed were not as vigorous, tended toward earlier maturity, and yielded slightly less than those from mature seed. A positive correlation was established between the vigor of the seedling and the yield of the resulting plant.

Sex ratios in cucumber flowers as affected by different conditions of soil and light, V. A. Tiedjens (*Jour. Agr. Research [U. S.], 36 (1928), No. 8, pp. 721–746, figs. 14*).—The fact that cucumber strains obtained at the Massachusetts Experiment Station by self-pollination differed when grown under like conditions in the proportion of staminate to pistillate blooms and in the location of the pistillate blooms is believed by the author to indicate that hereditary factors influence flower formation and position in the cucumber. Observations on plants of certain pure lines treated differently in respect to light and nutrients showed on fertile soil an increase in the number of staminate flowers as a result of additional light and a decrease in the case of below normal light. In unfertile soil the effect of light modifications was slight, there being noted a slight decrease in pistillate flowers in the above and below normal light series. During the short-day period of winter the use of supplemental electric light had an unusual effect in increasing the number of staminate flowers.

The removal of pistillate blooms at anthesis in every case increased the total number of pistillate blooms to form and reduced the ratio of staminate to pistillate blooms by at least 40 per cent. A cyclic production of pistillate and

staminate blooms was observed. The presence of fruit exerted an inhibitory effect on plant growth and on the production of pistillate flowers. Certain of the pure line selections under reduced light continued to develop an abnormal number of pistillate blooms which were often sterile and which failed to set seed, even though hand-pollinated, a fact considered due to an insufficient sugar supply to feed the growing pollen tubes. This heavy production of pistillate flowers was associated with a fasciation of the plant.

The degree to which various strains of cucumber could be influenced in the ratio of pistillate to staminate blooms by changes in environment differed considerably, suggesting that each type is flexible within certain limits and that these limits are controlled by the genetic composition of the plant. Preliminary data on the genetics of greenhouse cucumbers indicated that pistillate and staminate flowers result from factor genes on the chromosomes rather than from any difference in the number or shape of the chromosomes. Preliminary cytological studies failed to show any departure from the expected seven haploid chromosomes.

The author believes that sex in the cucumber is determined by some genetic factor mechanism which controls the metabolism in the plant rather than the actual character of sex expression, and that the ratio between staminate and pistillate flowers is the result of this nutrient condition. Sex ratio is considered as the result of a chemical balance in the plant which is probably the medium through which the control factors or genes exert their influence.

Cucumber growing, W. R. BEATTIE (*U. S. Dept. Agr., Farmers' Bul. 1563 (1928), pp. II+22, figs. 15*).—Superseding Farmers' Bulletin 254 (E. S. R., 18, p. 142), this presents general information on the importance and the location of the cucumber industry, culture in the field and under frames, pollination problems, control of insect and fungus pests, and the marketing of the crop.

Fertilizers for tomatoes, D. COMIN (*Ohio Sta. Bimo. Bul., 13 (1928), No. 4, pp. 147–151, fig. 1*).—Studies extending over a 4-year period, 1922–1925, indicated that nitrogen is the limiting factor in the production of tomatoes on the soil utilized in the test. Ammonium sulfate and nitrate of soda were practically of equal merit when used on limed soil, but nitrate of soda was superior on the unlimed areas. Superphosphate (acid phosphate) did not increase yields when used as a supplement to 8 tons of manure per acre. An application of 1,000 lbs. of ground limestone per acre gave small increases in yield according to the materials with which it was used. Manure was very effective in all instances. An application of 1,000 lbs. of 4–10–7.5 (N–P–K) fertilizer produced from 30 to 80 per cent more tomatoes than did half this quantity.

Grading tomatoes for quality, F. C. GAYLORD and H. M. CLEAVER (*Indiana Sta. Bul. 317 (1927), pp. 24, figs. 10*).—Data obtained in the 1927 canning season on a total of 3,518 tons of tomatoes received at 12 different canning factories, showed only 30.4 per cent grading up to the U. S. Standard No. 1, 50.6 per cent up to U. S. Standard No. 2, and the balance culls. Computations showed that while $12 per ton was paid to the grower, the usable tomatoes actually cost approximately $15, and that under the flat contract price system the careful grower delivering high-grade tomatoes was actually penalized. Both quantity and quality of tomatoes canned were increased by packing from graded stock. Emphasis is placed on the advisability of adopting a grading system in Indiana as a forward step in the tomato canning industry.

Fruits recommended for New York (*New York State Sta. Circ. 103 (1928), pp. 8*).—Accompanied by brief comments as to quality, soil adaptability, pollination requirements, etc., lists are presented of desirable hardy fruit varieties for various sections of New York State.

Spraying tree fruits, C. C. Wiggans and E. H. Hoppert (*Nebraska Sta. Circ. 36 (1928), pp. 28, figs. 15*).—A general discussion concerning spray materials and their preparation, spray equipment, and spraying practice. Spray schedules are presented for various fruits, with comments upon insect and fungus pests.

The removal of spray residue from apples and pears (*Oregon Sta. Bul. 234 (1928), pp. 38, figs. 3*).—This paper is reported in three parts.

I. *Chemical phases pertaining to the removal of the spray residue from apples and pears,* R. H. Robinson (pp. 9–22).—The results of various experiments upon the efficacy of the hydrochloric acid treatment are presented. The natural wax forming on the surface of ripening fruits was found to cover the lead arsenate particles and to render cleaning difficult, leading to the suggestion that fruit be harvested promptly and treated without delay. Combined oil and lead arsenate sprays were difficult to remove, actual analysis showing excess arsenous oxide above the accepted tolerance, even after two washings. Much of the trouble existed in the caked residue in the stem cavity. Abnormally heavy sprays left excessive residues difficult to remove. Dust deposits occurring on fruits in clean tilled orchards caused trouble, but laboratory studies suggested that this dust accumulation might be more easily removed if calcium carbonate, hydrated lime, or Bordeaux mixture were added to the regular spray.

Hydrochloric acid solution warmed to 90 to 95° F. was found more effective than cool acid in removing residues covered by small amounts of wax but could not effectively clean very waxy fruit or that sprayed heavily with oil. Wax formation was delayed by placing fruits in cold storage directly after picking. The addition of spreaders not containing lime increased difficulty in removing residues. In respect to the bearing of the number of sprays on residue removal, excess arsenic was found on apples sprayed but twice.

Recommendations are given upon the operation of commercial fruit washing machines and a description given of the apparatus and methods of determining the strength of acids.

II. *Effects of spray residue removal on the keeping quality of apples and pears,* H. Hartman (pp. 23–36).—It is reported that washing in acid when properly done results in no serious injury and may under certain conditions contribute to keeping quality. Wiping or brushing, on the other hand, may lead to injury and cause rapid weight losses by removing the wax. Hydrochloric acid in the solutions used did not at temperatures below 90° react with the wax; furthermore, the acid being volatile, disappeared from the fruit, even though not completely rinsed. The addition of lime to the rinse water gave promise as a helpful neutralizing agent. Very little difference in the percentage of blue mold and other storage diseases was observed whether the fruits were packed dry or wet, but it is suggested that the humidity of the storage room should be kept low during the time that wet fruit is being stored. No serious results in respect to keeping were observed with washing solutions below 110°, provided the treatment was relatively short. Noting injury in certain cases from the penetration of the acid wash into cores of the fruit, a study was made of various factors. Some penetration occurred irrespective of the manner of washing, but serious injury from penetration was confined almost entirely to baths which employed the deep submersion principle. No great amount of penetration was noted where fruits were floated on the surface, but even at depths of 3 or 4 in. much penetration occurred in slow washing. Little penetration occurred in the spraying and sluicing methods, except where the treatment was continued too long. Under like conditions an increase in the strength of the acid solution increased penetration injury.

Studies of the varietal factor in respect to open cores led to no definite conclusion. Large apples usually showed a higher percentage of open cores than smaller apples of the same variety. Trees bearing light crops usually bore a higher proportion of open cored fruits. Practically no open cores were observed in pears.

Calyx injury in apples was found associated with acid and with soluble arsenic and in the first case was almost entirely a result of improper rinsing. Deep submersion aggravated this condition. Soluble arsenic when moistened before or after picking was a frequent cause of calyx injury but was eliminated by prompt and efficient washing. Lime in the rinse water proved beneficial. No consistent differences were found in the rate of ripening of washed and unwashed fruits. The necessity of frequent renewal of the acid and of fresh water in the rinsing baths is emphasized. Wax development as related to varieties is discussed.

III. *Disinfectants*, H. Hartman and S. M. Zeller (pp. 37, 38).—The results of experiments upon the adding of various antiseptics to the bath to decrease the subsequent injury from rots are briefly discussed. Moderate quantities of materials such as formaldehyde, boric acid, and borax caused no serious injury to apples and pears. Formaldehyde in large amounts caused darkening of the flesh about wounds and in the core.

Training and pruning apple trees, F. N. Fagan and R. D. Anthony (*Pennsylvania Sta. Bul. 224 (1928), pp. 27, figs. 29*).—Pointing out the serious loss resulting from the breaking down of mature apple trees due to improper training, the authors outline and discuss a simple system of framework selection obtained by debudding of the yearling tree. Very little difficulty was experienced in inducing the selected buds to grow, and usually complete frame branches were developed the first season. Varietal peculiarities are emphasized and methods of treatment suggested.

Of 290 1-year Stayman Winesap and Grimes trees debudded in the spring of 1927, only 15 of the selected buds failed to survive, although 120 others formed only spur-like growths. Data on Northern Spy trees debudded following planting in 1927 showed the debudded trees to have made more total growth than trees pruned back in the customary way, and to require markedly less pruning the succeeding spring. After pruning, the debudded trees had slightly more branch growth remaining.

Information is given on the necessary follow-up pruning through the early years of the tree's life, and the relation of pruning to fruitfulness is discussed.

Grape pruning, F. E. Gladwin (*New York State Sta. Circ. 104 (1928), pp. 17, figs. 8*).—Information of a general nature is offered on the principles and practices of grape pruning, discussing the various methods of training, the structure of the grapevine, etc.

Vinifera or European grapes in New York, R. Wellington (*New York State Sta. Circ. 101 (1928), pp. 7*).—Discussing the planting, training, and propagation of vinifera grapes, the author briefly describes a number of pure vinifera varieties and hybrids which approximate vinifera in quality and appearance. Three of the hybrids, Keuka, Golden Muscat, and Urbana, are station seedlings.

Effect of topping on yield of coffee in Porto Rico, T. B. McClelland (*Porto Rico Sta. Bul. 32 (1928), pp. 8, figs. 5*).—Records taken over a 10-year period on the yield of coffee plants (1) unpruned, (2) untopped but pruned to the original stem, (3) topped at 6 ft., and (4) topped at 4 ft., showed a distinct loss in production of berries from topping and the subsequent removal of suckers necessary in this treatment. The average annual production per

plant during the first 3 years following the initiation of the experiments was not widely dissimilar for the 4 groups, being 2.3, 2.5, 2.2, and 2.0 liters, respectively, but for the entire 10-year period the average production was 2.8, 2.1, 2.1, and 1.6 liters, respectively.

In conclusion the author points out that although topping coffee trees considerably facilitates the collection of the crop and gives a well kept appearance to the plantation, these advantages are gained at the expense of yield and do not compensate for the heavy loss entailed. The growth and fruiting habits of the coffee plant are discussed in detail.

Chrysanthemums and pompons, W. W. Wiggin (*Ohio Sta. Bimo. Bul., 13 (1928), No. 4, pp. 130–141, figs. 4*).—Records taken on chrysanthemums growing on raised greenhouse beds, one of which consisted of freshly composted soil and the other of old soil which had grown flowers for two seasons, failed to show returns from the new soil sufficient to offset the cost of changing the soil. In large flowered varieties stem length was slightly longer in most varieties on new soil, and with pompons new soil increased the average number of shoots per plant, the average total number of flowers, and the average stem length. It is pointed out that the results do not apply to culture in raised benches. In respect to spacing of the plants, with three varieties of pompons and anemones 10 by 10 in. gave larger returns per unit area than did 10 by 14 in., but the danger of disease and insect injury was increased. Observations on the results of pinching out terminal buds of pompons indicated that early pinching is desirable, since late treatment tended to decrease the number of flowers to the plant and to the stem and to cut down the length of the stems.

FORESTRY

Why grow timber? W. N. Sparhawk (*U. S. Dept. Agr., Misc. Pub. 26 (1928), pp. II+14, figs. 4*).—A popularly written pamphlet, designed to instill confidence in the landowner in the planting of forest trees by pointing out the varied and manifold uses for wood and the dependence of the modern industries of the Nation on a permanent supply.

Growing pine timber for profit in the South (*U. S. Dept. Agr., Misc. Pub. 24 (1928), pp. 13*).—A compendium of brief popular articles prepared by lumbermen and others concerning the rates of growth, possible returns in lumber and naval stores, methods of management, etc.

[Forestry investigations at the California Station] (*California Sta. Rpt. 1927, pp. 76, 78*).—The usual annual report (E. S. R., 57, p. 242).

Tests of the seedlings of 10 species of western conifers to determine their resistance to high temperature showed even aged seedlings of all species to be killed at approximately the same temperature, about 132° F. for 4-week seedlings. Very young seedlings were killed at 120°. Some difference was noted in the ability of the several species to keep their tissues cool under exposure to high temperatures, this ability being proportional to the mass of the stem.

A growth study of *Abies magnifica* showed the distribution of trees by diameter classes in even-aged groups to be practically independent of age and site, in both spread of stems and skewness. Taper measurements on 445 *A. magnifica* trees showed that trees of the same form class have the same taper (inside bark and root swelling) regardless of size, age, or site. The taper was identical with that of second-growth *Sequoia sempervirens.*

Farm forestry (*Idaho Sta. Bul. 160 (1928), pp. 23, 24*).—A preliminary study in 1927 of the influence of windbreaks on the growth and yield of crops in an irrigated section showed both a beneficial and a deleterious effect. Wind pro-

tection which extended a distance approximately 20 times the height of the windbreak trees was offset by the competition of the roots of the trees with the farm crops. Alfalfa, clover, and other forage plants suffered less than did beans, potatoes, etc.

Yield variability in Hevea brasiliensis, H. ASHPLANT (*Nature [London], 121 (1928), No. 3061, pp. 1018, 1019*).—Commenting on the great variability in the yield of individual Hevea trees, the author reports the results of detailed anatomical studies on 250 trees in which he found a very distinct correlation, $+0.76 \pm 0.018$, between the diameter of the latex tubes and the yielding capacity of the trees. Considering only the yield per ring the correlation rose to $+0.83 \pm 0.014$. Since the diameter of the latex tube may be determined early in the life of the tree, the author believes that this should serve as a very valuable and practical index to the worth of the tree. Furthermore, an examination of the progeny plants showed that the diameter of the latex tube is strongly inherited. A correlation was also noted between the average cortex cell diameter and yield of latex, but this is considered much more difficult to establish.

DISEASES OF PLANTS

Plant pathology [at the California Station] (*California Sta. Rpt. 1927, pp. 83–85, 85–87*).—In continuation of the work on the internal rot of the fig, H. N. Hansen developed a method of control. This consists in injecting the inside of caprifigs with fungicidal solutions, thereby destroying the parasitic fungus and preventing its transmission by the Blastophaga insect.

A. G. Plakidas is reported to have been successful in transmitting strawberry yellows by aphids. In breeding experiments for resistance, some strawberry seedlings have been obtained which are said to show a high degree of resistance to yellows.

Investigations by M. C. Goldsworthy of some obscure troubles of fruit trees, commonly referred to as sour sap or winter trouble, have associated with them several bacterial organisms.

The pink root disease of onions was found to be caused by the genus Phoma rather than a species of Fusarium by investigations carried on by Hansen.

A report is given of the treatment of chlorosis of pear trees by a method devised by J. P. Bennett, in which iron salts were introduced directly into the base of the tree trunks. More than 6,000 trees were treated, with approximately 90 per cent complete cures.

A method for the control of pear blight cankers caused by *Bacillus amylovorus* was worked out by L. H. Day. The method consists in painting a solution of zinc chloride directly on the bark of the infected area without previous bark surgery.

Following a serious outbreak of peach rust, W. P. Duruz and Goldsworthy found that the best control was obtained by the application of an early fall spray of lime-sulfur solution. A dilute solution of the same material gave promising results as a summer spray.

In studies on the various phases of the rootstocks problem, M. J. Heppner and W. L. Howard report that black-end rot of Bartlett pears was associated with the use of the Japanese pear (*Pyrus serotina*) as a rootstock. This disease is said to occur much less frequently when the Bartlett is budded upon the French pear (*P. communis*).

[Miscellaneous investigations on plant diseases and their control] (*California Sta. Rpt. 1927, pp. 72, 73, 73–75*).—It is claimed that E. R. de Ong found that sulfur recovered in the purification of illuminating gas was superior to

available commercial types of sulfur in fineness of division of the individual particles. Such sulfur is said to cover a much larger leaf surface than coarser types and also drifts well in light air currents. Field tests with it showed good control of grape mildew, clover mildew, and apple mildew. Synthetic sulfurs made from purified gas into which hydrogen sulfide, hydrocyanic acid gas, and carbon disulfide have been introduced and that made from hydrogen sulfide alone did not give as high a toxicity in spore tests as did the recovered sulfur from the gas plant. It is believed to show a value aside from that of elemental sulfur in approximately a collodial condition for the hydrocarbon residue and probably from the sodium thiocyanate and nickel salts present in very small quantities.

From laboratory experiments by J. Tyler and field trials, potassium xanthate was found to cause a decided reduction in the population of garden nematodes (*Caconema radicicola*). Repeated trials have led to the conclusion that potassium xanthate combined with calcium phosphate, and preferably with a small amount of rapidly oxidizing sulfur, is worthy of practical trials for the control of the garden nematode in nurseries and seed beds instead of the more expensive method of steaming the soil.

Studies by H. H. Severin and T. E. Rawlins have shown that noninfective beet leafhoppers when fed on root juice pressed from curly-top beets in an advanced stage of the disease and filtered through a coarse filter transmitted curly top to sugar beets.

Severin and J. T. Rosa, jr., are said to have demonstrated that typical symptoms of western yellow blight of tomatoes developed when infected beet leafhoppers were transferred from curly-top beets to healthy young tomato plants. Noninfective beet leafhoppers when allowed to feed on western yellow blighted tomato plants and then transferred to healthy tomatoes and sugar beets transmitted the western yellow blight to tomatoes and curly top to sugar beets.

Plant pathology [at the Citrus Experiment Station] (*California Sta. Rpt. 1927, pp. 60–64*).—Studies on powdery mildew of cantaloupes were conducted by J. T. Barrett and P. A. Miller in the Imperial Valley and at Riverside, Calif. Collections were made of powdery mildew on a number of different host plants, and studies of the conidia showed that they compared very closely with *Erysiphe cichoracearum* from cantaloupes. Cantaloupe plants were successfully inoculated with conidia from dahlia and casaba. Sulfur applied to plants is said to injure them at temperatures above 16° C. (46.4° F.) All plants dusted with sulfur and held at 32.5° were killed within eight days, but no injury was noticed on plants held at a temperature of 11°. Applications of sulfur to soil proved injurious in proportion to the amount of sulfur used.

Investigations on walnut crown rot by Barrett and C. O. Smith are said to have shown the presence of *Pythiacystis* sp. in lesions on the white trunk of the English walnut. Inoculation experiments with the organism on other species of walnuts showed slight infection on the southern walnut and none on the English walnut when inoculated aboveground.

Barrett is reported to have isolated a species of Pythiacystis from diseased crowns and roots of rhubarb and a Fusarium from diseased avocado seedlings. He has also shown that *Colletotrichum gloeosporioides* and *Dothiorella* sp. cause important rots of avocado fruits.

H. S. Fawcett is said to have found severe spotting of Valencia oranges caused by *C. gloeosporioides* and *Alternaria citri*. An extensive decay of navel oranges was found to be due to the combined action of weather and growth conditions resulting in early maturity.

In tests of Prunus stocks resistant to crown gall, Smith is reported to have obtained good results with apricots on *P. mume* stock. Commercial varieties of peaches are said to have been dwarfed and were practically failures when grafted on *P. mume*. Certain varieties of *P. domestica* were found to be promising.

Studies by Smith on bacteria isolated from avocado fruits, lilac twigs, citrus blast, and apricot gummosis are said to indicate that the organisms were closely related. All produced black pits on lemons that were indistinguishable.

Internal decline or endoxerosis of lemon was studied by E. T. Bartholomew, and he found that overhead irrigation reduced the percentage of affected fruits. Bagging the fruits did not reduce the trouble. An inherent tendency of certain lemon trees to produce endoxerotic fruits was observed.

Plant pathology (*Idaho Sta. Bul. 160 (1928), pp. 26, 27*).—Further tests than those previously reported (E. S. R., 57, p. 740) are said to have shown that copper carbonate is the most economical and efficient material for stinking smut control. For oat smut control, the concentrated formalin spray method is said to have proved most satisfactory.

Hot formalin treatment preceded by sprinkling the tubers with water and keeping them moist for 48 hours was found an efficient method for the control of Rhizoctonia and scab of potatoes.

Extensive tests of various organic mercury compounds used as dips and dusts showed that they were less efficient and more expensive for seed treatment of grains and potatoes than the methods suggested above.

Greenhouse tests and field observations are said to have shown that symptoms of bean mosaic are most pronounced and more readily recognized at high temperatures. The spreading of mosaic is said to be more rapid where bean fields are close together.

Department of botany (*Indiana Sta. Rpt. 1927, pp. 29–32, figs. 2*).—In cereal rust investigations carried on in cooperation with the U. S. Department of Agriculture, additional physiologic forms of leaf rust were found. Resistance to leaf rust in wheat, barley, and corn is said to be inherited as a simple Mendelian factor. Instances were observed in which there was a change of reaction toward rust infection with increased development of the host. Field tests of selections and crosses of wheat varieties are said to have shown that 17 were outstanding for rust resistance. Sulfur used as a dust gave good control of leaf rust of wheat.

Miscellaneous rust investigations are said to have shown that resistance to rust in carnations is probably inherited as a dominant factor. Selections of snapdragons resistant to rust have yielded several rust-resistant forms. Dusting with sulfur is reported to have controlled the rust of snapdragons in the field.

In the corn disease studies, hybrid recombinations of root-rot-resistant inbred strains of several varieties of corn have given new strains that are said to have a wide range of adaptation and a high degree of tolerance to soil deficiencies. Some are said to serve as very sensitive plant indicators of phosphate and potash deficiencies. Tests of cornstalks and soils from representative fields in all of the more important corn-growing States are said to have shown a high degree of correlation between the condition of the stalks and the deficiencies and excesses of plant nutrients.

Cooperative experiments for the control of early blight of tomatoes are reported, in which 2 sulfur and 2 copper-lime dusts were applied to the plants in from 5 to 7 dustings. Increased yields of from 3 to 4 tons per acre were secured with the copper-lime dusts. Sulfur dusts are said to have injured the growing tips of the plants.

The winter blight or streak type of tomato mosaic was found to be due to a combination of virus of the ordinary tomato mosaic and of virus from potatoes. Practically all varieties of potatoes tested, healthy as well as mosaic, were found to contain the virus, and as a consequence potatoes are considered a menace to tomato growing.

Additional experiments on the control of apple blotch confirmed the previous year's conclusions regarding the time of application of Bordeaux mixture (E. S. R., 57, p. 638). The season was one of mild infection, and weak Bordeaux mixture (1–3–50) and lime-sulfur sprays gave about as good results as the stronger Bordeaux mixture.

Division of plant pathology (*North Carolina Sta. Rpt. 1927, pp. 95–105*).—Summary accounts are given of investigations pursued during the year.

[*Soy bean and other diseases*], S. G. Lehman (pp. 95, 96).—The leaf spot disease of soy beans caused by *Cercospora daizu* is said to be widespread in the State, and infected plants yield less foliage and seed. A second leaf spot disease, apparently due to *C. kikuchii*, is reported.

Treatments of soy beans with chemical disinfectants for the control of seed-borne diseases, such as mildew and bacterial blight, are said to have given inconclusive results, as no mildew appeared and bacterial wilt was present in only limited amounts on the untreated plats. Formaldehye and corrosive sublimate solution reduced germination of soy beans to some extent when the fungicides were used in quantities sufficient to destroy the parasites.

Comparative tests of strains of wilt-producing fungi from soy beans and cowpeas are said to have indicated that when grown on sandy loam cowpeas are more readily infected by strains of Fusarium from wilted cowpeas than from wilted soy beans. On coarse sand a greater number of cowpea plants succumbed to wilt than on sandy loam. A positive relation was found to exist between root injury by bean-beetle larvae and the amount of wilt infestation of cowpeas grown on infested soil. Soy beans were more resistant than cowpeas, and in none of the experiments was there observed to be infection by the cowpea wilt fungus.

Investigations of seed-borne diseases of cotton, carried on in cooperation with P. H. Kime, were said to have shown a high degree of mortality of field-planted seed due to diseases, in some instances from 50 to 66 per cent of the seed failing to grow.

In wheat rust investigations, some promising rust-resistant selections and hybrids are reported.

[*Studies of dewberry diseases*], R. F. Poole (pp. 96–99).—The control of blotch or brown spot caused by *C. rubi* was effected by a heavy application of a 4–4–50 Bordeaux mixture early in October. A new root disease of dewberries caused by *Collybia dryophila* is reported and described. This disease is said to be spread from place to place by diseased plants and within plantings by contaminated pruning shears. Experiments with various chemical treatments for the control of the disease are said to have shown that sulfur destroyed all the plants. The lime and some other treatments appeared to afford some protection.

Sweet potato diseases, R. F. Poole (pp. 99–105).—Studies of cultures of *F. batatatis* showed that the growth of the fungus was inhibited by various chemicals. Further tests in large pots indicate that Bordeaux mixture 1–1–10 and copper-lime dust reduced stem-rot infection without injury to the plants. A number of other fungicides tested either caused injury or were unsatisfactory for use under field conditions.

Culture experiments on the control of sweet potato diseases in storage and in transit showed that a great many chemicals are possibly excellent disin-

fectants for the fungi that caused rot of the sweet potatoes, but experiments do not indicate what effect they will have under practical applications. Treatments in storage houses are said to indicate that copper carbonate, Bordeaux mixture, copper sulfate and lime, and calcium oxide controlled soft rot caused by *Rhizopus nigricans*. In another series of experiments, Bordeaux mixture, calcium oxide, monohydrated copper sulfate, and copper carbonate controlled surface rot and soft rot.

Studies of the relative resistance of varieties of sweet potatoes to nematodes (*Heterodera radicicola*) showed that all strains of Porto Rico and Jersey varieties were so highly resistant that yields were not affected. On the other hand, Southern Queen, Norton Yam, Yellow Yam, Pumpkin Yam, Red Bermuda, and Nancy Hall were severely diseased.

[**Sulfur as a fungicide**] (*Texas Sta. Rpt. 1927, pp. 62, 63*).—Various forms of sulfur were tested for the control of mildew of roses and crape myrtles. Mildew was controlled on these plants so long as sulfur remained on the leaves. It is claimed that sulfur can be generally used for the control of mildew, but it causes severe burning on squashes, cantaloupes, and allied species. Tests were made of 26 formulas containing sulfur, but all caused burning of cantaloupe leaves. Histological studies were made of the leaves to determine the tissue changes caused by applications of sulfur.

Experiments were carried on with sulfur applied to the soil for the control of *Sclerotium rolfsii*, Pythium, Rhizoctonia, and Fusarium, but all the organisms were found to tolerate a wide pH range in soil reaction. Applications as great as 30,000 lbs. per acre were without effect on the control of the damping-off fungi. Sulfur naphthalene was found not to change the soil reaction, and further experiments with this compound are in progress.

[**Studies of chlorosis in Idaho**] (*Idaho Sta. Bul. 160 (1928), p. 16*).—Studies are said to have shown that chlorosis of apple and prune trees may be controlled by removing the soil about the tree so as to form a basin and placing therein 5 lbs. of iron sulfate, which is put in solution by the addition of water.

A study of Sclerospora graminicola (Sacc.) Schroet. on Setaria viridis (L.) Beauv. and Zea mays L., I. E. Melhus, F. H. Van Haltern, and D. E. Bliss (*Iowa Sta. Research Bul. 111 (1928), pp. 293–338, figs. 8*).—A report is given of studies on the host relationships of the conidial and oogonial stages of *Sclerospora graminicola*.

The authors report that species of Euchlaena, Setaria, Holcus, Saccharum, and Zea were susceptible to *Sclerospora graminicola*, *Setaria viridis* being the most susceptible of all hosts and pop corn more subject to attack than sweet or dent corn. Two species of Setaria, teosinte, and Japanese Hulless pop corn were infected when exposed to conidia of the mildew. Oospores are said to have overwintered under natural conditions in the field soil, and the overwintered spores gave nearly twice as much infection as oospores that had been kept in the laboratory.

The period of incubation of the oospores was about 6 days. Infection was obtained from the time the testa was broken until the emergence of the plumule above ground. Relative susceptibility of seedlings was found to decrease with age. Temperatures of from 15 to 16° C. were more favorable to infection than temperatures of from 24 to 30°. The germinating oospore is considered unable to penetrate the older leaf tissue. The viability of the oospores was little affected by soaking in 2 per cent copper-sulfate solutions for 10 minutes, while 1 per cent formaldehyde for 5 minutes destroyed them.

Spontaneous conidial sporulation was found to be comparatively rare on corn in the field. Infection was obtained on corn and teosinte planted in plats which

had been artificially infested with oospores. Infected plants were either killed outright or became stunted and unproductive. In Iowa, the mildew was observed only twice occurring naturally on corn in the field. The oospores which had been held for 30 months under dry conditions in the laboratory were found to be viable. Soil is not considered necessary as a medium for the germination of oospores.

Treatment for powdery mildew not effective (*Texas Sta. Rpt. 1927, p. 112*).—In a report on experiments carried on in the lower Rio Grande Valley it is shown that sulfur dust and Bordeaux mixture did not control powdery and downy mildew of cantaloupes. Bordeaux mixture is said to have produced a chlorotic condition of the leaves, while sulfur killed the foliage except on the growing tips.

Cotton root rot (*Texas Sta. Rpt. 1927, pp. 60, 61, 93*).—Infection experiments using roots from freshly wilted plants, pure cultures of the fungus, and spores of the fungus are reported upon. It was found that the best results were obtained when material from freshly wilted roots was used. No infection was secured with spores, and pure cultures of the organism did not prove uniformly successful.

During the year spots were found in central Texas where spores of the fungus were produced. Moisture is considered the limiting factor in spore production.

Studies on spore germination are said to indicate that germination takes place best at temperatures of from 110 to 130° F., and a small percentage of germination was secured when spores were subjected to a weak soap solution.

Tests made of numerous varieties of cotton to determine the possibility of resistance to root rot indicated that no variety in the test was resistant.

A detailed study was made of the causal organism (*Phymatotrichum omnivorum*). One of the accomplishments reported was the successful inoculation of cotton on bottom land that had never before had root rot. The disease when once started on this soil type thrived and spread as rapidly as on the typical Blackland uplands.

Lettuce investigations, C. D. Matthews (*North Carolina Sta. Rpt. 1927, pp. 86, 87*).—Following a preliminary report on tipburn of lettuce (E. S. R., 57, p. 249), investigations were continued on some of the conditions which favor the development of this trouble.

Tipburn was found to be more severe on plants under shade than in the open. Spraying with Bordeaux mixture and limewater gave no control. Ammonium sulfate was found to be detrimental to the growth of lettuce. Basic slag and nitrate of soda showed no important results in relation to tipburn. Tipburn was most abundant when a light rain was followed by a hot, humid day. In the experimental plats, early formed heads showed no tipburn until several days after they had reached the cutting stage. Later formed heads also escaped for a time, indicating that much loss could be avoided by early cutting.

Experiments are in progress to develop strains of Iceberg and Big Boston lettuce adapted to eastern North Carolina conditions.

Factors in the inception and development of Fusarium rot in stored potatoes, F. Weiss, J. I. Lauritzen, and P. Brierley (*U. S. Dept. Agr., Tech. Bul. 62 (1928), pp. 36, pls. 6, figs. 4*).—Under controlled conditions the authors made a study of some of the factors that contribute to Fusarium rots in stored potatoes.

Injury to tubers, high temperatures, moisture of tubers, and lack of ventilation in storage were found to be factors in the development of the rots.

The species of Fusarium most commonly found to cause rots in storage were *F. coeruleum*, *F. sulphureum*, and *F. trichothecioides*. *F. eumartii*, *F. radicicola*, and *F. oxysporum*, all vigorously pathogenic to potatoes, were able to infect tubers only slightly at temperatures below 10° C. (50° F.), whereas *F. sulphureum* and *F. coeruleum* produced infection and caused progressive decay down nearly to the lowest safe temperature for the storage of potatoes.

The direct effects on the growth of the pathogene of temperature, humidity, and rate of air exchange were found to be overshadowed by suberization and wound periderm formation of the tubers. The rate of healing of wounds was found to vary with the different varieties of potatoes.

It is concluded that the presence of moisture in the wound and its persistence there until infection has occurred greatly overshadows, in its influence on infection, the relative humidity of the atmosphere.

For prevention of storage rots the authors recommend careful handling to reduce mechanical injury to the minimum. Control is said to consist fundamentally in removing superficial moisture from the tubers as promptly as possible after digging and keeping the stock dry at least for the first four weeks of storage. So long as the stock is kept dry, the degree of humidity should be that most favorable for maintaining the quality of the tubers, but in general the higher the humidity the better. If the tubers are stored in small packages, as in slatted crates or bags piled with suitable dunnage, so as to provide thorough ventilation, the temperature need not be lower than from 4.4 to 7° for either the prevention of Fusarium rot or the maintenance of dormancy.

Studies on the mosaic disease of the tomato (*Indiana Sta. Rpt. 1927, pp. 53, 54*).—In cooperative experiments between the departments of chemistry and botany of the station, juice from mosaic tomato plants is said to have been separated into two fractions, a residue which contained the infectious principle causing typical tomato mosaic and a filtrate which produced fernleaf and filiform symptoms without any mottling. Repeated inoculations of tomato plants with the filtrate combined with potato juice failed to produce winter blight, but when they were inoculated with the residue in combination with potato juice winter blight was caused. It is believed that the filtrate does not contain typical tomato mosaic virus. It is claimed that the tomato mosaic virus has been separated from other constituents of the plant juice and secured in a clear solution of distilled water.

Pathogenicity of two strains of the tomato-wilt fungus, Fusarium lycopersici Sacc., H. H. Haymaker (*Jour. Agr. Research [U. S.], 36 (1928), No. 8, pp. 675–695, figs. 8*).—The results are given of physiological studies of two strains of *F. lycopersici*, which are considered typical representatives of the groups described by White (E. S. R., 57, p. 153).

The two strains are said to have shown markedly different characteristics in culture. Strain A proved to be very constant, while strain B was extremely variable. Without exception, strain A was more pathogenic than strain B, and the difference in pathogenicity could not be altered by regulating the soil temperature, increasing the spore concentration, or by using different types of inoculum. A soil temperature of 28° C. was found to be the optimum for the production of wilt in seedlings of two varieties.

The lack of stability displayed by different strains and the fact that variations in strain virulence were uniform on all host varieties tested are believed to make it inadvisable to establish varieties or forms of *F. lycopersici*.

Resistance in certain varieties of tomatoes is apparently correlated with two factors, the temperature range over which certain varieties are susceptible and

the possession of certain physiological characteristics that enable varieties to tolerate the final attack of the pathogene in spite of its invasion of the host tissues.

Relation of toxic excretory products from two strains of Fusarium lycopersici Sacc. to tomato wilt, H. H. HAYMAKER (*Jour. Agr. Research [U. S.], 36 (1928), No. 8, pp. 697–719, figs. 5*).—A report is given of experiments conducted to determine whether the excretory products of two strains are of equal toxicity, whether different varieties of the host show variations in susceptibility toward the toxic products of the causal fungus that are comparable to their reaction toward the pathogene, and whether there is any correlation between the effects of different temperatures upon the pathogenicity of the fungus and the toxicity of its metabolic products.

A definite correlation was found to exist between the pathogenicity of *F. lycopersici* and the toxicity of its metabolic products. The results are said to provide additional evidence indicating that final wilting is caused, at least in part, by toxic materials liberated by the fungus. They are also believed to suggest that resistance is influenced to some degree by physiological factors.

When tomato plants in the blossoming stage were treated with the filtrate from liquid cultures of the organism symptoms were produced similar to those occurring in older plants in the field. Varieties that were resistant to the fungus were likewise more resistant to the excretory products of the fungus grown in culture than were varieties strongly susceptible to the fungus.

Temperature and relative humidity were found to be important factors in causing wilting in plants inserted in fungal extracts. Those subjected to toxic materials produced under similar conditions wilted more quickly the higher the temperature and the lower the atmospheric humidity. The excretory products from cultures grown at 28° C. were more toxic than those produced at other temperatures.

The predisposition of the tomato to wilt at higher temperatures is considered to be due to a combination of factors: The vigor of the pathogene at temperatures ranging from 24 to 30°, the fact that at those temperatures the fungus produces excretory materials of greatest toxicity to the host plant, and at temperatures exceeding 30° the unbalanced physiological condition of the host plant renders it more subject to the action of the toxic products. The last-named of these is considered to be a factor of great importance, since temperatures from 30 to 32° were found to be more conducive to wilt production by the pathogene than those around 24°. The fungus is said to grow more luxuriantly and produces materials of greater toxicity at the latter temperature.

Tomato wilt disease, R. P. WHITE (*Kansas Sta. Circ. 140 (1928), pp. 5, fig. 1*).—The tomato wilt due to *Fusarium lycopersici* is described, the distribution and losses in Kansas indicated, and control measures suggested. The author states that spraying has proved of no benefit in controlling the disease, and rotation of crops has given only partial control. The only practical method of combating tomato wilt is believed to be the growing of resistant varieties. A report is made of a test of a number of varieties, in which Louisiana Red, Louisiana Pink, Marvel, Norton, Norduke, Marvana, and Marglobe proved to be resistant, while Comet, John Baer, Earliana, Jewell, Bonny Best, Grand Rapids, Beauty, Greater Baltimore, and others proved susceptible in all trials.

During the progress of the author's investigations several hundred crosses were made between varieties that proved wilt resistant and commercially grown wilt-susceptible varieties. As a result of the crosses a new variety known as Kanora was produced, which has outyielded all other varieties, whether wilt resistant or wilt susceptible, in the tests conducted at the station.

Infection studies with watermelon wilt caused by Fusarium niveum EFS., D. R. PORTER (*Iowa Sta. Research Bul. 112 (1928), pp. 345–368, figs. 9*).—While watermelon wilt is commonly described as a wilting of the seedlings characterized by a drooping of the cotyledons and by the presence of root cankers and wilting of the foliage of the older plants, the author describes new forms of the disease which he has observed. These are seedling rot, damping-off, and stunted growth due to the fungus.

It is claimed that the organism may cause lesions on any of the roots, and infection may be induced through the use of infested soil, by means of spore suspensions, and by the insertion of the mycelium into wounds. It is probable that the organism enters the host through the root hairs, root injuries, and through the epidermis of the hypocotyl. It flourishes best at high temperatures, the optimum in cultures being between 24 and 32° C. It flourishes on acid media, the optimum being between pH 4.6 and 6.0.

Black currant spreads white-pine blister rust, S. B. DETWILER (*U. S. Dept. Agr., Misc. Pub. 27 (1928), pp. 8, figs. 4*).—The relation of the black currant to white pine blister rust is pointed out. The cultivated black currant is considered to be largely responsible for the failure of efforts to eradicate the blister rust, and its eradication is recommended.

ECONOMIC ZOOLOGY—ENTOMOLOGY

[Report of work in entomology and parasitology at the California Experiment Station] (*California Sta. Rpt. 1927, pp. 68–72, 73, 75*).—Studies were made by E. O. Essig, F. H. Wymore, and L. M. Smith of the life history and control of the snowy tree cricket, which caused heavy loss to raspberry growers in the Santa Clara Valley. This cricket is of little economic importance in its nymphal instars, during which period it is omnivorous and largely predacious, but the adults show a decided preference for plant tissues and cause great damage by eating the flowers, buds, and young fruit of the second crop. The blue sharpshooter, *Cicadella circellata* Baker, also occurs in enormous numbers on the raspberries, although the extent of damage caused by the latter pest is not known. A number of sprays were tested and proved ineffective, but a mixture containing 50 per cent by weight of No. 10 nicodust and 50 per cent of a calcium cyanide dust containing about 50 per cent calcium cyanide was effective against the newly hatched nymphs but not against the nymphs in the fourth and fifth instars nor the adult tree cricket. When used at the rate of 4 lbs. to 100 ft. of row on newly hatched nymphs it will kill 80 to 90 per cent of the tree crickets and 90 to 95 per cent of *C. circellata* under favorable weather conditions.

In work by A. D. Borden in the Watsonville and Sebastopol districts, it was found that injury to the Newtown Pippin apple was caused largely by a new leaf roller, *Pandemis pyrusana* Kearf., and not by the skinworm as had been previously supposed. The early application of zinc arsenite followed by oil and lead arsenate proved quite effective against the larvae. Light traps failed to catch the adult moths, but molasses bait traps did so very successfully.

The eye-spotted budmoth was detected in three sections, this being the first record of its appearance in the State.

Life history and control studies of the skin worm, *Argyrotaenia* (*Tortrix*) *franciscana* (Wlshm.), were conducted in the Sebastopol district, where there were heavy infestations in several orchards. A summer oil spray is said to control the egg stage.

Life history studies of the common red spider (*Tetranychus telarius* L.), by J. F. Lamiman, show that the life cycle from egg to egg is passed in about

16 to 17 days at daily mean temperatures ranging from 68 to 83° F., and the number of eggs laid daily for the same temperatures is 1 to 13, with an average of 4.4 eggs per day.

In comparative tests made by Wymore with nicodust and calcium cyanide dusts of various mixtures for the control of onion thrips, a 5 per cent nicodust proved to be the most practical. The calcium cyanide dusts caused considerable burning when used strong enough to kill the thrips. Field experiments indicated that hydrated lime used as a carrier for poison dusts produced a toxic effect on cantaloupe plants. Sodium fluosilicate dusts of light and extra light grades caused considerable burning to both cucumber and cantaloupe plants when a rain occurred a few days after treating with the dust.

Work by Essig with paradichlorobenzene as a soil fumigant showed that young peach and apple trees may be severely injured and even killed if given treatments of more than 0.5 to 0.75 oz. to a tree. Little or no injury was apparent to trees over 4 years of age treated with a dosage of 0.75 to 1 oz. each. Excellent results were obtained in killing the Pacific peach tree borer and fair success in reducing the attacks of the pear root aphid and the woolly apple aphid.

A test by Essig in treating the mealy plum aphid on a dormant plum tree in January with miscible oil showed a 100 per cent clean-up as compared with unsprayed check trees.

The efficiency of the highly refined summer oil sprays was demonstrated in the control of mealybugs on a wide variety of hardy and succulent annual and perennial ornamental plants, such as columbine, clematis, delphinium, dahlias, gladiolus, roses, veronica, campanula, and geum, and also on loganberries, blackberries, raspberries, apple, plum, pear, etc. All applications of from 2 to 4 per cent concentrations made during the winter and spring months gave adequate control without appreciable injury to any of the plants. In the winter control of woolly apple aphids, the miscible oils gave much better satisfaction than did the highly refined white oils.

An application of commercial lime sulfur 1:10 in the Berryessa Valley, made in October, 1926, to demonstrate its control of the pear leaf blister mite, proved effective.

Studies of *Hippelates pusio* Lowe, a pest in the Coachella Valley, and of *Culiseta incidens* Theob. were under way by Herms in continuation of those previously noted (E. S. R., 57, p. 256).

A study by E. R. de Ong on the effect oxidation may have on highly refined spray oils has shown a correlation between the degree of acidity developed and foliage injury. It was found that such changes in the structure of an oil are important only with those of low volatility. The difficulties experienced in using nonvolatile oils led to the incorporation of active insecticides in a light petroleum oil and emulsifying the latter as usual. In this way the penetration and solvency power of the oil is utilized in carrying substances such as nicotine, paradichlorobenzene, and the nitrogenous bases extracted from petroleum directly into the tracheal tubes of the insect. Water, when used as a carrier, is not so successful as it does not dissolve the waxy covering of the insect nor penetrate the tracheae as does oil. Insecticides soluble in both water and oil tend to diffuse into the former on standing in the emulsion, even though present in the oil originally, hence insoluble forms such as certain nitrogenous bases and the chlorinated benzenes offer some advantage over nicotine, although the latter is more toxic. See also a note by de Ong on page 759.

An exploration of parasites of the beet leafhopper by C. F. Henderson, U. S. D. A. Bureau of Entomology, in cooperation with H. S. Smith of the

Citrus Experiment Station, has resulted in the failure to find the beet leafhopper in Argentina.

Work was conducted by G. H. Vansell in cooperation with the division of chemistry on methods of determining the chemical composition of nectar. The old idea that nectar was largely sucrose and that the bee inverted it to levulose and dextrose was found not wholly the case. Certain nectars were found to show almost equal amounts of sucrose and invert sugars.

[Report of work in entomology at the California Citrus Experiment Station] (*California Sta. Rpt. 1927, pp. 53–57*).—Fumigation work was carried on with calcium cyanide made by combining liquid hydrocyanic acid with calcium carbide, which produced a very fine powder carrying from 30 to 50 per cent hydrocyanic acid. Simple exposure of this powder to the atmosphere when the dust is blown into the air or spread as a thin layer on a surface results in the ready and complete liberation of hydrocyanic acid gas. This new calcium cyanide is said to overcome the objection to the earlier form of calcium cyanide, which was abandoned in the State because of the injury resulting from the dust residue. In the studies conducted it was shown that in the new calcium cyanide containing 30 per cent cyanogen, 1.15 oz. are equal when used under canvas tents to 20 cc. of liquid hydrocyanic acid, although carrying about 25 per cent less hydrocyanic acid.

Injury to the tree by the highly refined lubricating oil found effective in controlling the red scale has led to tests of lighter oils for general citrus spraying as well as oils noninjurious in themselves to which toxic substances are added. In work with the red scale, which has become resistant to hydrocyanic acid gas, it was found that when a spray is followed within a week or so by fumigation it generally results in a satisfactory control. This spray-fumigation combination method was found more satisfactory than two fumigations or two sprays. This is partly accounted for by the fact that fumigation and spraying are more or less complementary; that is, the most effective killing of the red scale by spray is accomplished on the fruit, whereas with fumigation the most effective killing of the red scale occurs on the leaves and branches. It was found that the oil absorbs little if any of the hydrocyanic acid gas and acts as a protective film, as a result of which higher doses of HCN can be given.

In codling moth studies as high as three times the usual amount of arsenical spray was applied to apple trees, and the arsenical residue on fruit determined. Tests were made of various kinds of baits, and this method gives promise of being an important aid in the control of the pest.

During the last year or two a severe outbreak of the grape bud beetle, *Glyptocelis squamulata*, occurred in the Coachella Valley. Control work has shown that calcium arsenate with fish oil or fish oil soap as a sticker gives promise of satisfactorily controlling the pest. This beetle remains under the bark of the older parts of the vines during the day, and feeding on the buds at night has destroyed most of the buds of the vines in some vineyards. While a second bud appears, the result is a delayed harvest with a less satisfactory quality, which results in considerable loss to the growers.

The tomato psyllid, *Paratrioza cockerelli*, appeared for the first time as a pest in the Coachella Valley and severely affected young tomato plants. It was found that a dust carrying a high percentage of nicotine, 3.75 per cent of actual nicotine, was effective in controlling it.

Mention is made of the effort to introduce natural enemies of the black scale. *Coccophagus modestus*, one of its South African parasites, is now believed to be permanently established, although it has not yet given any indication of being

of the importance that it is against this pest in South Africa. The oriental scale parasite *Comperiella bifasciata*, introduced from China and Japan, appears to have become permanently established on the Florida red scale, although unfortunately it does not destroy the California red scale as it does in the Orient.

The orange tortrix (*Tortrix citrana* Fern.) was especially serious in certain parts of Orange and Los Angeles Counties during the year. Life history and control studies of it and of *Holcocera iceryaeella* Riley are under way. The application of sodium fluoride as a dust with hydrated lime has shown promising results in small tests in the laboratory and field as a control measure for the pest. The natural parasitism in *H. iceryaeella* is too low to reduce its numbers materially, but *T. citrana* is frequently kept in check in this way.

The European brown snail, *Helix aspersa* L., is of considerable economic importance in certain localities as a pest in orange groves. Life history studies and control work are under way. The infestations by this snail have been materially reduced and good control obtained by the use of calcium arsenate, 1 part to bran 16 parts by weight, scattered under infested trees.

[Report of work in entomology at the Idaho Station] (*Idaho Sta. Bul. 160 (1928), pp. 21–23*).—Life history studies of the codling moth were completed. Best control was obtained by the use of 3 lbs. of lead arsenate to 100 gal. of water. Nicotine in combination with soap was much less effective than in combination with 0.5 per cent oil emulsion. The highest percentage of sting-free fruit was obtained by a nicotine-oil combination.

The Colorado potato beetle was found to have become established in two fields in southwestern Idaho and in Lemhi County, and eradication work was undertaken.

Life history studies were made of *Mineola scitulella*, which caused severe injury to prunes in a small area in the southern part of the State.

Oil spray experiments were continued. The season's work indicated that no injury was caused to fruit or foliage by repeated applications of highly refined oils against the codling moth and that as good control was obtained by oils of high viscosity and low concentration as by oils of lower viscosity and high concentration. The best controls with oils alone were slightly less than with lead arsenate alone, and there were many instances of low degrees of control with high grades of oil. On the average, a soap-cresol emulsifier gave slightly better control than a calcium caseinate emulsifier. The smaller amounts of calcium caseinate produced more toxic oil emulsions than the larger amounts. Lead arsenate sprays alone produced more toxic oil emulsions than the larger amounts. Lead arsenate sprays alone produced a greater percentage of sound fruit than when one or two cover sprays of lead arsenate were followed by two or three cover sprays of oil.

Oils of higher unsulfonated residue and lower viscosity were more toxic to fruit-tree leaf roller eggs, within certain limits, than oils of lower unsulfonated residue and higher viscosity. Sprays of 7 per cent actual oil killed an average of 99.37 per cent of the eggs; those of 4 per cent oil killed 95.80 per cent of the eggs. On the average, calcium caseinate produced a more toxic emulsion than soap-cresol in all proportions tried, and decreasing the amount of oil increased its killing properties. It appears from this year's experiments that practical control of the fruit-tree leaf roller may be obtained by the use of 4 per cent oil thoroughly applied.

Oil sprays for control of blister mites on apples were much less effective than lime sulfur, but in many cases a very high degree of control was obtained. Nearly 100 per cent control was the average on all plats where a combination of oil and lime sulfur was used.

In dormant oil sprays for San Jose scale 3 per cent actual oil was as effective as 4 per cent on heavily encrusted trees where the application was thoroughly made. The experiments for the year indicate that 4 per cent oil with emulsification will give commercial control of San Jose scale, leaf blister mite, and fruit-tree leaf roller where all three insects are to be combated on the same tree in southern Idaho.

Prebaiting and soil fumigation in rows with calcium cyanide in a 3-acre field did not prove very effective against wireworms which continued to cause heavy loss.

[**Report of the department of entomology of the Indiana Station**] (*Indiana Sta. Rpt. 1927, pp. 36–38, figs. 2*).—A continuation of the studies at the Vincennes laboratory is said to have shown conclusively that the tarnished plant bug and several other species of plant bugs were responsible for the injury to peaches known as cat-facing. Observations of the influence of different kinds of orchard management indicate that injury is more intense in orchards in which weeds have been allowed to grow freely the previous season or are close to rough, uncultivated land. Cover crops of sweet clover and alfalfa offer favorable conditions for these plant bugs

The Bordeaux-oil combination used on peach to control peach leaf curl and San Jose scale was found to reduce the efficiency of the oil spray for scale control at concentrations up to 1.5 per cent of actual oil but no decrease in effectiveness at higher strengths under experimental conditions. Experiments against black, gray, and striped blister beetles, which caused injury in vegetable and flower gardens, have shown sodium fluosilicate to be effective.

Calcium arsenate-gypsum dust was found to be quite effective against the striped cucumber beetle and superior under Indiana conditions to all other dusts used.

Zoology and entomology, Z. P. Metcalf et al. (*North Carolina Sta. Rpt. 1927, pp. 108–113*).—This is a report on the progress of station projects under way. The work on the biology of the leafhopper was devoted mostly to a study of the potato leafhopper as a pest of cotton, soy beans, and peanuts. It was observed that certain varieties of soy bean were much more susceptible than others to attacks of this leafhopper. Careful counts made of the number of nymphs on 100 leaflets of three different varieties showed 6 nymphs on Herman as compared with 220 each on Mammoth Yellow and Biloxi varieties. The potato leafhopper did widespread damage to the potatoes in the northeastern part of the State and in the Upper Piedmont. Cotton was severely damaged in several counties by another species of leafhopper that seemed to confine its attacks to the new growth.

The spring inspection in 1926 showed that corn on land kept continually planted to the crop was damaged by the corn rootworm to the extent of 43 per cent. On 2-year rotation it was damaged 21 per cent and on 3-year rotation 29 per cent. Corn harvested in the fall of 1926 showed the continuous corn with a yield of 393 lbs. of corn and stover and 204 lbs. of corn on the ear. Corn on the 2-year rotation showed corn and stover 519 lbs. with 285 lbs. of corn. The corn on the 3-year rotation showed corn and stover 468 lbs. and corn 250 lbs. The spring inspection in 1927 showed for the continuous corn 34 per cent injury by the corn rootworm, in the 2-year rotation 8 per cent injury, and the 3-year rotation 5 per cent injury.

A study was made of lime sulfur v. oils for scale control and the way in which they kill the scale. The experiments conducted led to the conclusion that lime sulfur does not kill by means of its gas being absorbed by the scale insect's body.

[Report of work in entomology at the Texas Station] (*Texas Sta. Rpt. 1927, pp. 36–42*).—In a study of the ingestion of poison by the boll weevil, the experiments showed that 70 per cent of the weevils killed by calcium arsenate obtain the poison by picking the particles of dust from the surface of the leaves or stems, and that only 30 per cent are poisoned by the dust as the result of feeding on the squares and bolls (E. S. R., 57, p. 162). Preliminary tests showed that better control is obtained on plants having more pubescence than on plants which lack this character, because of the ability of the former to retain the particles of dust.

In work with scale insects the use of oil emulsion made with canal water proved unsafe for spraying citrus in the Lower Rio Grande Valley. Fumigation for scale control gave a mortality of over 98 per cent, but it is not safe to fumigate during the spring or early summer.

Brief reference is made to the occurrence of the Mexican fruit fly (*Anastrepha ludens* Loew) in citrus orchards in the Lower Rio Grande Valley, first detected on March 18, 1927.

Control of the boll weevil by the use of airplanes for dusting was highly successful. In work with sulfur and sulfur compounds, sulfur dust proved to be superior to other dusts in the control of the cotton hopper.

In work with insect pests of corn and grain sorghum while in storage, it was found that the infestation of the shucked corn was so slight that practically no loss occurred after 10 months' time, while in the field-run samples there was a loss of 31 per cent during the same period.

In foulbrood inspection work (E. S. R., 57, p. 162) a total of 24,873 colonies belonging to 306 beekeepers were inspected. American foulbrood was found in 203 colonies belonging to 48 beekeepers. The report concludes with an account of other beekeeping investigations under way.

Insects attacking the peach in the South and how to control them, O. I. Snapp (*U. S. Dept. Agr., Farmers' Bul. 1557 (1928), pp. II+42, figs. 26*).—This is a practical summary of information on the important enemies of the peach in the Southern States and the manner of combating them.

[Report of work with insects and parasites affecting livestock at the Texas Station] (*Texas Sta. Rpt. 1927, pp. 30, 31*).—In studies of the life history of the sheep scab mite, some 30 tests were conducted in the summer of 1926 with a view to determining the longevity of the scab mites off the host, the adult mites in most cases being placed in pill boxes in a small tin box. Kept under varying conditions, the maximum longevity was approximately 16 days. It was found that the mites live but a very short time when exposed to the rays of the sun. Dipping experiments with nicotine sulfate at a strength of 0.065 per cent and a temperature of 102.2° F., the cattle being dipped twice at intervals of 7 to 17 days, all proved effective.

Petroleum oil as a carrier for nicotine, E. R. de Ong (*Jour. Econ. Ent., 21 (1928), No. 3, pp. 502–504*).—The author finds that the value of petroleum oil as a spray is not confined to its insecticidal value alone but includes a potential value as a carrier for other and more active chemicals which may act as insecticides and fungicides or perform functions not now recognized. Experiments with the brown apricot scale (*Lecanium corni* Bouché) showed a material increase in toxicity by the addition of small amounts of nicotine to oils, especially kerosene.

The dormant oil spray and the pear spray schedule, F. Z. Hartzell and F. L. Gambrell (*New York State Sta. Circ. 102 (1928), pp. 4*).—Following a discussion of the place of oil in the pear spray schedule and summer applications for pear psylla, the authors present a pear schedule to be followed when

oil sprays are used to control the pest. It is pointed out that when smutting of the fruit is threatened by late summer broods of psylla it becomes necessary to destroy the nymphs, and the possibility of spray residue must be considered. It is emphasized that the station can not recommend oil sprays to replace the approved treatments in the regular spray schedule until further experiments have shown oils to be safe and efficient when used for successive years on the same trees. Directions for making emulsions have been given in an earlier circular (E. S. R., 59, p. 59). Special formulas offered which avoid spray residue include the use of soap and nicotine sulfate.

The codling moth in Indiana, B. A. Porter and L. F. Steiner (*Indiana Sta. Circ. 151 (1928), pp. 28, figs. 19*).—This report, based upon cooperative studies conducted by the U. S. D. A. Bureau of Entomology and this station, summarizes the more important information on the codling moth and its control.

It is pointed out that spraying with arsenate of lead is the best control measure known, the calyx spray, which should be applied within a week after the petals fall, being the most important application. This should be followed by one to three applications in late May and June, during the period when the first brood worms are entering the fruit. Additional applications are usually needed during July, early in the period when second and third brood worms are entering the fruit.

In view of the impossibility of securing complete control by spraying, certain supplementary measures must be utilized in controlling severe infestations, including scraping and banding the trees and sealing the packing shed during late spring and early summer to prevent the escape of emerging moths into the orchard.

Weather and probability of outbreaks of the pale western cutworm in Montana and near-by States, W. C. Cook (*U. S. Mo. Weather Rev., 56 (1928), No. 3, pp. 103–106, fig. 1*).—The author has found a rather close connection between the chances of a single favorable year and the ability of the pale western cutworm to maintain itself at a place. "At least 1 year in 10 must be favorable to increase or the insect will disappear. Outbreaks brought on by migrating moths are confined to regions where at least 1 year in 20 is favorable. There is a decided tendency for like years to follow in succession, and this tendency was evaluated, without any implication of periodicity, by forming a distribution curve of interannual differences, neglecting signs. In all cases a decidedly skewed distribution was obtained from which the probability of a deviation of 1 in. or less between successive years was calculated.

"Severe attacks of the pale western cutworm may be expected only at long intervals in most parts of its range. In the dry mountain foothills near Helena such outbreaks will be about 16 years apart, on the central plains of Montana and in Wyoming it may occur once in 20 to 25 years, and in eastern Montana and Colorado the average interval between outbreaks is about 30 years. In other parts of its range in the United States it will probably be more rarely injurious. Light outbreaks may be expected somewhat more frequently."

Earlier accounts of the study of this pest have been noted (E. S. R., 54, p. 554; 58, p. 559).

The relation of flies and fly sprays to milk production, S. B. Freeborn, W. M. Regan, and A. H. Folger (*Jour. Econ. Ent., 21 (1928), No. 3, pp. 494–501, figs. 2*).—In this contribution from the California Experiment Station the authors give data gathered to check results secured during the summer of 1925 (E. S. R., 54, p. 659) and to attempt to ascertain the causes for losses in production that resulted from spraying.

"In the absence of flies, sponging with water had no effect on production, spraying with water caused a loss of 5.4 per cent, with pine tar creosote a loss

of 6.9 per cent, and with oil a 9.7 per cent loss. During the last two weeks of spraying the loss in production was 12.5 per cent for the pine tar creosote and 22.8 per cent for the oil-sprayed group. The body temperature was consistently higher, sometimes as much as 3° F., for the oil-sprayed group than for the controls. The respiration rate of the former averaged 40 per cent higher than that of the latter."

Cockroach destruction in buildings, B. B. FULTON (*Iowa Sta. Circ. 112 (1928), pp. 4, fig. 1*).—It is pointed out that under most conditions cockroaches can be entirely eliminated or at least reduced to negligible numbers by any one of the several methods here described, including the use of sodium fluoride and fumigation.

ANIMAL PRODUCTION

[Nutrition studies at the Indiana Station] (*Indiana Sta. Rpt. 1927, pp. 50, 51, 54*).—Three experiments are briefly noted.

Vitamin A in corn is found only in yellow kernels.—Grains of corn with pure white endosperm, grains with pure yellow endosperm, and grains having the white plant characters but a yellow endosperm were fed to albino rats. It was found that the vitamin A content of corn bears a definite relation to the yellow endosperm.

Is anemia in pigs affected by variation in rations?—It was found that alfalfa meal, cod-liver oil, additional amounts of ferrous lactate, or ultra-violet light treatment added to a ration consisting of yellow corn, meat scrap, linseed meal, bran, middlings, minerals, and yeast did not prevent anemia in suckling pigs.

Water-soluble part of tankage is inferior to the insoluble.—Chemical analyses showed considerable variation in the amounts of water-soluble nitrogen materials of animal protein concentrates, ranging from 19.6 to 45.8 per cent of the total nitrogen. Biological analyses of this fraction proved that it is a deficient protein, not supporting growth or even maintenance in rats as a sole source of protein and having no supplementary value to corn.

[Animal nutrition studies at the North Carolina Station], J. O. HALVERSON and F. W. SHERWOOD (*North Carolina Sta. Rpt. 1927, pp. 68, 69*).—The results of two experiments, one of which is a continuation of previous work (E. S. R., 57, p. 265), are noted.

Nutritive properties of the peanut: A biological study of the distribution of vitamin B.—Tests have indicated that the distribution of vitamin B in the various parts of peanuts is quite uneven. The sheaths (red skins) are richest, the cotyledons least, and the germs moderate in vitamin B content.

Colony ration studies: Effect on longevity, reproduction, and rearing of young.—It has been found that a peanut ration if not properly balanced has a stunting effect upon growth, brings on an inability to rear young, or stunts the growth of the young if raised beyond the age of weaning.

The antirachitic properties of cod-liver meals, R. M. BETHKE, G. ZINZALIAN, D. C. KENNARD, and H. L. SASSAMAN (*Jour. Agr. Research [U. S.], 36 (1928), No. 8, pp. 747–753*).—Continuing this experiment (E. S. R., 57, p. 663) and using rats as experimental animals, a rickets-producing ration (E. S. R., 56, p. 464) was fed to which was added in three different lots ether extracts of the three meals studied at 0.5 per cent levels. Six lots of 5 rats each were used, one lot being killed at the start of the experiment and the femurs removed for ash determination. Another lot received the basal ration and the remaining lot 0.5 per cent crude medicinal cod-liver oil. After feeding for 4 weeks, the

rats were killed and the femurs removed for ash determination. The ash analyses agreed in general with the results obtained with chicks.

To gain further knowledge of the calcifying properties of the extracts of cod-liver meals the line-test method (E. S. R., 47, p. 566) was employed. The results showed that the cod-liver oil was 6 and 10 times as potent as the extracts of two of the meals and that the third meal possessed few, if any, antirachitic properties.

The authors conclude from the results obtained with chicks and rats that the dried residues remaining after the extraction of oil from fresh cod livers vary greatly in their antirachitic properties, and that the variation was not proportional to the residual fat content. The ether-extractable fraction was not as potent as ordinary cod-liver oil. It is recommended that liver meals should not be used as substitutes for cod-liver oil in the rations for livestock.

Commercial feeding stuffs, L. S. WALKER and E. F. BOYCE (*Vermont Sta. Bul. 281 (1928), pp. 32*).—The usual report of the analyses of over 300 brands of feeding stuffs from official samples taken during the month of December, 1927 (E. S. R., 58, p. 762).

Filling silos, J. B. FITCH (*Kansas Sta. Circ. 139 (1928), pp. 8, fig. 1*).—This is a revision of Circular 95 (E. S. R., 47, p. 865).

[Pasture investigations at the California Station] (*California Sta. Rpt. 1927, p. 48*).—A digestion trial by A. W. Sampson with range grasses, mostly *Bromus hordeaceus*, that had been exposed all summer on the ground showed that the digestible nutrients in 100 lbs. were crude protein 0, carbohydrates 43.42, and fat 0.47 per cent. This dried bleached grass was also deficient in calcium and phosphorus.

[Steer feeding investigations at the Caldwell, Idaho, Substation] (*Idaho Sta. Bul. 160 (1928), p. 17*).—The results of experiments (E. S. R., 57, p. 763) showed that steers receiving long alfalfa hay and barley made larger net returns than steers receiving chopped or ground hay and barley, although the latter lots made larger gains on less feed. When silage was added to the ration 771 lbs. of silage replaced 302 lbs. of alfalfa hay and 19 lbs. of barley. Steers fed silage gained slightly faster at a higher cost, but had a lower selling price and dressing percentage than steers not receiving silage. Yearling steers made larger gains on less feed and sold at a higher price than 2-year-old steers.

Cattle feeding (*Indiana Sta. Rpt. 1927, p. 27*).—Continuing this study (E. S. R., 58, p. 462) of supplements to a basal ration of shelled corn, silage, clover hay, and salt, 4 lots of 10 2-year-old steers each were fed for 160 days. The supplements fed were as follows: Lot 1 whole soy beans, lot 2 cottonseed meal, lot 3 whole oats, and lot 4 ground oats. The average daily gains in the respective lots were 2.42, 2.18, 2.13, and 2.15 lbs. per steer. The highest finish was attained in lot 1 and the poorest in lot 3. Lot 1 also returned the largest profit per steer, not including pork, and lot 3 the smallest profit. The differences between lots 2 and 4 were not great but favored the feeding of cottonseed meal instead of ground oats.

[Experiments with beef cattle at the North Carolina Station] (*North Carolina Sta. Rpt. 1927, pp. 40–42, 54–57*).—Results of two experiments are noted.

Quality of meat study, R. H. Ruffner.—A basal ration of cottonseed hulls, alfalfa hay, and wheat straw was fed to 2 lots of steers and 2 lots of heifers. One lot of each received cracked corn and the other lots cottonseed meal (E. S. R., 57, p. 265). The steers fed cracked corn made an average daily gain of 1.91 lbs. per head and the heifers 1.37 lbs. Of the lots fed cottonseed meal the

steers made an average daily gain of 1.44 lbs. and the heifers 1.53 lbs. per head. The feeding of cottonseed meal had no harmful effects during a 5-months feeding period even when the animals were confined. The daily consumption of corn was practically twice that of cottonseed meal, and the cost of 100 lbs. of gain was greater in the corn-fed lots. The carcasses of the cottonseed meal-fed cattle were somewhat darker than those of the corn-fed cattle, but this factor had no apparent effect upon the quality of the meat. The average grade of the cattle in all lots was practically the same at the beginning of the test. As slaughter cattle the grading was from 3 to 5 per cent higher and as carcass cattle approximately 5 per cent higher for those fed corn than for those fed cottonseed meal.

Beef cattle production, feeding, grading, and pasture work, R. S. Curtis.—In this study at the Blackland Substation 20 native cows were under observation to note the effects of native pastures. With the exception of 45 days during which the cattle were in cornfields and 49 days when they were fed grain and miscellaneous roughage, the cows were on reed pasture from October 2, 1926, to November 9, 1927. During this period they gained an average of 90.5 lbs. per head, in spite of the fact that during the period in the cornfields there was an average loss of 1.74 lbs. per head daily.

[Experiments with beef cattle at the Texas Station] (*Texas Sta. Rpt. 1927, pp. 28, 29, 66, 67*).—Results of three experiments are briefly noted.

The relation of body shape to rate of gain, to dressing percentage, and to value of the dressed meat in beef cattle.—A study of approximately 10,000 cattle weights showed that under constant weather and other environmental conditions the probable error of a single weight of a steer was from 4 to 6 lbs. and the probable error of a 3-day average weight only about 58 per cent as large. These variations were due chiefly to the varying amounts of feed and water in the digestive tract (E. S. R., 59, p. 563).

Method of preparing sorghum roughage and grains for feeding to fattening calves.—A ration of milo heads, cottonseed meal, and sorghum fodder was fed to 3 lots of 10 steers each. In one lot the heads were ground, and in another lot the fodder was chopped into pieces about 0.5 in. long. The lot receiving whole heads made approximately 14 per cent less gain and had a lower dressing percentage and a lower fat yield than either of the other lots. Chopping the fodder resulted in a 7 per cent increase in the consumption of roughage but did not increase the rate of gain.

Carrying capacity of pastures of the Ranch Experiment Station.—Using a 900-lb. cow as a unit for measuring the carrying capacity of pastures, the units per section were calculated to be 52 in the proportion of 23 units of cattle, 19 units of sheep, and 10 units of goats. The number of carrying-capacity units consumed by the different classes of livestock have all been above the proposed standard for the years 1924, 1925, and 1926.

The utilization of soft corn in beef cattle feeding, H. P. Rusk and R. R. Snapp (*Illinois Sta. Bul. 313 (1928), pp. 28, figs. 6*).—Since 1916 six experiments have been conducted involving the use of ear-corn silage, the essential details of which have been previously noted (E. S. R., 56, p. 262; 58, p. 354).

In all but one experiment the cattle relished well-preserved soft corn and made satisfactory gains on all forms. Ranked on the basis of combined gains produced on cattle and hogs by an acre of soft corn, ear-corn silage was first, followed in order by shock corn, corn left in the field and husked as needed, and standing corn pastured by cattle in the field. The method last named was quite wasteful. On the basis of the dry matter content, gains on soft corn were not so rapid but were as economical as those on sound mature corn, and the amount of dry matter required to produce 100 lbs. of gain was practically

the same whether the corn was fed in the form of soft or mature corn. Adding sound shelled corn or oats to the ear-corn silage ration was not profitable. Difficulties were encountered with calves fed ear-corn silage in two experiments, but the trouble could not be identified with the character of the ration.

The conclusions drawn from these experiments are as follows: The high moisture content of soft corn reduces the capacity of steers for total dry matter and retards the rate of gain as compared with that of cattle fed sound corn. It has been rather well established that the dry matter in well-preserved soft corn has the same nutritive value, pound for pound, as the dry matter in sound corn. The dry matter in the grain of an acre of soft corn should be used for determining its feed value. The keeping qualities of ear-corn silage are comparable to those of normal silage, and this method of conserving soft corn has proved to be the most effective for use in feeding cattle.

Market classes and grades of calves and vealers, D. J. SLATER (*U. S. Dept. Agr. Circ. 28 (1928), pp. 44, figs. 12*).—This publication contains a detailed description and explanation of the tentative market classes and grades of calves and vealers as set up by the Bureau of Agricultural Economics.

[Experiments with sheep at the Texas Station] (*Texas Sta. Rpt. 1927, pp. 25, 26, 31–33*).—The results of experiments, most of which have been previously noted (E. S. R., 57, p. 170), are reported.

Relation of skin folds to weight of fleece in Rambouillet sheep.—During the year 1926–27, 87 C type Rambouillet ewes produced an average of 3.34 lbs. of scoured wool, as compared with 3.41 lbs. produced by 37 B type ewes. The C type ewes, however, produced a staple averaging 2.47 in. in length, as compared with 2.22 in. for the B type ewes.

A study of the adaptation of the Corriedale sheep to southwest Texas conditions.—Aged Corriedale ewes weighed an average of 14 lbs. per head less than aged Rambouillet ewes in the spring of 1927. The average birth weight of 17 Corriedale ram lambs born in the spring of 1927 was 10.28 lbs. and of 56 Rambouillet ram lambs 10.62 lbs. The average birth weight of 4 Corriedale and 51 Rambouillet ewe lambs was 10.08 and 9.9 lbs., respectively. The lambing percentage for 31 Corriedale and 143 Rambouillet ewes was 74 and 65 per cent, respectively. The aged ewes of both breeds produced an average of 3.36 lbs. of clean wool per head.

Shearing sheep once v. twice a year.—During the year 1926–27 the aged ewes sheared twice a year produced 1.44 lbs. more grease wool than those sheared once a year. The yearling ewes produced 1.38 lbs. more grease wool when sheared twice than when sheared once a year. Scouring tests showed a shrinkage of 54.7 per cent for 12 months' fleeces, as compared with shrinkage of 56.6 and 56.1 per cent for fall and spring shorn fleeces, respectively.

Soy bean hay versus alfalfa hay for winter maintenance of sheep, R. H. RUFFNER (*North Carolina Sta. Rpt. 1927, pp. 48–50, fig. 1*).—Uniform lambs were divided into 2 lots of 10 head each and fed for 130 days. Lot 1 received 4 lbs. of alfalfa hay and lot 2 4 lbs. of soy bean hay per head per day. Neither lot received any supplementary grain or pasture. The average daily gains were 0.073 and 0.135 lb. per head in the respective lots. All lambs remained thrifty and were in excellent condition to go on pasture.

[Lamb feeding investigations at the Aberdeen, Idaho, Substation] (*Idaho Sta. Bul. 160 (1928), p. 17*).—Tests showed that alfalfa screenings could profitably replace a portion of the barley when fed with alfalfa hay in the ration for fattening lambs. Cull beans were also found a limited but profitable supplement for barley. Cottonseed cake increased the rate of gain and decreased the feed requirements of fattening lambs.

[Types of fattening western lambs at the Indiana Station] (*Indiana Sta. Rpt. 1927, p. 26, fig. 1*).—On the basis of rate of gain, lambs of the following breeding ranked as follows: Hampshire-Rambouillet, Hampshire-Corriedale, Corriedale, and Rambouillet. On the basis of market finish they were grouped as follows: Hampshire-Corriedale and Corriedale (same finish), Hampshire-Rambouillet, and Rambouillet. The Hampshire-Corriedale cross on the basis of two years' tests has given the best results from the standpoint of rate and cost of gain and market finish.

[Swine experiments at the California Station] (*California Sta. Rpt. 1927, p. 47*).—Soft pork investigations by E. H. Hughes showed a difference in the percentage of soft carcasses of Duroc-Jersey and Poland China pigs fed rolled barley and skim milk 1:3. Young pigs, weighing 75 lbs. or less, when fed barley or barley and salt developed symptoms of rickets either in the presence or absence of the direct rays of the sun. However, the symptoms appeared much earlier in the absence of sunlight.

[Swine feeding investigations at the Idaho Station] (*Idaho Sta. Bul. 160 (1928), pp. 17, 18*).—A ration of 6 parts of rolled wheat and 1 part of cracked Canada field peas fed to 150-lb. hogs for 42 days produced an average daily gain of 1.83 lbs. per head. It required 442 lbs. of feed to produce 100 lbs. of gain. Pigs so fed had a dressing percentage of 79.5.

A ration of ground Canada field peas and ground barley 3:7 fed to 8 pigs averaging 85 lbs. produced over a period of 94 days an average daily gain of 1.08 lbs. per head, requiring 472 lbs. of feed for each 100 lbs. of gain. A similar lot fed about 0.25 lb. of cut alfalfa hay in addition to the above ration gained 1.2 lbs. per head daily and required 437.5 lbs. of feed per 100 lbs. gain.

[Experiments with swine at the Indiana Station] (*Indiana Sta. Rpt. 1927, pp. 24–26, 27, 28*).—Results of four experiments are noted.

[*Mineral supplements for fattening hogs*].—Based on the results of feeding tests with over 900 head of swine, it was found that as a supplement to corn and soy beans 6:1 special steamed bone meal gave faster gains than other phosphorous feeds combined with limestone dust and salt. Feeding 4 per cent of the special steamed bone meal produced faster gains than when 2 per cent was fed, but the feed required per unit of gain and the cost were higher. Native hardwood ashes were superior to Canadian hardwood ashes when combined with 16 per cent superphosphate (acid phosphate) and common salt. A mixture of limestone dust, powdered rock phosphate, and salt 10:10:1 produced the slowest and most expensive gains. A mixture of special steamed bone meal, limestone dust, and salt was more efficient than the standard mixture of native wood ashes, 16 per cent superphosphate, and salt.

Protein supplements for growing pigs.—In an effort to find efficient rations for growing pigs in the dry lot, it was found that a combination of corn, shorts, and tankage was superior to any of the various corn and soy bean rations. The latter rations were greatly improved by the addition of alfalfa meal and the following protein-rich feeds, given in the order of their efficiency: Dried buttermilk, fish meal, and tankage. At the end of the growing period pigs that had been fed corn and soy beans were divided into two lots. One lot was fattened on a ration of corn, soy beans, and minerals, and the other on corn and tankage. At an average weight of 200 lbs. the pigs were slaughtered. It was found that soy beans had a softening effect not fully overcome by finishing on corn and tankage, but that pigs so finished showed more firmness of carcass than those fattened on rations including soy beans.

Feeding hogs on pasture.—Continuing this study (E. S. R., 56, p. 566) 60 per cent protein tankage, special tankage, processed garbage, and reduction tankage

were compared as protein supplements for fattening pigs on pasture. The processed garbage proved inferior for producing rapid gains, though economical. Reduction tankage, which is made from dead animals, when of the highest grade was as satisfactory as the 60 per cent tankage. The special tankage, which differed from the 60 per cent tankage in that it had not been reenforced with "stick" and blood, proved practically equal to the 60 per cent tankage.

Swine efficiency test.—Preliminary results in this work are summarized as follows:

The length of body is a minor factor in determining the value or percentage of domestic wholesale cuts that a hog carcass yields. The greater the finish the lower is the percentage yield of hams and loin and the higher the yield of bacon belly. Strictly lard type hogs are soft when immature, and as they increase in finish the fat becomes harder. Virgin gilts, identical in breeding, feeding, and management and of similar type to barrows, carry less finish, yield slightly less trimmed bacon belly and shoulder, dress as well, show more ham, and the fat has practically the same degree of hardness as in barrows. Cured fat backs apparently have the same refractive reading as they do before curing. Individuality of pigs may cause variations in any of the factors studied.

Swine feeding investigations, 1923 to 1926, A. D. Weber, B. M. Anderson, and H. W. Marston (*Kansas Sta. Circ. 138 (1928), pp. 14, fig. 1*).—The results are reported of several experiments conducted at the station during the years 1923 to 1926, some of which have been previously noted (E. S. R., 56, p. 864).

Alfalfa and and sweet clover as pastures in conjunction with a ration of corn and tankage were compared in two tests. In both trials the amount of concentrate feed required to produce 100 lbs. of gain was practically the same on both forage crops. In trial 1 the average daily gain on alfalfa pasture was 1.51 lbs. and on sweet clover pasture 1.13 lbs., and in trial 2 1.34 and 1.42 lbs. per head, respectively. During the first trial the sweet clover made a very rank growth, and it was supposed that the pigs filled up more on clover than on alfalfa. In the second trial the growth of sweet clover was finer due to a dry season and remained more succulent during July and August than did the alfalfa. From the results of these two trials it was concluded that sweet clover is highly satisfactory, especially in a dry season, as a pasture crop for hogs.

Pigs receiving 0.25 lb. of tankage per head per day in addition to corn while on alfalfa pasture made 60 per cent greater daily gains than similar pigs receiving no tankage. The former pigs were better finished, and the costs of gains were cheaper than in the latter lot. The average daily gain in the lot receiving no supplement was 0.85 lb. and in the lot receiving supplement 1.34 lbs. per head.

With access to alfalfa hay the average daily gain was 1.45 lbs. per head on a ration of corn and tankage, as compared with 1.21 lbs. on a ration of corn and tankage alone. The pigs on the former ration required 10 per cent less corn, and 9.56 lbs. of alfalfa hay replaced 37.14 lbs. of corn in the production of 100 lbs. of gain.

A lot of 83–88-lb. pigs fed corn and tankage in dry lot made average daily gains of 0.86 lb. per head. A lot fed ground threshed kafir and tankage made approximately 10 per cent less gain. Another lot fed whole threshed kafir and tankage and still another fed kafir heads and tankage made approximately 27 per cent less gain than the corn and tankage lot. It required approximately 12.5 per cent more ground kafir and 35 per cent more whole threshed and head kafir than corn to produce 100 lbs. of gain.

[**Experiments with swine at the North Carolina Station**] (*North Carolina Sta. Rpt. 1927, pp. 64–68*).—The results of experiments in continuation of those previously noted (E. S. R., 57, p. 268) are reported.

[*Experiments at the*] *Swine Research Farm, Raleigh*, E. H. Hostetler and J. O. Halverson.—Cottonseed meal fed with corn in the ratio of 1:6 showed marked hardening effects on pigs when the previous ingestion of peanut oil varied from 35 to 45 lbs.

Shelled corn and minerals were fed to 4 lots of 10 65-lb. pigs each. In addition lots 1 and 2 received fish meal, lot 3 soy bean oil meal, and lot 4 cottonseed meal. Lots 2, 3, and 4 were allowed to graze on soy bean pasture. The average daily gains in the respective lots were 1.23, 1.51, 1.45, and 1.39 lbs. per head. Lot 4 was the most economical and lot 1 the least economical in the feed consumed per 100 lbs. of gain. Lots 2 and 3 made little use of their pasture.

A record of the feed and labor for 33 sows at Raleigh, Rocky Mount, and Wenona from breeding time until their pigs were weaned at 8 weeks of age showed the average cost per pig at this time to be $4.81.

A lot of 8 pigs, averaging 90 lbs. initial weight, were self-fed free choice for 73 days on a ration of shelled corn, fish meal, and minerals. A second lot was similarly fed except that one-half of the fish meal was replaced by cottonseed meal. The average daily gains in the respective lots were 1.49 and 1.6 lbs. per head, and the feed consumed per 100 lbs. of gain was 432 and 412 lbs.

A similar feeding trial with 2 lots of 15 spring pigs each was carried on for 84 days. Lot 1 made an average daily gain of 1.28 lbs., and lot 2 1.5 lbs. per head. The feed consumed per 100 lbs. of gain was 347 and 351 lbs., respectively. The lot 2 pigs consumed an average of 4.7 lbs. of cottonseed meal per day without any harmful effects.

[*Experiments at the Upper Coastal Plain Substation, Rocky Mount*].—Continuing this comparison of two varieties of corn for hogging off before maturity. 57 83-lb. pigs were used. Due to unfavorable weather the corn made a poor yield, and each acre produced only 193 lbs. of pork. The pigs made an average daily gain of 1.04 lbs.

Mature corn and soy beans supplemented with minerals produced 256 lbs. of pork per acre with the addition of 32 lbs. of minerals. When further supplemented with fish meal an acre of corn and soy beans produced 363 lbs. of pork with the addition of 83 lbs. of fish meal and 11 lbs. of mineral.

[*Experiments at the Blackland Substation, Wenona*].—Two experiments were conducted to compare fish meal and fish meal and soy bean meal equal parts as protein supplements to a ration of shelled corn. In the first test 2 lots of 30 pigs each, averaging 90 lbs., were fed for 55 days. The pigs receiving fish meal made an average daily gain of 2.07 lbs., and those receiving soy bean meal and fish meal 2.09 lbs. In the second trial 2 lots of 27 and 28 pigs, respectively, averaging 119 lbs., were fed for 67 days. The pigs receiving fish meal made an average daily gain of 2.28 lbs., and those receiving the combination 2.22 lbs. per head. In both trials the latter lots consumed less corn, but the addition of soy bean meal made the cost per 100 lbs. of gain slightly higher.

[**Feeding experiments with swine at the South Dakota Station**] (*South Dakota Sta. Rpt. 1927, pp. 9, 10*).—The second paragraph of the section on winter feeding fall pigs of the abstract previously given under this title (E. S. R., 58, p. 765) should read as follows: A limited ration of ground barley, tankage, and linseed oil meal plus alfalfa hay ad libitum produced larger and more economical gains than did rations of ground barley and tankage plus alfalfa hay or ground barley and ground oats plus alfalfa hay.

The importance of vitamin A and vitamin C in the ration of swine, concerning especially their effect on growth and reproduction, J. S. HUGHES, C. E. AUBEL, and H. F. LIENHARDT (*Kansas Sta. Tech. Bul. 23 (1928), p. 48, figs. 26*).—This study of the vitamin A and C requirements of swine was begun in 1921. Since that time six lots of pigs at varying intervals have been fed rations deficient in vitamin A and eight lots have received no vitamin C except slight traces in alfalfa meal. The progress of the study has been noted (E. S. R., 56, p. 864).

The authors conclude that the lack of vitamin A in the diet of pigs causes a degeneration of the nervous system, characterized in advanced stages by impaired vision, extreme incoordination, and spasms. Histological examination of the nerves showed definite degeneration of some bundles in portions of the spinal cord, optic, sciatic, and femoral nerves. The eye lesions in extreme avitaminosis A of swine are of minor importance. The oestrous cycle of gilts with avitaminosis A was irregular, occurring more frequently and being of longer duration than normal. Breeding prior to the onset of nervous symptoms causes either abortion or dead pigs at farrowing time. Vitamin C was found to be not essential for the growth and reproduction of swine.

Cottonseed meal for maintaining, growing, and fattening hogs (*Texas Sta. Rpt. 1927, p. 71*).—A lot of pigs fed cottonseed meal free-choice in self-feeders on oat pasture made good gains and showed no bad effects from the cottonseed meal. However, when pasture conditions are not favorable this system is not recommended. A ration of ground milo, tankage, and cottonseed meal 87:4:9, with salt and limestone added, gave better results for fattening pigs than when an increased proportion of cottonseed meal was used. Two pigs on a self-fed ration containing 15 per cent of cottonseed meal died from poisoning. It was demonstrated that not more than 12 per cent of cottonseed meal should be included in the ration of 57-lb. pigs that are to be fed for 120 days. Sows fed rations containing 15 per cent of cottonseed meal remained in good health and produced as many pigs as sows fed tankage, but the former pigs grew less rapidly than the latter (E. S. R., 57, p. 172).

Death and crippled losses in shipping hogs to market, J. R. WILEY (*Indiana Sta. Bul. 318 (1927), pp. 32, figs. 30*).—A study of the condition of the hogs arriving in carload lots at the Indianapolis, Cleveland, Buffalo, and Pittsburgh terminal yards at the time of unloading is reported in this publication.

Death losses were 2.13 hogs per 1,000 receipts at the first three markets during a period of 4 years, and crippled losses 3.46 hogs per 1,000. Feeding in cars while in transit increased the death and crippled losses during warm and hot weather, and the benefits derived from feeding during cool and cold weather were not sufficient to pay the cost of the feed. Cleaning cars before loading in warm and hot weather lowered the death losses but had little influence on losses during cool and cold weather. Poor footing in the cars increased losses about twice as compared with cars having good footing during all kinds of weather. Sand was the only bedding that furnished a high percentage of desirable footing during all kinds of weather, followed in order by straw, old bedding, and no bedding. The death losses in cars bedded with sand were about 50 per cent as great as in cars bedded with other materials, and crippled losses were also reduced in the sand-bedded cars. Showering hogs in cars bedded with sand during transit reduced the average death loss to 0.56 hog per 1,000 receipts as compared with an average loss of 3.12 hogs in cars when other kinds of bedding were used. During cold, cool, and warm weather death losses were doubled and during hot weather trebled by loading a single-deck 36-ft. car with 18,000 lbs. or more as compared with lighter loading. Death

and crippled losses were higher when large and small hogs were mixed in a car than where mixed carloads of stock were shipped with each kind of stock partitioned off.

[Experiments with poultry at the Idaho Station] (*Idaho Sta. Bul. 160 (1928), pp. 27, 28*).—One year's results indicated that sour and sweet skim milk are practically equal in value for egg production. The sweet skim milk, however, had a tendency to cause digestive disorders. Lactose alone, or lactose combined with milk salts, did not reproduce the results obtained with either sweet or sour skim milk.

Birds receiving lawn clippings and allowed outdoors the year round had a higher percentage of production than those confined and fed cod-liver oil, irradiated wheat, or lawn clippings. Mixing cod-liver oil with the mash 6 months before feeding caused birds to produce slightly larger eggs, but did not increase the rate of production to any extent over birds receiving no vitamin feeds. Irradiating wheat at a distance of 1 ft. for one hour caused a mortality of over 50 per cent from what was evidently a nutritional disorder.

Alfalfa meal and pea meal as supplements to sour skim milk tended to increase the size of eggs, while the use of bean meal resulted in smaller eggs.

[Experiments with poultry at the Indiana Station] (*Indiana Sta. Rpt. 1927, pp. 47–49, figs. 2*).—Four experiments are briefly noted.

Do minerals supplement meat scrap rations?—Two years' results have shown that the addition of calcium phosphate and salt to rations containing 5 per cent or more of meat scrap did not increase egg production. Meat scrap containing about 25 per cent of mineral matter from bones furnishes sufficient minerals for the laying ration, and approximately 10 per cent of such meat scrap appears to be necessary to furnish the protein for such a ration.

Animal protein studies with chicks.—In this study chicks were fed a basal ration of 15 per cent each of wheat bran and wheat middlings with 30 per cent or more of ground yellow corn. It was found that it required about 20 per cent of commercial meat and bone scrap to maintain rapid growth during the first 10 weeks of the life of chicks (E. S. R., 59, p. 164). The best results were obtained when part of the meat scrap was replaced with dried buttermilk. Adding tankage to the ration in varying amounts proved unsatisfactory, for not only was the ration unpalatable but the rate of growth was slow and the mortality high. A meat meal low in minerals and containing about 75 per cent of protein did not prove satisfactory.

Sun's rays for vitamin D.—To each 100 lbs. of feed was added 3 pints of cod-liver oil in the ration of a flock of Plymouth Rock pullets, and a similar flock was fed and handled in the same manner except that it received no cod-liver oil. Both flocks were allowed outdoors in the afternoon each day during the fall and winter. There was no significant difference in the number, fertility, or hatchability of eggs laid, and the mortality was low in both pens. These results indicate that sufficient vitamin D may be obtained from the sun's rays during the fall and winter.

Turkey experiments.—Two years' results in this study (E. S. R., 57, p. 665) show that it requires from 4 to 5 lbs. of feed for each pound of gain up to 6 months of age when turkeys are confined. On limited range the requirements were somewhat less. Turkeys reared in confinement and fed similarly to chickens began laying in some cases when only 31 weeks of age.

[Experiments with poultry at the North Carolina Station], B. F. Kaupp (*North Carolina Sta. Rpt. 1927, pp. 90–93, fig. 1*).—The results of experiments, most of which have been previously noted (E. S. R., 57, p. 271), are reported.

Experiments in fattening poultry.—In three experiments one half of the Rhode Island Red cockerels used were fed equal parts of corn meal and pulver-

ized oats and the other half a mixture of 48 lbs. each of corn meal and pulverized oats and 4 lbs. of limestone. At feeding time the mash was mixed with buttermilk or sour skim milk at the rate of 2 lbs. of milk to 1 lb. of mash. In the first trial those receiving limestone made a gain of 38.7 per cent and the controls a gain of 41.2 per cent. In trials 2 and 3 the gains were 28.8 and 43.5 per cent and 37 and 40.4 per cent, respectively. The feed cost per pound of gain was slightly less in all cases with the control birds. In a fourth test 2 lots of cockerels were fed a basal ration consisting of 40 lbs. of corn meal and 20 lbs. each of pulverized oats, wheat middlings, and meat meal mixed with water. One lot gained 43.8 per cent and the other 46.4 per cent. The fattening period in all cases was for 10 days.

Influence of meat meal and milk on production and health.—Of 1,476 eggs from hens receiving meat meal as the sole source of animal feed, 8.8 per cent were infertile, 20.3 per cent died in the shell, and 70.5 per cent hatched. Of the fertile eggs 77.3 per cent hatched. Of 1,468 eggs from hens receiving milk 9.7 per cent were infertile, 26.3 per cent died in shell, 63.4 per cent hatched, and of the fertile eggs 70.2 per cent hatched.

Fish meal v. meat meal in egg production.—In a flock of 339 hens receiving meat meal the average annual production was 168 eggs per hen, or an average flock production of 46 per cent. It required 6 lbs. of feed to produce 1 doz. eggs, at a cost of 14.5 cts. The annual feed cost per hen was $2.03. In a flock of 338 hens receiving fish meal the average annual production was 166 eggs per hen, or an average flock production of 45.4 per cent. It required 6.2 lbs. of feed to produce 1 doz. eggs, at a cost of 14.9 cts. The annual feed cost per hen was $2.06.

Inheritance in egg production.—Hens with a record of 180 eggs per year bred to a low-producing sire produced daughters which in their pullet year averaged 99.3 eggs per head. Hens with an average of 90.8 eggs per year bred to the same sire produced daughters with a record of 90 eggs in their pullet year.

The cost of putting pullets into lay.—Single Comb Rhode Island Red pullets hatched March 13 and beginning to lay on August 12 cost 84.6 cts. each to put into lay.

[Experiments with poultry at the Texas Station] (*Texas Sta. Rpt. 1927, pp. 74–76*).—The results of two experiments are noted.

Breeding as affecting egg production.—A trap-nest study of the female progeny of six cockerels showed a range in average egg production of from 130.3±5.1 to 180.6±4.9. The standard deviation ranged from 52.2±6.9 to 16±3.5 eggs. The percentage of daughters laying more than 180 eggs ranged from 12.5 to 60, and for daughters laying less than 100 eggs, from 22.6 to 0.

An analysis of the data on the relation of body characters to egg production has been made, and zero order correlation coefficients and partial correlation coefficients with annual egg production have been calculated, and the results are given in tabular form. The study led to the belief that there were not enough classes for some of the characters and possibly that some of the characters were duplicates of others.

Studies of variation in hatching quality of eggs.—In continuing this study (E. S. R., 57, p. 174), it was found that the hatchability of eggs from individual hens varied from 0 to 100 per cent. The average hatch of the 43,107 eggs set was 65.7 per cent for the year.

Vigor in production-bred flocks, F. A. Hays and R. Sanborn (*Massachusetts Sta. Bul. 242 (1928), pp. 149–175, figs. 4*).—The studies reported, cover a 5-year period beginning with birds in the flock hatched in 1922 and ending

with the flock hatched in 1926. The birds have all been pedigree-bred since 1913, and the greater proportion have been bred for high fecundity, with a limited number for other purposes (E. S. R., 59, p. 72). The chicks have been placed in brooder houses on clean range at 1 day old, and the sexes separated at 8 weeks. The pullets were put in the laying house at 150 days of age. All culling has been done by families only, and no pullets were culled at any time in the laying house.

It has been found that mortality in chicks to 8 weeks of age is not a reliable index of vigor because it bears little relation to mortality rates in the same families after surviving daughters are placed in the laying house. Age at first egg, genetic early maturity, weight at first egg, winter pause, and intensity of laying were not measures of vigor. Chicks from hen mothers were more vigorous to 8 weeks of age than chicks from pullet mothers, but there was no significant difference after the pullets were placed in the laying house. Hens had a higher hatchability than pullets, and high hatchability had a tendency to be associated with low mortality in the laying house. Late hatching decreased the vigor of chicks slightly, but had no effect in the laying house.

The occurrence of broodiness before July 1 of the pullet year appeared to indicate superior vigor, the nonbroody birds having a higher mortality than the broody birds. Although the winter production of low-vigor birds was more variable than that of high-vigor birds the number of eggs laid to March 1 was approximately the same.

Fixing early maturity, high intensity, nonpause, and high persistency does not decrease vigor, but eliminating broodiness, in Rhode Island Reds at least, may have a detrimental effect upon vigor. For improving vigor the authors believe that the best practice consists of breeding exclusively from families showing the lowest mortality of pullets in the laying house.

Anti-rachitic values of cod liver oil, cod liver meal, and fish meal, H. O. Stuart (*New Hampshire Sta. Circ. 28 (1928), pp. 4*).—In a study of the vitamin D value of the above feeds, 3 lots of 100 Rhode Island Red chicks each were brooded for a period of 8 weeks in a single colony house divided into three sections and so equipped that no ultra-violet light could enter. The basal ration was the same for all groups, and water only was allowed for drinking. In addition, lot 1 received 2 per cent of cod-liver oil, lot 2, 2 per cent of cod-liver meal, and lot 3, 5 per cent of fish meal. Records of weights by weeks, mortality, and feed consumption were kept.

On the eighteenth day of the test a few chicks in lot 1 showed rachitic-like symptoms. Post-mortem examination of these chicks showed no "beaded ribs," although the leg joints corresponded with conditions found in rachitic chicks. Without any changes in methods of management the remaining chicks returned to normal in a few days. Lot 3 made the largest gains during the early part of the experiment, due probably to the high protein content of its ration. The cockerels were eliminated from the test after 5 weeks, and at this time there appeared to be a strong relationship between the size of chicks at hatching time and at 5 weeks of age. The feed consumption per bird for the entire test was greatest in lot 1 and least in lot 3.

The experiment shows that 5 per cent of fish meal in conjunction with the ration fed contains sufficient vitamin D to prevent rickets for at least 8 weeks. Fish meal, however, did not produce as much growth as the other supplements. Cod-liver oil and cod-liver meal were quite comparable in regard to growth production, although it was evident that the group with the highest feed consumption per unit made the greatest gains.

[Studies on egg quality] (*California Sta. Rpt. 1927, p. 87*).—Some results of this study by Parker (E. S. R., 59, p. 362) have been summarized as follows:

By comparing samples of eggs from the same individual birds, it was found that there was fully three times as much darkening in the yolk shadow as in the yolk color when the eggs were held for four weeks. Pale yolked eggs changed relatively more in actual yolk color and less in candling grade, while the dark yolked eggs changed relatively more in candling grade and little or none in actual yolk color.

DAIRY FARMING—DAIRYING

[Experiments with dairy cattle at the Idaho Station] (*Idaho Sta. Bul. 160 (1928), pp. 19–21*).—Calves fed powdered buttermilk, substituted for skim milk, with alfalfa hay and grain showed little digestive disorder, appeared to be quite thrifty, and their growth in weight and height was very satisfactory. It cost $23.76 per head to raise these calves to 6 months of age.

Alfalfa hay, skim milk, and barley produced greater growth but at a higher cost per unit of growth than alfalfa hay and skim milk as rations for calves. The cost to 6 months of age was $28.90 with the first ration and $17.92 with the second ration.

Three groups of well-grown thrifty heifers were fed as follows: Lot 1, pea straw, corn silage, and barley; lot 2, alfalfa hay, apple pomace, and barley; and lot 3, alfalfa hay, corn silage, and barley. The groups ranked 2, 3, 1, in relative gains, although all lots made satisfactory gains. Lot 1 was not so fat, nor was the hair coat so smooth as in the other lots, and lot 2 appeared to be the most thrifty. The feed costs were greatest in lot 3 and least in lot 2.

Heifers wintered on alfalfa hay and barley made greater gains in weight and height than similar lots wintered on alfalfa hay and on alfalfa hay and corn silage. The cost of feed was least in the lot receiving hay alone and greatest in the lot receiving grain.

Pasture studies indicated little value in cultivation for dairy cows. The addition of manure was practically equal to additional water, and proper irrigation plus manure gave the best results.

[Experiments with dairy cattle at the Indiana Station] (*Indiana Sta. Rpt. 1927, p. 33*).—The results of two experiments are noted.

Sudan grass as summer pasture for heifers.—In a comparison of summer pastures 8 heifers placed on Sudan grass on August 2 made an average daily gain of 0.59 lb. per head for 49 days. A similar lot of heifers on bluegrass pasture gained an average of 0.18 lb. per head per day.

Value of grinding dairy feeds [and roughage].—Continuing this study (E. S. R., 57, p. 665) it was found that a cow consuming whole corn and oats excreted between 30 and 35 per cent of undigested whole corn and 20 to 25 per cent of undigested whole oats. Cracking the corn and crushing the oats reduced this loss to from 5 to 10 per cent of cracked corn and 1 to 2 per cent of crushed oats. All but 1 to 2 per cent of medium ground corn and all the crushed oats fed in conjunction with it was digested. Grinding alfalfa hay resulted in a slight increase in milk production and body fat, but not enough to offset the cost of grinding.

[Experiments with dairy cattle at the North Carolina Station] (*North Carolina Sta. Rpt. 1927, pp. 42–48, 61, 63*).—The results of several experiments are briefly noted.

Cottonseed meal investigations.—Continuing this series of studies (E. S. R., 57, p. 267), 8 cows divided into 4 lots have been fed their regular rations without any reduction in quantity for 2 years, with the exception of 1 animal receiving a large quantity of cottonseed meal, which had to be removed for a time. All

cows with the exception of this animal have produced normal living calves during the year.

The study of the effect of deficiencies of meals prepared from high oil-bearing seeds on health and reproduction has been continued. The roughage portion of the ration has been changed to beet pulp and cottonseed hulls. The mineral mixture and iron oxide have been fed as previously noted. Two animals in each of the cottonseed meal, linseed meal, and peanut meal groups, but none in the soy bean meal group, have survived. Cod-liver oil fed to the surviving animals somewhat alleviated the deficiency symptoms of partial blindness, running eyes, and unthriftiness, but discontinuing the oil brought them on again in a rather severe form in the linseed meal and peanut meal groups.

The results obtained in the groups fed cottonseed meal, cottonseed hulls, and timothy hay are comparable to those previously noted.

Effect of milk on calves.—A lot of 5 heifers was divided and fed in an identical manner except that 3 received 5 lbs. of green rye daily, the other animals receiving no green feed. The remainder of the ration consisted of 1 lb. of cottonseed meal, 5 lbs. of cottonseed hulls, and 10 lbs. of wheat straw. The cottonseed meal was gradually increased until each animal received 11 lbs. per day. This feeding was continued from January 28 to November 1, and the animals were bred to drop their calves at 3 years of age. No difficulties were encountered during parturition, and except for 2 calves all were apparently normal when dropped. One calf weighed 77 lbs. at birth, but died at 2 days of age, and it was believed that any effect from cottonseed meal must have happened in utero. Another calf was slightly under weight and apparently blind, but this condition grew no worse during the suckling period. The other calves developed normally. The work gave no indications of harmful effects upon calves suckling mothers receiving large rations of cottonseed meal, and feeding green feed made no apparent difference in the development of the calves.

Value of fly repellents in maintaining summer milk production.—When 2 groups of cows were sprayed at the Coastal Plain Substation, using the double reversal system through 3 periods of 20 days each, with 5-day transition periods, the results slightly favored the use of repellents, though not enough to justify conclusions. Similar results were obtained at the Mountain Substation.

Dairy cattle feeding studies.—A feeding trial at the Coastal Plain Substation to compare complex and simple concentrate mixtures for economical production was conducted with 2 groups of 5 cows each during 3 30-day experimental periods preceded by 10-day transition periods. The consumption of feed was approximately equal, but the simple ration gave slightly better results.

[Experiments in dairying at the California Station] (*California Sta. Rpt. 1927, pp. 67, 68*).—In a study of the methods of making bacterial counts of milk, it was found that various market peptones had no significant influence on the count. Incubating at 30° C. instead of 37° and adding lactose to the medium had a marked influence on the count. There was a definite upward trend of counts as a result of the time required for plating.

G. A. Richardson and F. H. Abbott in a preliminary investigation found indications that from 6 to 8 weeks on straight alfalfa feed caused cows to produce butterfat that made up into a typical sticky butter. Adding silage to the ration removed this condition, but it required about the same length of time for the fat to become normal.

Abbott and A. Ashenfelter found indications that no definite relationship existed between the yeast and mold count and the number of bacteria in salted and unsalted butter. Yeast and mold and bacteria counts increased more rapidly in unsalted than in salted butter during storage.

The possibility of producing iodized milk, C. F. MONROE (*Ohio Sta. Bimo. Bul., 13 (1928), No. 4, pp. 153–156, fig. 1*).—The work with iodized milk (E. S. R., 59, p. 575) was continued in cooperation with a commercial herd. Of the cows in the test, 2 received no iodine, 2 others received 2 oz. of the seaweed dulse, 1 2 grains of calcium iodide, and 1 2 grains of potassium iodide per day. The milk from these cows showed no trace of iodine previous to the experiment. After 30 days' feeding, samples of milk from the test cows were analyzed for iodine. No traces were found in the check samples, but the other four showed traces of iodine estimated from 1 part in 100,000,000 to 1 part in 10,000,000. As far as it was possible to determine, the source of iodine made little difference in the iodine content of the milk.

Milk goats, C. A. MATTHEWS and E. WEAVER (*Iowa Sta. Circ. 111 (1928), pp. 15, figs. 5*).—A popular publication discussing the adaptability of goats and the characteristics and uses of the milk. The breeds and methods of breeding, feeding, and management are described.

The economy and efficiency of a milking machine, C. A. MATTHEWS, J. M SHAW, and E. WEAVER (*Iowa Sta. Bul. 248 (1928), pp. 201–223, figs. 8*).—The essential points brought out have been previously noted (E. S. R., 59, p. 72).

The accuracy of composite cream samples, W. B. COMBS, L. M. THURSTON, A. E. GROTH, and S. T. COULTER (*Minnesota Sta. Bul. 243 (1927), pp. 38, figs. 12*).—This study, made in cooperation with local creameries of the State, was divided into three parts, as follows: (1) A general survey of the practice of sampling cream, (2) methods of caring for composite samples, and (3) a comparison of the accuracy of the composite sample and the daily sample.

Of the 455 creameries in the survey 68 per cent reported that daily analyses of the cream were made. The remainder used composite samples. The sampling dipper was used by 70 per cent of the creameries, the cream stirring rod by 15.6 per cent and both by 5.4 per cent. Only 4 per cent used no preservatives in their composite samples. Where composite samples were used the general practice was to test every two weeks. For holding the composite samples 70 per cent of the plants used glass-stoppered bottles, 8 per cent metal-screw-top jars, 6 per cent cork-stoppered bottles, and 5 per cent rubber-stoppered bottles.

In the second phase of the experiment the evaporation from the various types of containers and under different methods of holding was determined. In the third phase composite samples were prepared covering 2-week periods. The first of these was taken with a small dipper as was also a daily sample. The second composite was an aliquot sample taken at the rate of 1 cc. for each pound of cream delivered, except in the case of large deliveries when a 0.5-cc. sample was taken.

It was found that the average evaporation of moisture from composite cream samples was not sufficient to condemn the method as it was practiced in the creameries studied. The greatest evaporation was from the glass-stoppered bottles, followed in order by the rubber- and cork-stoppered bottles. However, the rubber stopper was preferred to the cork since the latter absorbs small amounts of butterfat. Where possible, aliquot portions should make up the composite sample, since an accurate test can be expected in 60.8 per cent of the cases from this kind of sample and in only 45 per cent of the cases from the dipper composite. The average variation per 100 lbs. of fat delivered was —0.745 lb. by the aliquot composite test and —1.012 lbs. by the dipper composite test. The Babcock test was a more serious source of error in determining the pounds of fat in cream than the method of preparing the composite. When all 0.5 per cent readings of the test were dropped in the case of the aliquot composite sample the average loss was 0.7453 lb. and with the dipper composite sample 4.3 lbs. per 100 lbs. of fat delivered.

Parchment paper as a source of mold infection in butter, H. Macy and G. M. Pulkrabek (*Minnesota Sta. Bul. 242 (1928), pp. 23, figs. 2*).—This is a more detailed account of work previously noted (E. S. R., 58, p. 69).

VETERINARY MEDICINE

[Report of work in veterinary science at the California Station] (*California Sta. Rpt. 1927, pp. 95–99*).—Experimental work with the university dairy herd at Berkeley is said to have demonstrated that the vaccination of cows with living virulent cultures of *Bacterium abortus* will confer resistance to this type of abortion for at least three regular gestation periods. Such vaccination may, however, cause a localization of the infection in the udder so that the germs are frequently discharged in the milk. Nonvaccinated cows during the first two months of pregnancy have been found to be rather resistant in that no placental infections followed the ingestion of *B. abortus*, while cows from the fourth to the seventh month of gestation were proved to be very susceptible.

In the effort to control the disease in the University Farm herd (E. S. R., 57, p. 277) it was divided into negative and positive groups in March, 1926. Four reactors were removed from the negative group during the first 6 months and during the following 6 months 4 additional reactors developed, it being evident that the nonreactors were in too close contact with infection to prevent the negative group from becoming infected.

Reference is made to a case of orchitis in a 15-months-old bull at the University Farm caused by *B. abortus*.

Two cases of abortion induced by *Vibrio fetus* occurred in a group of beef animals at the University Farm known to be free from *B. abortus* infection.

Investigation of an affection in a herd of beef calves in the San Joaquin Valley was found to be caused by *Ostertagia ostertagi*, this being apparently the first time reported for California and the third time for the United States. The administration of copper sulfate is said to have resulted in a gradual improvement in the condition of the whole herd.

In the vaccination of calves and pigs against tuberculosis by the use of Calmette's bile-treated culture of tubercle bacilli (B. C. G.) (E. S. R., 59, p. 79) and also in a large commercial dairy herd, no apparent injury resulted, although the protective value of such vaccination has not yet been determined.

The rapid agglutination test developed by Huddleson and Carlson for the detection of bovine infectious abortion (E. S. R., 57, p. 672) was found to be as satisfactory in the detection of bacillary white diarrhea as the usual tube method.

In diagnostic work with poultry diseases, 7.4 per cent of 60,084 blood samples reacted to the agglutination test for bacillary white diarrhea.

[Report of the department of veterinary science of the Indiana Station] (*Indiana Sta. Rpt. 1927, pp. 10, 54–57, figs. 2*).—Studies of fowl paralysis were conducted, field and experimental evidence having shown that the dissemination of the disease is closely associated with the sale of eggs for hatching, baby chicks, and breeding stock from flocks in which affected birds occur. While paralysis or neuritis was not produced by inoculation, the experimental work has shown that the virus of the disease is transmitted through the egg. Several of the chicks hatched from eggs laid by an affected flock developed typical paralysis before they were 2 months of age. Recommendations for the control of the disease based upon the field and experimental data are as follows: "Eggs for hatching, baby chicks, and breeding stock should not be purchased from flocks or premises where cases of the disease have occurred; birds that have this disease should be killed, the carcasses burned, and the balance of the

flock killed and dressed, and the premises vacated for a period of at least 6 months after the houses have been cleaned and all litter removed from the runs."

In work with bacillary white diarrhea the lung lesions of the disease were readily produced by dusting chicks with sterile alfalfa dust that had been infected artificially with *Bacterium pullorum*. From 30 to 85 per cent of the different flocks of hens showed lesions of bacillary white diarrhea in the lungs when autopsied. In flock testing work 20 per cent of the birds reacted to the first annual test, 12 per cent to the second, and 9 per cent to the third.

Of 2,503 blood samples from dairy and breeding herds tested for infectious abortion, 633 were positive to the agglutination test.

Young cockleburr plants in the two-leaf or cotyledon stage of growth proved poisonous to pigs.

[Report of work in veterinary science at the Texas Station], [H. Schmidt and W. L. Black] (*Texas Sta. Rpt. 1927, pp. 9–15*).—In continuation of previous accounts (E. S. R., 57, p. 180), the results have shown that it is possible to practically eliminate bone chewing on the range by feeding bone meal and fine salt mixtures, and that when bone chewing and the consumption of putrid carcass material are eliminated the trouble from loin disease is practically eliminated. No cases of creeps appeared among animals receiving bone meal and fine salt mixture, while 30 per cent suffered from creeps more or less severely in the case of the control cows nursing calves and receiving no bone meal and fine salt mixture. It has been determined that loin disease can be reproduced artificially at will by an anaerobic organism not yet isolated, but grown in cultures and used to reproduce the disease when cultured material was given to healthy animals. However, all carcass material is not toxic, and only in rare instances will carcass material produce loin disease.

Only two cases of swamp fever in mules were under treatment during the year. The injection of one with Bayer 205 (Naganol) failed to indicate any curative effect. The second animal was being treated with tartar emetic.

Of 35 cows vaccinated with live culture of *Brucella abortus* by either one or two treatments, 33 calved during the year and 2 aborted, the data indicating that the breeding efficiency of the herd had not suffered from the vaccination.

Further investigations were made of the disease of sheep and goats occurring in the vicinity of Marfa known as swellhead, but it still remains to be determined whether swelling of the head is charactertistic and pathognomonic. In studies of two goats, smears made from the spleens and kidneys revealed streptococci in 2 to 16 very short rods. Inoculation experiments conducted with this organism are reported upon which indicate that it may play a part in the causation of the disease, although no definite conclusions can as yet be drawn.

In work with stomach worms of sheep and goats Black leaf 40 proved so toxic for the hosts that its use was abandoned after several trials, and carbon tetrachloride was used with similar results. A summary of the work conducted indicates that a 1.75 per cent solution of copper sulfate is 90 to 100 per cent efficient in 9 out of 14 cases, and practically ineffective in 5 cases. In 29 cases treated with a 2 per cent solution of copper sulfate only 3 cases were practically without effect, the others ranging from 75 to 100 per cent efficient. In a treatment of 17 cases with a 3 per cent solution of copper sulfate, 1 was 15 per cent effective, 1 59 per cent effective, 1 60 per cent effective, and all the rest 94 to 100 per cent effective. Carbon tetrachloride in 8 treatments has shown 1 73 per cent effective, 1 90 per cent effective, and all the rest 100 per cent effective. None died from copper sulfate poisoning.

The immunity index method of testing antigenic values, A. T. Glenny and H. Waddington (*Jour. Path. and Bact., 31 (1928), No. 2, pp. 403–421, fig. 1*).—This account includes illustrations of the immunity index method for use in showing the effects of broth, formaldehyde, phenol, sodium ricinoleate, alum, turpentine, toluol, acid precipitation, and heat on diphtheria toxoid; the interference of dye blockade with antigenic response and of one response with another; and the dissociation of toxin-antitoxin mixtures on dilution.

Parasitological research in relation to the prosperity of the live-stock industry, I. C. Ross (*Jour. Council Sci. and Indus. Research [Aust.], 1 (1928), No. 4, pp. 233–241*).—Following a general account, the author deals with the subject under the headings of parasites and diseases of Australian livestock, the biological method of control, what parasitological research has done in Australia and what it has yet to do, and the training of the veterinary parasitologist and the utilization of the results of research.

A calendar of livestock parasites, M. C. Hall (*U. S. Dept. Agr., Misc. Pub. 25 (1928), pp. [2]+14, figs. 22*).—Information on the time and manner of combating parasitic enemies of livestock is given in calendar form.

Studies on the physiology of Ascaris lumbricoides, J. F. Mueller (*Science, 67 (1928), No. 1745, p. 590*).—This is a contribution from the zoological laboratory of the University of Illinois. The author finds it to be certain that these helminths can and do live aerobically.

Notes on the occurrence of Sarcocystis, H. L. Osterud and K. F. Bascom (*Science, 67 (1928), No. 1743, pp. 531, 532*).—The authors report upon two cases of parasitic infestation of Sarcocystis encountered, one in the heart muscle of the ox and the other in the pectoralis major muscle of the turkey-buzzard.

Ticks infesting domestic animals in Southern Rhodesia, R. W. Jack (*Rhodesia Agr. Jour., 25 (1928), Nos. 5, pp. 537–556, figs. 2; 6, pp. 704–716, pl. 1*).—This is a summary of information on the more important tick enemies of domestic animals.

Studies of the blood of cows in Switzerland and the Netherlands [trans. title], R. H. van Gelder (*Tijdschr. Diergeneesk., 55 (1928), No. 13, pp. 699–703; Ger., Eng., Fr. abs., p. 703*).—In studies of the blood of a large number of cows from the high and low altitudes during summer and winter, no correlation was found between the shape of the body and the composition of the blood, including the hemoglobin percentage and the number of erythrocytes. The hemoglobin percentage of Swiss cattle in the mountains is much higher in summer than in winter, which is attributed to more sunlight, the chlorophyllful food, and more exercise because of climbing. The hemoglobin percentage in Switzerland in winter is, however, higher than in summer in the Netherlands, while the number of erythrocytes in summer is larger in the Netherlands than in Switzerland (Engadine). In winter the number is equal in both countries. The albumin percentage of the serum is nearly the same in both breeds.

Comparative agglutinating properties of different strains of Bact. abortus (Bang), E. S. Good, W. W. Dimock, and A. H. Harms (*Jour. Amer. Vet. Med. Assoc., 73 (1928), No. 2, pp. 223–231*).—The details of comparative studies of different strains of *B. abortus* at the Kentucky Experiment Station are reported upon, in large part in tabular form.

Bovine infectious abortion, R. H. Ruffner (*North Carolina Sta. Rpt. 1927, p. 60*).—Brief reference is made to work undertaken with 20 herds, 4 of which reacted negatively to the first blood test. It is pointed out that in eradication work with this disease the herds which contain reactors are tested every 60 days and the reactors separated from the nonreactors. Recommendations which serve as a guide in the management of herds are briefly outlined.

The eradication of infectious abortion from the dairy herd of Oregon State Agricultural College, B. T. Simms, C. R. Donham, F. W. Miller, P. M. Brandt, and I. R. and R. C. Jones (*Oregon Sta. Bul. 232 (1928), pp. 12, figs. 3*).—This is an account of eradication work with infectious abortion in the college herd into which it was introduced in 1915 through the purchase of infected pregnant animals. The attempts to control the disease through temporary isolation of aborting cows, cleaning and disinfecting the stalls and stanchions in which abortions had occurred, burning or burying aborted fetuses and membranes, and using different bulls for mating with the abortion-infected cows failed. The agglutination test proved to be a reliable method of diagnosis. It was found that infected cows did not always abort. The infected cows were unprofitable because they gave less milk, had more garget and more breeding trouble, developed more cases of chronic inflammation of the joints and lameness, and produced fewer live calves. The infected cows did not develop an immunity, and the disease did not disappear.

The eradication was accomplished through separating the reactors from the nonreactors in 1922 by a distance of 1 mile to stop the spread of the disease, raising abortion-free females to take the place of abortion-infected animals, removing reactors from the herd, cleaning and disinfecting the barn, and testing frequently and removing all new reactors before they became dangerous.

"The infected cows were bred to the herd sires which were used for the abortion-free animals. In such breeding operations the infected cows were never taken either into the bull pens or upon any ground to which abortion-free cows had access. Calves born from infected animals were isolated for 6 weeks and then placed with the calves from the abortion-free cows. The abortion-free herd was tested monthly and any reactors found were immediately removed and placed in the abortion-infected group. During the 2 years, 10 reactors were found.

"Under this system of management the number of nonreacting females increased from 68 in September, 1922, to 101 in October, 1924. At this time the entire group of abortion reactors was sold to the department of veterinary medicine and the college dairy herd was finally rid of abortion-infected animals.

"Testing at regular intervals was continued. Four reactors were removed from the herd between October, 1924, and March, 1926. It is believed that these animals became infected through the use of feed which had been placed on a floor on which infected animals had been kept. During the last 2 years no reactors have been found."

The herd has since been protected from reintroduction of infectious abortion through preventing any contact in barns, pastures, or show rings between any females in the college herd and any other females not tested for abortion, and through preventing spread of infection by contact with the clean animals by caretakers or on feed.

Foot-and-mouth disease from abroad (*Jour. Min. Agr. [Gt. Brit.], 35 (1928), No. 1, pp. 16–22*).—This is a statement of the measures taken by the Ministry of Agriculture and Fisheries to prevent the introduction of foot-and-mouth disease from South America, based upon a recent mission to Argentina, Brazil, and Uruguay.

Studies in so-called "skin-lesion" tuberculosis, A. B. Crawford (*Jour. Amer. Vet. Med. Assoc., 73 (1928), No. 2, pp. 216–222*).—In studies conducted by the U. S. D. A. Bureau of Animal Industry, the inoculation of the abraded skin of cattle with the bovine, human, and avian tubercle bacilli and three strains of saprophytic acid-fast microorganisms and the injection into the skin and under the skin of the five last-named bacteria failed to produce lesions

of or under the skin. The inoculation of the abraded skin with bovine tubercle bacilli, of the one bovine animal so treated, produced only internal lesions of tuberculosis. The microscopic examination of over 20 subcutaneous tubercular nodules showed the presence in the majority of cases of an acid-fast microorganism. All attempts to grow this organism on artificial media, or to cause lesions by subinoculation of sections of lesions into guinea pigs, rabbits, mice, rats, chickens, and cattle failed. Statistics are presented to show that internal tuberculous lesions and subcutaneous tubercular nodules may be present in the same animal, also in the same herd but in separate animals; and that subcutaneous nodule reactors only may be found in herds in which true bovine tuberculosis has never occurred. The term "subcutaneous tubercular nodule" is proposed to replace the term "skin-lesion tuberculosis."

Bovine tuberculosis: Progress in its eradication (*N. J. Dept. Agr. Circ. 131 (1927), pp. 83*).—The papers here presented, which were delivered at the eighth annual Eastern States Tuberculosis Conference combined with the forty-third semiannual meeting of the New Jersey Veterinary Medical Association, held in Atlantic City, N. J., June 20–22, 1927, are as follows:

Progress in Tuberculosis Eradication, by J. R. Mohler (pp. 3–5); Progress of Tuberculosis Eradication in New Jersey, by J. H. McNeil (pp. 6–9); Progress of Tuberculosis Eradication in Pennsylvania, by S. E. Bruner (pp. 10–15); The Progress New York Is Making in Eradicating Bovine Tuberculosis, by E. T. Faulder (pp. 16–25); The Results of the Tuberculin Testing of Cattle Supplying Milk to the City of Baltimore and Its Effect on the Production and Consumption within the Territory, by I. W. Heaps (pp. 26–29); Bovine Tuberculosis Eradication in the Chicago Milk District, by J. R. Brown (pp. 30–34); Cleaning and Disinfection, by H. B. Leonard (pp. 35–38); Methods of Obtaining Clean Milk, by E. Kelly (pp. 39–45); Holding Market Preference for Eastern Milk, by W. B. Duryee (pp. 46–52); The Rural Practitioner's Part in Tuberculosis Eradication, by W. F. Harrison (pp. 53–56); The Growing Importance of the Veterinary Profession, by R. A. Pearson (pp. 57–62); Safeguarding Milk, the Child's Most Important Food, by W. H. Donnelly (pp. 63–72); and Ten Years' Work in Eliminating Tuberculosis, by J. A. Kiernan (pp. 73–83).

Report on the elimination from a dairy herd of cows reacting to the tuberculin test, D. R. Edwardes-Ker (*Vet. Rec., 8 (1928), No. 27, pp. 537–540*).—In the author's work it was found that repeated clinical examinations may give no indication of tuberculosis even if in an advanced stage. The value of the new double intradermal test is confirmed in that of 27 reactors all excepting 1 showed undoubted tuberculosis on slaughter. Reactors to the tuberculin test may give milk entirely free from infection, even with tuberculosis of the udder glands, provided the actual milk-producing glands are not affected. It is thought that the continued housing of cows, even in well ventilated cowsheds, may possibly lead to one animal's infecting a whole herd.

Stomach worm control, R. H. Ruffner (*North Carolina Sta. Rpt. 1927, pp. 50–54, fig. 1*).—This is a report of progress made in the study conducted to determine the value of pastures under various conditions for maintaining breeding flocks and the further relation of stomach worms to permanent pastures which have not been used for sheep.

Three lots of 6 sheep each were used, the first being on permanent pasture alone, the second on temporary pasture without additional feed, and the third on temporary pasture with cottonseed cake. The experiments were

continued from April 12 to November 1 during the grazing season, 3 of the lambs in each of the 3 lots being drenched with bluestone solution monthly throughout the summer season. They were weighed at intervals, the results being presented in tabular form. The work was conducted during the year with both lambs and yearling ewes. The average gain in weight during the season for the 9 drenched ewes was 36.4 lbs. and for the undrenched ewes 29.2 lbs. However, assuming that a ewe in the undrenched lot which was injured as a result of an attack by dogs would otherwise have maintained a weight of 156 lbs., the drenched lot of ewes would have shown an average daily gain of 2.8 lbs. per head more for the season than the undrenched lot. The ewes which were on the permanent pasture without additional feed did exceptionally well, the average gain for the 3 drenched ewes being 37.3 lbs. and for the undrenched ewes in this lot 41.6 lbs. The average gain for the drenched ewes on temporary pasture was 36 lbs. for the period, and for the undrenched ewes 26.3 lbs. The drenched ewes on temporary pasture which received grain in addition made an average gain of 41.5 lbs., while the undrenched ewes handled and fed under similar conditions made an average gain of 37.5 lbs. for the period.

In addition to the stomach worm control work with mature sheep, studies were also conducted with 10 spring lambs, which were weighed and drenched every 2 weeks with a combination of bluestone and nicotine sulfate solution in doses of 50 cc., or 1.75 oz. The results are presented in tabular form. In this work, which was started on August 1 soon after weaning, the 10 lambs were divided into 2 flocks of 5 each, the 5 in the first group being weighed and drenched every 2 weeks and those in the second group weighed only, at the same time. The lambs had the run of an alfalfa pasture and in addition were given 1 lb. of a grain mixture per head daily. The difference between drenching and not drenching in lambs is considered to have been rather clearly brought out in the work, as shown by a late lamb that was drenched with a resulting gain of 21 lbs. compared with a late lamb that was not drenched and showed a loss of 19 lbs.

It is pointed out that while definite conclusions can not be based on this small number of lambs, the results quite clearly show that there is a difference between drenched and undrenched lambs, and that late lambs are never advisable under any circumstances, but should they be late in coming the drench is of material benefit.

Bacterium viscosum equi, a factor in joint-ill and septicemia in young foals, W. W. Dimock, P. R. Edwards, and J. F. Bullard (*Jour. Amer. Vet. Med. Assoc., 73 (1928), No. 2, pp. 163–172*).—In this contribution from the Kentucky Experiment Station the authors deal with the gross pathology, microscopic pathology, morphology and staining, cultural characteristics, and pathogenicity of this organism. It was found that since January 1, 1926, *B. viscosum equi* had increased in importance as a factor in the diseases of young foals, until at the time of writing disease due to this organism had reached alarming proportions.

Duration of the carrier stage of bacillary white diarrhea, B. F. Kaupp (*North Carolina Sta. Rpt. 1927, pp. 93, 94*).—This is a report of studies conducted, the details of which are included in the accounts previously noted (E. S. R., 57, p. 577; 59, p. 370).

Coccidiosis in chickens, E. M. Gildow and W. Wisnicky (*New Hampshire Sta. Circ. 27 (1928), pp. 4, fig. 1*).—This is a brief practical summary of informa-

tion on the life cycle of *Eimeria avium*, the causative organism; the symptoms produced; prevention, including an outline of sanitary measures; batteries and wire floors; and methods of treatment.

AGRICULTURAL ENGINEERING

[Agricultural engineering studies at the California Station] (*California Sta. Rpt. 1927, pp. 37–40*).—A study of three types of continuous can washers, by A. W. Farrall, to determine the consumption of steam, water, and electricity, together with the bacterial reduction efficiency and cleanness of washing, showed that the use of superheated steam for sterilizing dairy equipment greatly improved the bacterial reduction in cans and made possible efficient moisture elimination. Investigations of the time and temperature characteristics of oil and electrically heated steam type dairy sterilizers showed that a satisfactory bacterial reduction was obtained in most cases by holding utensils above 170° F. for 20 minutes and in all cases by holding them above 210° for 20 minutes. An investigation of an electrically heated hot air sterilizer (E. S. R., 58, p. 781) showed satisfactory bacterial reduction with 10-gal. milk cans held at 230° for 30 minutes or longer.

An investigation of 14 types of coating materials for metallic surfaces under conditions found in creameries showed that practically all of the greases, oils, and paints gave good protection for one year, but that light-bodied shellac and lacquers failed in less time.

A. H. Hoffman reported that a continuation of studies of dust encountered by carburetors showed that when the carburetor inlet opening faced forwad 3.5 times as much dust was taken in as when it faced toward the rear.

In tests of orchard heaters (E. S. R., 58, p. 485) Hoffman found that, even in the case of heaters that smoked the most, the heat lost in the carbon of the smoke was less than 0.1 per cent of the heat in the fuel consumed in the same time. Also, no appreciable heat was lost in carbon monoxide, and it was concluded that the fuel-to-heat conversion efficiency of all of the heaters tested was practically 100 per cent.

In a study of electrically heated brooders (E. S. R., 58, p. 486), Moses found the temperature under the brooder heated with glowing coils to be due to radiation from the coils and to convection currents from the floor. Temperature readings revealed that the surface temperature of the wire, the location of the coils, the type of reflector, and the height of the brooder above the floor are all important factors in brooder design.

E. J. Stirniman reported that clogging of the grain drill feed with excess chemical and brush hairs from grain treated with copper carbonate increases the draft of drills and decreases the feeding rate. The amount of free excess material varied with the amount of copper carbonate used per bushel and the length of time of mix from 0.17 gm. for 0.5 oz. copper carbonate treatment per bushel for a 2-minute mix to 0.91 gm. for a 2-oz. treatment for a 10-minute mix.

Stirniman also reported a 95 per cent control of foxtail with a 14-ft. atomizing type of hooded burner when from 40 to 45 gal. of low-grade oil per acre were sprayed at pressures varying from 300 to 500 lbs. This also gave a good control of aphids if applied at a certain stage of their development.

Burning with a barrel-type stove after the tree had been removed and the stump split by blasting was found by Stirniman (E. S. R., 57, p. 282) to be considerably lower in cost than clearing by pulling or blasting. Burning was not successful on green or wet stumps. The temperatures in the barrel stove

were found to range from 320 to 980° while burning oak stumps ranging from 12 to 18 in. in diameter under a 30-in. diameter steel barrel.

[Agricultural engineering studies at the Indiana Station] (*Indiana Sta. Rpt. 1927, pp. 15, 16, 18, 19, 20, 43, figs. 2*).—The progress results (E. S. R., 57, p. 675) of agricultural engineering studies at the station are reported.

In experiments on the use of electricity in agriculture it has been found that a considerable saving in time is effected by grinding feed at home, and that the power cost is usually from one-third to one-half that of the cost for custom grinding. Records obtained on shallow well water systems showed that the consumption of water in homes without modern bathroom conveniences is very low, being in one case less than 5 gal. per person per day. The power required for pumping averages 1.75 kw. hours per 1,000 gal. The time spent in milking was reduced approximately one-half by the use of the milking machine. Electric illumination increased winter egg production as indicated in the results obtained on two farms.

In experiments with electrical equipment for the farm home, an average power consumption of 50 kw. hours per month was indicated for refrigerators when the machines were not operated from November 1 to April 1. Electric washing machines used from 2 to 4 kw. hours per month for the family washing. Electric ironers reduced the time spent in ironing from 30 to 50 per cent.

Studies of artificial heat and insulation in the control of humidity, temperature, and air movement in poultry houses as they relate to egg production showed that there was little difference in the egg production in pens variously arranged. Where the temperature was above 40° F. the pen maintained a lower relative humidity and a much drier litter than the other pens and required cleaning only about half as often.

Detailed data are also given on the icing of underground apple storages in the fall, no conclusions being drawn.

In soil erosion experiments only a slight erosion took place in the flow line of a Mangum terrace having a 0.7 per cent grade. Clover withstood the winter best on this field.

In experiments with the vertical rotary tiller fitted to a plow, it was found that speed and position of the tiller and the shape of the cutter blades are the factors in the effective covering of cornstalks.

In stack and grain drying experiments the need for better heat control and stock building was indicated, but the records show that a fine quality of alfalfa hay can be dried artificially for a fuel expenditure of about 65 cts. per ton.

A survey of 1,400 rural homes in Indiana indicated that during the winter months one-third of the rural homes use coal entirely and another third use coal with other fuels. More than 50 per cent of the homes use wood for cooking in winter, and about half of these use wood alone. In hot weather almost half of the homes use kerosene as the only fuel for cooking. Gasoline was reported in use during the summer either as the principal fuel or as supplementary fuel in one-tenth of the homes.

[The rate of infiltration of water in Palouse silt loam soil] (*Idaho Sta. Bul. 160 (1928), pp. 14, 15*).—Studies conducted in tanks showed that the rate of infiltration decreases with the volume weight of the soil. Tanks of different sizes filled to the same volume weight settled at different rates, and the amount of settlement varied directly with the diameter of the cans.

Run-off water losses in relation to crop production (*Texas Sta. Rpt. 1927, pp. 58, 59, 97, 98*).—The progress results of this study (E. S. R., 57, p. 186) indicate that one of the most important factors concerned in the loss of run-off is the rapidity of the fall of water. The physical condition of the land is

apparently another important factor in the water loss, and there seems to be a considerable difference in the losses from lands under different crops. Results indicate that milo is more efficient in this respect that cotton early in the season, depending probably upon the extent to which the crop is taking water from the soil.

The L-block: A type of concrete block adapted to the economical construction of farm buildings, J. B. DAVIDSON and H. GIESE (*Iowa Sta. Bul. 249 (1928), pp. 225–247, figs. 26*).—Practical information on the manufacture and use of the L-block, with particular reference to dwellings and farm buildings, is presented, together with working drawings.

RURAL ECONOMICS AND SOCIOLOGY

[Investigations in agricultural economics at the Indiana Station, 1926–27] (*Indiana Sta. Rpt. 1927, pp. 38–41, 49, 50, figs. 2*).—Results of investigations not previously noted are reported as follows:

Cost of producing pork.—A hog-cost study in central Indiana, 1922–1926, showed that the profits per 100 lbs. of pork produced varied from 74 cts. in 1924 to $5.24 in 1926, the returns per bushel of corn fed from 50 cts. in 1923 to $1.35 in 1925, and that 80, 25, 79, 100, and 100 per cent of the cooperators made a profit in the respective years.

Farm power and farm organization.—The results on 47 farms with tractors and 50 without tractors in central Indiana showed that the former produced more livestock in proportion to their size, and 8 per cent higher crop yields per acre. The crops handled per man increased on both types of farms from 1921 to 1925. On tractor farms about three-fourths of the draw-bar work was done by horses, tractors replacing only 2.2 horses per farm. In 1925 two-bottom tractors averaged 241.2 hours of work at an average cost of $205.74. Horse work averaged 768.1 hours at a yearly cost of $89.09.

Egg marketing investigations.—In one community 240 farmers from March 1, 1926, to January 1, 1927, gained $1,876.85 by selling eggs by grades rather than on a flat price. The gain in the same community from January 1, 1927, to September, 1927, was $3,323.26. The gain in the case of one farmer was 2.7 cts. per dozen.

[Rural economics investigations at the Ohio Station] (*Ohio Sta. Bimo. Bul., 13 (1928), No. 4, pp. 157–160, fig. 1*).—Results of investigations in rural economics are reported as follows:

Seasonal variation in the estimated gross cash income from Ohio's agricultural industry, V. R. Wertz (pp. 157, 158).—A table and chart are given showing the monthly indexes (averages for the period 1921–1927) of total estimated gross income from the sale of farm products and from meat animals, dairy products, grains, and poultry and eggs.

Receipts and expenses on Ohio farms for 1927, J. I. Falconer (p. 159).—A table is given showing the average cash receipts, cash expenses, and labor income for 1926 and 1927 on 113 farms on which account books were kept. The farm labor income decreased $421, or 28 per cent, from 1926 to 1927, due chiefly to shrinkage in inventories.

Index numbers of production, wages, and prices, J. I. Falconer (p. 160).—The table previously noted (E. S. R., 59, p. 482) is brought down through April, 1928.

What is happening to agriculture in northwestern Indiana? M. H. OVERTON (*Indiana Sta. Bul. 321 (1928), pp. 47, figs. 25*).—Since 1900 the area of the State including the 12 northwestern counties has changed from an area

dominantly agricultural to one dominated by the industrial growth of cities. The changes in crop and livestock production, the effects of industrial development on the supply and cost of farm labor, the efficiency in the use of farm labor, and the agriculture of the section in general are discussed.

A study in the ratios of assessed values to sale values of real property in Oregon, W. H. DREESEN (*Oregon Sta. Bul. 233 (1928), pp. 45, figs. 8*).—This bulletin reports a study made to discover the inequalities or tendencies in assessing real estate in Oregon, and the probable cause of and possible remedies for such inequalities. It is based upon data obtained from the State Tax Commission regarding 16,806 transfers of rural property and 23,327 transfers of city property made during the period 1921 to 1926, inclusive. The transfers included all sales made during the period, except those where the consideration was nominal and the Government stamp less than $2, sales executed during any period preceding the 12 months for which the data were gathered, and forced and sheriff's sales. The assessed value of the property included was 11.22 per cent of the total assessed value of all real property of the State in 1921.

Tables are given showing (1) by counties for the period the distribution of sales and the ratios of assessed values to sale values, the counties being divided into three classes of 8, 9, and 9 groups, respectively, based on sale prices for the rural property, and into two classes of 8 groups each for city property; and (2) the ratios of assessed values to sale values by classes and groups by years and for the periods 1921–1926, 1921–1923, and 1924–1926. Other tables give similar data for the ratios of assessed to sale values for city property in Multnomah County and the larger cities in other counties, the former being divided into 11 groups and the latter into two classes of 9 groups each.

The low value groups of both rural and city property were as a whole found to be overassessed, the ratios of assessed to sale values for the period 1921–1926 for the lowest and highest value groups being 105.56 and 38.89, 71.72 and 41.65, and 64.14 and 38.80 per cent, respectively, for the three classes of rural property; 76.11 and 38.43, and 72.93 and 45.06 per cent, respectively, for the two classes of city property; and 72.86 and 52.05 per cent for Multnomah County city property. The ratios for the higher value groups were found to be higher than those for the intermediate groups for both rural and city property in a number of counties. The weighted ratios of assessments indicated that city properties were assessed higher than rural properties in 21 of the 36 counties in the years 1921 to 1923, and in 9 counties in the years 1924 to 1926. The value of the property in the overassessed groups represented only 32 per cent of the total value of all groups in the case of rural property, and only 45 per cent in the case of city property. The amount of taxes misplaced among the value groups, due to inequalities in assessments, was found to be less than 4 per cent of the total annual assessment.

Coefficients of variability of assessments were calculated for assessments for the years 1921, 1923, 1925, and 1926 on rural properties included in 11,738 transfers, and on city properties included in 9,474 transfers. The 4-year averages of these coefficients indicate that 12 to 23 per cent, averaging approximately 18 per cent, of the tax on rural properties, and 10 to 25 per cent, averaging approximately 17 per cent, on city properties were misplaced. It was also found that there is a strong tendency for inequalities in assessments to increase with a decrease in the general ratios of assessment.

On the basis of the findings as to overassessment in the lower value groups and the inequalities in the assessment of individual properties, it was estimated that less than 50 per cent of the real property of the State bears 68 per cent of the tax burden.

The probable causes of variations in the assessments between value groups and between individual properties in the same group and the probable results of these variations and inequalities are discussed. The remedies suggested are a thorough revision of the existing assessment rolls and a constant change in assessed values to agree with changes in actual values.

Farmers' cooperative business organizations in New York, J. F. Booth (*New York Cornell Sta. Bul. 461 (1928), pp. 123, figs. 20*).—This bulletin presents the results of a study made of the development and present status of farmers' cooperative business organizations in New York. Particular emphasis is placed on the reasons for the success or failure of such organizations.

An intensive study was made in 10 representative counties, the records of all incorporated associations being obtained from the county clerks, personal visits being made to 84 active associations, persons connected with 136 associations no longer active being interviewed, and records by questionnaires being obtained regarding 176 active and 108 inactive associations.

The first part of the report describes the development of the associations for different purposes, and discusses the organization, financing, operation, amount of business done, and other phases of the different types of organization.

The second part discusses the amount of capital needed; methods of raising capital; security for borrowed capital; relation of capital to volume of business; the average assets, liabilities, and ratios of current assets to current liabilities of 28 stock and 24 nonstock associations; membership and patrons and number of years of operation of associations; qualifications, duties, etc., of managers; membership contracts; meetings of members and directors; accounting and auditing; reasons for associations ceasing to operate; and the effects of outside promotion of associations upon the life, membership, success, etc., of the associations.

Prices of farm products in Indiana, E. C. Young and O. A. Day (*Indiana Sta. Bul. 320 (1928), pp. 24, figs. 8*).—Using publications of the U. S. Department of Agriculture showing monthly prices received by producers of corn, wheat, oats, rye, hay, potatoes, apples, horses, beef cattle, calves, sheep, lambs, hogs, chickens, eggs, butter, and wool, and weighting the various prices on total sales from Indiana farms as reported by the 1925 census on a basis determined from detailed records from 2,772 farms for the period 1914–1917, this sample being weighted by crop reporting districts, monthly index numbers of Indiana farm prices were constructed of the type $\frac{\Sigma Q_0 P_1}{\Sigma Q_0 P_0}$ in which Q_0=fixed monthly base weight (average sales, 1914–1917), P_0=fixed monthly base price (5-year averages, 1910–1914), and P_1=given monthly price.

Tables and curves are given showing the monthly index numbers of farm prices, 1910–1927; monthly index numbers, 1910–1927, of the purchasing power of Indiana farm products; index numbers (average January 1 farm prices, 1910–1914=100) of the January 1 purchasing power of horses, milch cows, other cattle, sheep, and hogs, 1867–1928; average 1910–1927 variations by months from yearly average of the prices of the 17 commodities (no curve); monthly corn-hog ratios, 1910–1927, unweighted and with the price of corn weighted according to the percentage of corn used during each of the 12 months required to produce a hog; and monthly ratio, 1910–1927, of poultry feed (3 parts corn and 1 part wheat) to the price of poultry and eggs (10 doz. eggs and 6.5 lbs. of poultry).

Marketing American cotton in England, A. B. Cox (*U. S. Dept. Agr., Tech. Bul. 69 (1928), pp. 88, figs. 30*).—The marketing facilities and processes at Manchester and Liverpool, as they are related to America and Americans are described and discussed. Some of the differences between American and Liver-

pool futures are described, and statistics are given of weekly imports into England, August, 1919, to July, 1924, from the United States and other countries.

Marketing Calhoun County apples, J. W. Lloyd and H. M. Newell (*Illinois Sta. Bul. 312 (1928), pp. 561–612, figs. 27*).—This bulletin gives the methods used in grading, packing, transporting, and selling the apple crop of Calhoun County, Ill., and makes recommendations for improvements.

The county has an average annual production of 400,000 bbls. of apples, but is without a railroad, a cold storage plant, or marketing organizations, and has scarcely a packing shed.

The Indianapolis apple market, H. M. Cleaver, M. R. Cooper, and J. W. Park (*Indiana Sta. Bul. 322 (1928), pp. 38, figs. 9*).—This bulletin reports the results of a study made in cooperation with the U. S. D. A. Bureau of Agricultural Economics to determine the sources of the apple supply in the Indianapolis market; the consumer preferences as to varieties, grades, and sizes; and the advantages and disadvantages of different types of containers. The data, which are chiefly for the year 1926, were secured from all wholesalers in the city handling car lots, the buyers of the four chain-store organizations having a total of 450 stores, and 55 independent retail stores.

About 62 per cent of the car-lot receipts in 1926 were sold to jobbers. In a full-crop year, such as 1926, Indiana growers furnished only from 30 to 35 per cent of the Indianapolis apple receipts. Independent groceries handled more locally grown and fewer western boxed apples than did the chain stores. Approximately one-third of the apples received in car lots were in barrels and slightly less than one-third in bushel baskets. About one-third of the customers asked for varieties by name.

Tables and graphs are included showing the percentages of car-lot receipts each year, 1923–1926, from different States, or receipts in 1926 by varieties, of sales in 1926 of chain and independent retail stores by varieties, of sales in 1926 by wholesalers to different classes of trade, and of car lots by varieties received in different types of containers, the percentages in different containers handled by chain stores and independent retailers, and the monthly prices of different varieties of apples from 1921–22 to 1926–27.

Judging price risks in marketing hogs, R. M. Green and E. A. Stokdyx (*Kansas Sta. Circ. 137 (1928), pp. 29, figs. 12*).—Graphs are given and analyzed showing the average monthly prices for hogs, 1880–1926, for the 28 years when production was decreasing and the 18 years when production was increasing; the average monthly top prices at Kansas City, 1880–1926, and the average monthly receipts at principal markets, 1915–1925; the number of times the top price in any month exceeded that in the preceding month; hog values, 1862–1927; the average monthly top prices at Kansas City and the number of times the price in any month exceeded that in the preceding month; and the average top prices at Chicago by 10-day periods and the number of times such price in any 10-day period exceeded that in the preceding 10-day period in years of (1) increasing hog production preceded by small corn crops, (2) increasing hog production preceded by large corn crops, (3) decreasing hog production preceded by small corn crops, and (4) decreasing hog production preceded by large corn crops. A table is also given showing the years in which the Kansas City top price in each month was higher or lower than the preceding month when price trends were up and when price trends were down.

Hog values, 1862–1927, show 11 distinct upward and downward swings, the former varying from 17 to 70 months and averaging 36 months, and the latter varying from 12 to 49 months and averaging 31 months. From 1901 to 1926 the period of advance averaged 27 months and that of decline 20 months. July prices increased over the preceding month in 26 of the 29 years in which the price trends were up, August prices in 15, and September prices in 17 years.

There were increases in 12 Julies, 11 Augusts, and 9 Septembers of the 19 years when the price trend was down. In years of advancing price tendencies the chances were about 9 to 1 that the late summer and early autumn prices would be better than the average price for the year. In years of declining price tendencies the chances of better prices were only about 1 to 1. The chances of declines in April and advances in December were much greater in years of advancing prices. April hog prices were most often, but not always, quite sensitive to changes in the hog market influences. In 16 of the 19 years of downward trend the April prices were lower or only equal to March prices, and in 13, 11, 12, and 16 of the 16 years the July, August, September, and December prices were below the March prices. In 20 of the 29 years of upward trend in prices the April prices were higher than in March, and in 20, 18, 19, and 9 of the 20 years the July, August, September, and December prices were above the March prices.

The major trend in hog prices was found to be downward in years of increasing and upward in years of decreasing hog production regardless of whether the preceding years were years of small or large corn crops. In the years of increasing hog production the March price was the peak price and the spring market average was higher than the fall market average. In years of decreasing hog production the fall market price level was the higher and the upward swing was well sustained from 50 to 90 per cent of the time.

The effects on prices of changes in demand in the United States and for export are discussed briefly.

Marketing country creamery butter by a co-operative sales agency, H. B. PRICE (*Minnesota Sta. Bul. 244 (1928), pp. 45, figs. 9*).—The organization and operation of the Land O'Lakes Creameries, Inc., a cooperative sales agency for 420 creameries, are described, and the advantages of the organization and the improvements it has brought about are discussed.

Advantages of keeping records of household accounts, and of budget making, G. FERNANDES (*Oklahoma Sta. Circ. 72 (1928), pp. 4*).—This is a statement of some of the uses that can be made of household accounts.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

Proceedings of the forty-first annual convention of the Association of Land-Grant Colleges and Universities, edited by H. L. KNIGHT (*Assoc. Land-Grant Cols. and Univs. Proc., 41 (1927), pp. 444, figs. 2*).—This is the customary report of this convention (E. S. R., 56, p. 587) held at Chicago, Ill., November 15–17, 1927, and previously discussed (E. S. R., 58, pp. 1, 99, 101).

The following papers, together with discussions, are included; Presidential address—The Solution of Present-Day Problems, and the Contribution by Land-Grant Institutions, by H. A. Morgan (pp. 24–35); The Most Important Contribution of the Negro Land-Grant Colleges, by J. W. Davis (pp. 35–38); Address of the Director of Scientific Work, U. S. Department of Agriculture, by A. F. Woods (pp. 38–41); The survey of Engineering Education, by W. E. Wickenden (pp. 42–52); The Relation Between Rural Electricity and Our Colleges and Universities, by E. A. White (pp. 53–55); The Study of Land-Grant Institutions, by A. J. Klein (pp. 56–60); Report of the Bibliographer—History of the Act of Congress Elevating the United States Department of Agriculture to Cabinet Rank, by A. C. True (pp. 62–73); Ways and Means of Measuring College Teaching Efficiency, by A. C. True et al. (pp. 73–84); Report of the Special Committee on the Agricultural Situation (pp. 88–114) (E. S. R., 58, p. 587); Improvement of Instruction in Land-Grant Colleges, by C. D. Bohannan (pp. 116–131); Opportunities Before Students of Agricultural Colleges, by E. H. Shinn (pp. 131–141); Agriculture as a Business Compared

to Agriculture as a Mode of Life, by A. Boss (pp. 141–149); Responsibilities of the Land-Grant Colleges in Teaching Agriculture as a Way of Life, by W. F. Kumlein (pp. 149–155); What is the Best Type of Education for Extension Workers in Aiding Them in the Solution of Present-Day Problems? by H. C. Ramsower (pp. 157–163); What is the Best Type of Education for Station Workers in Aiding Them in the Solution of Present-Day Problems? by E. C. Johnson (pp. 164–171); Increasing Teaching Efficiency with Special Reference to Agriculture, by G. A. Works (pp. 172–178); The Responsibility of the Agricultural Experiment Station in the Present Agricultural Situation, by C. G. Williams (pp. 179–184); The Place of Economic Research in the Solution of Present-Day Agricultural Problems, by E. Englund (pp. 184–190); Some Trends in Agricultural Research, by E. W. Allen (pp. 190–196); How Far should Research Problems be Predicated upon Extension Experience? by W. C. Coffey (pp. 208–215); Development of Research in Rural Sociology, and Some Problems in Need of Attention Having a Bearing upon the Agricultural Situation, by C. C. Taylor (pp. 215–221); Development of Research in Home Economics, by L. Stanley (pp. 221–227); What Is the Agricultural Problem in Respect to Marketing? by T. Macklin (pp. 228–235); The Agricultural Problem from the Point of View of Farm Management, by W. I. Myers (pp. 235–240); What Is the Agricultural Problem from the Home Standpoint? by L. Bane (pp. 241–243); The Agricultural Problem from the Point of View of Sociology, by E. Mumford (pp. 243–254); What Contribution Can the Extension Service Make to the Solution of the Agricultural Problem from the Marketing Standpoint? by B. H. Crocheron (pp. 254–256); Contributions Which the Extension Service Can Make Toward the Solution of the Agricultural Problem from the Farm Management Standpoint, by C. R. Arnold (pp. 256–261); What Contribution Can the Extension Service Make to the Solution of the Agricultural Problem from the Home Standpoint? by R. G. Smith (pp. 261–268); What Contribution Can the Extension Service Make to the Solution of the Agricultural Problem from the Standpoint of a Sociologist? by W. Burr (pp. 268–272); The European Corn Borer in Europe, by C. F. Curtiss and G. I. Christie (pp. 275–279); Progress in Corn Borer Control, by W. H. Larrimer (pp. 279–283); Contributions of Engineering Colleges of Land-Grant Institutions to the Solution of Present-Day Problems, by A. A. Potter (pp. 284, 285); The Attraction and Admission of Students to Engineering, by R. L. Sackett (pp. 285–289); The Orientation, Guidance, and Elimination of Engineering Students, by O. M. Leland (pp. 299–304); The Selection, Development, and Compensation of Engineering Teachers, by D. S. Kimball (pp. 312–315); The status of Engineering Extension at Land-Grant Institutions, by C. R. Jones (pp. 327–342); Graduate Fellowships and Scholarships in Engineering Colleges of Land-Grant Institutions, by G. W. Bissell (pp. 342–344); Training of Men for Engineering Research at the University of Illinois, by M. S. Ketchum (pp. 347–350); The Fifth Year for Gifted Students, by A. Marston (pp. 352–359); Some Present-Day Social Problems of the American Family, by T. D. Eliot (pp. 370–385); The Economic Problems of the Family and What Home Economics Has to Offer Toward Their Solution, by C. G. Woodhouse (pp. 386–394); Educational Problems in the Home, by R. Andrus (pp. 396–399); The Land-Grant College Home Economics Survey, by L. Bane (pp. 404, 405); and The Status of Purnell Research in Home Economics, 1927–28, by S. L. Smith (pp. 405–411).

A laboratory guide in dairy industry, H. E. Ross (*Philadelphia: Lea & Febiger, 1928, pp. VII+17–134, figs. 16*).—The laboratory exercises included are prepared for use in agricultural and vocational schools and cover the composition of milk, the relation of the constituents of milk to one another, the value

of milk as a food, and the effect of dairy practices on the sanitary production and handling of milk.

Commerce and industry, J. R. Smith (*New York: Henry Holt & Co., 1925, new ed., pp. X+767, [pls. 3], figs. [360]*).—This is a new edition of a book previously noted (E. S. R., 44, p. 393).

FOODS—HUMAN NUTRITION

Growth, reproduction, and longevity of experimental animals as research criteria in the chemistry of nutrition, H. L. Campbell (*Diss., Columbia Univ., New York, 1928, pp. 39, figs. 14*).—The purpose of the investigation which is reported in detail in this dissertation was to demonstrate the possibility of forming a quantitative estimate of the value of different approximately adequate diets by long-time feeding experiments on rats for comparisons of the relative growth of the young animals, the vigor of the adults as shown by the ability to bear and rear young, and the relative longevity. The diets used were the Sherman diets of whole milk powder and whole ground wheat in proportions of 1:5 (diet A), 1:2 (diet B), and 1:9 (diet 110), each with the addition of sodium chloride to the extent of 2 per cent of the weight of the wheat. Analyses are given of these diets in terms of the proportions of the different constituents in parts by weight and by calories per 100 gm. of diet. The relative values for diets B, A, and 110, respectively, were calories 4, 3.73, and 3.62 per gram; protein 0.15, 0.13, and 0.12 gm.; and ratio of milk protein to cereal protein 1:1, 1:2, and 1:4. Diet B contained about 1.75 times as much calcium, slightly more phosphorus, and slightly less iron than diet A, and diet 110 one-third as much calcium, slightly less phosphorus, and slightly more iron than diet B. Diets A and B were both considered adequate with respect to vitamin A and diet 110 just below adequacy. Milk being richer in vitamin G than in F and wheat in F than in G, all of these diets were considered adequate in these vitamins and were also thought to be adequate in vitamin E.

In the first comparison 10 female rats of different ancestry and different dietary history were placed on each diet. All of the young were continued on the diet until records of early growth and maturity were acquired in large numbers, when 20 females and an appropriate number of males of each generation were continued for complete breeding experiments. The selection was made on the basis of fair but not superior representatives from the different litters, but with Diet A so few young were raised that in the sixth and seventh generations it was never possible to get the quota of 20 females. One superior litter in the eighth generation on this diet formed the basis for continuing the series, which had reached the seventeenth generation at the time of writing, at which time the series on diet B were in the twenty-fourth generation. Breeding was so poor on diet 110 that the study stopped at the second generation.

The average gain for 730 males on diet B and for 304 males on diet A was greater by over 45 times the probable error, while for 911 females on diet B and 364 on A the difference was 40 times the probable error. The animals on diet B also showed a significantly greater gain per 1,000 calories of food and per gram of protein eaten, but the calories per gram of rat per day were practically the same. The data for diet 110 were not sufficient to treat statistically, but the gains per 1,000 calories and per gram of protein eaten were much less than for diet A. Diet B was also shown to be superior in respect to the size of animals at all ages and to all phases of the breeding records. A study of the longevity of 100 males and females on diets A and B showed a difference of about two months (or about 10 per cent of the normal length of life) in favor of diet B.

The author concludes that properly standardized animals under carefully controlled conditions may be used as criteria in nutritional research, growth, reproduction, and longevity. "This promises to be of special value when the field of investigation is that which approaches more or less closely to the adequate in nutrition, in which short time experiments are of little value."

The determination of the surface area of young women and its use in expressing basal metabolic rate, H. S. BRADFIELD (*Missouri Sta. Research Bul. 109 (1927), pp. 31, figs. 5*).—This is the complete report of an investigation which has been noted previously from another source (E. S. R., 58, p. 591).

The food consumption of rural school children in relation to their health, E. S. DAVIES (*Massachusetts Sta. Bul. 241 (1928), pp. 97–147, figs. 12*).—This is the complete report of a qualitative study of the dietary habits of elementary rural school children of two small towns in the State, one in a cranberry growing section and the other in a tobacco and dairy farming section, and of the relationship between the habits observed and the nutritional status of the children as judged by records of physical examinations given by the children's clinic of the Division of Tuberculosis of the State Board of Health and examinations of the teeth by a dental hygienist.

Of particular interest in the report are the discussion of the limitations of data secured by the survey method, the optimum score used in evaluating the diets, and the reports of the dental examinations, which are considered to be the most important available data for judging the nutritional status of the children.

In the optimum score of 100, 24 points were allowed for the consumption of 1 qt. of milk per day; 23 for cooked vegetables, including 5 for potatoes once a day, 10 for vegetables other than potatoes or leafy once a day, and 8 for leafy vegetables 4 times a week; 21 for fruits and raw vegetables, including 7 for cooked fruit once a day and 14 for raw fruit or vegetables or canned tomatoes twice a day; 14 for whole grain cereal foods twice a day; and 18 for meat and eggs, including 9 for eggs three times a week and 9 for meat once a day. Graded on this basis, the diets of only 15 per cent of the 155 children of Carver (cranberry section) and 24 per cent of the 120 children of Southwick were considered satisfactory, scoring 70 per cent or more. The best feature of the Carver diet was the amount of fruit and vegetables and the poorest the large amount of sweet foods such as cake, doughnuts, and pie. The best feature of the diet in Southwick was the high consumption of milk and the poorest the low vegetable consumption. The amounts of whole-grain cereals were low in both cases.

In evaluating the results of the dental examinations, the 6-year molars were chosen for purposes of comparison, thus obviating chances of error arising from data based on teeth with varying tendency to decay. The condition of these teeth was much better among the Southwick children, both native and foreign stock, than among the Carver children. The chief causal factor for this is considered to be the higher milk consumption by the former group. No other differences, economic, social, or dietary, were found to explain the differences in the condition of the teeth. An appendix contains the questionnaires used in the study and the dental record form.

The physical curd character of milk and its relationship to the digestibility and food value of milk for infants, R. L. HILL (*Utah Sta. Bul. 207 (1928), pp. 32, figs. 14*).—The curd test of milk, which is considered to give an indication of the suitability of milk for infant feeding (E. S. R., 57, p. 594), is described, previously-reported data obtained in the study of factors influencing the character of the curd (E. S. R., 51, p. 379) are reviewed, and an extension of the investigation is reported as follows:

Individual samples of milk from the university herd tested on the same date gave curd tensions varying from 16 to 160 gm. The average tension of the milk from the Jersey cows was 86 gm. and from the Holstein 38. The milk of the same cows tested at intervals over several years showed slight variations, but not as great as between the milks of different cows. At the beginning and end of the lactation period the curd tended to be harder than normal. In tests conducted on purebred herds in the State there was a variation of from 26 to 117 gm. in five Holstein herds, with an average between 50 and 64 gm. Samples of milk from the single Jersey herd examined varied from 63 to 141 gm., with an average of 97 gm. Examination of milk from 1,017 cows, most of which were not purebred, gave further indication that the curd character of the milk is an individual characteristic of the cow rather than a breed characteristic, although there is a greater probability of obtaining cows giving a soft curd milk in some breeds than in others.

Heating milk for 5 minutes on the boiling water bath reduced the curd tension consistently, but pasteurizing it by heating at 143 to 144° F. for one-half hour gave variable results.

Several case reports are given showing the beneficial results obtained in feeding babies milk with low curd tension. While the most favorable tension has not been determined, it is stated that with a curd tension of less than 20 gm. very little modification of the milk is needed for infant feeding.

Iodine content of milk powder, D. R. Mathieson (*Soc. Expt. Biol. and Med. Proc., 25 (1928), No. 9, p. 826*).—A sample of powdered whole milk from Indiana (a goitrous region) was found to contain 166 parts of iodine per billion as compared with 62 parts per billion for milk from Berne, Switzerland (goitrous region), and 400 parts per billion for milk from the California coast (nongoitrous region).

The commercial production of sauerkraut, E. LeFevre (*U. S. Dept. Agr. Circ. 35 (1928), pp. 31, figs. 12*).—This compilation of information on sauerkraut manufacture includes statistics showing the economic importance of the sauerkraut industry in the United States, data on its food value, a discussion of the bacteriology of its production and of factors influencing the quality of the product, and a description of a typical sauerkraut factory and of the processes involved throughout, including canning, packing, and testing. Information is also given on Federal regulations governing the manufacture and sale of sauerkraut, weights of sauerkraut in cans of various sizes, and definition and standard for sauerkraut. A list of 23 references to the literature is appended.

Calcium metabolism, C. P. Stewart and G. H. Percival (*Physiol. Rev., 8 (1928), No. 3, pp. 283–312*).—This is a concise review of the literature on the subject, classified under the headings the absorption of calcium, the excretion of calcium, the functions of calcium, the calcium content of blood, physiological variations in the serum calcium, and factors controlling the calcium content of the serum. A list of 190 references is appended.

Relation of bone development in infants to calcium and phosphorus retention ratios, A. L. Daniels and M. K. Hutton (*Soc. Expt. Biol. and Med. Proc., 25 (1928), No. 9, pp. 794–797*).—Calcium and phosphorus metabolism experiments were conducted at frequent intervals on 2 babies receiving boiled milk and dried milk (Klim), respectively, and for a single period on 1 baby and two periods on another receiving S. M. A., a cow's milk preparation in which the fat has been modified to resemble that of human milk. Cod-liver oil and orange juice were given in all but one case. Data are also included for 1 rachitic child receiving no cod-liver oil.

Röntgenograms of the epiphyses and long bones of the babies receiving boiled and dried milk modifications were taken once a month and showed complete calcification, as was also the case with a 9½-months-old baby which had received S. M. A. since it was 2 weeks old. The tabulated data show a higher retention of both calcium and phosphorus on the boiled or dried milk than on the S. M. A., but similar retention ratios of calcium to phosphorus, averaging about 2 to 1. The rachitic child retained about the same amount of phosphorous as one of the normal children, but was in negative calcium balance.

The authors conclude that normal calcification of the skeleton takes place when the conditions are such that the calcium and phosphorous are retained in the proportion of approximately 2 parts of calcium to 1 of phosphorus, but that the levels of calcium and phosphorus retention may be different. "These data, together with others to be reported later, suggest that the disproportion in the calcium and phosphorus retentions observed in rachitic infants receiving metabolic disturbance being primarily to a faulty calcium metabolism, the metabolic disturbance being related to a deficiency of vitamin D."

Nutrition, W. H. Eddy (*Baltimore: Williams & Wilkins Co., 1928, pp. VII+237*).—Of particular value in this elementary text on general food requirements and vitamin requirements is the chapter entitled How Does Cooking Affect Vitamin Values, which contains a summary of the available literature on the subject, with a discussion of the practical significance of the findings reported.

The absorption spectrum of vitamin A, R. A. Morton and I. M. Heilbron (*Nature [London], 122 (1928), No. 3062, p. 10*).—A large number of fish liver oils and vitamin A concentrates have been found to have a prominent absorption band at 328.5 $\mu\mu$, the intensity of which runs closely parallel with the vitamin A potencies of the various materials as determined by the antimony trichloride color test. Oils which have lost their vitamin A potency through aeration or oxidation have also been found to lose this characteristic absorption band. Evidence has been obtained that the first decomposition products of vitamin A include a substance having an absorption band in the region of 275 to 285 $\mu\mu$.

"The adoption of the 328 $\mu\mu$ band as a criterion of vitamin A will, we hope, assist in the elucidation of the chemical nature of the substance. Whilst the test may not always be as delicate as the antimony trichloride reaction, it is less empirical and in all probability more trustworthy."

The vitamin A and vitamin D content of cod liver meal, E. M. Cruikshank (In *Report of World's Poultry Congress, Ottawa, Can., 1927. Ottawa: Mortimer Co., [1928], pp. 246, 247*).—A sample of cod-liver meal was tested for its potency in vitamins A and D, using White Leghorn chicks as the experimental animals and for the basal ration a mixture of corn 97, calcium carbonate 2, and salt 1 part, with skim milk ad libitum. In the vitamin D experiments the corn was yellow and in the A experiments white. Positive and negative controls were run in both series. It was found that 1 per cent of cod-liver meal was sufficient to protect the chicks against rickets and from 7 to 10 per cent to meet the requirements for vitamin A. Ophthalmia was not observed in the vitamin A deficiency, but respiratory and lung trouble, with nodular lesions of mouth and pharynx, and characteristic changes in the kidneys, in which the ureters and renal tubules were filled with an accumulation of urates, were observed.

Nutritive value of the garbanza pea, H. S. Mitchell (*West. Hosp. and Nurses' Rev., 11 (1928), No. 6, pp. 26, 27, 52, 53, figs. 3*).—The garbanza pea, otherwise known as the chick or Idaho pea, has been found by biological tests to be somewhat superior to the soy bean and approximately equivalent to casein in the quantity of its protein, to be a rich source of vitamin B, and to have

slight potential alkalinity. In the Sherman units the vitamin B value is given as 5 units per gram. Several recipes for the use of the garbanza pea are included.

The vitamin B content of white yautia, yellow yautia, and plantain, D. H. Cook and E. J. Quinn (*Amer. Jour. Trop. Med., 8 (1928), No. 1, pp. 73–77*).—This has been essentially noted from another source (E. S. R., 57, p. 690). Calculated in the Sherman units, the vitamin B values of the materials tested were for plantain 0.3, white yautia 0.6, and yellow yautia 1 unit per gram.

Effect of ash of liver on blood regeneration in pernicious anemia, C. A. Elden and W. S. McCann (*Soc. Expt. Biol. and Med. Proc., 25 (1928), No. 9, pp. 746–748, fig. 1*).—In connection with the experiments of Robscheit-Robbins et al. on the effect of the ash of liver on blood regeneration in dogs (E. S. R., 59, p. 295), observations were made on its effect in two cases of pernicious anemia. The administration of the whole ash in amounts of from 3 to 4.5 gm. daily (equivalent to 369 to 387 gm. of raw liver) was followed by the appearance of some of the preliminary phenomena of a remission, particularly a slight increase in reticulocytes, but in neither case did a true remission occur until Minot's liver extract was given. The activity of the ash was destroyed by dissolving it in hydrochloric acid, neutralizing with sodium hydroxide, and evaporating to dryness.

Blood regeneration in severe experimental anemia: Influence of inorganic elements, G. H. Whipple, F. S. Robscheit-Robbins, C. A. Elden, and W. M. Sperry (*Soc. Expt. Biol. and Med. Proc., 25 (1928), No. 9, pp. 748–750*).—In this preliminary report of a continuation of the studies previously noted (E. S. R., 59, p. 295), data are given on the effect of the administration of various inorganic salts on hemoglobin regeneration in dogs rendered anemic by bleeding. No response was secured with salts of manganese, aluminum, arsenic, and antimony and with sodium iodide, and definite but varying response with various salts of iron, copper, and zinc. In the doses given iron appeared to be more potent than copper or zinc.

The energy factor in relation to food intake: Experiments on the dog, G. R. Cowgill (*Amer Jour. Physiol., 85 (1928), No. 1, pp. 45–64, fig. 1*).—The experiments reported in this paper were undertaken to answer the following questions: What is the ideal or optimum state of nutrition in the dog? Will the food intake of two rations of different caloric content vary inversely with their respective energy content?

Twelve dogs, ranging from 3.41 to 15 kg. body weight were fed an adequate artificial diet ad libitum, and the amounts consumed and weights of the animals were recorded. In all cases the animals ate all the food offered, with an increase in body weight until a certain weight, different for each animal, was reached, after which the food intake varied widely from day to day while the body weight remained constant. Four of the dogs were then offered another ration of much higher energy content. All responded to this change by eating amounts furnishing approximately the same number of calories per day as on the first diet. The author uses the term "caloric adjustment" to designate this maintenance of constant body weight and nutritive state.

A comparison of the energy intake under caloric adjustment conditions with body weight showed that the smaller the animal the greater the total metabolism per unit of weight. In comparison with body surface area the caloric adjustments of six dogs ranging from 3.41 to 15 kg. body weight were approximately the same, 64 calories per hour per square meter with a standard deviation value of 8.4 per cent.

On the basis of the linear relationship which was found to exist between the body length and the logarithm of the calories per hour after caloric adjustment,

a table has been constructed by means of which it is possible to estimate from a given length the caloric intake at the adjustment level or at a level suitable for maintenance in good nutritive condition.

In discussing the practical application of the principle of caloric adjustment, it is emphasized that in the planning of experimental diets care should be taken to see that the ratios of salt content and other essentials to the total calories are such that the adjustment of intake to the calorific value of the total diet can be made without reducing the consumption of these essentials below the minimum requirement. The practice of regulating arbitrarily the amount of milk mixtures to be given babies is considered inadvisable. It is thought wiser to see that the food is complete and fed in the proper concentration and to restrict the amount only when definite indications of gastro-intestinal troubles appear. It is the belief of the author that "the healthy infant may be relied upon to govern the amount of his food intake wisely according to the principle of caloric adjustment."

TEXTILES AND CLOTHING

Standardization in the textile industry, J. C. SHOVER (*Ann. Amer. Acad. Polit. and Social Sci., 137 (1928), No. 226, pp. 168–175*).—Some of the advances made or being made in the textile industry in the standardization of materials and products, textile machinery, processes and operations, and personnel are described, and attention is called to the furthering of the movement by trade and technical organizations.

The textile syndicate of the U. S. S. R. (*Textile Recorder, 46 (1928), No. 544, pp. 35, 36*).—A résumé of the organization and activities of the Textile Syndicate of the Union of Socialistic Soviet Republics in supplying raw materials, developing and financing the industry, and exporting textile goods.

Research in cotton technology in India, 1927, A. J. TURNER (*Indian Cent. Cotton Com. [Bombay] Bul. 13 (1928), pp. [2]+26*).—This is a summary report of results published in 1927 of investigations in the laboratory and already noted (E. S. R., 58, pp. 95, 596, 695).

The use of hydrocyanic acid gas for the fumigation of American cotton on import into India, A. J. TURNER and D. L. SEN (*India Dept. Agr. Mem., Ent. Ser., 10 (1928), No. 5, pp. VI+69–166, pls. 6, figs. 7*).—This memoir gives a detailed account of the investigations noted earlier from another source (E. S. R., 57, p. 597).

The effect of using unbalanced drafts instead of balanced drafts in the spinning preparation for spinning tests, A. J. TURNER (*Indian Cent. Cotton Com. [Bombay] Bul. 15 (1928), pp. [1]+30, figs. 3*).—To test the validity of the present procedure at the Technological Laboratory of spinning three different counts (20's, 30's, and 40's) from one set of rovings, experiments were made on eight standard Indian cottons differing considerably between one another. Drafts of 4.5, 6.6, and 8.6 were used for 20's, 30's, and 40's, respectively, in the unbalanced draft series, and drafts of 5.3, 6.2, and 6.9 for 20's, 30's, and 40's, respectively, in the balance draft series.

The difference in the system of drafting made no practical difference to the number of breakages in the ring frame, or to the evenness, neppiness, strength, and extension of the yarn, indicating that a comparatively wide variation is possible in the series of drafts used in the spinning tests without affecting the results appreciably, and that the procedure at the laboratory is justified. An appendix deals with the principles of roller drafting in relation to the arrangement of the fibers of the material drafted.

The effect of different spindle speeds on the results of spinning tests, A. J. TURNER (*Indian Cent. Cotton Com. [Bombay] Bul. 14 (1928), pp.*

1]+*22*).—The effect of increasing the spinning speed was determined for eight standard Indian cottons, each of which was spun into three different counts of yarn at low and high speeds. The low spindle speed was 8,600 r. p. m. for all counts, and the high spindle speeds were 8,900 for 20's, 9,550 for 30's, and 9,950 r. p. m. for 40's counts. Yarn breakages in the ring frame were recorded, and each yarn was classified for evenness and neppiness and subjected to textile tests.

Within the rather narrow test limits the higher spinning speed seemed to make no difference whatever to the number of ring frame breakages or to the strength, extension, evenness, and neppiness of the yarns. Breakages are evidently due primarily to unevenness of the yarn, extending over an inch or two, rather than to neppiness or dirt in the yarn. So long as the counts of yarn spun are well within the spinning capacity of the cotton the results at the high spinning speed are identical with those at the low spinning speed; hence the use of the higher spindle speeds in the spinning tests on the standard Indian cottons seemed justifiable. However, if a cotton is being spun near its spinning limit, an increase of spinning speed will probably cause an increase in the number of spinning breakages.

Removal of non-cellulosic constituents of cotton in scouring and bleaching of fabric, M. Freiberger (*Textile World, 73 (1928), No. 26, pp. 53, 55*).—Recent discoveries in the chemistry of the removal of the noncellulosic constituents of cotton are reviewed, with discussion of related technical problems.

Cotton fabrics and their uses (*Washington: U. S. Dept. Com., Bur. Foreign and Dom. Com., Textile Div., 1928, pp. II+36*).—This outline of current uses of cotton includes brief descriptions of cotton fabrics and their uses and lists of articles wherein cotton fabrics are used.

Testing of narrow fabrics in hosiery, W. Davis (*Wool Rec. [Bradford], 34 (1928), No. 1001, pp. 173, 175, 177, 179, figs. 9*).—The ballistic testing machine illustrated and described is deemed suitable for testing such fabrics as strings, tapes, and narrow strips of cotton, rayon, etc. The test seemed too drastic for woolen and rayon yarns used in the knitting industry.

The microscopical investigation of artificial silk fibres, L. G. Lawrie (*Jour. Soc. Dyers and Colourists, 44 (1928), No. 3, pp. 73–78*).—The technique of preparing rayon filaments for microscopic examination is outlined, and comments are made on the general characteristics of the fiber and cross sections, on typical interference colors produced by the principal rayons under polarized light, and on the swelling of rayon filaments in water.

Report of committee D–13, W. F. Edwards and K. B. Cook (*Textile World, 73 (1928), No. 26, p. 28*).—This report includes proposed tentative specifications for asbestos yarn and tire cord and tentative definitions of terms relating to textile materials.

[Causes of shady wool piece goods], R. D. B. (*Textile World, 73 (1928), No. 26, pp. 49, 51*).—Weaving and finishing operations, rather than the dyehouse, seemed responsible for most cases of shadiness in wool piece goods.

Identification of mill starches by the use of microscope and camera, A. H. Grimshaw (*Textile World, 73 (1928), No. 24, pp. 42, 45, figs. 7*).—Tests at the North Carolina State College Textile School on 63 samples of starches and sizing compounds showed the majority to be either plain or modified cornstarch. The granules of the several kinds of starch are illustrated by microphotographs.

The measurement of luster and sheen, L. B. Desbleds (*Cotton, 92 (1928), No. 10, pp. 1007–1009, figs. 5*).—The method of determining luster and sheen by the use of the photo-electric photo-colorimeter is described and illustrated.

Testing the fastness properties of dyestuffs: Methods adopted, J. S. Heuthwaite (*Textile Colorist, 50 (1928), No. 593, pp. 311–315*).—A brief discus-

sion of technique involved in tests for fastness to laundering, water, washing, milling, alkalies, acids, rubbing, perspiration, and light.

[Tests for fastness] (*Amer. Dyestuff Rptr., Sample Swatch Quart., 1928, July, pp. 444–446*).—The methods outlined for testing fastness to crocking, to stoving, and to degumming of dyed silk were submitted to the research committee of the American Association of Textile Chemists and Colorists.

Fabric damage, A. W. STURTEVANT (*Natl. Cleaner and Dyer, 19 (1928), No. 9, pp. 87–89*).—Ways of identifying the fabric damage for which the dry cleaner is not responsible are outlined, and dry cleaners are urged to adopt the merchants' three-grade rule on silk dress adjustments.

MISCELLANEOUS

Report of the [California] Agricultural Experiment Station, [1927], E. D. MERRILL (*California Sta. Rpt. 1927, pp. 1+110*).—This contains the organization list, a report of the director and summary of the work of the station for the year ended June 30, 1927, including data as to projects and publications, and a summary, by B. H. Crocheron, of the work of the agricultural extension service (pp. 104–110). The experimental work reported not previously noted is for the most part abstracted elsewhere in this issue.

Work and progress of the [Idaho] Agricultural Experiment Station for the year ended December 31, 1927, C. W. HUNGERFORD (*Idaho Sta. Bul. 160 (1928), pp. 32*).—This contains the organization list, a report of the acting director, and financial statements for the Federal funds for the fiscal year ended June 30, 1927, and for the remaining funds for the fiscal year ended December 31, 1927. The experimental work reported not previously noted is for the most part abstracted elsewhere in this issue.

Fortieth Annual Report of [Indiana Station], 1927, G. I. CHRISTIE and H. J. REED (*Indiana Sta. Rpt. 1927, pp. 75, figs. 24*).—This contains the organization list, a report of the director summarizing the activities of the station, and a financial statement for the Federal funds for the fiscal year ended June 30, 1927, and for the remaining funds for the fiscal year ended September 30, 1927. The experimental work reported and not previously noted is for the most part abstracted elsewhere in this issue.

Fiftieth Annual Report of the North Carolina Agricultural Experiment Station, [1927], R. Y. WINTERS ET AL. (*North Carolina Sta. Rpt. 1927, pp. 117, figs. 9*).—This contains the organization list, a report of the director and heads of departments, and a financial statement for the fiscal year ended June 30, 1927. The experimental work not previously reported is for the most part abstracted elsewhere in this issue. A tribute to Wilbur Fisk Massey, the first horticulturist of the station, is included.

Fortieth Annual Report [of Texas Station], 1927, A. B. CONNER (*Texas Sta. Rpt. 1927, pp. 128, fig. 1*).—This contains the organization list, a report of the director on the work and publications of the station, and a financial statement for the Federal funds for the fiscal year ended June 30, 1927, and for various State funds for the fiscal year ended August 31, 1927. The experimental work not previously reported is for the most part abstracted elsewhere in this issue.

Classified list of projects of the agricultural experiment station, 1927 (*U. S. Dept. Agr., Off. Expt. Stas., 1928, pp. [2]+XVI+417*).—This revision of the mimeographed list previously noted (E. S. R., 57, p. 697) is noted editorially on page 704.

NOTES

Georgia College and Station.—Miss Leah Ascham, research assistant professor in food economics and nutrition in the Kansas Station, has accepted a position as nutrition specialist in the station. She will carry on a project on child growth and nutrition, with headquarters at Athens, where she will work in cooperation with the College of Agriculture.

R. C. Campbell, cotton fiber specialist, resigned from the station staff September 1 to take up work in North Carolina.

Purdue University and Station.—Dr. R. A. Whiting, instructor in veterinary science and associate in animal pathology in the station, resigned September 1 to become director of veterinary research of the San Diego Zoological Society and Poultry Association. H. S. Jackson, head of the station department of botany, has resigned to accept a position as professor of cryptogamic botany at Toronto University, beginning January 1, 1929.

F. G. King, associate chief of the department of animal husbandry, has been appointed professor of animal husbandry and head of the department beginning October 1. Daniel DenUyl, manager of the Municipal Forest Nursery of Jefferson City, Mo., has been appointed assistant in forestry beginning September 1, giving half time to instruction in the School of Agriculture and the remainder to research in the station.

Kansas College and Station.—E. H. Webster, dean of agriculture and director of the station from 1908 to 1913, died August 24 at the age of 57 years. Dean Webster was a native of Kansas, a graduate of the college in 1896, and assistant in dairying from 1901 to 1903. The succeeding five years were spent mainly in the service of the U. S. D. A. Bureau of Animal Industry, culminating in his appointment in 1905 as chief of the Dairy Division. He became associate editor of *Hoard's Dairyman* in 1913, and subsequently had been engaged in commercial work.

Louisiana State University.—*Science* notes that a new bee-culture field station has been established by the U. S. Department of Agriculture on the university campus.

Arrangements have been made to make grade, staple, and price studies of cotton in cooperation with the U. S. D. A. Bureau of Agricultural Economics. Dr. W. Mackenzie Stevens, recently appointed to a position in the College of Commerce, is to have charge of the station work in this field and probably will undertake other marketing studies in the State. R. L. Thompson, also of the College of Commerce, will begin studies in the near future of agricultural credits in Louisiana.

Dr. Gertrude Sunderlin has been appointed associate professor in home economics research. C. W. Upp, assistant professor of poultry husbandry of the Oklahoma College and assistant in poultry husbandry in the Oklahoma Station, has been appointed in charge of the station poultry department and will devote his entire time to research. Arrangements have been made by which Dr. R. L. Mayhew, assistant professor of zoology, will devote half of

his time during the regular session to research in parasitology and his entire time during the summer months.

Massachusetts College.—The registration of 220 freshmen has broken all previous records for entering classes and brings the total enrollment to nearly 900. This is taxing the housing accommodations of the institution severely.

A horse barn 34 by 84 ft. is under construction.

Clarence H. Parsons has been appointed instructor in animal husbandry.

Minnesota University and Station.—Dr. M. C. Tanquary has accepted an appointment as professor of entomology and zoology and apiculturist. Charles F. Rogers, instructor in botany in the Colorado College and assistant botanist and entomologist in the Colorado Station, has been appointed instructor in agricultural biochemistry. Dr. F. B. Hutt has been appointed assistant professor of poultry husbandry and assistant poultry husbandman.

Col. John T. Stewart, professor of agricultural engineering and head of the agricultural engineering investigations of the station from 1908 to 1917, died June 9 at the age of 60 years. He was a native of Illinois and a graduate of the University of Illinois in 1893. In 1909 he received the C. E. degree from the same institution.

Colonel Stewart was field assistant with the U. S. Geological Survey from 1897 to 1903 and drainage engineer with the U. S. Department of Agriculture from 1904 to 1908. In 1917 he was granted leave of absence from the university and appointed lieutenant colonel of engineers. Upon his discharge from the Army in 1921 he took up commercial work. He was widely known as an agricultural engineer and an educator, and as the author of numerous articles and bulletins on various phases of agricultural engineering, particularly those dealing with land reclamation and drainage, as well as of a textbook entitled Engineering on the Farm.

Nebraska University and Station.—W. W. Burr, associate dean of the College of Agriculture, has been appointed dean, continuing in addition as director of the station.

New Hampshire Station.—The nutrition laboratory of the station has been enlarged. It now houses the offices and laboratories in animal nutrition, including metabolism stalls and respiration chamber, and the laboratory for studies in human nutrition.

A. H. Watson has been appointed research assistant in vegetable gardening; C. A. Bottorff, poultry pathologist; and Paul T. Blood, research assistant in agronomy. H. C. Moore has been appointed assistant dairyman vice H. F. DePew, resigned.

New Mexico College and Station.—Cotton day was observed September 24 with an attendance drawn from nine counties in the State, as well as Texas and Arizona. The experimental work in variety testing, duty of water, dates of planting and topping, and similar lines was inspected, addresses were given on the work of the station in general, and a State seed growers' organization was effected.

On September 14 a meeting of cattlemen was held on the college livestock ranch. A good representation of the cattlemen of the State was in attendance, and keen interest was shown in the experimental work under way.

A field meeting of over 50 farmers and business men of Las Vegas was held on the experimental plats east of that city on September 11. The experimental work was inspected and discussed, particularly that in connection with Irish potatoes.

Miss Mary Louise Greenwood has been appointed research specialist in home economics. Early work contemplated in this subject includes a study of the

cooking qualities and palatability of the Pinto, Bayo, and other varieties of beans. H. V. Jordan, assistant professor of agronomy and assistant agronomist, resigned September 1 to accept an appointment with the U. S. Department of Agriculture and has been succeeded by James E. McKittrick. Dr. G. N. Stroman has been appointed associate agronomist and is to take up improvement work with Acala cotton.

New York State Station.—F. B. Morrison has resigned as director to become head of the department of animal husbandry at Cornell University and has been succeeded by Dr. U. P. Hedrick, vice director since 1920. Both appointments became effective October 1.

Cornell University and Station.—Dean A. R. Mann of the College of Agriculture has been appointed director of the station.

Vermont Station.—Dr. A. H. Robertson, dairy bacteriologist, has accepted an appointment as bacteriologist of the New York State Department of Farms and Markets, effective October 1. Lemuel J. Peet, a 1928 graduate of the university, has been appointed assistant agricultural economist vice A. R. Gans, resigned to take up graduate work at Cornell University.

Virginia Station.—J. F. Eheart, assistant chemist, has been granted leave of absence for one year, beginning October 1, to take up graduate work at Columbia University. L. D. Lasting has been appointed acting assistant chemist. Part-time appointments, effective October 1, have also been given to R. E. Hunt as animal husbandman and Dr. I. D. Wilson as zoologist and animal pathologist.

Wisconsin University and Station.—Construction is soon to be begun on a new wing for the agricultural library and a $1,500 concrete milk house.

Howard J. Brant, animal husbandry specialist, has resigned to engage in farming in Pennsylvania. C. P. Wilsie, assistant in the Spooner Substation, has been appointed instructor in agricultural engineering (farm buildings) vice C. H. Jefferson, resigned; C. H. Griffith, assistant economic entomologist (truck crop pests investigations); C. E. Woodworth, assistant economic entomologist (tobacco investigations); Agatha R. Raisbeck, technical assistant in agricultural journalism, vice W. E. Ogilvie, resigned; G. W. Longenecker, instructor in horticulture and gardener vice W. D. Popham, resigned to accept a similar position in the Iowa College; Hannah I. Dow, assistant in agricultural bacteriology, vice Harriet Mansfield, resigned to accept a research position in the New York State Veterinary College; and A. E. Darlow and Elmer H. Hughes, on leave, respectively, from the Oklahoma College and the University of California, assistants in animal husbandry.

Biological Farm Given Wistar Institute.—A farm of 150 acres in Bucks County, Pa., 27 miles from the institute's museum and laboratory buildings in Philadelphia, has been given by its president, Dr. Effingham B. Morris. The farm is equipped with modern buildings, machinery, and livestock, and it is expected that the necessary laboratory facilities for experimental work with mammals and other organisms will be provided. Colonies of several species of small mammals will be maintained for research purposes, and it is contemplated that studies will be extended to other animals, especially cattle, horses, sheep, dogs, hogs, and poultry. The farm is expected to be ready for occupancy early in the spring of 1929, and will be known as the Effingham B. Morris Biological Farm of the Wistar Institute of Anatomy and Biology.

Lancetilla Experiment Station, Honduras.—According to a note in *Science*, this station was established by the United Fruit Company, near Tela on the north coast of Honduras, about three years ago and is under the direction of Wilson Popenoe. Its purpose is the introduction and testing of new agricultural

products which may be grown successfully in tropical America and the study of conditions affecting banana production.

New Wheat-Growing Experiment Station in Sicily.—*Giornale di Agricoltura della Domenica* announces that an experiment station for wheat growing has been established in Sicily to be known as the Benito Mussolini Station. This station is to be supported jointly by the Italian Government and other public and semipublic bodies in Sicily for the purpose of solving problems of wheat growing under hot and dry climatic conditions. The station is to have departments of pedology, fertilizers, biology, ecology and pathology of wheat, and wheat genetics.

Primary Produce and Other Experiment Stations in Queensland.—Under legislation enacted in 1927 in Queensland, known as the Primary Produce Experiment Station Act, the Governor in Council is empowered to establish and equip primary produce experiment stations. The purposes of these stations are set forth as to conduct "experiments (including soil analyses) in connection with such primary produce, for the treatment of by-products thereof, for the prevention of the spread of disease in connection therewith, and otherwise for promoting the successful cultivation of such primary produce." The stations may also be used for experiments directed toward the improvement of primary produce, the dissemination of information, and generally for the well-doing of the growers and the industry concerned.

A Primary Produce Experiment Station fund has been established, half to be derived from appropriations to match assessments levied on the growers of the primary produce, calculated on produce grown for sale of the commodity for which the station has been established. The fund may be apportioned as the Government may decide, and a portion may be used for work against pests and diseases.

The Government of the Australian Commonwealth has also agreed to establish in Queensland one of the chain of research stations for the Empire. A fund of £50,000 will be supplied for capital expenditure and £10,000 per annum for maintenance.

East African Agricultural Research Institute.—This institute has now been estimated to require £22,500 for capital expenditure. The Colonial Research Committee has provided £2,000 for this purpose, while the remainder is expected to be obtained from the East African Guaranteed Loan. Maintenance is to be derived in part from the East African Governments, while not to exceed one-third or over in any one year may be granted by the Empire Marketing Board on a three-year basis. At present Tanganyika is contributing £4,000, Kenya, Uganda, and Zanzibar £1,200 each, and Northern Rhodesia and Nyasaland £200 each.

The institute is located in Amani in Tanganyika Territory, and the staff so far selected includes the following: Director, W. Nowell; entomologist, C. B. Williams; plant pathologist, Dr. H. H. Storey; soil chemist, G. Milne; geneticist, G. F. Clay; plant physiologist, F. J. Nutman; and systematic botanist, P. J. Greenway.

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EXPERIMENT STATION RECORD

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RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

The phosphorus of caseinogen, I, II, C. RIMINGTON (*Biochem. Jour., 21 (1927), No. 5, pp. 1179–1193, fig. 1*).—Two papers are presented under this caption:

I. *Isolation of a phosphorus-containing peptone from tryptic digests of caseinogen* (pp. 1179–1186).—An account is given of the isolation from tryptic digests of caseinogen of a peptone containing 50 per cent of the organic phosphorus of the original casein in the yield obtained, possessing a composition leading to the empirical formula $C_{37}H_{62}O_{33}N_9P_3$, and to which the name phosphopeptone has been assigned. Phosphopeptone was found to be a strongly acidic substance forming well-defined salts with copper and with barium (each of which contained nine equivalents of the metal), and titrating as an acid of nine acid hydrogen atoms. In addition to the copper and barium compounds a brucine salt was obtained. The optical rotation of the free acid peptone was determined as $[\alpha]_{5461}^{t} = -80.53°$.

The amino nitrogen of the peptone was found to comprise one-ninth of its total nitrogen, but after hydrolysis the entire nitrogen content of the peptone had become amino nitrogen. The biuret and ninhydrin reactions and the primary color reaction with diazobenzenesulfonic acid were positive, but other amino acid color reactions were not obtained. The peptone was slowly attacked by trypsin, such hydrolysis being accompanied by the slow liberation of phosphoric acid.

II. *Constitution of phosphopeptone* (pp. 1187–1193).—Hydrolysis of phosphopeptone yielded hydroxyglutamic acid, hydroxyaminobutyric acid, and serine in proportions leading to the belief that "the molecule of phosphopeptone would thus appear to be made up of . . . hydroxyglutamic acid 3 molecules, hydroxyaminobutyric acid 4 molecules, serine 2 molecules, and phosphoric acid 3 molecules."

A hypothetical formula in accordance with the known properties, components, and elementary composition of phosphopeptone is given. A supplementary note very briefly discusses the conclusions of Posternak (E. S. R., 56, p. 709) with respect to the phosphorus nucleus of casein in relation to the author's observations above noted.

The effect of hydrogen-ion concentration and protein concentration on the osmotic pressure of serum-proteins, J. MARRACK and L. F. HEWITT (*Biochem. Jour., 21 (1927), No. 5, pp. 1129–1140, figs. 3*).—The osmotic pres-

sures of serum proteins were measured at pH values ranging from 6.7 to 8.2 in bicarbonate-carbon dioxide buffer solutions and compared with values, the calculation of which is shown in detail for ideal solutions, on the assumption of complete dissociation of the protein base compound. The observed osmotic pressures increased with increasing pH, but the increase was less rapid than the calculated theoretical value. The activity coefficients of anions were observed to be slightly reduced by the proteins in solutions.

As an explanation of the discrepancy between the observed and the calculated ideal values, the opinion is offered that "both the excess of diffusible ions in the protein solution (due to the Donnan effect) and deviations from ideality will cause the observed osmotic pressures of proteins not to bear a linear relation to the protein concentration. It is not necessary to suppose that proteins in solution occupy a greater bulk than they do when dry."

The preparation of taurine in considerable quantity, W. O. Kermack and R. H. Slater (*Biochem. Jour., 21 (1927), No. 5, pp. 1065–1067*).—On a small scale it was possible to obtain 5 gm. of taurine from 1 liter of ox bile, but difficulty was encountered when the attempt was made to apply the method on a large scale; and commercial sodium tauroglycocholate, obtainable in large quantities, was substituted for the original source. A large scale method, by means of which 173 gm. of taurine could be obtained from each 5 kg. of sodium tauroglycocholate, is described.

Note on the Erlenmeyer amino-acid synthesis, C. R. Harrington and W. McCartney (*Biochem. Jour., 21 (1927), No. 4, pp. 852–856*).—In the synthesis of thyroxine, in which process sodium amalgam or sodium in alcohol could not be used because of the removal by these reducing agents of the iodine combined in the molecule, it was shown that the necessary reduction can be obtained by means of hydriodic acid and red phosphorus with a resulting 25 per cent yield of the required amino acid. A further improvement was subsequently effected by substituting a mixture of equal parts of constant boiling hydriodic acid and acetic anhydride for the hydriodic acid, the procedure in this latter form yielding 82 per cent of the theoretical quantity of the amino acid salt. Details of the synthesis of various intermediate substances are given.

The photosynthesis of urea from ammonium carbonate, W. R. Fearon and C. B. M'Kenna (*Biochem. Jour., 21 (1927), No. 5, pp. 1087–1090*).—Urea was produced by the irradiation of solutions of ammonium carbonate at temperatures not exceeding 45° C. with ultra-violet light. Effective wave lengths lay between 200 and 250 $\mu\mu$. The yield of urea was increased by the presence of malachite green, but not by methylene blue, methyl orange, or eosin.

Concentrated nitric acid directly attained in pressure synthesis, G. Fauser (*Chem. and Metall. Engin., 35 (1928), No. 8, pp. 474–478, figs. 8*).—Increased pressure increases the rate of attainment of equilibrium in the formation of nitric acid from nitrogen peroxide, oxygen, and water. As it was found not practicable to compress the gases from the ammonia oxidizer, the oxidation itself was conducted at increased pressures, with the result, among others, of increasing the yield from 2.76 kg. of nitric acid per gram of platinum catalyst per day at ordinary pressure to 12.8 per gram per day at a pressure of 5 atmospheres, the percentage yield, basis of the reacting materials, being reduced only from 91.6 to 91.2. The increased pressure also enormously increased the rate of oxidation of nitric oxide to nitrogen peroxide, so that marked increases in the general efficiency of the process, as well as a product containing a high percentage of nitric acid without the use of concentrators, were obtained. The process is said to be in actual commercial operation at Novara, Italy.

Glycerol and the glycols, J. W. Lawrie (*New York: Chem. Catalog Co., 1928, pp. 447, figs. 81*).—This monograph, No. 44 of the American Chemical Society series, is primarily concerned with the history, the production by various processes, and the properties and uses of glycerol, but one chapter being given to the production and properties of the glycols and their derivatives. The book is designed as a summary of available information, both representative and as complete as possible, and was written with the needs in mind of industrial and research workers with the compounds constituting its subject.

The equation of alcoholic fermentation, A. Harden and F. R. Henley (*Biochem. Jour., 21 (1927), No. 5, pp. 1216–1223*).—A study of the reaction of a hexose, inorganic phosphate, and yeast juice or zymin (yeast treated with acetone) is reported, the resulting quantities of carbon dioxide, hexosemonophosphate, and hexosediphosphate having been determined. The ratio of carbon dioxide to total phosphorus esterified having been determined as averaging 0.9, it was concluded that if Harden and Young's equation (E. S. R., 29, p. 714) is correct, about 10 per cent of the phosphorus is esterified without evolution of carbon dioxide, and that the product of this esterification is probably a hexosemonophosphate.

"The ratio CO_2/diphosphate is on the average 2.38 but varies considerably in individual cases. The fact that this ratio is almost invariably somewhat greater than the value 2 required by Harden and Young's equation suggests that the diphosphate is originally produced in accordance with the equation, but that a part of it is subsequently partially hydrolyzed with formation of a monophosphate. The ratios CO_2/monophosphate and monophosphate/diphosphate are highly variable and show no definite relations."

The action of carbon monoxide on certain oxidising enzymes, M. Dixon (*Biochem. Jour., 21 (1927), No. 5, pp. 1211–1215, figs. 3*).—Carbon monoxide was found not to inhibit aerobic oxidations by milk oxidase, nor the oxidation of succinic acid by the succinoxidase of muscle. The action of carbon monoxide thus differs from that of cyanide, which strongly inhibits the succinoxidase reaction.

The dilution and neutral-salt errors of buffer mixtures, C. Morton (*Jour. Chem. Soc. [London], 1928, June, pp. 1401–1413*).—A study was made of the following mixtures: Half-neutralized solutions of acetic and cacodylic acids; one-fourth neutralized solutions of aspartic acid and of arginine; three-fourths neutralized solutions of *o*-phthalic and of *α*-monoglycerylphosphoric acids; and mixtures of sodium pyrophosphate and hydrochloric acid in the molecular proportions 2:3 and 2:1. To such solutions were added, for the study of neutral-salt effect, varying proportions of N-potassium chloride, N-sodium chloride, M/3-potassium sulfate, M/3-barium chloride, and M/4-magnesium sulfate. The effect of dilution was studied in solutions ranging from an original 0.02 M to 0.00125 M. Experimental data are given in detail in nine tables. From these data and from some considerations of the thermodynamic theory are drawn the following conclusions:

(1) The Van Slyke buffer capacity unit, $\beta=\frac{dB}{dp_H}$, is not in itself a true criterion of buffer efficiency, but should be supplemented by the unit $\pi=\frac{dp_H}{d\sqrt{\mu}}$ to express the dilution and neutral-salt errors. (2) The limiting dilution error is independent of the strength and specific nature of the buffer electrolyte and is dependent on the valency type only. (3) The limiting dilution error of a monobasic buffer mixture is $\pi=-0.5$, while that of a mixture of valency n is

approximately $(2n-1)$ times this value. (4) The neutral salt error is expressed by the Debye-Hückel equation in the form $p_k=p_K+A\sqrt{\mu}-B\mu$, the value of A, a true constant, being for a buffer mixture of valency n approximately $(n-0.5)$, while the value of B is dependent both upon the specific nature of the salt and upon the strength and valency of the buffer electrolyte.

The thermodynamic dissociation constants of aspartic (k), acetic, cacodylic, *o*-phthalic (k_2), α-glycerylphosphoric (k_2), and pyrophosphoric (k_3, k_4) acids, and of arginine (k_{B_1}) are given.

The antimony-antimony trioxide electrode and its use as a measure of acidity, E. J. Roberts and F. Fenwick (*Jour. Amer. Chem. Soc., 50 (1928), No. 8, pp. 2125–2147, fig. 1*).—This is a detailed study of the properties, and of the best working conditions as a means of measuring hydrogen-ion concentrations, of the antimony-antimony trioxide electrode originally proposed by Uhl and Kestranek (E. S. R., 49, p. 803).

The potential of the antimony electrode in solutions saturated with antimony trioxide was found to depend upon (1) the crystalline character of the oxide used, (2) the presence or absence of air in the electrolyte, and (3) the direction of approach to equilibrium. The best results were obtained with the cubic oxide in an air-free electrolyte, the electrode having been pretreated with a solution more alkaline than that to be studied. Under these conditions the potential was found to be a linear function, with the theoretical slope, of the pH value of the solution, the difference between the potential of the antimony electrode under the given optimum conditions and the potential of the hydrogen electrode in a solution of the same hydrogen-ion concentration having been determined as 0.1445 volts±0.2 millivolts at 25° C.

Numerous other more or less related data are recorded.

Modification of Ridsdale's method for determining phosphoric acid, A. S. Dodd (*Analyst, 53 (1928), No. 626, pp. 276–278, fig. 1*).—"The process [Ridsdale's phosphoric acid determination] is undoubtedly an excellent one, and is worthy of recognition as a reliable method for determining phosphates in fertilizers." The author of the present paper makes several recommendations for modification, however, giving the following as the modified method:

Treat 4 gm. of the fertilizer as directed in the Official Methods of Analysis. Make the solution up to 250 cc. and filter. Of the filtrate, measure 25 cc. (=0.4 gm.) into the special flask, and add sodium hydroxide solution (30 per cent) until a precipitate appears. Add dilute nitric acid (1:3) from a 5 cc. pipette, drop by drop, until the precipitate dissolves, then a further 5 cc. of the dilute nitric acid. Place the flask on a water bath, and, while heating, add potassium permanganate solution (a few drops) until there is a permanent purple coloration. Add 1.75 gm. of ammonium nitrate, 1.6 gm. of ammonium chloride, and 0.25 gm. of ammonium oxalate, and make up to 60 cc. with water. Continue heating on the water bath until the oxalate is entirely dissolved. Add a cold mixture of 25 cc. of nitromolybdate reagent and 25 cc. of water (measured for convenience in graduated Nessler tube). Rotate for one minute and allow the mixture to settle for 10 minutes. Attach wash-bottle fittings (with cotton-wool pad at end) and siphon off the supernatant liquid. Refill with 0.1 per cent postassium nitrate solution, rotate, and allow the precipitate to settle for a few minutes. Again siphon off the supernatant liquid and repeat the washing with potassium nitrate solution until the washings are found to be neutral to litmus paper. (Three or four washings are usually sufficient.)

Remove the cotton-wool pad, tease it out, and drop it into the flask. Add 25 cc. of N sodium hydroxide solution to the contents of the flask, and, when

the precipitate is entirely dissolved, titrate the excess of sodium hydroxide with N/2 sulfuric acid, using phenolphthalein as indicator (1 cc. of N/2 H_2SO_4= 0.001542 gm. of P_2O_5=0.003364 gm. of $Ca_3P_2O_8$).

Behavior of indicators in the titration of ammonia, sodium and calcium phosphates, the methylamines, pyridine bases, and boric acid, R. T. THOMSON (*Analyst, 53 (1928), No. 627, pp. 315–821*).—The author considers that the pH range of an indicator is not always a reliable index of its suitability for the practical analysis of commercial products, citing as an example the behavior of bromophenol blue, which has a range about the same as that of methyl orange but fails to give accurate results in the determination of free acid in ammonium sulfate.

The work reported consisted for the most part in the preparation of commercial neutral solutions of ammonium sulfate, of various phosphates of sodium and of calcium, and of titrations of known quantities of ammonia, ammonia bases, etc. In the case of ammonium sulfate the free base or acid indicated in the titration, together with the character of the end point (distinct, fair, or obscure) is tabulated for the following indicators: Bromophenol blue, methyl orange, Sofnol No. 1, methyl red, bromothymol blue, phenol red, naphtholphthalein, cresolphthalein, phenolphthalein, phenol violet, and thymol violet.

Similar data are shown for the sodium phosphates except for the omission of the inidicator Sofnol No. 1; and several precautions necessary to secure accurate titrations of sodium phosphates are noted. In the case of acid calcium phosphate, the complete analysis of a commercial sample is given, together with a considerable discussion of its behavior in titrations.

With respect to the methylamines, the statement is made that "the behavior of indicators with mono-, di-, and tri-methylamines is exactly the same as with ammonia, and methyl orange is the best indicator when carbonic acid is present." In connection with the pyridine bases and with boric acid also, several indicators are discussed.

Further developments of rapid volumetric methods for the determination of amino-acids, organic acids and bases, I, II, F. W. FOREMAN (*Biochem. Jour., 22 (1928), No. 1, pp. 208–229, figs. 2*).—The two papers of this series here presented deal with the author's further developments of his alcohol method for the titration of amino acids (E. S. R., 44, p. 411).

I. *Rapid accurate determination of ammonia or ammonia and volatile amines in fluids of biological interest, and the determination of the different classes of acid radicles represented in the total alcohol titration value* (pp. 208–221).—From among numerous findings the following may be cited:

"Among the bases so far examined, only those in the 'strong' category, namely guanidine, quaternary ammonium bases (tetramethyl and tetraethyl ammonium hydroxides and choline) and the hydroxides of the alkali metals and alkaline earths, neutralized acids to phenolphthalein in alcohol, all requiring precisely one equivalent. All the other bases tested with this indicator, including ammonia and the three types of amines, were neutral in concentrations of alcohol exceeding about 85 per cent by volume. Creatinine and the —$CONH_2$ groups of amides were neutral in alcohol as in water. Apparently 'strength' determines the titratability in alcohol. It seems very remarkable, however, that none of the many bases examined titrated partially to phenolphthalein in 85–87 per cent alcohol. In all cases either quantitative titratability or quantitative neutrality was shown. . . .

"Acids such as carbonic, uric, hippuric, nucleic, lactic, fatty acids, etc., titrate quantitatively as monobasic acids and orthophosphoric as a dibasic acid to phenolphthalein in alcohol. The color changes are much sharper and the results

are more satisfactory, generally, in alcohol than in water. For example, aqueous solutions of pure sodium oleate were appreciably alkaline to phenolphthalein. On adding neutralized alcohol up to 87 per cent, however, the resulting solutions were precisely neutral, probably due to the alcohol either causing a slight increase in K_a or preventing hydrolysis."

The behavior of the carboxyl derivatives of bases and that of the weaker acids are also discussed in a similar manner. Methods are given for the preparation of alcohol extracts, the estimation of the "total alcohol value," the differentiation of the total alcohol value into "class values," the rapid estimation of ammonia or ammonia with volatile amines, the estimation of the internal salt carboxyl groups of amino acids, the estimation of nonvolatile amines, the elimination and estimation of the bicarbonate radical, together with various subsidiary determinations, etc.

II. *Rapid quantitative removal and determination of the carbonic acid radicle, especially in bacterial cultures, without exposing other constituents to risk of loss or change* (pp. 222–229).—A method dependent in part upon those described in the preceding paper and in part upon the observation that carbon dioxide can be rapidly and quantitatively removed, without materially affecting the alcohol concentration, from 87 per cent alcohol containing volatile acids by aeration with carbon dioxide-free air at room temperature. Either volatile acids or volatile bases present in the alcoholic solutions were found to be quantitatively retained. The carbon dioxide of bicarbonates of weak nitrogenous bases, as well as free carbon dioxide, was found to volatilize readily when aerated.

The determination of amino-acids in the blood: A note on Folin's method, S. H. Edgar (*Biochem. Jour., 22 (1928), No. 1, pp. 162–167, fig. 1*).—In the course of a study of the effect of varying certain of the conditions specified in Folin's directions for the determination of amino acid nitrogen in the blood (E. S. R., 47, p. 410), it was found that the figures obtained varied with the alkalinity of the solutions, increasing with increasing concentrations of sodium carbonate up to a maximum at an alkalinity considerably in excess of that specified by the originator of the method. The fact that increasing alkalinity increases the rapidity of color development was taken into consideration, and experiments showing that the time factor is not concerned in the production of the variations noted are described.

Quoting Folin's statement of the effect of 1 cc. of the solution of sodium carbonate prepared as specified, added to 1 cc. of the amino acid solution, which has been made to 0.1 N with respect to hydrochloric acid, the author states that "no experimental proof is there given to show why this particular concentration of sodium carbonate has been chosen. It is in this respect, we feel, that the description published by Folin requires explanation." The series of increasing amino acid nitrogen values obtained by using increasing proportions of sodium carbonate were found to constitute "a progression described by the formula

$$u_n = ar^{n-1} + b$$

where r is the ratio, 1:2 in this series, and a and b are constants, u_n being the value of the *nth* term in the series. By substituting actual values for n from the table a and b are found, and the amino acid N at infinite alkalinity is shown to be 8.92 mg. per cent. This, of course, is the asymptote to the curve."

The titration of protein hydrolysates, W. L. Davies (*Biochem. Jour., 21 (1927), No. 4, pp. 815–822*).—By means of experimental titrations of single amino acids and of synthetic mixtures of known composition, and from summa-

tions of the titration values of fractions separated by the Van Slyke method (E. S. R., 26, p. 22), it was found that the amino acids of protein hydrolysis can be titrated accurately with phenolphthalein as indicator by a method combining the principles of the Foreman alcohol titration (E. S. R., 44, p. 411) and Sørensen formalin titration (E. S. R., 19, p. 808). The combination method appeared to give better results and to have a somewhat wider application than either the formalin or the alcohol methods applied as originally described.

By working in terms of nitrogen equivalents of the titrable acidity of solutions of mixed amino acids it was found possible to secure much information concerning the nitrogen distribution in such solutions. The use of a formalin alcohol titration as a supplement to a suitably modified form of the Van Slyke nitrogen partition is recommended, and a procedure of this kind is given. The nitrogen of the monoamino acid fraction was found to be incompletely represented by the titration value, the nontitrable nitrogen corresponding to three-fourths of the arginine nitrogen and two-thirds of the histidine nitrogen not precipitated by phosphotungstic acid in the separation of the bases.

In the diamino acid fraction the amino nitrogen as determined from the formalin alcohol tiration was uniformly about 22 per cent higher than the amino nitrogen as determined by the nitrous acid, in accordance with the original form of the Van Slyke method; the belief being expressed that the short period allowed for the decomposition of the amino acids in the amino nitrogen determination was inadequate, and that the titration value represented the more accurately the actual amino acid content of the fraction. Using the modified form of the Van Slyke method above mentioned, including the use of titration values at various points in the partition, the author was able to obtain results agreeing more closely with those of the Kossel and Kutscher method (E. S. R., 58, p. 12) than with those obtained by the unmodified Van Slyke method for gelatin.

Determination of small quantities of benzoic and cinnamic acids, with some notes on the colorimetric determination of salicylic acid, J. R. Nicholls (*Analyst, 53 (1928), No. 622, pp. 19–29, figs. 3*).—The colorimetric determination of benzoic acid by a partial oxidation to salicylic acid with hydrogen peroxide in the presence of ferric chloride is described. The procedure depends upon standardized concentrations of mineral acid, hydrogen peroxide, and ferric chloride, a constant proportion slightly over 10 per cent of the benzoic acid having been oxidized to salicylic acid under specified conditions which include oxidation in a solution containing no appreciable quantity of salts other than nitrates. It is claimed that cinnamic acid can be determined by first oxidizing it quantitatively to bezoic acid; and a method for such quantitative oxidation is described.

Tests for reconstituted cream, F. W. Richardson (*Analyst, 53 (1928), No. 627, pp. 334, 335*).—Reconstituted cream, described as made by combining dried separated milk with unsalted butter and water to form an emulsion containing about 50 per cent of butterfat and said to be indistinguishable from fresh cream either by direct tasting or by ordinary use was found to be detectable by the following procedure:

"If 5 cc. or 5 gm. of the cream are shaken with a mixture of equal parts of benzene and methylated spirit (60 O. P.), and the mixture is then centrifuged, the reconstituted cream will throw up its butterfat as an amber upper layer, while the fresh cream will remain as an emulsion with no appreciable separation of the fat layer. After strong centrifuging the reconstituted mixture shows three distinct layers, while the fresh cream mixture shows only two layers, viz,

the aqueous lower layer and an upper opaque stratum. The results are the same even when the cream has become sour."

The reconstituted cream also failed to show, because of a heat treatment for sterilization to which the reconstituted product had been subjected, the reductase reaction with methylene blue, a reaction which fresh cream of the same day showed strongly.

The determination of butter in margarine, L. V. COCKS and E. NIGHTINGALE (*Analyst, 53 (1928), No. 627, pp. 322–327*).—In the determination of butterfat in margarines by means of the Reichert-Meissl, Polenske, and Kirschner procedures as described by Bolton, Richmond, and Revis (E. S. R., 28, p. 208), discrepancies between the results obtained by different analysts, "all of which may differ from the actual amount of butter incorporated," were found to occur. In addition to the necessity for adherence to certain details specified by previous investigators, it was observed that in the determination of the Kirschner value small quantities of sulfuric acid may be carried over in the distillation and included with the volatilized organic acids determined, "unless every precaution is taken to insure a perfect fit between the distillation flask and the protecting shield."

When the specified practical precautions were observed, the experimental figures showed a close agreement with the calculated in the case of butterfat of known Kirschner value. Since, however, it is possible for the Kirschner value of ordinary butters to vary from 19 to 27, the analyst "can not be entitled to state the actual percentage of butter present to a greater degree of accuracy than between the range −13 per cent and +24 per cent, both figures being calculated on the reading to be obtained from standard graphs drawn up for a butterfat of Kirschner value 23.5."

An apparatus for continuous gas analysis, E. C. WHITE (*Jour. Amer. Chem. Soc., 50 (1928), No. 8, pp. 2148–2154, figs. 2*).—This is a contribution from the Fertilizer and Fixed Nitrogen Laboratory of the U. S. D. A. Bureau of Chemistry and Soils. An apparatus for the continuous automatic analysis of such gases as ammonia, hydrogen, chloride, sulfur dioxide, chlorine, hydrogen sulfide, carbon dioxide, carbon monoxide, and probably others, in flowing gaseous mixtures is described, the details of the adaptation of the system to the determination of carbon monoxide in the presence of hydrogen and of hydrocarbons being given.

The principle of the device is the measurement of the change in electrical conductivity of a solution adapted for the selective absorption of the gas to be determined and exposed to the gas in an apparatus controlling the volume ratio.

METEOROLOGY

Sun-spots in weather prediction, H. N. RUSSELL (*Sci. Amer., 138 (1928), No. 6, pp. 512, 513, figs. 2*).—Referring briefly to the "enormous amount of work" which has been done on this subject, the author concludes that "the influence of sun-spots on the weather is exceedingly small. . . . Small effects which only come clear if the much larger casual variations due to other causes when an average over many years can be taken, appear sometimes to exist. But they are so small in comparison with the other variations that their influence in determining the type of weather on different days, or even the average weather for a whole year, may safely be ignored."

The fires and the weather, S. SUZUKI (*Jour. Dept. Agr., Kyushu Imp. Univ., 2 (1928), No. 1, pp. 73, pls. 3, figs. 19*).—In studies of the rate of burning of various materials and of house fires under varying conditions, relative humidity was found to be the most important determining factor.

It is stated that "the combustion of some substances is influenced, in large degree, by the variation of the water-quantity within, when they burn in low temperature without flame. The combustion of some substances is influenced by the water-quantity of air, when they burn with flame and temperature is moderately high. The combustion of other substances is, if temperature is enormously high, controlled by the humidity of air, but in the way contrary to the preceding, that is, they burn strongly with increasing humidity. The influence of wind on fires is not so remarkable as it is now believed. The fire statistics in many cities and prefectures in Japan indicate that the outbreak of fires has the most intimate correlation with the relative humidity among many other meteorological elements. The outbreak of fires undergoes a change yearly and daily. It corresponds in many respects with the seasonal and daily variations of the moisture in timber, paper and cloth, etc., in the room."

Climatological data for northern and western tropical South America, W. W. Reed (*U. S. Mo. Weather Rev. Sup. 31 (1928), pp. III+21, figs. 4*).—The available meteorological data for the tropical region of South America outside of Brazil, including French, Dutch, and British Guiana, Venezuela, Colombia, Ecuador, Peru, and Bolivia, are summarized, and the climatic conditions of the area as a whole and of its several subdivisions are described.

SOILS—FERTILIZERS

A note on the determination of the volume-weight of different soils in the soil profile, J. S. Joffe and L. L. Lee (*Soil Sci., 26 (1928), No. 3, pp. 217–219*).—A new type of soil sampler for the determination of the volume-weight or apparent specific gravity of soils, recently described by Lebedev (E. S. R., 58, p. 811) was tried out in the experiments here reported from the New Jersey Experiment Stations, and was found to give trouble in the cases of (1) the A_0 horizon (the leaf mold of virgin soils) and (2) soils containing pebbles. "The pebbles obscured the true volume of the soil, and the determinations made on such soils with the sampling tube could not be used." Therefore, "although pebbles in a soil are an integral part of the soil mass, their weight or volume does not enter into the chemical and biological or even most of the physical properties of the soil material itself."

The authors modified the determination to secure a value designated the "active volume-weight" of the soil, proceeding as follows: "Three or four samples of the soil are taken from each horizon on a freshly dug soil profile cut with the sampling tube described by Lebedev. The soil is placed into tared aluminum dishes, tightly covered, and weighed as soon as it is brought to the laboratory. The dishes are then opened and placed in an electric oven and the soil dried at 100–105° C. for 12 hours or more to constant weight. The soil is then removed, sifted through a 2-mm. sieve, and the weight and volume of the mineral débris are determined. . . .

"From a series of determinations on the débris of several soil types it was found that by taking their specific gravity as 2.6 the volume calculated checked very well with the volume obtained by the displacement method. The volume of the débris is subtracted from the volume of the sampling tube, the weight of the débris subtracted from the dry weight of the sample, the new weight divided by the new volume, and the quotient taken as the active volume-weight."

The hydrometer method for making a very detailed mechanical analysis of soils, G. J. Bouyoucos (*Soil Sci., 26 (1928), No. 3, pp. 233–238*).—Extending the scope of his hydrometer method, previously reported from the Michigan

Experiment Station (E. S. R., 57, p. 710), the author reports in the present paper the results of an examination of 14 soils by the determination of the hydrometer readings of their suspensions at the end of 1, 2, and 15 minutes, and 1, 4, 8, and 24 hours, showing that by the application of Stokes's law such data can be made to yield a mechanical analysis considerably more detailed than that formerly made available by much more time-consuming procedures. "More than 10 soils can be analyzed in one or two days, and a greater number of textural divisions can be obtained than in the regular mechanical analysis method."

The data presented include the particle diameter represented by each of the readings as well as the percentage of the corresponding fraction present in the sample in each case.

Diversity of soil type in the Prairie Provinces and causes of the same, A. H. JOEL (*Sci. Agr., 8 (1928), No. 10, pp. 651–664, figs. 4*).—The following phases of the subject are discussed: Diversity of soil types, soil genesis, environment and geological origin, natural vegetation and soil genesis, soil classification, the climatic factor and major soil groups, parent materials and district soil belts, soil texture and soil types, and representative soil types, their natural vegetation and general agricultural adaptations.

Soil classification in Quebec [trans. title], A. SCOTT (*Sci. Agr., 8 (1928), No. 10, pp. 668–674*).—Though the problem of soil fertility maintenance is not as yet a pressing one in the Province of Quebec, it is the author's opinion that the present destructive agricultural methods will exhaust even the most productive soils of that area. In the present paper the value of soil classification as a basis for improved methods of agriculture and the nature and methods of a soil survey as carried out in the United States are discussed, and some account is given of the nature and basis of the soil classifications of European countries.

Soil survey of Jackson County, Minnesota, M. W. BECK, J. A. ELWELL, J. S. HALL, and G. B. BODMAN (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1928, pp. III+775–798, fig. 1, map 1*).—Jackson County is described in this report, prepared in cooperation with the Minnesota Experiment Station, as comprising 450,560 acres of a drift-covered plain of undulating surface modified by erosion. Drainage is provided by the West Fork Des Moines River, Little Sioux River, and Elm Creek, the sections dependent upon the latter two streams being in part inadequately drained.

The most extensive of the 11 types, here referred to 9 series, mapped and described in the present report, are Clarion clay loam, which occupies 54.3 per cent of the entire acreage surveyed, Webster silty clay loam 16.4 per cent, and Webster silty clay 10 per cent. Muck, a shallow phase unclassified, was found to the extent of 2.2 per cent.

Investigations on physical properties of Fargo clay, J. E. CHAPMAN (*North Dakota Sta. Bul. 217 (1928), pp. 29, 31*).—A brief report of experiments on unmanured plats as compared with plats manured in the fall for corn is presented, the points of comparison having been drawbar-pull in plowing, volume weight, pore space, and parts per million of nitrate nitrogen in the dry soil. Comparative crop yields are also stated.

In the rotation corn, barley, red clover, and wheat the drawbar-pull was, for the unmanured plats 6.98 and for the manured plats 6.30 lbs. per square inch. In the rotation corn, barley, timothy or millet, and wheat the corresponding data were 7.68 and 6.85 lbs. Pore space and nitrate nitrogen were also found greater under the influence of the first than under that of the second of the above-noted rotations. Volume weight was slightly less under the first than under the second rotation.

Contribution to the chemical composition of peat.—II, Chemical composition of various peat profiles, S. A. Waksman and K. R. Stevens (*Soil Sci., 26 (1928), No. 3, pp. 239–251*).—In this second contribution to this series of papers from the New Jersey Experiment Stations (E. S. R., 59, p. 717), further observations on the biochemistry of peat formation are presented.

"The lowmoor peat with a vegetation of grasses, sedges, reeds, and shrubs, rich in readily decomposable celluloses and pentosans, is favorable to certain processes which result in the formation of the particular peat. These processes can be summarized as follows: (1) Rapid decomposition of the water-soluble substances; (2) comparatively rapid decomposition of the pentosans and celluloses; (3) resistance of lignins to decomposition and their rapid accumulation; (4) decomposition of the plant proteins and synthesis of microbial cell substance, finally leading to an accumulation of organic nitrogenous complexes resistant to rapid decomposition, especially under anaerobic conditions; (5) the persistence of certain hemicelluloses, some of which were no doubt formed through the synthesizing activities of microorganisms; (6) rapid decomposition of the oils, fats, and certain ether-soluble constituents and slow decomposition of the waxes, resins, etc.; (7) drainage of these bogs brings about an abundant development of aerobic actinomyces and bacteria, which lead to a rapid liberation, from the peat complexes, of nitrogen, in the form of ammonia, which is rapidly changed to nitrate and is made available for the growth of cultivated crops.

"The formation of a highmoor peat with a vegetation of Sphagnum, Eriophorum, Calluna, etc., rich in resistant hemicelluloses, seems to take place somewhat as follows: (1) A rapid decomposition of a considerable part of the nitrogenous substances present in these plants; (2) a slow decomposition of the carbohydrates of the plants; (3) because the microorganisms have not sufficiently readily available sources of energy, the nitrogen of the decomposing sphagnum is used immediately by the newly growing plants, thus accounting for the fact that the peat has no more, and even less, nitrogen than the original plant; (4) slow decomposition and slow but gradual accumulation of the lignins and of the waxy substances; (5) persistence of the celluloses and hemicellulose for a considerably longer period of time than in the case of the lowland peats."

Laterite and lateritic soils in Sierra Leone, F. J. Martin and H. C. Doyne (*Jour. Agr. Sci. [England], 17 (1927), No. 4, pp. 530–547, pls. 2*).—Following a rather extensive analysis of the literature, a study of the mode of formation and of the composition of the laterite and lateritic soils of Sierra Leone is presented, the loose use of the term "laterite" for almost any red tropical soil and the need for a more precise terminology being noted in a preliminary discussion of the question "What is laterite?"

The chemical analyses and physical properties of some of the Sierra Leone laterites and lateritic soils and of the genetic (norite) rocks are given, and the discussion is illustrated by photographs of cuttings through norite-laterite formations.

In conclusion the suggestion is presented that since the clay fraction is regarded as the most important fraction in determining the reactions of a soil, the classification of laterite and lateritic soils should be based upon an examination of the clay fraction. It is further suggested that where the silica: alumina ratio in the clay fraction falls below 2.0 the soil should be described as "lateritic," and that where the ratio in question falls below 1.33 the soil should be described as "laterite." The entirely arbitrary character of the last stated ratio is recognized, and the possibility of its being shifted in either direction as a result of further analyses is admitted; but in fixing upon 2.0 as the upper limit of the "lateritic" ratio the authors consider themselves quite secure.

Physical characteristics and silvicultural importance of podsol soil, P. W. Stickel (*Ecology, 9 (1928), No. 2, pp. 176–187, figs. 7*).—Defining podzol soil ("ash gray soil") as being characterized by a gray leached layer directly below the organic layer, with an enriched horizon of burnt sienna color below the zone of outwashing, the author of this contribution from the Northeastern Forest Experiment Station notes the danger of podzolization of the forest soils of any region of humid climate, abundant rainfall, and severe winters; and even in regions of more favorable climatic conditions when pure stands, especially of conifers, are produced.

In a physical and chemical examination of a typical northern podzol profile it was observed that more organic matter, clay particles, and nutrients were present in the enriched than in the leached zone, these conditions having been reflected in the determinations of maximum water-holding capacity and of calculated wilting point made on samples from the various horizons. Low temperatures and acid soil conditions are considered to assist in the podzolization process by interfering with oxidation and decomposition, and the belief is expressed that colloidal acid humus extracts the basic materials in passing through a layer subject to leaching, and subsequently deposits these substances in the enriched zone.

As measures for the prevention of podzolization, the thinning of the stand, especially of conifers, and the admixture of such hardwoods as ash, birch, maple, and beech are recommended, such a procedure being considered to encourage microorganismic activity, to cause the formation of alkaline buffer substances, and to "produce a more lively nitrogen transformation."

On the Repetek sand station [trans. title], V. A. Dubiánskiĭ (*Izv. Gosud. Inst. Opytn. Agron. (Ann. State Inst. Expt. Agron. [Leningrad], 5 (1927), No. 4, pp. 305–307*).—This is a report on the sand deserts of Turkestan, their agricultural possibilities and drawbacks, irrigation projects for amelioration, the movements of the sand, and methods of combating them.

Biochemistry of water-logged soils, I, II, V. Subrahmanyan (*Jour. Agr. Sci. [England], 17 (1927), No. 4, pp. 429–467, figs. 13*).—Two papers of the indicated series are noted.

I. *The effect of water logging on the different forms of nitrogen, on the reaction, on the gaseous relationships, and on the bacterial flora* (pp. 429–448).—A Rothamsted and an Indian soil were air-dried, freed from undecomposed plant residues, passed through a 1-mm. sieve, and artificially water-logged by thoroughly shaking 100 parts of the soil with 250 parts of water. The samples were then incubated, the English soil at 20° C., the Indian soil at 35°, while samples for analysis were taken at 3-day intervals. The results are succinctly stated as follows:

"*Nitrogen changes.*—Water logging resulted in (1) a distinct increase in the free and saline ammonia content; (2) a significant though only slight diminution in the nitric nitrogen; (3) no marked loss of ammonia by volatilization or otherwise in the gaseous form, nor considerable variation in the nitrites, nor any observable diminution in the total nitrogen.

"*Reaction.*—Water logging resulted in an increase in alkalinity; the increase in pH value was closely correlated with the corresponding increase in ammonia.

"*Gaseous relations.*—Water logging resulted in (1) no release of any soluble reducing matter capable of absorbing dissolved oxygen, (2) no appreciable carbon dioxide production, (3) an absorption of dissolved oxygen from the surface water. An equation has been worked out expressing the concentration gradient of dissolved oxygen with depth.

"*Bacterial numbers.*—From bacterial counts on water-logged soils it was found that (1) there was significant though slight decrease in bacterial numbers on Thornton's agar. (2) Very few colonies were obtained by plating aerobically (and fewer still anaerobically) on Giltay's agar. None of the organisms appearing on the plates brought about any nitrate reduction in soils. (3) The total counts on gelatin plates also showed some decrease. The numbers of gelatin liquefiers on the other hand did not vary. There was no evidence to suggest that the increased production of ammonia was due to the activity of the gelatin liquefiers.

"*Agency responsible for ammonia formation.*—The results indicate that the formation of ammonia in water-logged soils is not due to biological action. It is suggested that the action is due to an enzyme."

II. *The presence of a deaminase in water-logged soils and its rôle in the production of ammonia* (pp. 449–467).—The ammonia formed in water-logged soils was found present mostly in the soil sediment, the surface water containing but a small proportion of the total produced. Added ammonia was in a similar way mostly retained in the soil itself, resisting both extraction by water and volatilization by warming. Evidence obtained indicated the existence of the ammonia in the soil as an exchangeable base.

When the soils were allowed to dry out the ammonia rapidly disappeared, with the formation of corresponding quantities of nitrates, very little ammonia being lost by volatilization. The ammonia production took place even in the presence of volatile antiseptics, and it is considered demonstrated that the reaction was brought about by a deaminase.

Witte's peptone, containing amino acids, was attacked. An active enzyme preparation was extracted by means of an aqueous solution of glycerin saturated with toluene from the soil samples. A deaminizing action was shown by the enzymes obtained from cultures of the mixed microflora of the soils.

It is considered that by acting upon amino compounds otherwise resistant to biological action, the deaminase probably helps to release nutrients in a readily available form. The probable importance of such an action in swamp soils is noted.

Soil acidity, J. E. Chapman (*North Dakota Sta. Bul. 217 (1928), p. 32*).—Though North Dakota soils in general have been considered alkaline, acidity has now been found in the surface 6 in. of certain soils in both the eastern and western parts of the State. Most of the surface soils of the station farm have proved acid, and some of those of the Dickinson Substation farm especially so. The lowest pH recorded was 5.8, this figure representing the condition of a poor field of alfalfa. A good field of alfalfa on the same soil type showed a pH value of 6.3.

The sulfur content of Alberta soils, F. A. Wyatt and J. L. Doughty (*Sci. Agr., 8 (1928), No. 9, pp. 549–555*).—A sulfur content in many cases greater than the phosphorus content and increasing with the depth, a condition contrary to that ordinarily found in the soils of humid climates, was observed in the examination of Alberta soils here reported.

With an annual precipitation of but from 12 to 18 in., it is stated that the rainfall may reach a percolation depth of from 3 to 6 ft. only, so that concentration zones of soluble salts may remain within the feeding range of many plant roots. "This inverse relationship between leaching and rainfall, together with the sulfate-bearing materials of some . . . Alberta soils, accounts for the high sulfur content of many of these soils."

The nonalkali mineral soils of Alberta were found to vary in the sulfur content of the surface soils from 320 to 710 parts per million, with a phosphorus

content ranging from 380 to 1,250 parts per million. In the lower layers of the soil, on the other hand, the sulfur content was in some cases several times as much as the phosphorus content.

A zone of sulfate concentration from 3 to 4 ft. below the surface was quite commonly observed in the brown (plains) soils, but was a less frequent condition in the black (park) soils and in the gray (wooded) soils. "In certain areas, especially for the plains soils, two or even more zones of sulfate concentration may be encountered."

The zone of sulfate concentration was found usually at a greater depth than was the lime layer. Sulfates constituted the principal salt content of the Alberta alkali soils examined. Where the principal sulfate was gypsum and little water-soluble sodium was present, the soils were found to remain relatively productive under irrigation, the water extracts of alkali soils of this type having an alkalinity much lower than was expected and consisting principally of bicarbonate alkalinity, while the total alkalinity seldom reached 0.1 per cent and was generally less than half this concentration.

On the gray (wooded) and the black (park) soils, crops of wheat, oats, barley, and sweet clover have not thus far given increased yields under treatment of the soils either with elementary sulfur or with potassium sulfate.

On the algae of some normal English soils, B. M. Bristol Roach (*Jour. Agr. Sci. [England], 17 (1927), No. 4, pp. 563–588, fig. 1*).—Having previously reported in two communications upon the algae determinable in old stored soils (E. S. R., 44, p. 520) and in desiccated soils (E. S. R., 42, p. 726), the author has now supplemented these observations with a study of the alga-flora of normal soils not subjected either to drying or to prolonged storage. Most of the soil samples for the work reported were taken from the Rothamsted experimental plats and were examined by means of cultures in solutions of mineral salts, various dilutions of the well-shaken suspensions prepared immediately after the collection of the samples having been used. The present paper gives an account of such an investigation of 4 soils, samples having been taken from the first, second, fourth, sixth, and twelfth inches and from the mixed upper 6 in. of each soil.

A counting method found applicable to the green algae and diatoms is described. By means of this procedure the distribution of these algae through the upper 12 in. of the soils was demonstrated, though the organisms were considerably less numerous at the sixth and twelfth inch depths than nearer the surface.

The unmanured Broadbalk wheat field plat yielded the same main species as did the plat receiving farmyard manure, but it was poorer in numbers of individuals. From each plat 35 species are described, these apparently including both true soil forms and casual species. Of the true soil forms some were found to grow equally well at the surface and in the lower layers, while others appeared to be more numerous at the surface than within the soil. From another experiment field and from a cottage garden the same main types were determined, but in both of the last-named soils the blue-green species were "less conspicuous."

Experimental evidence indicated that many of the algae exist rather in a vegetative than in a resting condition.

The rôle of microorganisms in the transformation of organic matter in forest soils, S. A. Waksman, F. G. Tenney, and K. R. Stevens (*Ecology, 9 (1928), No. 2, pp. 126–144*).—Using, among other experimental procedures, their own methods of analysis for plant residues and soil organic matter, more fully described elsewhere (E. S. R., 58, pp. 508, 516), the authors of this communication from the New Jersey Experiment Stations find the components of forest

humus divisible into four groups: (1) A number of the residual constituents, such as the celluloses, hemicelluloses, fats, waxes, etc., of the various plant products (leaves, twigs, roots, mosses, etc.) which are undergoing decomposition; (2) the constituents of the plant products which are more or less resistant to decomposition, such as the lignins, cutins, tannins, resins, etc.; (3) the microbial cells (fungus mycelium, spores, bacterial cells, protozoa, worms, etc.) synthesized in the process of decomposition of the natural organic materials continuously added to the soil; and (4) the products of decomposition of the natural materials and cell products, such as organic and inorganic acids, ammonia, etc.

The opinion is presented that the organic matter of forest soils should be considered with regard to the composition of its originating plant material and with respect both to the conditions of the decomposition and the nature of the microorganisms by which the decomposition is brought about.

The nitrogen-fixing microörganisms of an arid soil, E. G. Carter and J. D. Greaves (*Soil Sci., 26 (1928), No. 3, pp. 179–197, figs. 27*).—The dry-farm soils of Utah are low in nitrogen, are systematically cropped to legumes only exceptionally, and rarely receive nitrogen-carrying manures, yet have in many cases produced good crops for years, and in fact frequently show on analysis more nitrogen in the surface foot of the cropped soil than in the adjoining virgin soil. Most of these soils fix nitrogen actively on incubation with an optimum moisture content at a temperature of 28° C.

The specific subject of the present communication from the Utah Experiment Station is the soil of the Nephi Substation, a highly productive soil active in nitrogen fixation yet containing no Azotobacter. The behavior of this soil is noted as raising two questions: (1) What organisms are fixing nitrogen in this soil? and (2) Are there any conditions in this soil which render it unsuitable for the growth of Azotobacter? The present paper reports an examination into the first of these questions by means of counts by the plate method on beef extract agar, Ashby's mannite agar, and a medium described as a "synthetic agar," the averages of the numbers of organisms found in 24 determinations being 19,526,000, 19,080,000, and 12,725,000 for the three media, respectively. The nitrogen-fixing power of the isolated organisms was also determined.

"Of the cultures isolated, 27 probably represent new species and varieties and are given in this paper. A study of the morphological characteristics shows 10 actinomyces, 8 bacilli, 8 micrococci, and 1 penicillium. The study of the physiological activities indicates that 26 of the 27 are nitrogen-fixing organisms, ranging in nitrogen-fixing ability from 0.25 to 8.1 mg. Most of the cultures hydrolize starch; out of 27 tested, 24 hydrolyze starch rather rapidly; 22 liquefy gelatin; 7 form indol; and 10 reduce nitrates to nitrites with varying ability. Nine cultures have optimum cultures from 35 to 37° C., 13 from 30 to 34°, and 5 have optimum temperature below 30°."

Relation of weather, cultural practices, and soil conditions in nitrification of Nebraska soils (*Nebraska Sta. Rpt. [1927], p. 14*).—Temperature and moisture variations not in excess of the daily variations obtaining under field conditions did not appear to repress or stimulate nitrification.

Residual effects of sweet clover and grasses upon nitrate production under pasture conditions, J. E. Chapman (*North Dakota Sta. Bul. 217 (1928), pp. 32–34*).—Adding sweet clover and other legumes to the pasture mixture increased nitrate production, while increased proportions of brome grass in the mixture decreased the nitrate nitrogen supply.

The value of nitrification tests on soils representing extreme contrast in physical and chemical properties, W. V. Halversen (*Soil Sci., 26 (1928), No. 3, pp. 221–231, figs. 2*).—A comparative study of the nitrification character-

istics of a number of soils made at the Oregon Experiment Station by means of such a group of nitrification tests as has been recommended by Waksman (E. S. R., 50, p. 118) is reported.

On heavy, well-buffered soils a consistent parallelism of the variations in nitrifying power of the fertilizer plats the soils of which were used for this work was noted in trials of several modifications of the soil method for the determination of nitrifying power, but extremely sandy soils of low buffer capacity and low content of organic matter did not yield consistent results with the addition of the same quantities and kinds of nitrogenous material. The data obtained are considered to indicate that an incubation period of not more than two weeks should be used, and that smaller quantities of nitrogenous material should be added in the case of the extremely sandy soil. It is emphasized, however, that these latter findings apply only to "the extreme in agricultural soils . . . an arid sand of no agricultural value except where sufficient irrigation water is available."

Normally productive soils, representing sandy loam, loam, and clay loam types, should have buffer capacity sufficient to take care of the acidity "produced from 30 mg. of nitrogen as ammonium sulfate in a 28-day incubation period," the shorter incubation being deemed necessary when smaller quantities of nitrogen are to be used. An incubation of two weeks was found suitable for an addition of 2.5 mg. of nitrogen, and three weeks for 10 mg.

The suitability of ammonium sulfate as a source of nitrogen for nitrification tests on normally productive soils is considered to be sustained by the data obtained in this study.

A time and labor saving method for the preparation of legume cultures, D. B. Shutt (*Sci. Agr., 8 (1928), No. 10, pp. 665–667*).—It was found possible to save much time and labor in the preparation of legume cultures by placing the bottles in large trays, two thicknesses of factory cotton covering the entire tray being used in place of individual cotton plugs in the bottles. A further improvement was effected by the use of an atomizer for the inoculation of the agar slants, the suspension of the organism to be used in sterile water being first strained through a sterilized metal strainer to remove particles capable of clogging the atomizer, and then sprayed from the sterilized atomizer by air pressure from an electric pump onto the agar slants in the previously sterilized bottles. This method is said to make possible the inoculation of 1,000 or more cultures per day and has been in use by the author for two years.

Either Ashby's agar or the following proved a satisfactory medium: Agar 20 gm., cane sugar 10 gm., tricalcium phosphate 1 gm., trimagnesium phosphate 1 gm., potassium sulfate 1 gm., sodium chloride 0.1 gm., and tap water 1,000 cc. The medium described was observed to give good growth in from 5 to 6 days when incubated at 25° C.

Restoration of organic matter of soils (*Nebraska Sta. Rpt. [1927], p. 15*).—Recent work has indicated the loss of as much as 30 per cent of the original content of organic matter, the annual loss at the agronomy farm having been about 1,140 lbs. per acre. Manure at the rate of two tons per acre per year maintained the organic matter content of this soil.

Soil fertility (*Nebraska Sta. Rpt. [1927], pp. 13, 14*).—Notes from six years' accumulated data include the following points: Manure has consistently increased the yields of wheat and oats. The returns per ton per acre varied with the rate and frequency of application, being slightly greater for the lighter and more frequent applications. Corn yields were but little increased by manure. Phosphorus in various combinations increased wheat yields slightly at times, but on the average not profitably, and was found to be generally without effect

on oats and corn. Nitrogen in various combinations produced no increases of practical importance. Potassium was found consistently without effect on any of the crops. A shortage of moisture in the subsoil, attributed to alfalfa which had occupied the field for several years previous to the beginning of the plat experiments, was found to have limited the yield of alfalfa in the rotation to such an extent that results from manurial and fertilizer treatments have been generally insignificant.

Lime has not proved beneficial at the station farm, but on glacial soils in the southeastern part of Nebraska it gave distinct evidence of value, especially with a new seeding of alfalfa.

The Solikamsk deposits of potash salts [trans. title], V. G. KOTEL'NIKOV (KOTELNIKOV) (*Izv. Gosud. Inst. Opytn. Agron.* (*Ann. State Inst. Expt. Agron.* [*Leningrad*], *5* (*1927*), *No. 4, pp. 296–299*).—A preliminary survey of the district indicated that on a small area of 7 sq. km. (2.6 sq. miles) there are deposits equal to about 500,000,000 tons, 360,000,000 tons of carnalite and 140,000,000 tons of sylvinite. There is said to be every reason to believe that similar deposits are to be found within an area of 40 square miles nearby. According to geologic investigations these deposits are far greater than the well-known German-French deposits of potash.

Elemental sulfur and phosphate salt mixtures as fertilizer, R. B. MCKIBBIN and W. H. MOORE (*Sci. Agr., 8* (*1928*), *No. 9, pp. 579–581*).—Further experiments confirming the conclusions stated in Bulletin 296 of the Maryland Experiment Station (E. S. R., 59, p. 425) with respect to the toxicity of mixtures of elementary sulfur with superphosphate (acid phosphate) toward certain farm crops on Coastal Plain soils are reported. It is stated that this toxic effect also obtains in the case of other soluble phosphate sulfur mixtures, though not to the same extent as with calcium monophosphate.

"With the tricalcic phosphate . . . although the yields are greater where sulfur was added, the experimental error is so large as to render conclusions unwarranted from this trial. With all the treatments except tricalcium phosphate, the average yield of wheat from the cultures has been decreased by the addition of sulfur."

As an explanation of the observed toxicity the theory is advanced that the soluble phosphate strongly buffers locally the acidity resulting from the oxidation of the sulfur. "The consequent long-maintained intense acidity in 'pockets' is injurious to the plant root tissues."

AGRICULTURAL BOTANY

Principles of plant growth, W. W. ROBBINS (*New York: John Wiley & Sons; London: Chapman & Hall, 1927, pp. VII+299, figs. 136*).—"The object of this book is to present in nontechnical language some of the fundamental principles of plant growth. It aims to answer questions which have come to the attention of the writer from farmers and others interested in the growing of plants. . . .

"This book is so designed as to make it useful as an elementary text in secondary schools. . . . Furthermore, the thought has been to give information for the orchardist, the nurseryman, the farmer—in fact, for all those who grow plants and desire to be familiar with the principles of plant behavior and the various factors which influence this behavior."

Laboratory manual for elementary botany, E. W. SINNOTT (*New York and London: McGraw-Hill Book Co., 1927, pp. IX+106*).—"The present manual has been written in response to requests for a series of laboratory exercises to

accompany the author's Botany: Principles and Problems [E. S. R., 54, p. 123], and is in large part a codification of the laboratory procedure which has been worked out in his own course."

Botanists' aid and lexicon for gardeners, amateurs, and plant fanciers, A. Voss (*Botanisches Hilfs- und Wörterbuch für Gärtner, Gartenfreunde und Pflanzenliebhaber. Berlin: Paul Parey, 1927, 7. ed., rev. and enl., pp. [4]+256, figs. 246*).—In the preface to this edition by M. Tessenow (the author having died in 1924), it is stated that this book is intended to be adapted largely for use by gardeners uninstructed in Latin. Accordingly, Latin terms are translated into German.

The hydrion concentration of plant tissues, I—V (*Protoplasma, 1 (1926), No. 3, pp. 324–344; 1 (1927), No. 4, pp. 497–536; 2 (1927), No. 1, pp. 45–58, fig. 1*).—"It is proposed to present all these results as a series under the general title which is used as a heading for this description of the method."

I. *The method,* J. Small (pp. 324–333).—Any indicator method of determining hydrion concentration which depends upon a finely developed color sense is not considered capable of general application, requiring a trained color specialist. The method here described depends upon the fact that in a two-color indicator series one color is what may be called a dominant. This method was used during five years in studies by M. W. Rea and S. H. Martin, noted below.

II. *Flowering and other stems,* M. W. Rea and J. Small (pp. 334–344).—Observations using lower, middle, and upper sections from 164 stems, mostly flowering and differing as to species, showed no significant differences corresponding to stem portion.

"The so-called 'acid' range lies below pH 5.3. The so-called 'alkaline' range lies above pH 5.5. This division was, and still is, considered suitable for a preliminary differentiation of plant tissue reactions, and is based upon what appeared in 1921 to be the average position of the isoelectric points of plant proteins." Recent observations by authors named show, however, that the average isoelectric point may be a few points lower, around pH 4.5, and bromocresol green has been added to the series in use, in order to split up the 5.2–4.0 range as much as is possible at present.

The reactions of the several plant tissues are summarized separately, and the reactions of several families are also summarized. The observations are not generalized, but are presented as records of the application of the "range-indicator" method of determining the pH of plant tissues and as a preliminary demonstration of the variation in hydrion concentration which occurs from tissue to tissue in the same stem and from species to species within the same family.

III. *The tissues of Helianthus annuus,* S. H. Martin (pp. 497–521).—Sunflower (*H. annuus*) was studied in detail at all practicable life stages, and the reactions, as shown by sections, were obtained with the "range-indicator" method above described by Small. The characters of the different parts are detailed. No distinct gradient of reaction for the different regions of sunflower was observed except the difference in various tissues above and below ground.

IV. *The buffer of sunflower hypocotyl,* S. H. Martin (pp. 522–536).—Certain experimental changes obtained in the hydrion concentration of the tissues of the sunflower hypocotyl, the disturbance which resulted from alkali-yielding bottles, and the large natural variations found among cells of the same tissue all seemed to indicate the absence of strong buffers in some plant cells. It was found that the inorganic phosphate content in different samples of sap varies from 0.005 to 0.007 M phosphoric acid, and the buffer values of this sap, in terms of molar phosphoric acid, corresponded very closely to the actual phosphate concentrations.

"The normal reactions of the sap of sunflower hypocotyl are, therefore, only slightly buffered, and this small amount of buffer action is due to a correspondingly dilute concentration of inorganic phosphate present in the sap."

V. *The tissues of Vicia faba*, M. W. Rea and J. Small (pp. 45–58).—Early observations having indicated that the sunflower and the broad bean differ considerably in the differentiation of their tissues with regard to hydrion concentration, one of the outstanding features of the sunflower being the marked acidity of the epidermis, the tissues of *V. faba* were examined as to their hydrion concentration throughout the plant and at various life stages. The results are recorded, summarized, and briefly compared with those obtained for *H. annuus*.

Recent studies on the chondriome of the plant cell [trans. title], L. Emberger (*Rev. Gén. Bot., 39 (1927), Nos. 462, pp. 341–363, pls. 4; 463, pp. 420–448*).—From this detailed account, including a history, an extensive bibliography, observations, and other information, it appears that the chondriomes throughout the range of living beings present a remarkable degree of unity, those of the higher plants being separable only somewhat arbitrarily from those of the fungi. It is stated that the only difference, as regards the chondriomes, between heterotrophic and autotrophic plants is that in the latter the chondriomes are of necessity in part highly specialized as regards the chlorophyll function.

[Chloroplasts], E. Küster (*Protoplasma, 2 (1927), No. 1, pp. 65–79, figs. 11*).—Characters and behavior are detailed for chloroplasts, chiefly of Spirogyra and Bryopsis.

Pigments of plastids and their transformation in living tissues of plants [trans. title], V. Lubimenko (*Rev. Gén. Bot., 39 (1927), Nos. 465, pp. 547–559, figs. 2; 466, pp. 619–637, figs. 2; 467, pp. 698–710, figs. 2; 468, pp. 758–766, figs. 4; 40 (1928), Nos. 469, pp. 23–29, fig. 1; 470, pp. 88–94, fig. 1; 471, pp. 146–155; 472, pp. 226–243; 473, pp. 303–318; 474, pp. 372–381*).—This is the second part (though under title changed—except in No. 465—to read as shown above) of the contribution, the first part of which has been noted (E. S. R., 59, p. 24).

Concluding this detailed account, the author states that the great variability in the transformation of the pigments is due to the fact that the plastids behave as independent biochemical units. The development of pigments goes on at rates which differ even in plastids of the same cell.

The final chapter comprises extensive bibliographies on the chemistry and physiology of pigments and on heredity and the transformations of pigments in living plant tissues.

Physiological and anatomical investigations on Mimosa pudica, J. C. Bose and G. P. Das (*Roy. Soc. [London], Proc., Ser. B, 98 (1925), No. B 690, pp. 290–312, figs. 8*).—Experimental results presented are claimed to show that the theory of the transpiration current as the agent of conduction of excitation in Mimosa is opposed to the facts, and that conduction in the petiole and in the stem of Mimosa is a phenomenon of transmitted protoplasmic excitation. It is claimed that the conducting or nervous tissue in Mimosa has been localized in the phloem of the vascular bundles.

"Local stimulation at any point (in the vertical line passing through the one row of leaves) gives rise to two impulses which travel in opposite directions at the same time, causing fall of leaves both above and below the point of stimulation. The ascending impulse due to unilateral stimulation of moderate intensity is conducted only along the stimulated side; the impulse generated by a stronger stimulus is transmitted further; it crosses over at the apex, and the ascending impulse at one side becomes reversed into a descending impulse at the opposite side. These characteristic effects are also strongly against the trans-

piration-current theory. . . . The high motor excitability of the pulvinus of Mimosa is shown to be due to special protoplasmic modification of the active cells. . . . It is further shown that the relative extent and density of staining affords a measure of the excitability of the motor organ. The characteristic staining is absent in inactive pulvini, such as those of Phaseolus and of Erythrina.

"The energy of rapid movement must ultimately be derived from oxidation of an active substance present in the protoplasmic contents of cells of excitable pulvini. It is shown that they contain an active substance which is highly oxidizable and reactive, being an unsaturated compound with double or treble bond combinations."

Regulation in plants.—A system of unified concepts as regards plants [trans. title], E. UNGERER (*Die Regulationen der Pflanzen. Ein System der Ganzheitbezogenen Vorgänge bei den Pflanzen. Berlin: Julius Springer, 1926, 2. enl. ed., pp. XXIV+363*).—This is a revised and elaborated edition of a work published in 1919.[1] As claimed in the introduction, it belongs partly to the domain of logic as well as to that of botany.

Effect of light and darkness on plant growth, L. KOLISKO (*Physiologischer Nachweis der Wirksamkeit Kleinster Entitäten bei 7 Metallen. Wirkung von Licht und Finsternis auf das Pflanzenwachstum. Dornach, Switz.: Philos.-Anthropos. Verlag am Goetheanum, 1926, pp. 111–165, figs. 30*).—The experimentation herein detailed is claimed to have shown that it is characteristic of silex to activate light in soil. It is said to be characteristic of humus that it is effective in darkness.

Studies on the permeability of living cells.—VII, The effects of light of different wave lengths on the penetration of 2,–6,– dibromo phenol indophenol into Valonia, M. M. BROOKS (*Protoplasma, 1 (1926), No. 3, pp. 305–312, figs. 2*).—"When Valonia is placed under screens which transmit light of wave lengths from 300 to 700 μ, the amount of 2,-6,- dibromo phenol indophenol penetrating the sap increases as the wave length decreases. In these experiments the penetration of the dye follows the course of a unimolecular reaction."

The influence of air humidity on the plants of arid regions [trans. title], V. N. TIKHOMIROV (*Izv. Saratovsk. Gosud. Inst. Selsk. Khoz. i Melior., No. 3 (1927), pp. 139–152, figs. 3*).—Air humidity influences composition, xeromorphism, and transpiration of plants in arid regions, but analysis of the changes shows that the absolute humidity of the air is very stable. In dry years or in the arid regions the absolute humidity is not markedly greater or smaller than in many humid regions. Thus the differences in plant composition, the xeromorphism, or the high transpiration noticeable in the arid region can not be ascribed to the influence of small amounts of water vapor in the air.

The characteristics used to indicate the humidity of air change primarily because of temperature changes in the air. If the "deficit of saturation" according to the law of Dalton (for the speed of evaporation) may show the evaporative influence of the air, then the relative humidity, which does not change parallel with the change of the deficit, can not show this. The capability of the leaves to absorb light and the property of easily changing their temperature point toward temperature as the primary factor in transpiration. The changes ascribed to humidity appear, upon closer analysis, to be due to temperature.

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[1] Die Regulationen der Pflanzen. Ein System der Teleologischen Begriffe in der Botanik. Berlin: Julius Springer, 1919, pp. XI+260.

Variations of mineral matter in leaves during the course of autumnal yellowing [trans. title], R. Echevin (*Rev. Gén. Bot., 39 (1927), Nos. 463, pp. 405–419; 464, pp. 488–514, pl. 1*).—Analyses have shown that sap mineral content (calcium, and all other minerals taken together) diminishes as regards absolute quantity in five plant species out of six examined. Interpretations are discussed.

Genesis and forms of localized storing of manganese in hydrophytes [trans. title], J. Gicklhorn (*Protoplasma, 1 (1926), No. 3, pp. 372–426, pls. 3, figs. 4*).—This work and its results are detailed, with a bibliography of 43 titles.

A study of sex change in papaya and of correlation between sex and certain morphological characters of seedlings, T. P. Reyes (*Philippine Agr., 14 (1925), No. 7, pp. 391–412, pls. 3*).—It is claimed that, contrary to current beliefs of papaya growers, the margin of the initial leaves, the color and vigor of the stem, and the size or extent of the root systems of young papaya seedlings are not associated collectively or individually with maleness or femaleness. The preponderance of fruit-bearing forms in papaya orchards near Los Banos is said to be due mainly to the use of seed of hermaphrodite elongata fruits for planting purposes. This fact suggests an effective method of eliminating males in the plantation.

Removal of the central root systems of young papaya seedlings had no effect on the normal ratio between the male and female individuals. Topping can not be depended upon to convert sterile male papaya trees into fruit-bearing forms completely and permanently. Of 88 decapitated trees only 1 showed a change in sex expression, and this was incomplete and temporary. A second and a third topping failed to bring about the desired sex transformation, the sex changes produced in 2 out of 83 treated branches being likewise partial and transient. Forms of topping severely rather than merely pinching off the terminal bud brought no positive response.

Sex change in the male does not appear to be influenced by the stage of growth of the plant. The localized sex changes in the male do not appear to be bud sports in the strict horticultural sense. The female papaya was not found to alter its sex following the removal of its top.

GENETICS

Cytology of the genus Secale [trans. title], H. Emme (*Ztschr. Induktive Abstam. u. Vererbungslehre, 47 (1928), No. 2, pp. 99–124, figs. 55*).—Extensive studies (E. S. R., 58, p. 823) in Leningrad showed that 14 is the diploid chromosome number of *S. cereale, S. montanum, S. fragile,* and *S. africanum.* From 1 to 2 per cent of 16-chromosome examples were noted in the first three species, and these species were similar in the average values of the total length of chromosomes. The haploid chromosomes were similar in different phases. The origin of 8(16) and 7(14) chromosome types is discussed.

Heritable characters in maize.—XXXI, Tassel seed—4, I. F. Phipps (*Jour. Heredity, 19 (1928), No. 9, pp. 399–404, figs. 3*).—The thirty-first of this series (E. S. R., 58, p. 527) describes the inheritance of a fourth gene for the tassel seed type of corn plant designated ts_4. This variant was found to behave as a simple Mendelian recessive to normal, and linkage tests indicated that Ts_4 ts_4 is probably inherited independently of the *Pr pr, Y y, B b,* and V_2 v_2 factor pairs. There was inconclusive evidence of linkage between Ts_4 ts_4 and the *A a* factor pair for anthocyanin pigment.

Correlated inheritance in Kanred×Sevier varieties of wheat, G. Stewart (*Jour. Agr. Research [U. S.], 36 (1928), No. 10, pp. 873–896*).—The behavior of several characters was studied at the Utah Experiment Station in several filial generations from Kanred×Sevier wheat. Kanred had lax spikes, red kernels,

white glumes, and intermediate culms, and was fully awned, and Sevier intermediate spikes, white kernels, bronze glumes, and long culms, and fully awned, with awns shorter than Kanred awns.

One major factor and apparently some minor factors seemed to be involved in the inheritance of spike density. Although segregation in height was apparent, no ratios were found which indicated the nature of the segregation, and definite conclusions were not reached as to the inheritance of the number of spikelets or the number of culms. There appeared to be a 3-factor difference in regard to grain color and a 1-factor difference in glume color. Correlation studies indicated that linkage exists between spike density and awn length and gave a suggestion of correlation between spike density and number of spikelets and between height of plant and number of spikelets.

Coat color inheritance in greyhounds, D. C. Warren (*Jour. Heredity, 18 (1927), No. 12, pp. 512–522, figs. 4*).—In a study of the inheritance of color in greyhounds at the Kansas Experiment Station, the color of the offspring produced in 733 matings was tabulated, from which it was concluded that black, brindle, and fawn or red form an allelomorphic series, with dominance in the order given. Blue and fawn are probably the result of dilution factors acting on black and red, respectively, but the evidence did not indicate that the same factor was responsible. White spotting was recessive to self-color as in other mammals and varied greatly in degree, the more extended white condition being recessive to the more restricted. All colors appeared to be due to extension factors acting upon black, for which the breed was apparently homozygous, since all individuals observed had black noses. The similarity of greyhounds to great Danes in the inheritance of color is noted.

The mode of inheritance of yearly butterfat production, C. W. Turner (*Missouri Sta. Research Bul. 112 (1927), pp. 130, figs. 9*).—A hypothesis for the mode of inheritance of milk and fat secretion is presented based on (1) the influence of many genes on milk and fat secretion, (2) the dominance of many of the factors favoring high production, and (3) the assignment of unequal values to the genes. The hypothesis is substantiated by theoretical discussion of what would be expected in the correlation between parent and offspring and other related groups in production under different conditions and the relation of these values to the actual correlations reported for the different breeds by various authors. The possibilities in a three-factor case assuming dominance and an equal influence of each factor are discussed in detail. In an analysis of the progeny performance of all Jersey sires having 10 or more daughters in the Register of Merit, all fat records being converted to the mature equivalent, the regression of daughters' records on dams' records was calculated for each group of sires according to the average production of their daughters. As the correlation coefficients were in every case less than 0.3 and in many cases approached 0.1, the regression equations could not be considered of much prediction value. The regression equations were also calculated for the relation between the sons' daughters' fat production and the sire's progeny test and the dams' production records as follows:

Son's daughters' yearly fat production=302.3+0.481 sire's daughters' fat production

Son's daughters' yearly fat production=463.1+0.176 dam's yearly fat production

The dam's half sisters proved almost three times as valuable as an index of the son's transmitting ability to his daughters as the dam's record, the regression equation being

Son's daughters' yearly fat production=304.5+0.483 dam's sire's daughters' yearly fat production.

Congenital epithelial defects of calves, F. B. Hadley (*Jour. Heredity, 18 (1927), No. 11, pp. 487–495, figs. 2*).—From a study at the University of Wisconsin of the pedigrees of 50 calves showing defects in the formation of skin below the knees and hocks, one or more undeveloped claws, deformed ears, and defects in the muzzle, nostrils, and mouth, it was found that these calves largely traced back to the ancestors of a particular Holstein sire. Thirteen such defective calves occurred in one herd which practiced considerable inbreeding. Matings of supposedly heterozygous animals produced about one defective to three normals, leading to the conclusion that a simple recessive factor was responsible. The condition has been observed in the Netherlands among the ancestry of the bull to which the defectives traced.

Source of the testicular hormone, R. M. Oslund (*Soc. Expt. Biol. and Med. Proc., 25 (1928), No. 9, pp. 845, 846*).—In studying the source of the testicular hormone, extracts of the epididymis, which has no interstitial cells, were injected into experimental animals, with doubtful though not entirely negative results. In another experiment, fresh sperm from the vas deferens was injected into three caponized cocks, causing comb growth. When the injection was discontinued resorption of the combs followed. Testicular tissue injected in similar amounts did not produce noticeable effects. It is concluded that the results point toward the germinal epithelium as the source of the testicular hormone, and this is further confirmed in vasectomy experiments, which are followed by increased sex activity through the absorption of larger amounts of the spermatic fluid in the vascular or lymph system.

Breeding martens in captivity, F. G. Ashbrook and K. B. Hanson (*Jour. Heredity, 18 (1927), No. 11, pp. 498–503, figs. 3*).—The results of preliminary experiments conducted by the U. S. D. A. Bureau of Biological Survey in breeding martens indicate that all females producing young had access to a male during the summer as well as the winter months, and no females produced young when allowed to mate only during the winter, it could not be determined whether the gestation period was 2 to 3 months or approximately 8 months. No matings were observed during the winter.

FIELD CROPS

Influence of crop rotation and soil treatments upon the yield of crops in rotations on Cecil clay loam soil, C. B. Williams, S. K. Jackson, and F. T. Meacham (*North Carolina Sta. Bul. 256 (1928), pp. 12*).—Field results obtained in crop rotation experiments at the Piedmont Substation during the period 1919–1926 are reported.

Wheat fertilized and limed or unlimed in a 2-year rotation with corn without legume cover crops produced small, if any, yield increase over continuous wheat. Both corn and wheat yielded better in a 3-year rotation with legumes than in a 2-year rotation with legumes, whether complete fertilizer was supplemented by limestone or not. Red clover growing in a 3-year rotation of corn with cowpeas, wheat, and red clover needed both lime and fertilizer for satisfactory yields. With continuous corn and continuous wheat, limestone supplemental to complete fertilizer had only slight effect in increasing yields above those secured with fertilizer alone. Both crops grown in the 3-year rotation with legumes responded far better in increased yields to complete fertilizer supplemented by limestone every 3 years than when grown in either of the 2-year rotations or continuously.

Mixtures of spring cereals and flax in Ohio, L. E. Thatcher (*Ohio Sta. Bul. 421 (1928), pp. 17, figs. 2*).—Comparative tests were made of Fulghum

oats, Oderbrucker barley, Linota flax, and Marquis spring wheat grown separately and in mixtures.

The several crops and combinations ranked in the following order: Oats 100, barley-flax 88.9, barley-oats 88.3, barley 84.3, oats-flax 77.5, barley-spring wheat 68.6, spring wheat 65.7, oats-spring wheat 64.7, spring wheat-flax 60.6, and flax 43.8. Barley produced almost as much in mixture with flax as alone, whereas the oats yield was reduced 31.3 per cent in the oats-flax mixture. More flax was grown with oats than with barley or spring wheat. With oats sown 1 bu. per acre with flax 1, 2, and 3 pk. per acre, the oats yields decreased and flaxseed yields rose with the flax seeding rate. Oats seemed to suffer more than barley when in competition with companion crops. The barley-oats mixture had no advantage over oats alone or over equal areas of barley and oats grown separately.

The barley-flax mixture had the highest calculated feeding value, followed closely by oats alone, and its nutritive ratio was comparable to that of oats, although its practical value had not been determined. The barley-oats mixture was less desirable for feed than oats and little better than barley. The danger of prussic acid poisoning from feeding whole or ground flax seed is pointed out.

Farm prices cited suggest that oats may be more profitable than barley. None of the mixtures except the barley-flax and spring wheat-flax were promising as cash crops, and of these the barley-flax is at present impracticable because of the difficulty of separating the mixture. The spring wheat-flax mixture could be encouraged if the local market for flaxseed justified its culture.

[Field crops experiments at the Raymond, Miss., Substation, 1927], H. F. Wallace (*Mississippi Sta. Bul. 252 (1927), pp. 3–13, 20, 21, 22*).—Recommendations from the results of variety and fertilizer tests with cotton and corn and spacing tests with cotton resembled those of the previous report (E. S. R., 56, p. 731). Trials of nitrogen and potassium carriers for cotton are also noted. Variety trials were made with soy beans, grain sorghum, sorgo, and potatoes, and the value of vetch in rotations was tested.

[Field crops work in Nebraska, 1927] (*Nebraska Sta. Rpt. [1927], pp. 32, 33, 35, 36*).—Experiments at the North Platte Substation (E. S. R., 57, p. 522) in cooperation with the U. S. Department of Agriculture showed much higher yields of winter wheat from early than from late fall plowing. Winter wheat yields after listed and after plowed fallow were about equal, indicating that weed control is more important than the method by which secured. Winter wheat on disked corn stubble yielded 5 bu. more than where seeded in stubble without disking. The yields of all crops were higher after a cultivated crop than following small grain. Corn under irrigation averaged 63 bu. per acre, and without irrigation 42 bu., and silage corn made 15.7 and 5.5 tons, respectively. The maximum corn yield, 102.4 bu., was on alfalfa sod with one fall and three summer irrigations, totaling about 19 in. of water.

Potato yields at the Scottsbluff Substation decreased with successive plantings from May 12 to July 1, those planted after June 11 giving very low yields. The lowest yield of marketable tubers, 32 bu., was obtained on the first harvesting date, August 3, increasing to 365 bu. on September 22 for Triumph and from 111 bu. to 460 bu. for Irish Cobbler.

Kanred and Nebraska 60 wheat, Rosen rye, Nebraska 21 and White Burt oats, two barbless barleys, and Amber sorgo of the forage crops were outstanding in variety trials at the Valentine Substation. In meadow improvement work disking the sod again proved beneficial in obtaining a stand. Inclusion of red and alsike clover in native meadows gave an increase of 65 per cent in total hay yield.

[Field crops investigations in North Dakota, 1925–1927], H. L. WALSTER ET AL. (*North Dakota Sta. Bul. 217 (1928), pp. 15–28, 30, 31, 34, 35, 60–62, 97, 98, 101, figs. 8*).—Experiments reported on from the station and substations (E. S. R., 55, p. 527) included variety tests with wheat (E. S. R., 58, p. 330), corn, oats, flax, field peas, soy beans, and miscellaneous forage legumes and grasses; breeding work, including inheritance studies, with wheat, corn, oats, barley, flax, alfalfa, rye, sweet clover and *Trifolium medium;* planting tests with flax, corn, and field peas; and crop rotations.

In 12 different unmanured rotations average wheat yields ranged from 27.5 bu. per acre in the 4-year rotation corn, wheat, red clover, and flax, to 16.4 bu. in the rotation millet (or timothy), wheat, corn, and barley. Substituting oats for flax lowered wheat yields. Wheat yielded more after barley than after rye in 4-year rotations. Wheat yields after wheat varied in different sequences. After corn in five different rotations, wheat yields ranged from 23.8 to 27.5 bu., whereas those after flax were distinctly lower than after corn, except in manured rotations where the yields were similar. Unmanured rotations returned 22.7 bu. of wheat per acre and manured rotations 24 bu.

The average yield of wheat at Dickinson after the duckfoot fallow was a little better than after plowed fallow. Duckfoot fallow for a season cost about 20 per cent less than plowed fallow and seemed to control wild oats and other weeds better.

High or significant positive correlations were shown between test weight per bushel and flour yield, test weight and flour color, and protein content of flour and baking strength as measured by loaf volume. Protein content of wheat and percentage of dark vitreous kernels were correlated positively but not enough for the percentage of such kernels (E. S. R., 57, p. 38) to serve as a criterion of baking strength. Test weight was not correlated significantly with either protein content or loaf volume. The effects of climatic variations, soil fertility, and cropping systems have been discussed elsewhere (E. S. R., 53, pp. 838, 839; 58, pp. 136, 433).

Variety, rainfall, and soil and cropping systems may affect the diastatic activity of flour, which appears to vary inversely as the protein content of the wheat. Durum wheat starch is much more readily attacked and converted into sugar by diastase than the common wheat starches, and starch pastes prepared from durum starch show a lower viscosity than similarly prepared pastes from common wheat starches.

Flax seeded alone averaged 12 bu. per acre and wheat alone 20.6 bu. Flax-wheat mixture with flax seeded at the regular rate with 15 lbs. of wheat yielded 8 bu. of flax and 8.2 bu. of wheat per acre and with 30 lbs. of wheat 5.1 bu. of flax and 13 bu. of wheat. The relative yield for the mixed crop in both cases was 106 per cent. As the rate of wheat seeded was increased the wheat yield rose and the flax yield decreased. The weed factor was generally less as the quantity of wheat in the mixture was increased.

Manure evidently hastened the maturity of corn on Fargo clay. Where corn and soy beans were grown together in hills the presence of corn reduced the average yield of soy beans about 46 per cent, and the soy beans reduced the average corn yield about 13 per cent.

Alfalfa decidedly surpassed perennial grasses in forage production on Fargo clay. Inclusion of brome grass into pasture mixtures tended to lower total forage yields, whereas sweet clover was inclined to raise them. Sweet clover provided proper physical conditions for an abundance of French weed and wild barley. Isolation quadrats on plats receiving alfalfa in the original seeding were generally higher in yields, while the reverse was noted on plats receiving

the larger quantities of brome grass. Crested wheatgrass showed distinct promise at Dickinson as an early pasture crop, being ready to pasture 2 weeks ahead of brome or slender wheatgrass and about 3 weeks ahead of alfalfa and sweet clover.

[Agronomic work in Northumberland County, England], C. HEIGHAM (*Northumb. Co. Ed. Com. Bul. 40 (1928), pp. 10–56*).—Experiments with field crops at the county experiment station at Cockle Park were similar in scope to those noted previously (E. S. R., 58, p. 130).

[Agronomic experiments in Morocco, 1924–25 and 1925–26], ROCHER, NOURY, TOSAN, CHRISTIEN, POCHON, and [E.] MIÈGE ([*Morocco*] *Dir. Gén. Agr., Com. et Colon., Expt. Agr. Rap. Ann., 1924–25, pp. 154, figs. 12; 1925–26, pp. 116, figs. 15*).—Experiments with field crops at Casablanca, Fez, Marrakesh, Meknes, and Rabat are reported on for the above periods as heretofore (E. S. R., 56, p. 35).

Occurrence of the various groups of legume bacteria in Iowa soils, L. W. ERDMAN and R. H. WALKER (*Iowa Acad. Sci. Proc., 34 (1927), pp. 53–57*).—Studies in the vicinity of Iowa State College indicated that representatives of all except one of the different cross-inoculation groups of legume bacteria are naturally present in Iowa soils. While nodules have been found on the soy bean, it has been necessary to introduce the soy bean bacteria artificially in Iowa soils. Red bud, honey locust, Kentucky coffee tree, serradella, goat's rue, and fenugreek were not found inoculated.

The abacá project of La Carlota Experiment Station, A. F. LABRADOR (*Philippine Agr. Rev., 21 (1928), No. 1, pp. 3–19*).—Abaca experiments carried on over an extended period included variety, planting, selection, and cultural trials, flowering, hybridization, and textile tests, and observations on pests and diseases.

The Tangongon variety led in fiber production, and it and Maguindanao had the strongest fibers. Plants produced maximum yields and numbers of matured stalks in October, a very rainy month, and the lowest yield in January, a much drier month. With the 13 varieties used, plants grown from seedlings had a higher fiber content per stalk than those grown from suckers, and those with fruits in the suckers and in the seedlings gave a higher percentage per stalk than those without fruits. The plants grown from seedlings were also more resistant to diseases than those from suckers. Flowering studies showed that there are early, medium, and late maturing varieties of abaca, confirming earlier data by Hernandez (E. S. R., 50, p. 829). Cover crops planted between the rows while the abaca was still young proved very beneficial and cheaper than cultivation in weed control.

Alfalfa experiments [trans. title], G. SUNDELIN and O. FRANCK (*Meddel. Centralanst. Försöksv. Jordbruksområdet [Sweden], No. 335 (1928), pp. 46. pl. 1, figs. 13; Eng. abs., pp. 44, 45*).—Strain tests of alfalfa showed original Grimm to outyield other Grimm strains and other varieties, although it was excelled by Ultuna in winter hardiness. Alfalfa in pure stand was held superior to alfalfa-grass mixtures for conditions in middle Sweden. The hay yield was highest in the mixed plats, but the quantity of protein was smaller. Alfalfa was strongly inhibited by orchard grass, such that 3- to 4-year-old pastures of mixtures of alfalfa and orchard grass contained only from 15 to 20 per cent of alfalfa. Timothy seems to be the grass most suitable for mixtures. The results showed that cutting alfalfa during the planting year should be avoided.

Seasonal behavior of alfalfa flowers as related to seed production, J. W. CARLSON (*Jour. Amer. Soc. Agron., 20 (1928), No. 6, pp. 542–556*).—Investiga-

tlon on the Alfalfa Seed Farm of the Utah Experiment Station and on farms in the Uintah Basin showed that 82.1 per cent of 2,042 racemes tagged in alfalfa fields in the area in July, 1926, and June and July, 1927, produced pods. In plats at the seed farm an average of 34.2 per cent of the flowers on individual racemes formed pods, and the remainder stripped. The percentage of flowers stripping from the individual racemes is proportionally greater and probably of more consequence from the viewpoint of the seed crop than is the complete stripping of flowers from part of the racemes. Of the alfalfa flowers tripped artificially, 63.9 per cent formed pods as compared with 37 per cent when the flowers were allowed to develop naturally. Under the latter condition 10.8 per cent of the flowers were found to have become tripped, while 37 per cent formed pods, suggesting that alfalfa flowers can form pods rather freely in the absence of tripping. Under natural conditions of development many-flowered racemes formed proportionally more pods than did few-flowered racemes, whereas the reverse held with artificial tripping.

It appeared that when alfalfa flowers are from 1 to 3 days in the full-bloom stage and from 2 to 5 days in the wilted stage their chances of forming seed pods are greatest, while if the flowers remain in the fresh-looking, full-bloom stage for many days without showing a tendency to wilt or remain wilted unduly long the chances are very great that they will strip before forming pods. The results seemed to confirm the opinion of growers that the developmental changes of the flower while forming seed pods should occur in rather rapid succession if a good crop of seed is to result.

A physiological study of varietal differences in plants.—Part I, A study of the comparative yields of barley varieties with different manurings, F. G. Gregory and F. Crowther (*Ann. Bot. [London], 42 (1928), No. 167, pp. 757–770*).—The principal conclusions from this study have been noted from another source (E. S. R., 59, p. 130). Confirmation of the general conclusions of the authors are given in an appendix by E. S. Beaven from the results of barley experiments at Warminster.

Cotton production, J. F. O'Kelly and W. W. Hull (*Mississippi Sta. Bul. 249 (1928), pp. 12*).—Leaders in the different cotton variety trials were about the same as in work of the previous year (E. S. R., 56, p. 736). Certain D. & P. L. selections showed up well in the wilt-resistance test. Cultural and fertilizer practices are outlined, with information on maintaining varietal purity.

Cotton Experiments, 1927, South Mississippi Experiment Station, E. B. Ferris (*Mississippi Sta. Bul. 251 (1927), pp. 14, figs. 2*).—The current yields of cotton in tests involving varieties, fertilizer formulas, potassium and nitrogen sources, home v. factory mixed and high v. low analysis fertilizers, and rotations are tabulated and discussed as heretofore (E. S. R., 57, p. 36). The effects of different potassium carriers, used in varying quantities, on the control of rust and wilt in cotton are also noted.

Cotton fertilizer experiments, C. B. Anders and W. W. Hull (*Mississippi Sta. Bul. 250 (1928), pp. 9*).—Continued fertilizer tests (E. S. R., 56, p. 736) with cotton indicated that an 8–6–4 (P–N–K) formula would be desirable on the sandy clay hill soils (Choctaw County) and on hill and flat wood soils in east-central Mississippi, while on the Black Post Oak soil of the prairie belt an 8–8–0 fertilizer is suggested, with 4 per cent of potash added where rust or leaf diseases occur. With the 8–4–4 formula from 1,200 to 1,800 lbs. appeared to be the most profitable acre application. Source tests involving six carriers of nitrogen and four potassium carriers are also noted, together with comparative tests of several new fertilizer materials on cotton.

The toxicity to cotton seedlings of high concentration of soluble nitrogenous fertilizers, L. G. Willis and E. A. Davis (*North Carolina Sta. Tech. Bul. 30 (1928), pp. 12*).—The toxicity of sodium nitrate, ammonium sulfate, Leunasalpeter, calcium nitrate, and urea to cotton seedlings was studied, and attempts were made to correlate the effect with chemical reactions resulting from the treatment.

In pot tests on Norfolk sandy loam the concentration of nitrogen necessary for injury was about the same for the first four chemicals, whereas heavy applications of urea seemed more toxic than equivalent quantities of the other forms. The osmotic pressure of the soil solution, evidently not associated with injury, rose with increased rates of application of the chemicals, being least with urea and highest with the nitrates. Excepting the urea, practically all of the nitrogen added was recovered in its original form by suitable extraction methods, and no difference was observed between nitrates and ammonium compounds in tendency to cause injury.

Normal growth resulted from the smallest rates of all sources of nitrogen (0.78 and 1.57 gm. to 40 lbs. of soil), while distinct injury came from 7.84 gm. and death of all plants in the case of urea. Urea in noninjurious concentrations produced more dry matter than any other form used. Nitrogen absorption was rapid during the first 4 days of growth, being greater from ammonium compounds than from nitrates, and rose with increases in the application rate. Absorption was greatest with urea as the nitrogen source.

The protein content of grass, chiefly meadow foxtail (Alopecurus pratensis), as influenced by frequency of cutting, F. T. Shutt, S. N. Hamilton, and H. H. Selwyn (*Jour. Agr. Sci. [England], 18 (1928), No. 3, pp. 411–420*).—This reports in greater detail the experiments noted from another source (E. S. R., 59, p. 129).

The importance of temperature in the use of chemicals for hastening the sprouting of dormant potato tubers, F. E. Denny (*Amer. Jour. Bot., 15 (1928), No. 6, pp. 395–404, figs. 8*).—Continued experiments (E. S. R., 55, p. 829) at the Boyce Thompson Institute for Plant Research, involving Bliss Triumph potatoes in the early stages of the rest period, showed that when germination was hastened by dipping the cut dormant tubers into a dilute solution of ethylene chlorohydrin and storing the dipped tubers in closed containers for 24 hours, the temperature prevailing during this storage period is an important factor. With a dipping solution of 30 cc. of 40 per cent ethylene chlorohydrin to 970 cc. of water, favorable results were had at 20, 25, and 30° C., whereas at 35° (95° F.) the seed pieces were killed and rotted subsequently. Good results were obtained at 30, 31, and 32°, but at 33, 34, and 35° low percentage germinations due to rotting of tubers resulted. Below 20° a solution of 30 cc. per liter was only partly effective, and many seed pieces remained dormant. Better germination percentage was had when the concentration was increased to 60 cc. per liter.

In the method which consists in soaking cut tubers for 1 hour in a dilute solution of sodium thiocyanate, the solution temperature was found of less importance. Good results were had at 15, 22, and 30° and with 2, 1, and 0.5 per cent sodium thiocyanate. While at 35° some evidence of toxicity was noted at the highest concentration, there was no serious difficulty with rot.

Earlier results were confirmed in that treatments with these chemicals hastened the sprouting of dormant potato tubers. Untreated tubers showed 11 per cent germination at from 7 to 8 weeks after planting, the average of all chemical treatments was 66 per cent, and under favorable conditions the average was 83 per cent for ethylene chlorohydrin and 100 per cent for sodium thiocyanate treatment.

Dynamical investigations on the abscission of the rice grain and its measurement [trans. title], S. Mori and T. Shindo (*Bul. Sci. Fakult. Terkult., Kjusu Imp. Univ., Fukuoka, Japan., 3 (1928), No. 1, pp. 30–35, pl. 1, figs. 2; Eng. abs., p. 35*).—Using an instrument designed to determine the force needed to detach rice grains from the rachilla, the breaking-tensile strength (force strains along the direction of the rachilla) in 10 varieties ranged from 147.9 to 217.7 gm., and the breaking-bending strength (force strains perpendicular to the rachilla) ranged from 50.1 to 126.9 gm. The ratio of the breaking-bending strength to the breaking-tensile strength, from 1:1.6 to 1:3.1, is held to provide useful data to determine the arrangement of teeth on the cylinder of a rice thresher.

Yields of adjacent rows of sorghums in variety and spacing tests, K. H. Klages (*Jour. Amer. Soc. Agron., 20 (1928), No. 6, pp. 582–598, figs. 4*).—The comparative yields of individual rows (3.5 ft. apart) of 5-row plats of varieties of grain and forage sorghums planted on several dates and in spacing tests with kafir were studied in 1926 and 1927 at the Oklahoma Experiment Station to determine the influence of competition on the yields of adjacent varieties and whether border rows were essential to the accuracy of sorghum variety tests under the local conditions.

Individual rows did not differ significantly in yield from the averages of the inside rows protected from intervarietal competition or from the average yields of all five rows of the plats, and neither the yields of single rows nor of combinations of rows showed significant differences. Outside rows of plats in the variety tests exhibited a somewhat higher degree of variability than did inside rows, and combinations of rows showed a slightly lower degree of variability than single rows. A tendency toward a higher degree of variability was noted in the yields of respective rows in the earliest and latest dates of planting. Individual yields of the two outside rows of plats in variety tests and the yields of all inside rows were highly correlated. The values of the correlation coefficients indicated that the two respective outside rows of the plats were influenced either in like manner or not at all by rows of adjacent plats. The degree of competition found in spacing tests was evidently affected by environmental conditions. The yields of rows of dense stands gained at the expense of yields of adjacent rows of thinner stands.

Conclusions were that single row plats replicated often enough will give as reliable results as will plats with a larger number of rows repeated less frequently. In using single row plats varieties to be grown adjacent must be carefully selected so that extreme differences in growing habits may be avoided. The importance of uniformity of stands to the accuracy of variety tests is emphasized.

Soybeans in Canada, G. P. McRostie, R. I. Hamilton, F. Dimmock, and S. E. Clark (*Canada Dept. Agr. Pamphlet 93, n. ser. (1928), pp. 11, figs. 3*).—Cultural methods and field practices are given for growing soy beans for hay and seed, uses are indicated, and varieties grown in tests at the Harrow, Ontario, Experimental Station are described, with comparative yields.

Sugar-cane variety tests in Louisiana during the crop year 1926–27, R. D. Rands, S. F. Sherwood, and F. D. Stevens (*U. S. Dept. Agr. Circ. 36 (1928), pp. 15*).—Results of continued variety tests with sugar cane (E. S. R., 57, p. 546) in southern Louisiana again showed the superiority of P. O. J. Nos. 36, 213, and 234 over the commonly grown canes. P. O. J. 213 appeared to be the most promising of these three released canes. Preliminary trials on more recently introduced sorts, unreleased, indicated promising possibilities for P. O. J. 36-M and P. O. J. 2725.

Tucumán seedling canes [trans. title], W. E. Cross (*Rev. Indus. y Agr. Tucumán, 18 (1928), No. 11–12, pp. 183–205*).—The agronomic data and analyses tabulated for the crop years 1925–26 and 1926–27 supplement those recorded earlier (E. S. R., 56, p. 829.)

The effect of stripping off the dead leaves of sugar cane on the yield of sugar, M. Medina (*Philippine Agr. Rev., 21 (1928), No. 1, pp. 72–77; also in Facts About Sugar, 23 (1928), No. 35, pp. 832, 833*).—Studies at La Carlota Experiment Station showed that stripping the adhering leaves from sugar cane stalks generally increased the sucrose content and purity of the cane and also increased the cane tonnage and sugar yield per hectare. Late stripping, in October about the time of cessation of growth, gave the highest percentage of sucrose, purity, and sugar yield per hectare and also gave the highest net profit, 61.51 pesos more than the net profit of the control. Early stripping, the removal in June of dead leaves, together with a certain number of matured ones when cane was about in the full growth stage, resulted in 11.96 pesos less net profit than the control.

Cane (*Bacolod, Occidental Negros, P. I.: Prov. Carnival Assoc., 1928, pp. 54, figs. 5*).—This pamphlet on sugar cane culture includes the following papers in both English and Spanish: The Objectives and Scope of Field Experiments in the Sugar Industry, by H. A. Lee (pp. 7–14); Important Progress in Sugar Cane Breeding in the Philippines, by N. B. Mendiola (pp. 15–18); Sugar Cane Varieties, by M. L. Roxas (pp. 19–30); Hacienda Administration and Methods of Cultivation on Occidental Negros, by C. Gamboa (pp. 31–40); A Clean Culture System of Sugar Cane Insect Control, by W. D. Pierce (pp. 41–45); How Luzon and Negros May Help Each Other in the Control of Sugar Cane Pests, by L. B. Uichanco (pp. 46–52); and Clean Culture Program for Insect and Disease Control, by W. D. Pierce (pp. 53, 54).

The reference book of the sugar industry of the world (*New Orleans: La. Planter & Sugar Manfr. Co., 1928, pp. 27–112, pls. 4, figs. 45*).—This sixth annual review of the sugar industry contains the following articles of interest to agriculturists: The Sugar Cane Variety Situation, by F. S. Earle (pp. 27, 28); Cane Breeds and Breeding in Porto Rico, by D. W. May (pp. 28, 29); The Quest for Better Canes, by A. J. Mangelsdorf (pp. 29–31); The Queensland Sugar Industry, by H. T. Easterby (p. 31, 32); Some Aspects of Sugar Cane Agriculture in Java and the Hawaiian Islands, by E. D. Roberts (pp. 34–37); Soil Research: Its Application to the Cane Sugar Industry, by W. T. McGeorge (pp. 37–39); The Fungus, Pythium, in Relation to the Root Rot of Sugar Cane, by C. W. Edgerton (pp. 39, 40); How to Increase Sucrose Extraction from Cane, by P. van Harreveld (pp. 41–46); Further Applications of the Dye Test to Raw Sugar Manufacture and to Refining of Raw Sugar with Vegetable Carbon, by H. S. Paine and R. T. Balch (pp. 47–50); Bacteriology in its Relation to the Cane Sugar Industry, by W. L. Owen (pp. 51–53); The Growth of Microorganisms on Sucrose Crystals, with Special Reference to Certain Phases of Sugar Deterioration, by C. A. Browne and M. B. Church (pp. 53, 54); Preliminary Report Upon the Occurrence in Argentina of a Species of Diatraea New to the American Fauna, by H. E. Box (pp. 55, 56); Soil Animals and Root Pittings, by H. Spencer and C. L. Stracener (pp. 56–58); Fighting Insect Pests of Sugar Cane in North Queensland, by E. Jarvis (pp. 58–61); Control of Sugar Cane Pests in Southern Queensland, by R. W. Mungomery (pp. 62, 63); Progress Report for 1927 Work on Control of Sugar Cane Borer by Silicofluoride Dusts (pp. 63, 64), and The Egg Parasite Trichogramma and Sugar Cane Borer Control (pp. 64, 65), both by W. E. Hinds and H. Spencer; Conditions Necessary for Making the Sugar Beet Industry Permanent in the United Kingdom, by S.

Colyer (pp. 66–69); The British Beet Sugar Industry and Some of Its Problems, by W. Gracie (pp. 69–71); and Sugar Cane Gummosis, by M. T. Cook (pp. 72, 73).

An extensive list of cane and beet sugar factories throughout the world is appended.

Sugar, G. Martineau, rev. by F. C. Eastick (*London and New York: Isaac Pitman & Sons, 1927, 5. ed., rev., pp. XI+159, pls. 3, figs. 17*).—This is a revised edition of the book noted earlier (E. S. R., 24, p. 707).

A study of certain constituents of the leaf and their relation to the burning qualities of tobacco, D. E. Haley, E. S. Nasset, and O. Olson (*Plant Physiol., 3 (1928), No. 2, pp. 185–197*).—The chemical composition of cigar leaf tobacco in relation to its burning qualities, particularly fire-holding capacity, was studied at the Pennsylvania Experiment Station in cooperation with the U. S. Department of Agriculture. The plants were selected from variously fertilized plats of the Hibshman strain of Pennsylvania Broadleaf located at Ephrata, Lancaster County.

The ether-soluble organic acids of the plant appeared to occur almost wholly in combination with the alkali and alkali earth metals, as measured by the water-soluble alkalinity and the insoluble alkalinity, respectively, of the ash. A parallelism was noted between the burning qualities and the water-soluble alkalinity of the ash in practically all cases. The season and the form of potash supplied as a fertilizer quite generally affected the water-soluble alkalinity of the ash. It seemed that base exchange in the soil and the removal of certain active substances through leaching probably affect the burn and composition of tobacco considerably, but the difficulty involved in the absorption of potassium under different conditions in highly colloidal soils, such as those of the experimental plats, appeared also worthy of consideration. The lime content of the samples used in the experiment was too high and the potash content too low for maximum burning quality.

The nicotine content in fresh tobacco leaves [trans. title], S. Nishiyama (*Bul. Sci. Fakult. Terkult., Kjušu Imp. Univ., Fukuoka, Japan, 3 (1928), No. 1, pp. 10–15, fig. 1; Eng. abs., p. 15*).—Analyses indicated to the author that the nicotine content increases from the lower to the higher leaves of the tobacco plant.

"Denicotinized" tobacco, E. M. Bailey, O. L. Nolan, and W. T. Mathis (*Connecticut State Sta. Bul. 295 (1928), pp. 338–351*).—Analyses of brands of "denicotinized" tobacco in the form of cigars, cigarettes, and smoking tobacco compared with similar data on ordinary tobacco of representative types of leaf and blends and considered together with results of other investigators showed that the "denicotinized" products, as a group, averaged somewhat less in nicotine than tobacco not specially processed. Some of the treated products contained as much nicotine as ordinary tobacco and a few substantially less. None of the "denicotinized" tobaccos were low enough in nicotine to warrant unrestricted use by consumers who suffer ill effects from this alkaloid. "Denicotinized" tobaccos did not appear to differ very significantly from ordinary tobaccos in content of free nicotine, and both classes were similar in contents of nitrogen in the form of nitrates and of ammonia. The quantity of nitrate found did not indicate that tobaccos are nitrated to improve burning capacity.

Report of the First Annual Hard Spring Wheat Conference, edited and compiled by L. R. Waldron ([*Fargo: N. Dak. Agr. Col.*], *1928, pp. V+82+9*).—This is the report of the proceedings of the conference held at the North Dakota Agricultural College at Fargo in March, 1928. Among the papers presented are

the following: Wheat Breeding for Yield, Quality, and Disease Resistance, by J. A. Clark (pp. 9–27); the Rôle of Plant Breeding in Crop Improvement, by H. K. Hayes (pp. 28–34); The Interdependence of the Geneticist and Pathologist in Wheat Breeding, and Their Way of Working Together, by E. C. Stakman (pp. 35–38), and by O. S. Aamodt (pp. 39–41); Plant Breeding for Rust Resistance at the Dominion Rust Research Laboratory, Winnipeg, Manitoba, by C. H. Goulden (pp. 42–47); The Relation of the Cereal Chemist to a Wheat Breeding Project, by C. E. Mangels (pp. 48–50); A First Approach in Securing Commercial Rust-Resistant Wheats, by L. R. Waldron (pp. 51–57); Possibilities and Difficulties in the Field of Radical Wheat Crossing, by E. S. McFadden (pp. 58–61); An Extension Seed Program, by E. G. Booth (pp. 62–68); Maintaining the Identity and Purity of Wheat Varieties, by H. L. Bolley (pp. 69, 70); and New Wheat Varieties from the Point of View of the Commercial Miller, by M. A. Gray (pp. 71–73), and by T. C. Roberts (pp. 74, 75).

Programs for breeding hard spring wheats and for research fundamental to the breeding projects are appended.

Weeds of California and their relation to weeds in other sections of the country, L. H. Pammel (*Iowa Acad. Sci. Proc., 34 (1927), pp. 153–163, fig. 1*).—The occurrence and distribution of important weeds in California are discussed in comparison with conditions in Iowa.

HORTICULTURE

[Horticultural investigations at the Nebraska Station] (*Nebraska Sta. Rpt. [1927], pp. 15, 16, 17*).—Studies with the grape again suggested (E. S. R., 57, p. 533) that cane pruning is superior to spur pruning. With cane pruning the clusters appeared larger and were more easily harvested. Apple trees pruned severely at the time of transplanting made almost twice the shoot growth and averaged heavier in weight than lightly pruned trees.

None of the many strawberry seedlings produced in breeding studies are considered significantly superior to Senator Dunlap. One Genet × Delicious apple seedling appeared promising.

Fire blight interfered with the results of a fertilizer study with the apple, seriously injuring trees treated with commercial forms of nitrogen. However, a good supply of nitrogen is needed even with young trees to develop maximum growth and fruiting. Mulched grapevines showed nitrogen starvation in early spring but grew vigorously later.

Overhead irrigation greatly increased the yield of various vegetables. Superphosphate (acid phosphate) and manure either alone or in combination failed to hasten maturity or increase the yields of tomatoes. Straw mulch gave higher yields than did tillage. Large asparagus crowns made greater early growth than did smaller crowns.

In fruit stocks investigations difficulty was encountered in securing good germination of seed of various fruits. In vegetative propagation very great differences were noted in the vigor, growth, and rooting habits. Plum cuttings rooted more readily than did apple cuttings. Observations in 1926 on 1-year apple grafts showed scion rooted grafts to be generally smaller than those without scion roots.

[Horticulture at the North Dakota Station], A. F. Yeager and O. Strand (*North Dakota Sta. Bul. 217 (1928), pp. 86–88*).—A brief report upon breeding, selection, and variety studies with various vegetables, fruits, and ornamentals.

Of 14 varieties of tomatoes the station bred Red River gave the largest yield of ripe fruits. The Dry Weather everbearing strawberry obtained by crossing

the Americus and the Premier was found of sufficient promise to disseminate for trial.

[**Horticultural experiment station, Vineland, Ont.**] (*Ontario Min. Agr. Rpt. 1927, pp. 56–62*).—Among new seedling strawberries introduced by the station Vanguard showed promise as an early variety for heavier soils. Vandyke, another promising early ripening variety, showed wider soil adaptability. The Viking red raspberry is deemed worthy of extended use as a market berry. The Veteran, Vedette, and Valiant peaches present a succession of the Elberta type, maturing over a period of several weeks.

In vegetable breeding crosses were made between Marglobe and other varieties of tomatoes with the view of securing an earlier ripening variety of the Marglobe type. Trial lots of Grand Rapids × Earliana seed were distributed to growers to test the value of hybrid seed. Cabbage seedlings resulting from crosses of Early Jersey Wakefield, Copenhagen Market, and Tender Eight Weeks gave promise of early maturity. From a cross between Golden Bantam and Black Mexican sweet corns, there was evolved a seedling closely resembling the Golden Bantam but of a size suitable for canning on the cob.

Observations on apple trees in sod and in clean culture showed during periods of abnormal rainfall better foliage color in the sod-grown trees, indicating that soil conditions under the sod were at those times most favorable to growth. The fruits of the sod trees were more highly colored and of a better keeping quality than those of the tilled trees. Measurements of trunk diameter in the tilled and sod areas showed somewhat larger growth with tillage. The descending order of growth in the various sod plats was alfalfa, grass sod and manure, clover, and grass sod. Observations in the apple breeding plats indicated that temperature and sunlight during the blooming period have an important influence on the set of fruit. Abundant fruit setting was correlated with seed content. The Cortland apple appeared promising, both in appearance and in eating and keeping qualities.

Favorable progress was made in the variety rogueing work with nursery stock. Yield records taken on individual asparagus plants showed marked variability, ranging from 6 to 49 marketable shoots per plant. Male plants slightly outyielded the female plants. The Red River tomato proved a very promising early maturing variety.

Practical vegetable growing, J. W. Morton (*London: Ernest Benn, 1928, pp. 180, pls. 8, figs. 10*).—Information is presented on the cultural requirements of vegetable crops.

[**Vegetable studies at the Raymond, Miss., Substation**], H. F. Wallace (*Mississippi Sta. Bul. 252 (1927), pp. 13–20, 21*).—As in the preceding year (E. S. R., 56, p. 740), experiments with tomatoes received major attention. Of 12 varieties Gulf States yielded the largest weight of shipping tomatoes, with Marvel and Marvana closely following. With the same 12 varieties planted in wilt infected soil, Richards was outstandingly productive. Based on 2 years' trials 1,500 lbs. of an 8–5–3 (P–N–K) fertilizer gave the best returns. The nitrogen in all formulas was derived from equal pounds of nitrogen from nitrate of soda, ammonium sulfate, and cottonseed meal. Potash was derived from potassium sulfate. Of five nitrogen carriers compared in a mixed formula, urea gave the greatest net gains over a 4-year period.

A 1-year test of the shipping quality of tomatoes produced with different amounts of a mixed fertilizer, the nitrogen from nitrate of soda, suggested that heavy applications of fertilizer improved shipping quality. The maximum yield was obtained from the plat receiving 1,500 lbs. of a mixed fertilizer, the nitrogen of which was derived from nitrate of soda and cottonseed meal.

Comparing fertilizers with 0, 3, and 6 per cent potash from muriate of potash, no consistent differences in yield were recorded, but it is believed that the potash resulted in sturdier plants and better colored fruits.

For garden peas 1,000 lbs. of a 10–3–3 (P–N–K) material appeared most satisfactory. Nitrate of soda was slightly the better source of nitrogen. The World Record variety was the most productive of several tested, but Thomas Laxton is considered better on account of the size of the pods and disease resistance. Based on 4 years' data, a 10–3–3 (P–N–K) fertilizer with nitrogen from ammonium sulfate is recommended for snap beans. Commercial fertilizer proved much more effective than did sheep manure. For cabbage 1,500 lbs. of a 10–4–4 (P–N–K) fertilizer is recommended.

The relation of environment to shape of fruit in Cucumis sativus L. and its bearing on the genetic potentialities of the plants, V. A. Tiedjens (*Jour. Agr. Research* [*U. S.*], *36* (*1928*), *No. 9, pp. 795–809, figs. 7*).—That conditions of environment have a profound influence on the shape and size of mature cucumber fruits was shown in studies at the Massachusetts Experiment Station, and led to the suggestion that in genetic studies with the cucumber instead of averaging fruits for size the number of fruits allowed to mature on the plant should be restricted and the records taken on the maximum sized specimens. Usually the early maturing, large fruits represent the ideal type for the variety.

In the case of plants fertilized with nitrate of soda, a 24-hour delay in pollination following anthesis resulted in malformation of all the fruits, whereas immediate pollination resulted in all perfect fruits. Comparable results were obtained without the nitrate of soda, except that the percentage of perfect fruit in the immediate pollination group was less. Delayed pollination apparently accomplished fertilization only in the ovules near the tip. Pollen applied before anthesis generally resulted in satisfactory fruits. In no case did the number of seed exceed the number of pollen grains applied. No correlation was noted between the lobe of the stigma pollinated and the position of the seed in the fruit, nor was any correlation found between the number of seeds and the shape of the fruit.

Measurements taken on a large number of developing fruits showed that growth is interrupted at various periods after fertilization and that production is divided into very definite periods. The removal of ripe fruits stimulated new growth activity. If the period of growth inhibition directly follows pollination, fertilization of the ovules in the base may not occur, with imperfect fruit resulting. Where inhibition occurred after fertilization, in some cases the ovules near the base of the ovary apparently matured and did not resume growth, again resulting in malformed fruits.

There was apparently less tendency toward parthenocarpy during days of maximum sunlight. Under reduced sunlight less stimulation was necessary to initiate fruit development; hence more abnormal fruits. Apparently the surplus of sugars in days of maximum sunlight was a factor in preventing parthenocarpy. The hypothesis is suggested that under such conditions tissues mature more quickly by having sufficient carbon for skeletal structures.

Experiments in tomato production, W. B. Mack (*Pennsylvania Sta. Bul. 227* (*1928*), *pp. 27, figs. 7*).—In comprehensive fertilizer studies extending over two rotation periods of 4 years each phosphorus proved to be the outstanding plant food element in commercial fertilizers. The maximum yield of tomatoes was secured with manure alone but at costs much greater than those of commercial fertilizers. Complete fertilizer with a relatively large proportion of phosphorus produced the most economical increases in yield. Both nitrogen and

potash used singly gave no increase above no fertilizer during the first 4-year period. Nitrogen in combination with phosphorus or potash gave scarcely a significant gain, but potash in combination with other elements produced significant gains. The best carriers of nitrogen were sodium nitrate, calcium nitrate, and cyanamide; the best carrier of phosphorus was superphosphate (acid phosphate); and for potash, muriate and sulfate were not significantly different. Experiments in 1922 showed no consistent increase from the use of lime. No association was established between any fertilizer treatment and the occurrence of rots and sunburn.

Studies in 1927 failed to show any effect of commercial fertilizers on the quality of canned tomatoes, as measured in color, flavor, solidity, etc. On the other hand, large amounts of manure apparently reduced the flavor of the fruit.

Based on the study, recommendations are given for the use of fertilizers in tomato production. In addition various phases of tomato production, varieties, seed improvement, starting plants, types of containers, pruning young plants, soil for growing plants, hardening, planting, the use of protectors, pruning and staking, control of pests, and harvesting are disussed. Pruning before setting in the field delayed ripening, but when the central bud was pinched out when the plant had only three or four leaves a larger number of early clusters were formed. Records taken in 1926 on the temperature beneath plant protectors showed very little difference at night but large differences in midday, suggesting that the real value of protectors is in hastening early growth.

Fertilizers for early cabbage, tomatoes, cucumbers, and sweet corn, D. Comin and J. Bushnell (*Ohio Sta. Bul. 420 (1928), pp. 42, figs. 3*).—A report for the 4 years 1923–1926 on a fertilizer experiment in progress at the Washington County Experiment Farm since 1915 (E. S. R., 52, p. 23). Four vegetables are planted in a regular 4-year rotation so arranged that one-fourth of each plat is devoted to each vegetable each year.

Ground limestone at the rate of 1 ton per acre annually proved beneficial to cabbage, but when used in connection with manure or a complete chemical fertilizer had no significant effect on tomatoes, cucumbers, or sweet corn. The soil reaction before liming was about pH 5.6. That both nitrogen and phosphoric acid benefited cabbages, tomatoes, and cucumbers was shown in larger yields when nitrate of soda and superphosphate (acid phosphate) were used together than when used separately. With sweet corn nitrogen was beneficial but superphosphate was not. Potash apparently had no significant influence on any of the crops except tomatoes, hence a complete fertilizer is recommended only for the tomato.

Manure costing $3.75 a ton and applied at the rate of 16 tons per acre was more profitable in the case of cucumbers than was chemical fertilizer. As compared with chemical fertilizers, manure increased the yield of tomatoes and sweet corn but did not increase net returns. Chemical fertilizers gave the largest yields when applied to cabbage. Supplementing manure with superphosphate increased the yield of tomatoes above that obtained with manure alone. Nitrate of soda used as a supplement to manure and superphosphate increased the yields of cabbage and cucumbers.

Pomology [East Malling Research Station] (*East Malling [Kent] Research Sta. Ann. Rpt., 15 (1927), pt. 1, pp. 37–42*).—Studies indicated the value of the Pershore, Common Mussel, and Brompton plums as rootstocks. Observations on a planting of Morello cherries worked on various roots suggested that the habit of growth, quantity and size of fruit, and time of ripening may be affected by

the rootstock. An examination of young apple trees worked on four known rootstocks, I, II, VI, and IX, confirmed earlier statements (E. S. R., 52, p. 838) that the scion has a definite influence on the root, subordinate, however, to the general characters of the root. The removal of foliage from the stems of young apple trees had a marked reducing effect upon the weight, trunk girth, and root development and no beneficial effect on top growth. Some evidence was found that in double-worked pears the intermediate stock affects the top scion in vigor and in age of fruiting. This difference was, however, not always directly correlated with the vigor of the intermediate; for example, the vigorous Catillac appeared in some cases to dwarf the tree.

Leader pruning of pears delayed fruit bud production in the 12 varieties under test. Although headed trees were smaller than untreated trees, measurements showed that they actually made a larger total growth. Observations on Victoria plums pruned at three different periods, January, May, and August, showed no differences between January and August pruning, but May pruning had a very marked reducing effect upon growth. Results with Czar plums pruned with varying degrees of severity showed that pruning delays fruiting in the plum as well as in the apple and pear. Light heading caused the development of excessive lateral growth. The accumulated effect of four applications of sulfate of potash to apple trees was strikingly evident in increased vigor and larger crops of larger fruits.

Propagation of fruit trees, C. L. Vincent and W. A. Luce (*Washington Col. Sta. Pop. Bul. 141 (1928), pp. 46, figs. 19*).—Discussing the usefulness of grafting in providing satisfactory pollinizers in top-working unprofitable trees, etc., the authors discuss the principles and practices of grafting and budding, the after care of the grafted or budded trees, the preparation of grafting wax, etc.

Arsenical spray residue and its removal from apples and pears, F. D. Heald, J. R. Neller, F. L. Overley, G. D. Ruehle, and W. A. Luce (*Washington Col. Sta. Bul. 226 (1928), pp. 100, figs. 16*).—A summary of the results of comprehensive experiments in the 1927 fruit season upon the removal of arsenical spray residues from apples and pears.

Comparing the effectiveness of various wet and dry process machines, several of which are described and illustrated, it was found that in general dry cleaning failed to remove residues below the international tolerance, 0.01 grain of arsenious oxide per pound of fruit, where more than two cover sprays had been used. The arsenical loads on uncleaned lots of 11 varieties varied from 0.015 to 0.075 with an average of 0.032 grain of arsenious oxide per pound of fruit. The amount remaining after wet cleaning ranged from 0.0079 to 0.015 with an average of 0.011 and after dry cleaning from 0.021 to 0.027 with an average of 0.024 grain of arsenious oxide per pound. On testing various processes of cleaning on Jonathan apples, the jet spray process with dilute hydrochloric acid was most effective.

Arsenical and acid burning of the walls of the core cells was observed in fruits having open calyx tubes, especially in processes involving the submersion of the fruits. Core rots were also noted in such fruits treated by the submersion process. The need of frequent changes of both the cleaning and rinsing liquids was shown in the large accumulations of spores of blue mold and in the accumulation of arsenious oxide. The packing of fruits while wet had little or no effect on the incidence of decay in cold storage fruit, but a slight increase was noted in common storage.

In the case of Delicious, Rome, and Winesap apples slight, if any, difference in the loss of weight was recorded in either cold or common storage between

dry cleaned and acid cleaned fruits. Weight losses were greater in common than in cold storage and were affected by the humidities maintained. Neither wiping nor acid cleaning had any appreciable influence on the onset of scald or internal breakdown.

The removal of spray residue from apples and pears in Washington State, J. R. Magness, F. L. Overley, F. D. Heald, J. R. Neller, D. F. Fisher, and H. C. Diehl (*Washington Col. Sta. Pop. Bul. 142 (1928), pp. 29, figs. 12*).—Based on the results of fruit cleaning studies carried on at the station (see above) and by the U. S. Department of Agriculture, the authors discuss the present status of the spray residue problem and make recommendations as to the most effective methods of spray removal. Emphasis is placed on the precautions necessary in the cleaning and rinsing operations, and the factors underlying the effectiveness of the cleaning processes are discussed.

Removal of spray residue (*Farming in South Africa, 3 (1928), No. 27, pp. 835, 837*).—This is a summary of the results obtained in experiments conducted in 1928 by F. W. Pettey and Rose for the removal of spray residue from pears and apples by treatment with hydrochloric acid solutions.

Cherry pollination studies, J. S. Shoemaker (*Ohio Sta. Bul. 422 (1928), pp. 34, figs. 5*).—Remarking on the need of cross-pollination in the cherry, a chart is presented of the blooming periods of various varieties to show the physical impossibility of cross-pollination of certain varieties. Sweet cherries without exception failed to set satisfactorily when self-pollinated. The sour cherries, Dyehouse, Early Richmond, Montmorency, and English Morello, set fruit when covered, but the percentage of set was lower than in normally exposed flowers. When hand pollinated or confined in a tent with bees Montmorency set nearly as well as in the open. In the Duke group self-pollination failed in most cases to give satisfactory sets, indicating that these varieties are not commercially self-fruitful.

In respect to cross-pollination sweet cherries proved in general good pollinizers for other sweet varieties. Bing, Lambert, and Napoleon were intersterile. Windsor appeared to be the best general pollinizer. Sweet cherries pollinated sour cherries, but differences in the time of blooming were against interplanting for this purpose. Sweet cherries were apparently satisfactory pollinizers for Duke varieties, with which they overlapped in time of blossoming. Sour cherries gave evidence of being satisfactorily pollinated by other sour cherries. Montmorency pollinated with Early Richmond set somewhat higher than Montmorency self-pollinated. Sweet cherries fertilized with sour cherry pollen set low percentages of fruit. Sour cherries did not prove quite as effective pollinizers for Duke varieties as did the sweet cherries, but due to the time of blooming factor it is suggested that sour cherries be used for pollinating late blooming Dukes. Dukes were not found as good as sweet and sour varieties for pollinating other Dukes, a fact believed to be associated with low pollen viability. Dukes did not prove good pollinizers for sweet varieties or sour varieties.

Of various possible factors, pollen potency, pollen tube growth, and embryo abortion, causing low sets in the cherry, low pollen germination caused by abnormality in chromosome behavior is believed highly important. Abnormal pollen development was found in every cherry studied, most frequently in the Dukes, rather often in the sours, and occasionally in sweet varieties, and was evidenced by various sizes and different degrees of fragmentation and pairing in the diakinesis stage, by lagging and irregular behavior in division, by the presence of supernumerary microspores, by additional nuclei in the microspore, and by separation of the nucleus in the microspore. The basic number of chromosomes was found to be 8 in sweet and 16 in sour and Duke cherries.

Variations from these standards were frequently observed, due apparently to hybridity. Embryo abortion is believed to be an important factor in incompatibility as expressed by fruit dropping and in the development of fruits with imperfect seeds.

Nutritional studies with Fragaria, M. B. Davis and H. Hill (*Sci. Agr., 8 (1928), No. 11, pp. 681–692, figs. 2*).—In studies at the Central Experimental Station, Ottawa, upon the response of strawberry plants potted in pure sand and in garden soil to complete and nonnitrogen nutrient solutions in different concentrations, it was found that a ratio of 1 nitrogen to 1 minerals was near optimum. An excess of nitrogen over mineral constituents soon caused toxicity. On the other hand, an excess of minerals over nitrogen up to 1 nitrogen to 3.5 minerals caused no apparent injury. The ratio of 1 nitrogen to 0.85 minerals appeared optimum.

In the sand cultures all series where nitrogen was an absolute limiting factor soon showed characteristic yellowing and dwarfing, followed by a reddening of the foliage. Plants in the soil cultures exhibited the same symptoms, except that the nitrogen of the soil protected them from extreme distress. An excess in nitrogen resulted in abnormally dark foliage, with a tendency to curl upward and frequently accompanied by a bronzing and purpling of the older leaves. None of the solutions had any significant influence upon the set of blossoms, which ranged from about 50 to 60 per cent. On the whole there was a high correlation between the number of blossoms and the total dry weights of the plants the preceding autumn.

Herbaceous border flowers, H. H. Thomas (*London and Toronto: Cassell & Co., 1928, pp. VIII+184, pls. 8, figs. 23*).—A popular treatise on the planning, planting, and care of flower borders.

FORESTRY

Nursery investigations, H. M. Stevens ([*Gt. Brit.*] *Forestry Comn. Bul. 11 (1928), pp. 181, pls. 6, figs. 6*).—Following a discussion of the existing methods of nursery practice in England, there are presented the results of various nursery investigations with conifers covering a period of 8 years.

It was found that Douglas fir should be sown as early in the spring as possible, early sowing giving the maximum germination and the strongest seedlings, and preventing holdover germination. Sitka spruce was affected greatly by the tilth conditions prevailing at and after sowing, but where the soils did not tend to cake early sowing was preferable. Where spring frosts and caking were probable, European larch prospered best from delayed seeding, the middle of April to May.

Of various seed treatments, soaking in water, soaking in dilute chemical solutions, and moist incubation, tested as a means of stimulating germination, water at ordinary temperatures gave the best results, 7 days for Douglas fir and Sitka spruce and 1 day for European larch. The European larch responded markedly to seed treatment, but the gains with the other two species were insufficient to offset adverse factors.

Studies in seeding practice showed Norway spruce, Douglas fir, and Sitka spruce, shallow-rooted species, to benefit from drill sowing, while Scots pine, Corsican pine, and European larch did equally well when broadcasted. Thin seeding gave better results, as measured in the size of plants, with all six species, and the most successful rates of seeding are given for all species. In the case of European larch large seed was strikingly better than small seed. In tests in a sandy, loamy soil the optimum depth of sowing for Douglas fir and Sitka spruce was 0.25 in. and for European larch 0.125 in. The critical

depth below which germination dropped off rapidly was 0.75 in. for Douglas fir, 0.5 for Sitka spruce, and 0.25 in. for European larch. The larch required particular care in covering. Sand proved an efficient medium for covering Sitka spruce seed, accelerating germination and increasing the number of seedlings. Douglas fir was relatively insensitive to surface tilth, but both Douglas fir and European larch were benefited by a sand cover. Slaked quicklime applied at the rate of 2 tons per acre to the surface layer of a moderately acid loam decreased the rate of germination and the number of Sitka spruce seedlings, but when used at the same rate on a neutral soil and applied after the seed was covered lime accelerated germination and increased production in Sitka spruce and European larch, with little effect on Douglas fir. Variable results were secured with soil humus mixtures as seed covers.

In weed control experiments conducted during three successive seasons it was found that the treatment of the soil covering with 1 per cent copper sulfate solution, allowing the soil to dry before use, decreased weed growth notably without injury to germination and growth in Sitka spruce, the most sensitive species. The direct application of copper sulfate following sowing and covering eliminated weeds but caused soil caking and serious germination losses in the Sitka spruce. Copper sulfate solution applied before sowing gave good results when the seed bed was allowed to dry before seeding. Copper solutions expelled earthworms from the surface soil. Burnt soil did not prove an effective cover. Early sowing increased the cost of weeding and is not considered justified except where definite advantages accrue, as in Douglas fir. The method of sowing had no significant influence on weeding costs.

Tests of overhead screens as protection to seedlings during hot, dry weather showed these to be beneficial. Mulches, on the other hand, did not prevent losses, suggesting that injury is due primarily to heat. Laboratory studies with Norway spruce indicated that the critical temperature for Norway spruce seedlings is 43° C. (109° F.). Continuous shelter resulted in serious reductions in germination in cold, wet summers. After germination was advanced the use of shelters when the temperature exceeded 70° F. for 2 days or more appreciably reduced losses in all species. Frost heaving injury in the winter season occurred chiefly in Sitka spruce and Douglas fir. Thin sowing increased heaving injury, while lath or canvas screening effectively reduced losses. Frost injury to buds and shoots was most common in European larch. The source of the seed influenced the percentage of injury by affecting the time of the opening and the maturity of the buds.

The application of commercial fertilizers with and without a compost had no effect on the growth of five coniferous species growing on a moderately fertile soil. Conifer humus, broadleaf humus, and peat had a slightly beneficial effect on the growth of Scots pine and a greater influence on Sitka spruce and Norway spruce. Wood ashes increased the losses from damping-off in Scots pine and in Sitka spruce, a result believed associated with a rise in the H-ion concentration of the soil. Interplanting studies in the south of England with Corsican pine suggested that the period from December to February was safest for this operation.

Observations on the survival of seedlings separated into various grades on the basis of size and quality showed the best results with large, strong plants. Culls in all species tested suffered markedly higher losses than the other grades. Scots pine seedlings showed particular need of rigorous culling, as there was a steady increase in loss from grades one to three. In some cases grade one seedlings of Norway spruce and Sitka spruce were large enough to set out after 1 year. Spacing tests with several species showed no advantage from extra

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wide transplant distance, except with Norway spruce and Sitka spruce. The most successful spacings are given for the several species. Rapid transplanting had a marked beneficial effect on survival, except in the case of European larch.

Appended are notes on soil conditions in the several nurseries, on methods of testing seed, on the control of chafer larvae, and on the statistical methods employed in the preparation of the data.

A tree classification for the selection forests of the Sierra Nevada, D. DUNNING (*Jour. Agr. Research [U. S.], 36 (1928), No. 9, pp. 755–771, figs. 6*).—Pointing out the individuality in forest trees and suggesting the need of a tree class grouping applicable to selection stands in all aged mixed forests, the author proposes as a result of observations in 25 sample plats covering about 300 acres in the California Sierra a tree grouping for western yellow pine (*Pinus ponderosa*). Seven classes clearly marked by combinations of easily observed factors such as age, degree of dominance, and crown development are described and discussed. Marked differences observed in the seven classes in rates of growth and susceptibility to loss from insects and other causes are held to demonstrate that the proposed grouping is a reliable integration of vigor.

The forest industry of Finland, W. E. HILEY (*Oxford Forestry Mem. 8 (1928), pp. 39, pls. 5, fig. 1*).—A description of forests and forestry methods in Finland, based on a two months' journey through the forests and on contact with the scientific and practical workers.

DISEASES OF PLANTS

Plant diseases (*Nebraska Sta. Rpt. [1927], pp. 23–27*).—Collections of stem rust obtained from 55 counties of the State in 1927 are said to have embraced six physiological forms. Barberries infected with rust were found at some time or other throughout the State. In normal seasons pycnia appeared between April 20 and April 26, mature aeciospores between May 6 and May 10, and uredinia on grasses and grains about May 20 to May 25. The first uredinia not connected with barberries were noted in southeastern Nebraska during the first week in June, and two weeks later in the western part of the State. *Puccinia graminis tritici* and *P. graminis secalis* were observed spreading from barberries, but no clear evidence was obtained on the spreading of *P. graminis avenae* from barberries.

Studies of spindle tuber and other degeneration diseases of potatoes are said to indicate that a considerable amount of what had been formerly considered spindle tuber was in fact unmottled curly dwarf, a much more serious disease. Other diseases under observation were a mild form of mosaic and a type of potato disease referred to as yellow top. An investigation of these diseases showed that whatever the cause it was destroyed by temperatures above 50° C., and it was readily transmitted by cutting knives and by insects, especially grasshoppers.

In attempts to control seed-borne diseases of potatoes, the best control of Rhizoctonia was secured with the corrosive sublimate treatment following a 24-hour moistening of the tubers by sprinkling and covering them. Organic mercury compounds did not give as good control and did not produce significant increases in yield. Treating cut tubers with organic mercury compounds was found to reduce infection by Fusarium about 5 per cent, but the treatment did not prevent the disease.

In selection experiments of seed potatoes a distinct correlation was found between the length of time the spindle tuber plants remained in the seed potato fields and the percentage and severity of the disease in the ensuing crop. Continuing the tuber index work with disease-free Triumph strains, it was

found that the mosaic content had been reduced to less than 0.2 per cent as compared with the original lot, which showed as high as 38.2 per cent infection. In eastern and central Nebraska spraying with Bordeaux mixture during the season of 1926 had no beneficial effect. Hollow heart was found to be the most prevalent on plants with few stems, in large tubers, in spindle tubers, and in tubers showing second growth or growth cracks.

In further studies of the influence of environmental factors in the degeneration of potatoes, soil temperatures and different amounts of soil moisture did not show any significant differences in the seed value of potatoes grown under control conditions. Immature tubers were found to make less vigorous growth than more mature lots, and in lots exposed to disease the percentage of spindle tuber in the crop was in direct ratio to the length of time the parent plants were in the field. Potatoes planted early and harvested late gave the most inferior seed stock, while those planted late were the most productive. These results were obtained on irrigated land.

Botany, H. L. Bolley et al. (*North Dakota Sta. Bul. 217 (1928), pp. 52–55*).—Plant-breeding experiments for resistance to flax wilt are said to have resulted in the production of large seeded and heavier yielding strains that have all the resistance of the smaller seeded type. The authors claim that through crossing the quality of wilt resistance in flax can be gradually accumulated without perceptible change in morphological characters. Bison, a new wilt-resistant flax developed by the department, yielded 25.13 bu. of seed with an oil content of 42.37 per cent, as compared with 17.72 bu. and 38.67 per cent oil content for N. D. 114.

Wheat smut investigations are said to have shown that durum wheats are as commonly attacked by smut as are the bread wheats. Formaldehyde treatments of seed grain were found effective for smut control on both durum and bread wheats if properly applied.

Encouraging results are reported in rust control on wheat by dusting with sulfur, gains of from 0.45 to 8.62 bu. per acre being attributed to the treatments.

Cyanamide, tested as a soil fungicide, was found to be without effect in controlling flax wilt or root diseases of wheat, but its use is said to have increased the yield of grain.

In experiments for the control of scab and Rhizoctonia on potatoes it was found that much of the water used in making the solution precipitated the corrosive sublimate. Fresh rain water is recommended for use, but when this is not available 5 oz. of corrosive sublimate should be used to 30 gal. of any alkaline water that is found to precipitate the mercury.

Plant pathology, W. E. Brentzel (*North Dakota Sta. Bul. 217 (1928), p. 92*).—The author states that formaldehyde and Abavit B, a mercuric compound, used wet, gave greater control of *Helminthosporium sativum* than did dry copper carbonate.

Two strains of covered smut fungus, *Tilletia tritici* and *T. laevis*, were found occurring on common and durum wheats in North Dakota. Thirty varieties of wheat, including durum and common wheats, were inoculated at sowing time with smut spores *T. laevis* from Kota wheat. The durum varieties were not severely infected. Some varieties of common wheat showed appreciable amounts of smut, while others were not attacked. For the control of loose smut of wheat, hot water treatment is reported to have given better results than Uspulun or Semesan.

Seven different compounds were used in treating potatoes for the control of scab, and when treated with corrosive sublimate the crop produced was 98 per cent clean as compared with 84 per cent for the hot formaldehyde treatment. All other treatments gave appreciably poorer results.

Bacteriology, C. I. Nelson and M. Dworak (*North Dakota Sta. Bul. 217 (1928), p. 52*).—A progress report on studies of the globulins of flax has been previously noted (E. S. R., 56, p. 847). Continuing studies along similar lines, Dworak found that the mosaic disease apparently affects the serological qualities of the globulins of potato plants.

Photographing living conidia mounted on agar, C. D. Sherbakoff (*Phytopathology, 17 (1927), No. 3, pp. 195–198, fig. 1*).—A method of using agar mounts in photographing conidia or other small objects is described.

A method for testing in vitro the toxicity of dust fungicides to fungous spores, H. A. Lee and J. P. Martin (*Phytopathology, 17 (1927), No. 5, pp. 315–319*).—A method is described for comparing the toxicity of fungicides in the absence of organic matter, and it is stated that when tests were followed up with field trials the laboratory results were corroborated with the exception of sulfur, which did not affect spores of *Helminthosporium sacchari.* This fungus is said to have had no effect on spores in vitro, but when used as a dust in the field it reduced the eyespot disease of sugar cane.

Fungicidal value of oil sprays, F. P. McWhorter (*Phytopathology, 17 (1927), No. 3, pp. 201, 202*).—The author reports the successful control of rose mildew, *Sphaerotheca pannosa,* on rambler roses by three applications of an oil mixture sprayed upon the plants at intervals of two or three weeks after the mildew was introduced.

Some chemical treatments of soil for the control of damping-off fungi, H. E. Thomas (*Phytopathology, 17 (1927), No. 7, pp. 499–506*).—The results are given of soil treatments with various chemicals, including copper carbonate, copper sulfate, mercuric chloride, and chlorophenol mercury for the control of damping-off of tomatoes and cabbage grown in a greenhouse. Two strains of Phytophthora isolated from tomato and three strains of *Corticium vagum* isolated from cabbage, beet, and pepper were used as inoculating material. Copper carbonate, corrosive sublimate, and Uspulun controlled damping-off of tomatoes caused by *Phytophthora* spp. The mercury compounds caused injury to tomatoes in concentrations that did not injure cabbage. The mercury compounds were found effective in controlling Rhizoctonia in cabbage and tomato plantings, but copper carbonate and two forms of colloidal copper were almost completely ineffective. Treatments after damping-off appeared were of little value.

No evidence was obtained to indicate any stimulation by the use of chemicals.

An emendation of the description of Ophiobolus heterostrophus, C. Drechsler (*Phytopathology, 17 (1927), No. 6, p. 414*).—An emended description is given of *O. heterostrophus* previously described (E. S. R., 54, p. 544). The emendation is said to be of interest especially because the ascigerous stage under consideration is the only one hitherto recorded as associated with any species of that type of Helminthosporium which is distinguished by the bipolar germination of ellipsoidal conidia.

The effect of different hosts upon the sporangia of some Phytophthoras, L. H. Leonian (*Phytopathology, 17 (1927), No. 7, pp. 483–490, figs. 6; abs. in Phytopathology, 17 (1927), No. 1, p. 56*).—The author inoculated a number of fleshy fruits and vegetables with 85 different cultures of Phytophthora, and nearly all of the organisms brought about a ready infection. While the symptoms in all cases were very much alike, there were remarkable modifications in the morphology of the sporangia due to the influence of different hosts.

As a result of his investigations the author concludes that the identification of Phytophthoras directly from the host is misleading, and that controlled cultural work would be a more trustworthy method of identification.

Further germination tests with teliospores of rusts, W. E. Maneval (*Phytopathology, 17 (1927), No. 7, pp. 491–498*).—In a previous publication (E. S. R., 52, p. 447) the author gave the results of germination tests of the teliospores of 10 species of rusts. In the present paper similar data are given for 10 additional species, the results generally agreeing with those given previously. In his experiments, treatments with various chemicals, except to adjust the H-ion concentration, had little or no favorable effect. Under certain conditions spores of some species were found to require no rest period, but they were able to germinate after having been held in storage for from 8 to 10 months. Attempts to germinate the teliospores of several rusts collected soon after spore formation were unsuccessful, probably because the incubation period had been too short.

Physiology and parasitism of Sclerotium rolfsii, B. B. Higgins (*Phytopathology, 17 (1927), No. 7, pp. 417–448, figs. 8; abs. in Phytopathology, 17 (1927), No. 1, p. 53*).—An investigation was made of the temperature relations, reaction of substratum to growth, changes in substratum during growth, metabolic products on various media, relation of metabolic products to parasitism, and relation of fungus hyphae to host tissue. The minimum temperature for the growth of *S. rolfsii* was found to be near 8° C. (46.4° F.), with a maximum of about 40° and an optimum between 30 and 35°. The temperature relations are considered to be the limiting factor in determining the geographical range of the fungus.

The fungus appeared to be unable to utilize inorganic nitrogen readily when supplied either as nitrates or as ammonium salts. A slight variation in cultures of the fungus from different sources was observed in their relation to the reaction of the substratum. In broth cultures ammonia and oxalic acid were found to accumulate in nearly equimolecular proportions. Both are considered waste products in the utilization of certain amino acids as a source of energy and carbohydrate nourishment. Oxalic acid was produced from a number of other carbohydrates and from various plant decoctions, but none was produced from citric or tartaric acids. Filtrates from cultures of the fungus growing on certain nutrients proved to be toxic, both before and after boiling, and the injuries produced are said to have been very similar to those produced by oxalic acid solutions. The toxicity increased with the H-ion concentration and the increase in concentration of free oxalic acid in the filtrate. The toxicity of the filtrates and of oxalic acid solutions is considered to be due entirely to the H-ions in solutions.

In parasitic attacks on plants the fungus was found to form a considerable mat over the attacked portion, clinging to the epidermis by means of holdfasts. The underlying cells were killed before the fungus hyphae entered the host tissue.

From the evidence at hand it is considered that the death of the cells is due to the toxic action of oxalic acid, and that the oxalic acid is secreted by the fungus hyphae.

Nature of resistance of Berberis spp. to Puccinia graminis, L. W. Melander and J. H. Craigie (*Phytopathology, 17 (1927), No. 2, pp. 95–114, figs. 4*).—A report is given of an investigation undertaken to determine whether germ tubes of sporidia can penetrate the cuticle of resistant varieties, whether there is a definite correlation between resistance to puncture and resistance to rust, and if there is a correlation between resistance to puncture and thickness of the cuticle or of the epidermal walls.

Resistance to puncture was measured in leaves of 14 species of Berberis and the allied genus Odostemon, the age of the leaves varying from 1 to 14 days.

Some preliminary experiments with *B. thunbergii*, the immune variety, showed that the parasite was unable to penetrate the outer epidermal cell walls. According to the authors, those species of Berberis which are very resistant to puncture usually are resistant to rust also, but the converse is not necessarily true. In addition to this morphological resistance, there is believed to be a physiological resistance. While resistance to puncture probably indicates real resistance to the rust organism and possibly may be used as a criterion for resistance, ease of puncture does not necessarily indicate susceptibility.

A study of the distribution of Tilletia tritici and T. laevis in 1926, W. H. Tisdale, C. E. Leighty, and E. G. Boerner (*Phytopathology, 17 (1927), No. 3, pp. 167–174, fig. 1*).—A report is given of a study relative to the presence and distribution of *T. tritici* and *T. laevis* in 560 samples of wheat representing carload lots. It appeared from the data on hand that the western species, *T. tritici*, is not responsible for epidemics of smut east of the Rocky Mountains. This species was represented only in samples of wheat grown east of the Rocky Mountains in Montana, North Dakota, South Dakota, and Minnesota, and then only on durum wheats. *T. laevis* was found to occur throughout the entire region from Montana and Utah eastward.

The authors believe that if the samples examined can be considered as representative they furnish strong indications that *T. tritici* in the upper Mississippi and Missouri Valleys is confined almost entirely, if not completely, to durum wheat. The reason for this is unknown, as all the common wheats grown in that region are more or less susceptible to infection by *T. tritici*, and the durum wheats are likewise susceptible to infection by *T. laevis*. It is believed that if epidemics of smut occur east of the Rocky Mountains they are due to a strain of *T. laevis*.

Physiologic specialization in Tilletia levis and Tilletia tritici, H. A. Rodenhiser and E. C. Stakman (*Phytopathology, 17 (1927), No. 4, pp. 247–253, fig. 1*).—An account is given of investigations conducted to ascertain whether there are distinct physiologic forms of *T. levis* and *T. tritici*. The authors claim that both species comprise distinct physiologic forms which can be recognized by the degree of their virulence on Kota and Marquis wheats and on einkorn, and it is considered probable that a considerable number of forms of both *T. levis* and *T. tritici* can be distinguished if the proper differential hosts are used.

Experiments with dusts for controlling stripe disease of barley, R. W. Leukel, J. G. Dickson, and A. G. Johnson (*Phytopathology, 17 (1927), No. 3, pp. 175–179*).—Comparative tests with 21 commercial preparations recommended for the control of barley stripe are reported upon. Seed of Oderbrucker barley was used in the experiments, and the dusts were applied to all samples alike. Plantings were made at the Wisconsin Experiment Station and at the Arlington Experiment Farm near Washington, D. C.

Several of the preparations proved to be of little value in controlling stripe. The others reduced the average percentage of disease in varying degrees. The authors conclude that, while the results of certain of these chemical dusts for the control of stripe disease are very promising, additional experiments are needed to determine whether similar results would be obtained with different soil conditions and with other varieties of barley.

Second progress report on bunchy-top of abacá, or Manila hemp, G. O. Ofcemia (*Phytopathology, 17 (1927), No. 4, pp. 255–257, fig. 1*).—In continuation of studies of bunchy top of abacá (E. S. R., 59, p. 147), a description is given of the symptoms as they appear on the new growth. From the symptoms produced and its transmissibility by insects, the author concludes that the disease

is of the mosaic or transmissible chlorosis type. Browning of the tissues is said to follow the appearance of the disease, and if weather conditions are suitable rotting sets in that is believed to be the same as that described by Reinking as a bacterial heart rot of abacá (E. S. R., 41, p. 841).

Although it is not claimed that all heart rots of abacá are secondary diseases, it is believed that in bunchy-top infected districts, at least, many of the heart-rot cases are probably the final stages of bunchy top.

A wilt disease of alfalfa caused by Fusarium sp., J. L. Weimer (*Phytopathology, 17 (1927), No. 5, pp. 337, 338*).—The occurrence of a wilt of alfalfa is reported in which the affected plants were somewhat dwarfed and in some cases were dying from the top downward. From diseased material a species of Fusarium was isolated in nearly every case.

The relations of Bacterium vignae to the tissues of Lima bean, W. S. Beach (*Pennsylvania Sta. Bul. 226 (1928), pp. 15, pl. 1, fig. 1*).—A study was made of the migration of *B. vignae* through the tissues of its host plant and the changes produced by the parasite.

The migration of *B. vignae* through the tissues of the Lima bean is said to have been in the form of zoögloea. The first reaction of the host cells resembled plasmolysis, and this was followed by the disintegration of the plasma, plastids, and the nuclei. The lumina of a considerable number of cells were invaded ultimately, but the apertures of entrance were usually small and sometimes difficult to locate. The dense masses of bacteria occupying the lumina did not assume the characteristics of cysts. Within a week to 10 days following inoculation, the bacterial rods were found to have undergone a change of size, form, and staining reaction.

The activity of the parasite is said to have caused schizogenous cavities which are common and extensive, lysigenous cavities which are limited in number and extent, and the general collapse of the tissue.

Leafhopper injury to clover, E. A. Hollowell, J. Monteith, jr., and W. P. Flint (*Phytopathology, 17 (1927), No. 6, pp. 399–404, figs. 3*).—The authors describe an injury to clover in which the tips and margins of the leaves are browned, accompanied by a yellowing and dwarfing of the plants. Cage experiments at the Illinois Experiment Station and observations at the Arlington Experiment Farm, near Washington, D. C., have shown that the injury was caused by leafhoppers, and that it was reproduced by the leafhopper *Empoasca fabae* when transferred to protected plants. Smooth clover plants were found more subject to injury than those of the hairy American types.

In addition to red clover (*Trifolium pratense*) other species (*T. medium, T. hybridum, T. repens,* and *T. incarnatum*) are said to show similar symptoms to those described for red clover.

Studies on the scutellum rot disease of corn, B. Koehler (*Phytopathology, 17 (1927), No. 7, pp. 449–471, figs. 6*).—Laboratory and greenhouse experiments are reported in which an attempt was made to determine the species of fungi which caused scutellum rot of corn and also the nature of the resistance of the corn grain to attack.

Scutellum rot, which occurred during the seedling stage, was found to be caused by a number of organisms, *Rhizopus* spp. being the most common causal agents on the germinator. Isolations from seedlings grown from susceptible seed in soil at 16° C. (60.8° F.) showed that species of Mucor, Penicillium, and Fusarium were the predominating organisms associated with scutellum rot. Immature seed was more susceptible to the rot than mature seed, probably due to the more starchy nature of the endosperm. In mature field-selected seed corn the starchy ears were more susceptible to scutellum rot than those with horny endosperm.

During germination processes, especially after the pericarp broke, substances were found to diffuse into the surrounding water, and in the case of susceptible kernels the extract obtained by the diffusion process was a suitable medium for vigorous growth of Rhizopus. The extract from resistant seed induced very poor growth of the fungus. It is believed that substances emanating from germinating susceptible kernels stimulate vigorous growth of certain organisms on the exterior of the kernel or in the surrounding soil. As substances suitable for fungus growth did not diffuse from germinating resistant kernels, there was little fungus growth on the kernel and subsequently into it. When the substances extracted by the diffusion process from susceptible and resistant kernels were evaporated to dryness, no quantitative difference was found that would account for differences in resistance or susceptibility.

Cotton diseases in Mississippi and their control, D. C. Neal (*Mississippi Sta. Bul. 248 (1928), pp. 30, figs. 15*).—Popular descriptions are given of wilt, rust, anthracnose, bacterial blight or angular leaf spot, sore shin or damping-off, Alternaria leaf spot, and Diplodia and Fusarium boll rots of cotton. For the control of these diseases the author recommends the planting of resistant varieties, disease-free seed, proper use of fertilizers, rotation of crops, etc.

A disease of cotton roots produced by Fusarium moniliforme, N. C. Woodroof (*Phytopathology, 17 (1927), No. 4, pp. 227–238, figs. 3*).—For several years the author has observed a large percentage of dwarfed cotton plants in the fields of the Georgia Experiment Station. Studies were carried on from 1921 to 1926, and the cause of the dwarfed condition was found to be *F. moniliforme*. The dwarfed plants are said to usually remain small throughout the entire season, the causal organism being present on the roots at all times. The disease is spread on the lint of cotton seed and also by air-borne spores. In addition to dwarfing the fungus is said to cause a pink boll rot. Due to soil infestation with the fungus the disease was not controlled by the use of seed disinfectants.

Soil temperature studies with cotton.—III, Relation of soil temperature and soil moisture to the soreshin disease of cotton, M. N. Walker (*Florida Sta. Bul. 197 (1928), pp. 345–371, figs. 9*).—In connection with soil temperature studies with cotton (E. S. R., 58, p. 225) the author investigated the relation of temperature and moisture of soil to the sore shin disease of cotton caused by *Rhizoctonia solani*.

The maximum, optimum, and minimum temperatures for the growth of the fungus were determined. The maximum temperature for growth in cultures was found to be about 38° C. (100.4° F.), with an optimum temperature between 27 and 29° and a minimum between 7 and 11°. The optimum temperature range for killing cotton plants was between 17 and 23°. No minimum was determined as the cottonseed failed to germinate below 15°, but the maximum temperature at which cotton plants were killed was about 34°. It is claimed that any degree of soil moisture which permits the growth of the cotton plant is sufficient to allow Rhizoctonia to attack cotton plants if the soil temperatures are favorable.

Several strains of Rhizoctonia were studied, and one isolated from cabbage was practically nonparasitic on cotton, while a strain of the fungus from potatoes was nearly as virulent as those isolated from cotton plants.

A modified method of delinting cotton seed with sulphuric acid, C. D. Sherbakoff (*Phytopathology, 17 (1927), No. 3, pp. 189–193*).—The author claims that the delinting of cotton seed by the use of concentrated sulfuric acid is uneconomical as usually practiced. By testing different dilutions of sulfuric acid he found that 1 part of concentrated sulfuric acid diluted with 5 parts, by volume, of water, and 1 part of this diluted acid added to 10 parts, by volume,

of cotton seed, will effectively delint the seed if the mixing is thorough so that the acid is evenly distributed over the seed.

If the strong acid is preferred, it is believed that the treatment could be given with the addition to the seed of only the necessary amount of concentrated acid, which is about 1 part of acid to 17 parts, by volume, of seed. The standard method of delinting cotton seed with commercial sulfuric acid is said to require 10 times as much acid as is needed when the delinting is done with diluted acid by the method devised during the experiments.

Effect of early spray and dust applications on later incidence of cucumber wilt and mosaic diseases, E. E. Clayton (*Phytopathology, 17 (1927), No. 7, pp. 473–481*).—The striped cucumber beetle (*Diabrotica vittata*) having been shown to be the principal carrier of bacterial wilt and mosaic of cucumber, the author investigated some of the means suggested for the control of the beetles, particularly the value of adding Bordeaux mixture to the insecticide for increasing disease control.

It is claimed that bacterial wilt may be effectively controlled by spraying with Bordeaux mixture and lead arsenate or by dusting with lead arsenate-lime dust or calcium arsenate-gypsum dust. Bordeaux mixture and lead arsenate spray were found to reduce the amount of mosaic distinctly. The dust treatments reduced the mosaic slightly, but none controlled mosaic satisfactorily. Bordeaux mixture, 2–4–50, is said to be distinctly better than a stronger mixture, since the latter caused stunting and reduced yields.

Loose kernel smut on feterita, J. H. Martin and G. T. Ratliffe (*Phytopathology, 17 (1927), No. 5, pp. 338, 339*).—The authors report infections of feterita by *Sphacelotheca cruenta.*

A comparison of some strains of Rhizoctonia solani in culture, J. Monteith, jr., and A. S. Dahl (*Jour. Agr. Research [U. S.], 36 (1928), No. 10, pp. 897–903, figs. 4*).—A study was made of a strain of *R. solani* which is considered responsible for the large brown-patch disease of turf. No morphological or physiological differences were observed between the strains of Rhizoctonia causing large brown-patch disease on grass and stock cultures of *R. solani* that could be considered definite enough to separate the strains into different species.

Differences in resistance to bacterial wilt in inbred strains and crosses of dent corn, C. S. Reddy and J. R. Holbert (*Jour. Agr. Research [U. S.], 36 (1928), No. 10, pp. 905–910, figs. 2*).—Data are presented which are said to show wide differences in reaction to inoculation with *Aplanobacter stewarti* in a number of inbred lines of yellow dent corn maturing in the same length of time. All the progenies of some inbred lines were uniformly high in resistance. No apparent correlation was found between resistance and vegetative vigor, or between resistance to bacterial wilt and other important diseases of corn.

The results of the investigation are believed to indicate the possibility of developing resistance to bacterial wilt in some of the popular wilt-susceptible varieties of sweet corn. Other inbred lines were found to be less resistant, while still others were uniformly susceptible.

A new Alternaria disease of onions (Allium cepa L.), J. A. B. Nolla (*Phytopathology, 17 (1927), No. 2, pp. 115–132, pls. 3*).—A description is given of a disease of onions in Porto Rico that is said to be caused by *Alternaria allii* n. sp.

A technical description of the organism is given, as well as an account of studies on its pathogenicity, inoculation experiments, etc. The organism is believed to live over from one onion crop to the next as mycelium in onion leaf débris on the soil. The conidia were found to be relatively resistant to copper sulfate, being able to germinate in a 1:10,000 solution.

Additional hosts of Aphanomyces euteiches, the pea rootrot fungus, M. B. Linford (*Phytopathology, 17 (1927), No. 2, pp. 133, 134*).—Greenhouse experiments are said to have shown that in addition to infecting the common pea, alfalfa, sweet clover, *Lathyrus odoratus, L. latifolius,* and a species of Lathyrus from northern Utah, eight species of vetch and an undetermined species of monocotyledonous bulb plant were infected when grown in infested soil. In the case of alfalfa and sweet clover only the young roots seemed susceptible to attack. Some of the species of vetch and Lathyrus proved nearly as susceptible as peas.

Pale dwarf disease of peanut (Arachis hypogaea), C. Hartley (*Phytopathology, 17 (1927), No. 4, pp. 217–225, pl. 1, figs. 3*).—During an investigation of bacterial wilt of peanut in Java a type of dwarfing was encountered to which the name pale dwarf was applied to distinguish it from club-leaf dwarfing. The disease is said to be characterized by paling and marked reduction of the leaflets, and in extreme cases reduction of the petioles. The roots, hypocotyl, and stipules are not dwarfed. Plants usually recover, but as a result of the early setback their yield is reduced. The dwarfing is believed to be nonparasitic in origin.

[Potato disease investigations], A. F. Yeager and O. Strand (*North Dakota Sta. Bul. 217 (1928), p. 88*).—The authors report that the use of sulfur on soil for scab control gave no positive results after several years' trial. Spraying experiments with Bordeaux mixture are said to have not shown a profitable return during the last two years. Organic mercury compounds for seed-potato treatment did not prove superior to corrosive sublimate and hot formaldehyde.

The nature of seed-piece transmission of potato blackleg, J. G. Leach (*Phytopathology, 17 (1927), No. 3, pp. 155–160, figs. 4*).—In a previous publication the author reported that contamination of the potato seed piece at the time of cutting usually is not an important factor in the dissemination of blackleg (E. S. R., 58, p. 654). Later experiments with naturally infected and inoculated tubers are said to show that blackleg may be systemic in nature, and may be perpetuated with tubers naturally infected through the vascular bundles which enter the tuber from decaying stolons. Artificial inoculation through the parenchyma tissues appeared to be relatively ineffective in producing the disease unless aided by some agency which inhibited cork formation.

Internal rust spot of potatoes, W. A. Millard (*Nature [London], 118 (1926), No. 2979, p. 804*).—In a short preliminary announcement of the results of studies of potato internal rust spot, it is stated that two organisms have been isolated in work accredited to S. Burr, and that these isolates when inoculated into potato tubers have reproduced the characteristic symptoms. Each of the organisms is an extremely short and motile rod, difficultly cultivable on artificial media.

Sulphur as a control agent for common scab of potato, G. H. Duff and C. G. Welch (*Phytopathology, 17 (1927), No. 5, pp. 297–314, fig. 1*).—The authors conducted a series of experiments to determine whether sulfur was equally effective in controlling potato scab on all soils and under all climatic conditions, and whether its effect on Actinomyces was dependent solely, or for the most part, upon the increased acidity following its oxidation in the soil. Under the conditions of their experiments sulfur was found not to be uniformly effective in controlling common scab under all conditions of soil and climate, but gave encouraging results on clay soils infested by moderate numbers or by attenuated strains of the organism and under conditions of light rainfall.

Evidence was presented to show the independence of the effect of sulfur upon soil acidity and its effect upon the disease. No significant difference

was observed between inoculated sulfur and flowers of sulfur in respect either to control or to soil acidification.

Witches' broom of potatoes and tomatoes, P. A. Young and H. E. Morris (*Jour. Agr. Research* [*U. S.*], *36 (1928), No. 10, pp. 835–854, pl. 1, figs. 11*).—An account is given of a detailed study of witches' broom of potatoes, the occurrence of which in the Pacific Northwest was reported in 1924 by Hungerford and Dana (E. S. R., 56, p. 352).

This disease is considered to be one of the unmottled viroses that severely injure affected plants. Potatoes attacked by it are said to produce few or no marketable tubers when the tops show prominent symptoms. Tomatoes attacked by this disease produce no fruit, or poorly flavored small fruits of no value. The disease is characterized by extreme leaf dwarfing, marginal yellowing of the leaves, and abnormally numerous axillary branches. Transmission of the causal agent has been accomplished only by keeping diseased and healthy tissues in close contact for a few weeks. The disease is said to be perpetuated in potato tubers, but the disease was not transmitted in the field by aphids or mealybugs, by soil, or by root or leaf contact, and the exact means of dissemination in the field is unknown. Tubers from witches'-broom potatoes appeared to have no period of dormancy.

On the tomato the disease is considered to be a new one.

Frog-eye leaf spot of soy bean caused by Cercospora diazu Miura, S. G. Lehman (*Jour. Agr. Research* [*U. S.*], *36 (1928), No. 9, pp. 811–833, figs. 10*).—A detailed account is given of this disease of soy beans, the occurrence of which in North Carolina was previously reported by Wolf and Lehman (E. S. R., 55, p. 752).

Frog-eye leaf spot, as the disease is designated, is said to occur in at least five Southern States, where it causes important losses to the grain and hay crop of soy beans. The causal fungus is identified as *C. diazu*, which was first described from south Manchuria. The fungus in North Carolina differs in a few minor particulars from the description given by Miura, but the differences are not considered sufficient to justify the establishment of a new species. The fungus was found to cause pathological changes in the host by means of some substance which acted in advance of the foremost hyphae. It is able to grow over a wide range of acidity, and it is believed that it may overwinter on diseased leaves and stems and on seed from diseased plants.

Prevention of seedling diseases of sugar beets, G. H. Coons and D. Stewart (*Phytopathology, 17 (1927), No. 5, pp. 259–296, figs. 9*).—According to the authors, seedling diseases of sugar beets fall into three classes. One type, which is characterized by a browning and blackening of the hypocotyl accompanied by a dry type of decay, is chiefly associated with *Phoma betae*. The second type, characterized by a rapid wilting of the plants but not usually accompanied by any marked discoloration, is said to be associated with *Pythium* spp. The third type, which is less distinctive than the others, is generally due to *Rhizoctonia* spp. The authors claim that while the diseases usually fall into these types, field designation of the causal agent is hazardous.

In the investigations *P. debaryanum* was found to be the most common organism associated with diseased seedlings on muck soils, and it was also very prevalent in sandy loam soils. Tests with seedings grown in sand showed that 33 per cent of the seedlings appearing above the surface of the sand may be killed by damping-off, *Phoma betae* being chiefly responsible. Pasteurization of the seed at 60° C. (140° F.) for 10 minutes on 2 successive days proved an efficient treatment when pathogenes of a soil source were absent, but of no value in infested soils.

Experiments showed that *P. betae* and *Pythium debaryanum* were both strong, rapidly developing parasites. *Rhizoctonia* sp. caused a high percentage of disease, but it was slower in producing its effect. In all of the tests mercury and copper dusts not only reduced the diseases arising from a seed source, but they were more or less valuable in protecting against diseases arising from the soil. Wet treatments are said to be impracticable for commercial use because of the difficulties inherent in drying the seed.

The curly top of sugar beet in the Argentine, G. L. Fawcett (*Phytopathology, 17 (1927), No. 6, pp. 407, 408*).—The author reports the occurrence of curly top of sugar beets in Argentina with *Agallia sticticollis* as the agent of transmission, the North American leafhopper, *Eutettix tenella*, not being known to occur in that country. The disease was readily induced by the local insect in controlled experiments.

Zonate foot rot of sugar cane, J. A. Faris (*Phytopathology, 17 (1927), No. 2, pp. 83–94, figs. 10*).—A description is given of a foot rot of sugar cane which is said to occur in two widely separated localities in Cuba. The disease is said to be characterized by a zonate dry rot at the base of the stalk. Alternating bands of gray and reddish tissue are conspicuous above each node.

No indication was found to show that the disease is limited to certain types of soil, since it was found on a very heavy black soil with a clay subsoil and on a porous red soil.

Sugar cane root disease in Cuba, J. A. Faris and R. V. Allison (*Phytopathology, 17 (1927), No. 2, pp. 61–82, figs. 11*).—The authors state that the terms "root disease" and "root rot" as applied to the dying of sugar cane may be due to fungi, lack of drainage, lack of moisture, deficiencies in fertility, cultivation, and other factors. Various fungi were isolated from diseased cane stools, and two species of Melanconium were suspected of having a causal relation to the injury, but inoculations of cane plants gave negative results.

The field studies are said to have shown that root disease was associated with a lack of aeration in undrained soils, high salt content of the soil, drought and resultant cracking in the soil, high cutting and surface applications of fertilizers, infertile soils, and attacks on the roots by several insects and other small animals.

The occurrence of Blakeslea trispora in the Dutch East Indies, S. C. J. Jochems (*Phytopathology, 17 (1927), No. 3, pp. 181–184, fig. 1*).—The author reports that *B. trispora* occurs in Java on faded leaves of tobacco, particularly on leaves infested by the green tobacco bug (*Nezara viridis*), often the entire tops of the plants being infected. It is found also on tobacco in drying sheds.

The mold is said to occur on faded leaves of *Physalis angulata*, sweet potato, and probably other plants. It is considered to be only a weak parasite.

Ringspot of tobacco, an infectious disease of unknown cause, F. D. Fromme, S. A. Wingard, and C. N. Priode (*Phytopathology, 17 (1927), No. 5, pp. 321–328, figs. 6*).—In a previous publication (E. S. R., 48, p. 246) attention was called to this disease. Further study has shown that it is characterized by the occurrence on the leaves of circular or very irregular lesions which are delimited by lines of necrotic tissue. The disease is said to be infectious, and symptoms may appear after an infection period of four days or longer. All attempts to culture a pathogene from diseased plants are said to have been unsuccessful.

Phenomena associated with the destruction of the chloroplasts in tomato mosaic, H. Sorokin (*Phytopathology, 17 (1927), No. 6, pp. 363–379, pls. 4*).—An account is given of studies of the pathological inclusions found in mosaic infected cells of tomato plants and of the disintegration which takes place in

the chloroplasts. Several types of inclusions were found, and they are described and discussed in comparison with various organisms associated with virus diseases of animals.

The author claims that the intracellular bodies reported by others are quite definitely associated with the disease, and are always found in the cells of mosaic tomato in which there are many crystals. The physical and chemical properties of these intracellular bodies are said to correspond exactly with the properties of the living protoplasm but not with the peculiar reaction of the virus to certain chemicals.

In the summary of changes brought about in the cells and chloroplasts it is stated that the chloroplasts are destroyed through the dissolution of the proteins of the stroma. The normal chloroplasts are said to be rather solid, and the first indication of a pathological condition is the appearance of rapidly moving hyaline bodies within the chloroplasts. As the movement of these bodies is possible only after liquification of the stroma of the chloroplasts has taken place, it is assumed that a proteolytic enzyme, possibly secreted by an organism, is present.

The flagella of Bacillus amylovorus, M. K. Bryan (*Phytopathology, 17 (1927), No. 6, pp. 405, 406, pl. 1*).—The occurrence of peritrichiate flagella on the fire blight organism *B. amylovorus* having been questioned by Rosen (E. S. R., 59, p. 245), the author made a study of fire-blight organisms obtained from widely separated localities. Peritrichiate rods were found on practically every slide from all cultures. Some rods were said to have shown only one flagellum, and in some cases no flagella were present.

The relationship between Bacillus amylovorus and leaf tissues of the apple, J. M. Haber (*Pennsylvania Sta. Bul. 228 (1928), pp. 15, figs. 9*).—Following the publication by Nixon on the migration of the fire-blight organism through the stems of its hosts (E. S. R., 58, p. 247), the author made a study of the leaf as a portal through which infection might occur and the movement of the bacteria through the leaf tissue.

It was found that under artificial conditions young apple leaves can be the portal of infection for fire-blight organisms. The spongy mesophyll of the blade or the parenchyma of the vein in the leaf is the infection court. The bacteria migrate in the form of zoögloeae in the spongy mesophyll, the nature of the zoögloeae being closely correlated with the environment. The cellular effects on the host tissues include plasmolysis of the protoplast, the collapse of cell walls, and the separation of contiguous cell walls to form schizogenous cavities.

It is claimed that *B. amylovorus* multiplies by fission in the zoögloeae.

Apple blotch canker eradication, M. W. Gardner (*Phytopathology, 17 (1927), No. 3, pp. 185–188; abs. in Phytopathology, 17 (1927), No. 1, p. 46*).—The author claims that the effectiveness of blotch canker eradication was demonstrated in two apple orchards of the Oldenberg variety. The eradication campaign was begun in 1922 and consisted of shaving off or pruning out the old cankers and spraying to prevent the formation of new ones.

Preliminary studies on witches' broom of strawberry, S. M. Zeller (*Phytopathology, 17 (1927), No. 5, pp. 329–335, figs. 4*).—Witches' broom of strawberry is said to be characterized by a dwarfing of the whole plant, spindliness of petioles, and an arching downward of the margins of the leaflets, which are lighter in color than in normal plants. Runners are shortened, and the new plants, with symptoms like those of the mother plant, take root near the parent. The disease is reported to be more prevalent on some varieties of strawberries than on others.

Thus far witches' broom of strawberries has been found in western Oregon only, but it is thought that it may have a wider distribution. Viruliferous leaf lice (*Myzus fragaefolii*) were found to transmit the disease.

Control of internal rot of caprified figs, H. H. HANSEN (*Phytopathology, 17 (1927), No. 3, pp. 199, 200*).—By injecting fungicides the author claims to have controlled internal rot of caprifigs caused by *Fusarium moniliforme fici.*

The results of his experiments are believed to indicate that control may be effected economically by internal treatment of a limited number of caprifigs with fungicides. By the removal and destruction of all untreated figs the sources of infection would be eliminated and a clean strain of Blastophaga established.

Butt rot in Diospyros virginiana caused by Polyporus spraguei, J. R. WEIR (*Phytopathology, 17 (1927), No. 5, pp. 339, 340*).—The author reports a butt rot of persimmon caused by *P. spraguei* in southern Indiana.

A bacterial disease of Bowlesia, I. M. LEWIS and E. WATSON (*Phytopathology, 17 (1927), No. 7, pp. 507–512, fig. 1*).—A bacterial disease of *B. septentrionalis* is reported. By means of isolations and inoculations the causal organism was determined to be a species of Phytomonas, to which the name *P. bowlesii* n. sp. is given. The cultural features, physiological and biological properties, and morphological characters of the organism are described.

A sclerotium disease of larkspur, T. TAKAHASHI (*Phytopathology, 17 (1927), No. 4, pp. 239–245, pl. 1*).—A report is given of a study of a disease of larkspur occurring at Madison, Wis., and vicinity. The cause of the disease is considered to be similar to or identical with *S. delphinii*, described by Welch, from New York, Pennsylvania, New Jersey, and Indiana (E. S. R., 55, p. 850).

A new species of Exobasidium, J. W. HOTSON (*Phytopathology, 17 (1927), No. 4, pp. 207–216, pl. 1, figs. 2*).—The author describes as *E. parvifolii* n. sp. a fungus which was previously reported to attack *Vaccinium parvifolium* (E. S. R., 48, p. 143). The fungus is said to cause the formation of galls on the main stems or young branches of *V. parvifolium*, and less frequently on *V. ovalifolium*, probably gaining access through wounds. The mycelium was found to be perennial, one gall having been observed for 7 seasons and several others for from 3 to 5 seasons. According to observations, only the main stem, branches, and roots are infected, no indication of the disease on the leaves, buds, or flowers having been found.

ECONOMIC ZOOLOGY—ENTOMOLOGY

Zoology of Colorado, T. D. A. COCKERELL (*Boulder, Colo.: Univ. Colo., 1927, pp. VII+262, pls. 6, figs. 52*).—A work dealing with the animals met with in Colorado.

The problem of field mice in the Province of Moscow [trans. title], D. M. KOROL'KOV (*Trudy Opytn. Issledov. Uchast. Sta. Zashch. Rast. ot Vred. Moskov. Zemel. Otd., No. 1 (1927), pp. 45–62, figs. 6*).—This is a report of an investigation on the types of rodents found in the Moscow agricultural region, their mode of feeding, injury produced, type of burrows, quantitative estimation of the number of rodents per hectare, methods of extermination, and types of poison and decoy used in various places, including the field, stacks, granaries, and other farm buildings.

The American bats of the genera Myotis and Pizonyx, G. S. MILLER, JR., and G. M. ALLEN (*U. S. Natl. Mus. Bul. 144 (1928), pp. VIII+218, pl. 1, figs. 14*).—The authors recognize 34 forms of North American and 12 forms of South American Myotis and a single form of Pizonyx.

Birds of the Eurasian tundra, T. Pleske (*Mem. Boston Soc. Nat. Hist., 6 (1928), No. 3, pp. 107–485, pls. 23, figs. 2*).—The several parts of this work consist of (1) a brief account of the course of the Russian Polar Expedition, 1900–1903, with a list of the localities where the bird fauna was studied and collections were made (pp. 113–123), (2) material and observations (pp. 124–355), (3) literature and lists of the avifauna of the various artificial sections of the Eurasian tundra (pp. 356–431), and (4) summary and conclusions (pp. 432–469).

Birds and other checks upon insects, W. L. McAtee (*Sci. Mo., 27 (1928), No. 1, pp. 77–80*).—This supplements the account by Strickland (E. S. R., 58, p. 661).

Index of entomological literature, W. Horn and S. Schenkling (*Index Litteraturae Entomologicae. Berlin-Dahlem: Walther Horn, 1928, ser. 1, vol. 1, pp. 352, pl. 1*).—This first series of the world literature in entomology up to 1863, inclusive, extends from Aalborg to Fecrière.

[Notes on insects and insect control] (*Jour. Econ. Ent., 21 (1928), No. 3, pp. 510–514*).—The miscellaneous notes here presented include the following: The Use of Arsenicals in French Vineyards, by L. O. Howard (p. 510); Preliminary Tests of Ozone as an Insecticide, by E. N. Cory and H. B. McDonnell (p. 510); A Note regarding Temperature Curves, by W. C. Cook (pp. 510, 511); Naphthalene Control of Red Spider and Other Insects on Miscellaneous Crops in the U. S. Department of Agriculture Greenhouses, by G. M. Darrow (p. 511); Developments in Trichogramma Production, by S. E. Flanders (p. 512); and Spray Recommendations for Codling Moth Control, Washington, for 1928, prepared by representatives of the Washington College Experiment Station, the U. S. D. A. Bureau of Entomology, and the Washington State Department of Agriculture (pp. 512–514).

[Contributions on economic insects] (*Ztschr. Angew. Ent., 13 (1927), Nos. 1, pp. 1–242, figs. 48; 2, pp. 247–377, figs. 46*).—The papers presented in No. 1 relating to insects of economic importance (E. S. R., 58, p. 755) include the following: The Effect of Arsenicals on the More Important Forest Pests, by L. Kalandadze (pp. 1–96), which includes a list of 33 references to the literature; Contribution to the Biology and Control of the May Beetle, by O. Jancke (pp. 97–107); Influence of Food upon the Developmental Period of Plant Pests as Based upon a Study of Phylloxera: General Observations on Susceptibility, Resistance, and Immunity, by C. Börner (pp. 108–128); Biological Investigations on the Beet Leaf Bug, *Piesma quadrata* Fieb., in the Infested Area of Silesia (pp. 129–155), including a bibliography of 29 titles; Contributions to the Knowledge of the Ecology and Classification of Leaf-mining Insects, VIII, by M. Hering (pp. 156–198); The Institutions for and Work in Economic Entomology in Palestine, by F. S. Bodenheimer (pp. 199–203); Problems of Agricultural Entomology, by F. Silvestri, trans. by V. von Juraschek (pp. 203–210); Professor Ewald Rübsaamen, by E. Schaffnit (pp. 210–217), including a list of his entomological writings; and A Second Supplement to the Complete Literature on Bark Beetles, by R. Kleine (pp. 218–242) (E. S. R., 50, p. 255).

The papers presented in No. 2 include the following: On the Knowledge of the Variability of the Migratory Locust (*Locusta migratoria* L.), by G. F. Gause (pp. 247–266), with a bibliography of 13 titles; Investigations of the Development of the Reproductive Organs of the Female of *Melolontha melolontha* L. during the Swarming Period, by F. Schwerdtfeger (pp. 267–300), with a bibliography of 27 references; On the Biology of the Museum Beetle (*Anthrenus verbasci* L.) and Its Control, by L. Kalandadze (pp. 301–311); Contribution to the Knowledge of the Granary Weevil (*Calandra granaria* L.), by K. Miller (pp. 313–374), with a bibliography of 164 titles; and A New

Gall Midge (*Mayetiola phalaris* sp. n.) Reared from *Phalaris arundinacea*, by H. F. Barnes (pp. 375–377).

[Onion thrips and codling moth control investigations at the Nebraska Station] (*Nebraska Sta. Rpt. [1927], pp. 16, 17*).—In onion thrips control work it was found that nicotine sulfate 1 to 500 reduced the number of thrips 75 per cent, as compared with 54 per cent reduction in the case of a 1 to 1,000 solution. While it is concluded that the onion thrips can be controlled with nicotine sulfate, it was not possible to do so completely with the outfits now on the market, although the yield was 18 per cent greater where control was attempted.

The development of the codling moth in 1926 commenced early, the first and second broods overlapping and the peak emergence coming about the middle of July. In the attempt to determine the best and most satisfactory spray schedule, from 6 to 11 sprays were applied to the various plats. The results, reported in tabular form, indicate that the 2-per-brood and 3-week schedules of cover sprays were practical for the conditions of season and infestation occurring in that year. In average years four so-called cover spray applications would be required, the cost of making which would be about $3.25 per acre per application.

In a study of the kind and amount of materials used, it was found that heavy dosages, double spraying, etc., made little appreciable difference in either first-brood or final counts, but did increase the cost. Lead arsenate, 1.5 lbs. to 50 gal. of water, was the cheapest and most practical dosage tested.

[Economic insects and their control in New Jersey] (*N. J. State Hort. Soc. Proc., 1927, pp. 17–19, 59–71, 80, 81, 119–125, 213–225*).—Papers relating to economic entomology here presented are as follows: Some New Insecticides for Old Insects, by T. J. Headlee (pp. 17–19); [Insect Control] (pp. 59–71, 80, 81); The Requirements of the Japanese Beetle Quarantine and Its Relation to Fruit and Vegetable Growers, by L. B. Smith (pp. 119–125); and Some Results of a Study of Spray Residue on Apples in 1927, by H. C. McLean (pp. 213–225).

Entomology, J. A. Munro (*North Dakota Sta. Bul. 217 (1928), pp. 76–80, figs. 5*).—This report relates particularly to work with the apiary, including wintering of bees, sweet clover as a nectar yielder, moving colonies, size of package bees, and effect of weather on honey production. In a special study made of the wintering of bees in 1926, reports of beekeepers throughout the State indicated an average loss of colonies of approximately 20 per cent in the winter of 1925–26. Illustrations are given of a new bee cellar, made of concrete throughout, the walls and roof of which are reinforced by steel rods. In this cellar, in which upward of 100 colonies were carried through the winter of 1926–27, a temperature of 43° F. was found most conducive to quiet and contentment among the bees. The observations showed that colonies should have at least 40 lbs. of good quality honey stores to carry them safely through the winter, until nectar may be gathered freely in the spring. It is concluded that under normal conditions 1 acre of sweet clover while in bloom provides sufficient nectar for one hive of bees.

Preliminary observations indicate that the additional honey produced makes it profitable, at prevailing rates, to purchase the 3-lb. size of package of bees instead of the usual 2-lb. package when it is necessary to build the colony to the proper strength, for the main honey flow, in a short period of time. The study showed that the maximum amount of honey was produced on warm, bright days following cool nights.

Poison bran bait, consisting of bran 25 lbs., Paris green 1 lb., 3 oranges or lemons finely chopped, and crude molasses 2 qts., mixed with sufficient water

to bring the whole to a crumbly mass, if applied during the warm evenings when the pest first appears in the spring, was found to satisfactorily control the garden cutworm.

The observations indicate that the click beetle prefers to lay its eggs in slender wheat grass sod, and wireworm damage may be expected in crops following this crop.

Biological investigations on the insect predators of Chile [trans. title], F. CLAUDE-JOSEPH (*Ann. Sci. Nat., Zool., 10. ser., 11 (1928), No. 1, pp. 67–207, figs. 68*).—This account deals particularly with the wasps of the genera Crabro, Pison, Tachysphex, Bembex, Microbembex, Bembidula, Monedula, Gorytes, Philanthus, Cerceris, Sceliphron, Ammophila, and Sphex.

An annotated list of the species of injurious insects and their parasites recorded in Italy up to the close of 1911 [trans. title], G. LEONARDI (*Ann. R. Ist. Super. Agr. Portici, 3. ser., 2 (1927), pp. 185–260*).—This is in continuation of and concludes the systematic list previously noted (E. S. R., 58, p. 857). It deals particularly with the Hymenoptera and Diptera.

[**Economic insects in the Province of Moscow**] (*Trudy Opytn. Issledov. Uchast. Sta. Zashch. Rast. ot Vred. Moskov. Zemel. Otd., No. 1 (1927), pp. 9–43, 63–138, pls. 9, figs. 10*).—The translated titles of the papers here presented are as follows: Experiments on the Application of Cultural Methods in Combating the Swedish Fly, by E. A. Pokrovskiĭ (pp. 9–20); The Flax Flea Beetle (*Aphtona euphorbiae* Schrank, *Longitarsus parvulus* Payk.) and the Time of Planting Flax, by Z. P. Durnovo (pp. 21–43); The Cabbage Fly (pp. 63–89) and The Cabbage Seedstalk Curculio, a Pest on Cruciferae (pp. 91–109), both by A. N. Vasina; The Common Spider Mite, *Tetranychus telarius* L., by D. M. Korol'kov (pp. 111–131); and Testing Several Substances as Insecticides against the Apple Sucker in the Egg Stage, by E. A. Pokrovskiĭ (pp. 133–138).

Ichneumonid and braconid parasites of insect pests in Russia from 1881 to 1926 [trans. title], N. F. MEĬER (MEYER) ([*Gosud. Inst. Opytn. Agron., Leningrad*], *Izv. Otd. Prikl. Ent. (Rpts. Bur. Appl. Ent.), 3 (1927), No. 1, pp. 75–91*).—This is an annotated host list of the ichneumonid and braconid parasites of Russian insects, arranged alphabetically, and presented in connection with a list of 65 references to the literature.

Catalogue of Indian insects, XI–XV (*Calcutta: Govt., 1926, pt. 11, pp. XIII+50; 1927, pt. 12, pp. 70; 1928, pts. 13, pp. V+138; 14, pp. II+146; 15, pp. 23*).—These parts, in continuation of those previously noted (E. S. R., 56, p. 358), deal respectively with the Brenthidae, by R. Kleine; Tabanidae, by R. Senior-White; Cicindelidae, by M. Heynes-Wood and C. Dover; Palpicornia, by A. d'Orchymont; and Cecidomyidae, by R. Senior-White.

Insects injurious to crops.—I, Grain-infesting insects [trans. title], A. V. ZNAMENSKIĬ (*Trudy Poltavsk. Selsk. Khoz. Opytn. Sta., No. 50 (1926), pp. 296, pls. 7, figs. 118*).—This is a handbook on the more important cereal crop insects in Poltava. Many of the insects are illustrated in colors.

The problem of insects injurious to alfalfa, S. B. DOTEN ET AL. (*Nevada Sta. Rpt. 1927, p. 19*).—Comparisons indicated that dusting with calcium arsenate is as effective as spraying. The dusting method proved more simple and required less power, since it eliminated the necessity of hauling a heavy weight of water. It is thought probable that the horse-drawn sprayers, with special booms and nozzle arrangements, which have supplanted gasoline spraying machines, will be replaced in the near future by horse-drawn dusters of patterns especially adapted to the dusting of alfalfa fields.

Handbook of citrus insect control for 1928, R. S. WOGLUM, J. R. LAFOLLETTE, and W. E. LANDON (*Calif. Fruit Growers Exch., Los Angeles, Bul. 5*

(*1928*), *pp. 36, figs. 2*).—This analytical comparison of the insecticides used in California for the control of citrus insect pests, based upon results obtained during the 1927–28 season, is in continuation of the account previously noted (E. S. R., 58, p. 159). Accounts on Central California, by E. A. McGregor (pp. 29–32), and of The Use of Oil Sprays on Lemons, Co-ordinating Their Field Use with Packing House Handling, by H. W. Nixon (pp. 33–35), are included.

Insect pests of the tea plant in Formosa, I, II [trans. title], J. SONAN (*Formosa [Taiwan] Govt. Research Inst., Dept. Agr. Rpts. 12 (1924), pp. 132, pls. 7, figs. 3; 29 (1927), pp. 132, pls. 6, figs. 9*).—This is an account in Japanese of the insect enemies of the tea plant in Formosa.

Insects injurious to forest and orchard plantings [trans. title], N. SAKHAROV (*Izv. Saratovsk. Gosud. Inst. Selsk. Khoz. i Melior., No. 3 (1927), pp. 121–129, figs. 5*).—In this first report the author deals with *Biston hirtaria* Cl., *B. hispidaria* F., *B. pomonaria* Hb., *Phigalia pedaria* F., *Anisopteryx aescularia* Schiff, and *Exaereta ulmi* Schiff.

Insect enemies of California pines and their control, F. P. KEEN (*Calif. Dept. Nat. Resources, Div. Forestry Bul. 7 (1928), pp. 113, figs. 51*).—This work deals with the rôle of insects in the forest (pp. 9–12), what the insects do (p. 13), the natural control factors and influences (pp. 14–18), the artificial control of pine insects (pp. 19–27), and the pine insects (pp. 28–93), and gives a list of seven references to the literature. Forest Insect Control, Act 3704—General Laws of California, 1923, and The Field Identification of Insects Attacking California Pines are appended.

Fumigation of stored-product insects with certain alkyl and alkylene formates, R. T. COTTON and R. C. ROARK (*Indus. and Engin. Chem., 20 (1928), No. 4, pp. 380–382*).—In this contribution from the U. S. D. A. Bureaus of Entomology and Chemistry and Soils, cooperating, the authors deal with studies of certain alkyl and alkylene esters of formic acid. They find that the vapors of methyl, ethyl, *n*-propyl, isopropyl, *n*-butyl, *sec*-butyl, isobutyl, isoamyl, and allyl formates are toxic to insects infesting stored products, such as rice weevils, clothes moths, carpet beetles, and furniture beetles. All these formates, except the methyl and ethyl formates, can be made free from fire hazard by the addition of carbon tetrachloride to the extent of 60 to 75 per cent by volume of the mixture, and some of these mixtures appear promising as economical fumigants for use in fumigating vaults.

Key-catalogue of insects of importance in public health, C. W. STILES and A. HASSALL (*U. S. Pub. Health Serv., Hyg. Lab. Bul. 150 (1928), pp. IV+291–408*).—This paper represents part 4 of the authors' Host Catalogue, Index Catalogue of Medical and Veterinary Zoology (E. S. R., 57, p. 552).

Dusting menaces fruit-growers, P. GARMAN (*Gleanings Bee Cult., 56 (1928), No. 5, pp. 293, 294*).—Attention is called to the serious effect of dusting on insect pollinizers.

The biological control of prickly pear in Australia, A. P. DODD (*Aust. Council Sci. and Indus. Research Bul. 34 (1927), pp. 44, pls. 9*).—Following an introduction (pp. 5, 6), part 2 (pp. 7–24) consists of a general discussion of the work under way with the prickly pears in Australia, part 3 (pp. 24–42) of the insects peculiar to the cactus family, part 4 (pp. 42, 43) of the various prickly pears and the insects that attack them, and part 5 (pp. 43, 44) of the diseases of prickly pear.

Experiments with the infestation of Locusta migratoria L. with bacterial disease [trans. title], O. G. SHUL'GINA (SHULGUINA) and P. A. KALINICHEV (KALINITSHEV) ([*Gosud. Inst. Opytn. Agron., Leningrad*], *Izv. Otd. Prikl. Ent. (Rpts. Bur. Appl. Ent.), 3 (1927), No. 1, pp. 99–104; Eng. abs., p. 104*).—This is a report of inoculation experiments in which a culture of *Bacillus acridiorum*

and a mixed culture of bacilli obtained from Locusta nymphs, including *B. fluorescens liquefaciens*, *B. punctatus*, and *B. acridiorum*, were used.

The best results, namely, 90 per cent mortality, were obtained from infestation of the larvae by *B. acridiorum* under conditions of temperature varying from 12.5 to 23.5° C. (54.5 to 74.3° F.). The same culture in a constant high temperature (33 to 35°) gave but 10 per cent mortality. The mixed culture also gave little mortality, *B. acridiorum* in this culture being dislodged by other species of bacilli, *B. fluorescens liquefaciens* and *B. punctatus*.

A classification of the higher groups and genera of the coccid family Margarodidae, H. Morrison (*U. S. Dept. Agr., Tech. Bul. 52 (1928), pp. 240, pls. 7, figs. 116*).—In the first part of this account of the family Margarodidae the author deals briefly with the history, general geographical distribution, host relationships, economic importance, and relation to other coccids. This is followed by a discussion of the characteristics considered in developing a classification. The main part of the work deals with the classification of the family, which is represented by five subfamilies (pp. 30–218). The work includes a list of the generic and specific names assigned to the family and a 9-page list of the literature cited.

Notes on oil-emulsions with special reference to aphis on apple, S. W. Frost (*Jour. Econ. Ent., 21 (1928), No. 3, pp. 504–506*).—In this contribution from the Pennsylvania Experiment Station the author presents data which show that a degree of control of the rosy apple aphid can be obtained with a delayed dormant application of oil.

The identity of the new citrus aphid, A. N. Tissot (*Fla. Ent., 10 (1927), No. 4, pp. 56, 57*).—Brief reference is made to the transfer of aphids from apple shoots collected in Pennsylvania to apple and citrus shoots in Florida. Five groups of aphids from the Pennsylvania shipment, averaging eight individuals each, were placed on tender shoots of citrus of the Cleopatra variety. Two of the groups disappeared in two or three days. Of the young produced by the remaining three colonies, 26 were transferred to other shoots of citrus. Two of these individuals reached maturity and produced young, one producing 36, the other 29 young, in 10 days. It is pointed out that the results obtained seem to indicate that under favorable conditions a physiological race of aphids could develop on apple or spirea which would be able to live and reproduce on citrus.

Three lots of these aphids of about 10 individuals each—received September 15—were placed on growing shoots of apple. They at once began to feed and reproduce and soon there was a large colony on each shoot. Two of these shoots still had a few individuals alive at the time of writing on December 20, and on each of them eggs had been laid.

The life history and classification of the black plant lice [trans. title], R. Janisch (*Arb. Biol. Reichsanst. Land u. Forstw., 14 (1926), No. 3, pp. 291–366, pls. 3*).—This is an account of biological studies of the *Aphis fabae* group of plant lice of the German fauna, which includes *A. fabae* Scop., *A. euonymi F.*, *A. mordwilkoi* B. and J., *A. viburni* Scop., *A. philadelphi* CB., *A. rumicis* L. *A. podagrariae* Schrk., *A. hederae* Kltb., and *A. ilicis* Kltb.

The study reports upon the classification and biology of these species and the methods of study. This is followed by a detailed account of the work with the several species. A protocol is appended which gives the details of host-plant studies, in the course of which numerous transmissions were made from the primary host plant.

Codling moth banding materials, B. A. Porter and R. F. Sazama (*Jour. Econ. Ent., 21 (1928), No. 3, pp. 507–510*).—The results of preliminary tests of

several materials for codling moth banding indicate that corrugated paper may have a practical value as a banding material, and that tarred paper, corrugated paper, and a tough crêpe paper appear to be more effective than burlap.

A new Laspeyresia from Florida (Lepidoptera: Olethreutidae), C. HEINRICH (*Ent. Soc. Wash. Proc., 30 (1928), No. 6, p. 109, fig. 1*).—Under the name *L. palmetum* the author describes a new species of Laspeyresia, which attacks the small berrylike fruit near the Royal Palm State Park, Fla. (possibly *Icacorea paniculata*).

A new apple moth from Manchuria (Lepidoptera: Olethreutidae), C. HEINRICH (*Ent. Soc. Wash. Proc., 30 (1928), No. 5, pp. 91, 92, fig. 1*).—Under the name *Grapholitha inopinata* n. sp. the author describes a moth that is a very bad pest of the fruits of apple and Crataegus in China.

A study of the genus Eulia Hubner, with special reference to the North American species, S. W. FROST (*Pennsylvania Sta. Bul. 225 (1928), pp. 24, figs. 21*).—The knowledge of moths of this tortricid genus is summarized under the headings of geographic distribution; food plants; description of stages; discussion of species, including *E. velutinana* Walk., *E. quadrifasciana* Fern., *E. mariana* Fern., *E. franciscana* Wals., *E. citrana* Fern., *E. pinatubana* Kearf., *E. quercifoliana* Fitch., and *E. juglandana* Fern.; light and bait trap records; and new species. A bibliography of the 14 North American species of Eulia, with 134 references, arranged by species, is included.

[Gipsy moth control in Spain], M. AULLO (*Bol. Inst. Nac. Invest. y Exper. Agron. y Forest. [Madrid], 1 [1928], No. 1, pp. 178–207, pls. 5, figs. 18*).—Accounts are given of the organization of the control campaign against the gipsy moth and measures of protection employed.

The control of the beemoth, F. B. PADDOCK (*Jour. Econ. Ent., 21 (1928), No. 3, pp. 489–494*).—The author here gives an outline of the factors of control for the wax moth. Climate and parasites are factors of natural control which are much restricted in service. Traps, sanitation, fumigation, repellents, heat, and cold are factors of artificial control. It is stated that experiments are under way which will give much more definite information on some of the possibilities of artificial control.

The bacterial diseases of the silkworm, particularly septicemia [trans. title], R. SATO (*Centbl. Bakt. [etc.], 1. Abt., Orig., 107 (1928), No. 4–5, pp. 234–278*).—This is an extended account which deals with the subject in connection with a list of 38 references to the literature. Methods of investigation of bacterial diseases of the silkworm, occurrence and distribution of the septicemia bacteria, the complications in bacterial disease through mixed infections, influence of injections of bacteria and of temperature on the course of the septicemia, pathogenicity of the septicemia bacteria at different periods in the life of the silkworm, entrance of the septicemia bacteria through the skin of the silkworm, disease of the silkworm resulting from feeding with septicemia bacteria, etc., are considered.

Septicemia of the cutworm (Agrotis segetum Schiff) [trans. title], V. P. POSPELOV (*[Gosud. Inst. Opytn. Agron., Leningrad], Izv. Otd. Prikl. Ent. (Rpts. Bur. Appl. Ent.), 3 (1927), No. 1, pp. 1–23, pl. 1; Eng. abs., pp. 20–22*).—The author here reports upon studies of the bacterial disease (septicemia) of cutworms met with in Russia in the years 1925 and 1926. This disease was observed in autumn and spring after the hibernation of the cutworms. The diseased larvae become sluggish, cease to feed, and have thin excrements. They also lose turgidity of their body, which is transformed into a sack full of brown nonviscid liquid. The name *Bacillus agrotidis typhoides* is applied to the

causative organism, since its biological properties are very similar to those of *Bacterium typhi*. The account includes a list of 35 references to the literature

The mosquitoes of the Americas, H. G. Dyar (*Carnegie Inst. Wash. Pub. 387 (1928), pp. V+616, pls. 123*).—This is a revision of the systematic part of the account of the Mosquitoes of North and Central America and the West Indies, by Howard, Dyar, and Knab, previously noted (E. S. R., 37, p. 762), and includes in addition those of South America. It gives a bibliography of five pages.

New Jersey Mosquito Extermination Association, fifteenth annual meeting (*N. J. Mosquito Extermin. Assoc. Proc., 15 (1928), pp. 168, pls. 13, figs. 2*).—The papers presented at the annual meeting of this association (E. S. R., 59, p. 158), held at Atlantic City, N. J., February 15–17, 1928, are as follows:

Mosquito Work throughout the World during 1927, by L. O. Howard (pp. 6–24); A History of Salt-Marsh Ditch-Cutting and Ditch-Cleaning Machinery, by F. A. Reiley (pp. 24–34); Summary of Mosquito-Control Activities in New Jersey during 1927, by F. W. Miller (pp. 35–44); Mechanical Oiling Equipment Utilized in New Jersey Mosquito Work and Its Further Possibilities, by J. P. Peterson (pp. 45–53); Studies of Mosquito Oils and Dust Larvicides, by J. M. Ginsburg (pp. 53–65); Contribution to the Causes of Mosquito Breeding in Specific Places, by W. Rudolfs (pp. 66–77); The Effect of *Chara fragilis* on Mosquito Development, with a Note on a New Larvicide, by R. Matheson (pp. 77–86); Some Phases of the Salt-Marsh Mosquito Problem in the South Atlantic and Gulf States, by T. H. D. Griffitts (pp. 87–91); Methods Employed in Combating the Peak-Load in 1927, together with Suggested 1928 Improvements, by J. B. Leslie (pp. 100–106); The Past Year's Progress in Mosquito Control in Nassau County, New York, by E. Butchard (pp. 107, 108); The Function of the Experiment Station in Mosquito Control, and the Relationship It Should Bear to the County Mosquito Commissions, by J. G. Lipman (pp. 109–114); Mosquito-Control Activities of the American Public Health Association, by L. E. Jackson (pp. 115–122); Mosquito Suppression in Canada in 1927, by A. Gibson (pp. 136–145); Anti-Mosquito Activities in Connecticut in 1927, by W. E. Britton and R. C. Bostford (pp. 146–149); The Effects of the Local Mosquito-Control Campaigns Conducted Yearly in Burlington, New Jersey, by Mrs. J. L. Shedaker (pp. 150–153); A Report of the Activities of the Gorgas Memorial Institute in Mosquito Control, by E. M. Skinner (pp. 155–160); and The Development of Mechanical Apparatus for Detecting the Presence of Mosquitoes in Various Localities, by T. J. Headlee (pp. 160–168). Reports of several committees are also included.

The bloodsucking arthropods of the Dutch East Indian Archipelago.—VII, The tabanids of the Dutch East Indian Archipelago, J. H. Schuurmans Stekhoven, jr. (*Treubia [Buitenzorg], 6 (1926), Sup., pp. 552, pls. 18, figs. 289*).—This is a synopsis of the tabanids of the Dutch East Indian Archipelago, including those of some of the neighboring countries. Two hundred and sixty-six forms are described.

Plastophora crawfordi Coq. and Plastophora spatulata Malloch (Diptera: Phoridae), parasitic on Solenopsis geminata Fabr., M. R. Smith (*Ent. Soc. Wash. Proc., 30 (1928), No. 6, pp. 105–108*).—This contribution from the Mississippi Experiment Station reports upon observations of these two phorid species in that State.

A revision of the American parasitic flies belonging to the genus Belvosia, J. M. Aldrich (*U. S. Natl. Mus. Proc., 73 (1928), Art. 8, pp. 45*).—This account contains descriptions of 36 species and 2 varieties of Belvosia, of which 19 species and 2 varieties are new to science.

Some experiments for the control of mangold fly, C. L. WALTON (*Welsh Jour. Agr., 4 (1928), pp. 347–350*).—In control work with *Pegomyia betae* it was found that the application of green tar oil and nicotine sulfate dusts was not successful in deterring attack, neither was a spray with Bordeaux mixture. Spraying with either paraffin emulsion or nicotine sulfate does not injure the seedling plants and affords a very considerable degree of protection, but should be done as soon as the plants are through the ground. Rolling seems to offer a reasonable and effective means of control, and if carried out before thinning it does not harm the plants.

The cherry fruit fly (Rhagoletis cerasi L.) [trans. title], J. VERGUIN (*Rev. Zool. Agr. et Appl., 27 (1928), No. 2, pp. 17–36, figs. 6*).—This is a practical summary of information on the biology and means of control of this pest in France. A bibliography of 38 references to the literature is included.

An investigation of the Mexican fruit fly, Anastrepha ludens (Loew), in the lower Rio Grande Valley of Texas, D. B. MACKIE (*Calif. Dept. Agr. Mo. Bul., 17 (1928), No. 5, pp. 295–323, figs. 7*).—This is a summary of information on the Mexican fruit fly (*A. ludens*) situation in the lower Rio Grande Valley of Texas, based upon observations made by the author in 1927.

Observations of the gout fly (Chlorops taeniopus Meig.) and its parasites [trans. title], J. W. RUSZKOWSKI (*Rocz. Nauk Rolnicz. i Leśnych (Polish Agr. and Forest. Ann.), 17 (1927), No. 3, pp. 406–426, figs. 4; Eng. abs., pp. 425, 426*).—This is an account of a destructive pest of cereals in Poland, observations of it having been conducted at Posen from 1924 to 1926.

Contributions to the knowledge of the biology of Hydrellia griseola Fall. [trans. title], E. A. KREITER (KREUTER) ([*Gosud. Inst. Opytn. Agron., Leningrad*], *Izv. Otd. Prikl. Ent. (Rpts. Bur. Appl. Ent.), 3 (1927), No. 1, pp. 92–98, figs. 5; Ger. abs., p. 98*).—A report of biological studies of this dipteran.

Development of cold hardiness in the larva of the Japanese beetle (Popillia japonica Newm.), D. LUDWIG (*Ecology, 9 (1928), No. 3, pp. 303–306, fig. 1*).—In studies at the University of Pennsylvania the author has found that during its development the larva of the Japanese beetle becomes more cold hardy with age up to the period prior to moulting. The period of moulting was found to be a critical one in the life of the larva.

Insects of the family Dynastidae injurious to palms in tropical Africa [trans. title], R. MAYNÉ (*Ann. Gembloux, 34 (1928), No. 3, pp. 89–105, figs. 10*).—This account deals with 4 of the 15 species of Oryctes occurring in Africa and with *Archon centaurus* Burm.

On the morphology and biology of a new grain pest (Podonta daghestanica Reitt) [trans. title], L. I. VLADIMIRSKAĬA (*Izv. Opytn. Sev. Kavkaza (Jour. Agr. Research North Caucasus), No. 9 (1926), pp. 328–333, figs. 9; also in Rostovo-Nakhichevan. na Donu Oblastn. Selsk. Khoz. Opytn. Sta. Bŭl. 205 (1926), pp. 8, figs. 9*).—This is a report of studies of an important beetle enemy of sorghum in northern Caucasus.

Seed treatment as a means of preventing turnip flea beetle attack, J. R. W. JENKINS (*Welsh Jour. Agr., 4 (1928), pp. 334–342*).—In experiments in which turnip seed was treated with repellents, with the possible exception of the use of some commercial turpentines no ill effect was observed either upon the energy of germination or upon total percentage germination, and this still obtained when germination was delayed up to 17 days after treatment. Field experiments showed that under favorable conditions seed treatment with paraffin or turpentine does achieve a very appreciable degree of control over turnip flea beetles. The conditions necessary for success appear to be that sufficient liquid should be used to make the seed thoroughly wet,

that drilling should take place as soon as possible after treatment, and that germination should not be delayed. The experiments also showed that soaking the seed for half an hour does not neutralize the ill effect of prolonging the period between treatment and drilling, and indicated that it would similarly fail to neutralize the ill effect of delayed germination.

Weevils injurious to tea, S. S. Light (*Tea Quart. [Tea Research Inst. Ceylon], 1 (1928), No. 2, pp. 45–47, fig. 1.*—This is an account of the injury caused by the weevils *Astycus apicatus* Mshll. and *A. immunis* Walk, in Ceylon, where they are minor pests of tea and there are very few records of outbreaks.

Observations upon the biology of the pine weevil (Hylobius abietis L.), and experiments for its control [trans. title], A. M. Fateeva (Fateyeva) ([*Gosud. Inst. Opytn. Agron., Leningrad*], *Izv. Otd. Prikl. Ent. (Rpts. Bur. Appl. Ent.), 3 (1927), No. 1, pp. 55–65; Eng. abs., p. 65*).—An account of the biology and economic importance of and control measures for this pest.

On the biology of Nemeritis canescens Grav. parasites of the Mediterranean flour moth [trans. title], T. Voinovskaĭa-Kriger) (Wojnowskaja-Krieger) ([*Gosud. Inst. Opytn. Agron., Leningrad*], *Izv. Otd. Prikl. Ent. (Rpts. Bur. Appl. Ent.), 3 (1927), No. 1, pp. 24–35, figs. 10; Ger. abs., p. 34*).—This is a report of studies of an important parasite of the Mediterranean flour moth in connection with a list of 25 references to the literature.

Morphological differences between the larvae of the grain sawfly (Cephus pygmaeus L.) and the black sawfly (Trachelus tabidus Fab.) [trans. title], V. N. Shchegolev (*Izv. Opytn. Sev. Kavkaza (Jour. Agr. Research North Caucasus), No. 9 (1926), 259–264, figs. 9; also in Rostovo-Nakhichevan. Selsk. Khoz. Opytn. Sta. Bŭl. 197 (1926), pp. 8, figs. 9*).—This contribution on work in northern Caucasus reports upon the morphology of two species of sawflies. Photographs and drawings for use in differentiating them are included.

Pimpla pomorum Ratz. (Ichneumon) parasite of the apple blossom weevil, Anthonomus pomorum L. (Coleopt.) [trans. title], W. Speyer (*Arb. Biol. Reichsanst. Land u. Forstw., 14 (1926), No. 3, pp. 231–257, figs. 15*).—The first part of this account dealing with the injury and control of *A. pomorum*, its enemies and parasites, is followed by accounts of studies of *P. pomorum*, the most important parasite of the weevil, particularly its biology. The account concludes with a brief discussion of *P. pomorum* as a possible practical means of controlling this weevil pest.

The spider mite enemies of cereals in Poland [trans. title], L. Sitowski (*Rocz. Nauk Rolnicz. i Leśnych (Polish Agr. and Forest. Ann.), 17 (1927), No. 3, pp. 427–429; Ger. abs., p. 429*).—A loss of 50 per cent of the rye crop in fields in Inowroclaw and Konin is reported to have been caused by *Pediculopsis graminum* Reut.

ANIMAL PRODUCTION

Growth values of proteins from commercial animal products.—II, Commercial digester tankage, R. W. Prange, S. M. Hauge, and C. W. Carrick (*Poultry Sci., 7 (1928), No. 4, pp. 186–193, figs. 4*).—A study of the value of commercial digester tankage from two different sources was conducted at the Indiana Experiment Station (E. S. R., 59, p. 567), using crossbred chicks in trials 1 and 2 and Barred Rocks in trial 3. In trials 1 and 2, 3 lots each of 17 and 12 chicks each, respectively, were fed tankage, a different brand in each case, at a protein intake level of 15, 10, and 5 per cent of protein from the digester tankage. In trial 3, 4 lots of 18 chicks each and 3 lots of 17 chicks each were used. A check lot in this trial received 10 per cent protein from

meat and bone scrap. The other three groups in the first series were fed the same tankage at the same levels as in trial 1, and the three groups in the second series were fed as in trial 2.

The rate of growth was slow and unsatisfactory in all groups receiving tankage from either of the two sources. There was a consistently high mortality in the lots receiving tankage.

The comparative nutritive value of the proteins of linseed meal and cottonseed meal for different animals, R. M. Bethke, G. Bohstedt, H. L. Sassaman, D. C. Kennard, and B. H. Edington (*Jour. Agr. Research [U. S.], 36 (1928), No. 10, pp. 855–871, figs. 2*).—The results obtained in this study have been previously noted (E. S. R., 59, p. 258).

The digestibility of the proteins of some cottonseed products, W. D. Gallup (*Jour. Biol. Chem., 76 (1928), No. 1, pp. 43–53*).—The proteins of cottonseed meal, as determined with albino rats at the Oklahoma Experiment Station, were found to be somewhat less digestible than those of the seeds, due to the effects of cooking in the preparation of the commercial meal. Autoclaving to destroy the gossypol content lowered the digestibility of both the seeds and the meal. The addition of a small amount of gossypol made up of extracted cotton seeds had little effect upon the digestibility of the proteins when fed in such small amounts as not to interfere with growth. Increasing the amounts of gossypol proved fatal.

The effect of variations in the proportions of calcium, magnesium, and phosphorus contained in the diet, J. R. Haag and L. S. Palmer (*Jour. Biol. Chem., 76 (1928), No. 2, pp. 367–389, figs. 4*).—In studies at the University of Minesota the effect on rats of variations in the proportions of calcium, magnesium, and phosphorus contained in rations adequate in other respects was determined. The minerals were fed in various combinations of so-called high and low levels. At intervals representative animals from each ration were placed in balance cages for 10-day periods, and the calcium and phosphorus of the food and mixed excreta were determined analytically.

In general the results indicated the necessity of a more or less balanced condition of calcium, magnesium, and phosphorus salts in the ration for normal growth and functioning. A high magnesium intake was a disturbing factor in nutrition, the extent of the disturbance being governed by the intake of calcium, phosphorus, and vitamins. The response of the animals to certain vitamin levels indicated an even more important vitamin-mineral interrelationship than has been commonly recognized.

Occurrence of deciduomata in rats low in vitamins A and E, K. S. Bishop and A. F. Morgan (*Soc. Expt. Biol. and Med. Proc., 25 (1928), No. 6, p. 438*).—In studies at the University of California the presence of multiple deciduomata was noted to occur spontaneously in one rat on a vitamin A-low diet. When the diet was changed to one free from A and low in E, cornification of the vaginal cell and content became complete and persisted for 15 days when two drops of cod-liver oil were given daily. This was followed by the normal condition, though no oestrum occurred after the cure. Persistence of the decidual reaction in rats on E-free diets showing resorption of embryos before the tenth day of pregnancy has been frequently noted.

A new method of graphic representations of the motor activity of the empty stomach in intact animals, R. D. Templeton (*Amer. Jour. Physiol., 85 (1928), No. 3, pp. 512–517, figs. 3*).—The author describes a new method, known as the nipple method, for recording the motor activity of the empty stomach of a live animal. This new method confines the mechanical stimulation to the site of the fistula, thus reducing to a minimum the mechanical stimulation

of the mucosa of the stomach wall and avoiding the errors in the tracings due to the shifting of the balloon used in the present method.

By-products in the packing industry, R. A. Clemen (*Chicago: Univ. Chicago Press, 1927, pp. XI+410, pls. 31, figs. 50*).—A treatise on the development, importance, and use of the various by-products obtained in the preparation of meat for human consumption.

[Experiments with beef cattle at the Nebraska Station] (*Nebraska Sta. Rpt. [1927], pp. 18–20, 36, 37*).—Results of experiments, some of which have been continued (E. S. R., 57, p. 563), are briefly noted.

Effect of sex upon rate and economy of gain.—On a ration of corn and alfalfa hay steer calves gained 23 lbs. more from November 23 to April 17 than heifer calves, and the cost of 100 lbs. of gain was $1.04 cheaper. The profit per steer was $3.96 more than for the heifers, although the heifers excelled the steers in dressing by 1 per cent. When cottenseed cake was added to the ration the steers gained faster than the heifers, making gains for 58 cts. less per hundredweight and selling for 30 cts. more per hundredweight. The steers returned a profit of $2.08 more than the heifers, but were outdressed by 1.5 per cent.

Feeding rations for cattle.—Adding cottonseed cake to a ration of corn and alfalfa hay increased for both steers and heifers the rate and cost of gain, selling price, dressing percentage, and profit. Adding molasses feed and cottonseed cake increased the rate of gain for heifer calves but also increased the cost to a point where it reduced the profit.

Factors affecting the quality of meat.—In this study 18 steers and 20 heifers averaging 270 lbs. in weight and of uniform breeding and quality were used. Three of the steers and the same number of heifers were killed at the beginning of the test. The remainder were full fed shelled corn and alfalfa hay for 145 days. The steers made an average daily gain of 2.41 lbs. per head and required 460 lbs. of corn and 182 lbs. of hay to produce 100 lbs. of gain. The heifers gained at the rate of 2.25 lbs. per head daily, requiring 506 lbs. of corn and 244 lbs. of hay for each 100 lbs. of gain. The heifers outdressed the steers both at the beginning and at the end of the test and at both times carried more internal and external fat than the steers. The muscular development of the steers was greater than that of the heifers at the end of the test.

Effect of length of feeding period on quality of heifer carcasses.—Forty uniform heifers averaging 395 lbs. were used in this study. Three were slaughtered at the beginning of the test and 3 at each interval of 28 days through a feeding period of 224 days. During the first 168 days the average weight increased to 695 lbs. and the carcass weights increased from 190 to 420 lbs. With increased finish the dressing percentage increased from 53.5 to 61 per cent, the caul fat increased from 4.05 to 17.38 lbs., and the ruffle fat increased proportionately. While the meat was improved with fattening, the cuts became more wasty as shown by the fact that the kidney fat from the short loin increased from 1.46 to 6.75 lbs.

[Experiments at the Valentine Substation].—Shelter sheds, a windbreak, and open feed bunks were provided for 4 groups of calves wintered at this station. The following rations were fed: Lot 1 prairie hay, lot 2 prairie hay and 1 lb. of cottonseed cake, lot 3 prairie hay and 1.5 tons per head of cottonseed cake (for the period), and lot 4 mixed native hay. The gains during the wintering period of 150 days were 25.4, 174.4, 190.9, and 155.5 lbs. per head, respectively. The daily hay consumption in the respective lots was 9.1, 12.1, 11.3, and 12.6 lbs. per head. From the results obtained in lot 4 the value of seeding clover into native meadows is shown.

[Experiments with beef cattle at the North Dakota Station] (*North Dakota Sta. Bul. 217 (1928), pp. 36, 37, 45–48*).—The beef cattle experiments are largely continuations of those previously noted (E. S. R., 55, p. 564).

Range pasture studies, J. H. Shepperd.—The average seasonal gains for 11 years of 10 2-year-old steers per season were 1.99 lbs. per head daily on 100 acres of native pasture for 150 days, 1.98 lbs. on 70 acres for 150 days, 1.66 lbs. on 50 acres for 145 days, and 1.56 lbs. on 30 acres for 110 days. Rotating the grazing on 70 acres divided into 3 parts produced a gain of 1.81 lbs. per head daily on 14 steers for 149 days. Thirty acres of brome grass produced 1.53 lbs. of gain per head daily on 11.5 steers for 129 days. The rotation system requires 6 years to complete and permits of 5 acres doing the same work as 7 acres under continuous grazing.

Animal nutrition, F. W. Christensen.—The average daily gains per head for steers fed different silages were as follows: Corn silage, average of 6 years, 2.1 lbs.; sweet clover silage, average of 5 years, 1.7 lbs; sweet clover-oat straw silage, average of 2 years, 1.1 lbs.; sunflower silage, average of 3 years, 1.3 lbs.; and millet silage, 1 year, 1.3 lbs. The determination of digestible nutrients and metabolizable energy in the different silages agree in general with the results previously noted.

Maintenance and production requirements of ewes and lambs, T. B. Wood and W. S. Mansfield (*Jour. Min. Agr. [Gt. Brit.], 35 (1928), No. 3, pp. 211–219, figs. 2*).—Continuing this study (E. S. R., 57, p. 763), the problem reported was undertaken to obtain information for computing rations for sheep from birth to maturity. A lamb was killed at birth and the carcass ground, weighed, sampled, and analyzed. A similar procedure was followed with 2 lambs 25 days of age.

It was found that from birth to 25 days of age the percentage composition of live-weight increase was protein 16.5, fat 14.9, ash 3, and water 65.6. Each 1 lb. of starch equivalent produced 1,070 calories in live-weight increase. The production requirement of the suckling lamb was calculated to be 1 lb. of starch equivalent per 1 lb. of live-weight increase.

Maintenance requirements were determined by the indirect method, using 5 ewes and their 7 lambs. A careful record was kept of the weight of animals and feed consumed up to the time the lambs were 63 days of age. It was found that the maintenance requirements per unit of surface of sheep is constant throughout life, being 49 calories per square meter per hour.

The production requirement of the suckling ewe was found to be about 3 lbs. of starch equivalent per gallon of milk, and the average yield per ewe was from 2.5 to 4 pints of milk per day, containing 0.33 lb. of starch equivalent per pint.

While the experiment is only of a preliminary character, it indicates that a lamb's ration should be rich in starch equivalent and poor in protein.

Normal rectal temperatures of sheep, A. B. Clawson (*Amer. Jour. Physiol., 85 (1928), No. 2, pp. 251–270, figs. 9*).—A study was made by the U. S. D. A. Bureau of Animal Industry of the normal temperature of sheep during the months of June, July, August, and September for the years 1915 to 1926, inclusive. The study was made at a range station near Salina, Utah. The sheep were brought in from the range and placed in pens approximately 10 ft. square and fed alfalfa hay and sometimes bran. A part of the day they were allowed to run in a large corral where they had access to water and salt. Usually about 15 hours elapsed between the time the animals were brought in from the range and the time the first rectal temperatures were taken. From this time on, observations were made twice a day.

The mean value of body temperature was 102.31° F., with a standard deviation of 1, which leans slightly toward the negative. While the variations were great in individuals, about 64 per cent fell between 101.5 and 103.2° and a large proportion between 100.9 and 103.8°. There was no appreciable difference in the body temperature of ewes and wethers. Lambs had the highest temperature, which gradually decreased with age, the greatest decrease coming during the first year. Body temperature was lowest early in the morning and increased during the day, being on the average 0.95° higher at from 6 to 8 p. m. than at from 6 to 8 a. m. The mean temperature was about the same for the four months studied. Two factors were found to influence body temperature: (1) Nervousness or fear increased the temperature, and (2) changing from green feed and freedom to dry feed and confinement reduced the temperature. When first confined the average temperature was high and then fell gradually for a period, at which level it remained approximately the same, the rate of decrease depending upon whether the animals were being observed for the first time or not. Animals during the first observation period usually required about one week to reach a fairly constant level, while animals that had been confined before reached a constant level in a few days.

Work on the selection of the Romanov sheep [trans. title], S. G. Davydov, L. F. Smirnov, V. A. Golovina, and E. N. Dunaeva (*Yaroslavsk. Zootckh Opytn. Sta. Raboty 1926, pp. 51–85, figs. 21*).—A report of work at the Yaroslavl Zootechnical Experiment Station, Russia, with Romanov sheep to determine whether there was a correlation between down and heavy fiber in the fleece and the length of hair, whether it is possible to select types with fine fleeces for the production of fur, and whether the selection would segregate such characters as thickness of fleece and distribution of wool over the body. The work was also designed to maintain the present prolific qualities of the breed, to induce high milk production, and to establish definite live weights.

[Experiments with sheep at the Nevada Station], C. E. Fleming (*Nevada Sta. Rpt. 1927, pp. 19–21*).—Results of experiments in continuation of those previously noted (E. S. R., 58, p. 65) are briefly reported.

Lamb production: Methods of producing more and better lambs in Nevada range flocks.—The rate at which twin lambs overtake single lambs in weight during the pasture season depended upon their production by vigorous and well-fed ewes on good range. Observations point to the importance of keeping ewes in good condition before and after lambing, so that the milk supply will be sufficient for the two lambs.

Feeding and finishing range ewes and lambs.—Alfalfa hay and alfalfa stubble pasture have proved of great value for putting weight on immature range lambs and for getting them into market condition at a favorable time. Greater gains were produced by feeding corn than by feeding barley as supplements to alfalfa, but under Nevada conditions the gains on barley were more profitable. Sunflower silage has not given results that would recommend its use for finishing lambs under Nevada conditions.

Pasturage and silage production for sheep.—Russian sunflowers on land previously in alfalfa produced 29.1 tons of silage per acre. A combination of bluegrass and white clover pastured by the rotation system carried the equivalent of 12.1 mature sheep per acre from the end of April to the first of October. There was grass left at the end of the season, indicating that the carrying capacity might have been higher. Each acre of such pasture gave a gross return of $47.85.

[Experiments with sheep at the North Dakota Station] (*North Dakota Sta. Bul. 217 (1928), pp. 44, 45, 48–50*).—Three experiments are reported.

Shipping and shrinkage of [lambs], J. H. Shepperd and D. J. Griswold.—Data secured on 500 feeder lambs shipped from Helena, Mont., to southeastern North Dakota showed a shrinkage of 6.9 lbs. per lamb. After fattening, the lambs were shipped to Chicago. They were unloaded for feed and water at one point en route and held for 2 days' feeding at a second point. Weighed empty at the first point the lambs had sustained a loss of 8 lbs. per head. After feeding and watering they gained back 3.6 lbs. Their loss from this point to market weight was 2.7 lbs., or a total loss of 7.1 lbs. per head from the feed lot.

Finishing range lambs under farm conditions, D. J. Griswold.—In a cooperative test with farmers, 65.7-lb. feeder lambs purchased in Montana shrank 6.9 lbs. per head in transit to feed lot. During the fattening period they gained 29.9 lbs., and in shipping to Chicago lost 8.6 lbs. per head. The net gain from ranch to market was 14.5 lbs.

[Fattening lambs], D. J. Griswold.—A standard ration of 80 parts of barley and 20 parts of bran, with alfalfa hay, was fed to a check lot of lambs. Another lot received 95 parts of barley and 5 parts of linseed meal, a third lot 90 parts of barley and 10 parts of linseed meal, and in a fourth lot 20 parts of sweetclover seed hulls replaced the bran in the check lot. The lot receiving 10 parts of linseed meal made 13 per cent greater gains than the check lot, while lot 2 made only slightly greater gains than the check. Lot 4 made practically the same gain as lot 3, and this ration appeared to be the most palatable of any used. The check lot made the most economical gains.

In another test a check lot was fed the same ration as lot 1 above. In a second lot 80 parts of barley and 20 parts of sweet clover seed hulls and in a third lot 90 parts of barley and 10 parts of sweet clover seed hulls were fed. The average daily gains in the respective lots were 0.437, 0.455, and 0.443 lb. per head. Lot 3 made the most economical use of its feed and lot 1 the least.

Rations for fattening lambs (*Nebraska Sta. Rpt. [1927], pp. 20, 21*).—Medium to fine wool type lambs were fed from October 25 to December 14 in 8 lots of 25 head each. All lots except lot 1 received linseed meal. Lots 1 to 4 received shelled corn and the remaining lots cracked corn. Lots 1 and 2 received alfalfa hay, lot 3 alfalfa meal, lots 4 and 5 alfalfa molasses meal (30 per cent beet), lot 6 alfalfa molasses meal (20 per cent beet), lot 7 alfalfa molasses meal (40 per cent beet), and lot 8 alfalfa molasses meal (30 per cent cane).

When alfalfa meal or alfalfa molasses meal was fed, more corn was consumed and the average daily gains were greater than when alfalfa hay was fed. The replacement value of 100 lbs. of linseed meal amounted to 71.2 lbs. of corn and 78.5 lbs. of alfalfa hay. Grinding the alfalfa resulted in a saving of 130 lbs. of hay in the feed required per 100 lbs. of gain. Substituting alfalfa molasses meal for alfalfa meal increased the cost of gain and decreased the profit per lamb. The greatest death losses were in the corn and alfalfa lots. It was supposed that the mixing of corn with alfalfa meal or alfalfa molasses meal resulted in a more even distribution of both grain and roughage among the lambs.

Earlier work has been noted (E. S. R., 57, p. 565.)

[Experiments with swine at the Nebraska Station] (*Nebraska Sta. Rpt. [1927], pp. 21, 22*).—The results of two experiments in continuation with those previously noted (E. S. R., 57, p. 565) are reported.

Forage crops for growing pigs.—Pigs averaging 58 lbs. in weight were divided into 6 lots of 10 head each and fed for 30 days in dry lot. After this period 2 lots were turned on Sudan grass pasture for 75 days and all concentrate feeds self-fed. The pigs on pasture and fed corn and tankage gained at the rate of 1.34 lbs. per head daily, as compared with 1.23 lbs. for pigs similarly fed in dry

lot. The pasture reduced the cost of gains from $6.86 to $6.27 per 100 lbs., after allowing 15 cts. per pig per month for pasture. Pigs fed meat and bone meal gained 1.59 lbs. per head daily on pasture at a cost of $6.06 per 100 lbs. Cracklings produced more rapid gains than tankage as a supplement to corn, but the cost of cracklings reduced the profits. Linseed meal fed with tankage produced gains of 1.45 lbs. per head daily, and cottonseed meal fed in the same manner produced gains of 1.53 lbs. The use of the auxiliary supplement increased the cost of 100 lbs. of gain to $6.33 and $6.57, respectively.

Rations for fattening pigs.—The comparison was made of three grades of tankage, differing only in the amount of dried blood added, the amounts representing 45, 60, and 70 per cent, respectively, of the tankage. The amount of feed required to produce 100 lbs. of gain during an 85-day feeding period decreased from 363 lbs. of corn and 58 lbs. of tankage with 45 per cent protein to 325 lbs. of corn and 37 lbs. of tankage with 70 per cent protein. The rate of gain did not vary greatly among any of the lots. Including alfalfa hay in a corn and tankage ration increased the average daily gains from 1.22 lbs. to 1.58 lbs. and reduced the cost of 100 lbs. of gain 53 cts. Equal parts of cottonseed meal and tankage increased the gains over a straight tankage supplement ration from 1.22 to 1.43 lbs. per day and decreased the cost of 100 lbs. of gain 32 cts.

Hog feeding experiments, F. B. Headley (*Nevada Sta. Bul. 114 (1928), pp. 5, 7–27, figs. 8*).—A number of experiments have been conducted with hogs to determine the value of milk in the ration and for finding the most economical ration to use under varying price conditions. Alfalfa hay, alfalfa pasture, skim milk, ground barley, and ground rye in various combinations were used in the work. Rations were fed without milk or with medium or heavy milk allowances in addition to the grain. Some of the tests were carried out during the summer and some during the winter.

The value of milk was found to vary with a number of conditions, namely, price of hogs, price of grain, percentage of milk in the ration, percentage of grain in the ration, and whether or not the hogs were on pasture. A gallon of milk was more effective in producing gains when fed in a limited amount and also when a light grain ration was fed. In promoting growth milk was more essential to pigs in dry lot than to those on pasture. Gains were made at a higher cost in winter than in summer and also when pigs were fed in dry lot as compared with those on pasture.

[Experiments with swine at the North Dakota Station] (*North Dakota Sta. Bul. 217 (1928), pp. 38, 41, 42, 99, 100*).—Results of several experiments, some of which have been continued from previous years (E. S. R., 55, p. 566), are reported.

[*Pork production*], J. H. Shepperd and A. Severson.—Spring pigs of uniform type and age were divided into 3 lots at an average weight of 48.55 lbs. and grazed on alfalfa for 56 days with a supplementary grain ration of 3.5 lbs. of grain per 100 lbs. of live weight. Lot 1 composed of 29 Yorkshires gained 1.05 lbs. per head daily; lot 2, 30 Chester White-Yorkshire crossbreds, gained 0.95 lb.; and lot 3, 30 lard type hogs, gained 0.99 lb.

In August these pigs were turned on field peas with access to alfalfa pasture and a mineral mixture for 21 days. During this period the average daily gains in the respective lots were 0.91, 1.28, and 1.16 lbs. per head.

Records were made of the percentage of 5 carcass cuts by breeds. The cuts studied were hams, loins, bellies, picnics, and butts. The averages of all the cuts by breeds were as follows: Yorkshires 45.8 per cent, crossbreds 44.1, Duroc-Jerseys 43.6, Chester Whites 42.3, and Poland Chinas 41.1 per cent.

Hogging-off corn trials, J. H. Shepperd and A. Severson.—During the fall of 1926 82 pigs averaging 129.2 lbs. were turned into 16.4 acres of corn estimated

to yield 34 bu. per acre. The pigs made a total gain of 67.3 lbs. per head, a per acre gain of 343 lbs. of pork.

[*Experiments at the Edgeley Substation*], O. A. Thompson.—At the Edgeley Substation a 10-year comparison of hogging-off field peas and corn has been completed. The average daily gain for pigs on corn was 1.49 lbs., and on peas 1.2 lbs. The production of pork per acre of corn averaged 372 lbs. and per acre of peas 385 lbs.

[*Experiments at the Langdon Substation*], L. Jorgensen.—On August 14, 1926, 3 sows and 25 spring pigs were turned on 5.5 acres of field peas and grazed until October 24. They were fed small amounts of oat chop. The gain during this period averaged 1.1 lbs. per head daily, and with the oats consumed each acre produced 396 lbs. of pork.

Protein and lime in the ration of fattening pigs, T. J. Shaw (*Jour. Min. Agr.* [*Gt. Brit.*], *35 (1928), No. 4, pp. 342–347, pls. 2, fig. 1*).—Pigs from 2 litters were divided at weaning time into 3 equal lots of 6 pigs each at the Seale-Hayne Agricultural College, England. Pen A received 1 lb. of middlings, 1.5 lbs. of barley meal, 0.15 lb. of meat meal (from whale flesh), and 0.0251 lb. of lime. This ration contained 0.35 lb. of protein and 0.02625 lb. each of lime and phosphoric acid. Pen B received a ration similar to pen A but without the addition of lime. This ration contained 0.35 lb. of protein, 0.026 lb. of phosphoric acid, and 0.0011 lb. of lime. Pen C received a ration similar to pen A but without meat meal, and so containing but 0.26 lb. of protein and the same amount of mineral as pen A. The pigs were allowed 2 weeks in which to become accustomed to their feed and were then fed experimentally from October 1, when they weighed approximately 26 lbs. per head to an average final weight of approximately 212 lbs. per head. The average daily gains in the respective groups were 1.2, 0.95, and 1.1 lbs. per head, and it required an average of 154.5, 191.5 and 168 days for the pigs in the respective pens to attain the final weights.

The pigs in pen B all became lame as the feeding period progressed. One animal went off its legs and had to be removed from the experiment for a time, and rachitic conditions were apparent in most of the pigs. Their appetites were poor, and after the tenth week they ate considerable quantities of mortar from the walls of the sty. The pigs in pen C grew slowly but consumed large quantities of feed until 24 weeks of age. After this time they grew rather rapidly and became more economical in the use of their feed. It required 4.2, 4.85, and 4.6 lbs. of feed in the respective pens to produce 1 lb. of gain .

The author concludes that lime is necessary for normal growth and health of pigs, and though a shortage of lime may not cause rickets it results in a slow rate of growth and a decrease in the economy of gains. A shortage of protein affects materially the early growth of the animal, but has little or no effect during the later stages of growth.

The transport of ham and bacon, E. H. Callow ([*Gt. Brit.*] *Dept. Sci. and Indus. Research, Food Invest. Bd. Rpt. 1925–1926, pp. 17, 18, fig. 1*).—Experiments were undertaken in England to find the best conditions for transporting hams and bacon without the use of preservatives. To illustrate the danger of a film of moisture, 3 series of agar plates were inoculated with the same volume of a suspension of mold spores. One series was held at 0° C., another at 3°, and the third at 0° and 3° on alternate days. At the end of 10 days there were 4 colonies of molds on series 1, 18 on series 2, and 152 on series 3.

A mild and a hard cured ham were cooled in brine maintained at —14° to —16°, and by means of a thermocouple the freezing point of the mild-cured ham was determined at —1° and for the hard-cured ham at —3°. The hams were removed from the brine and held overnight in a room at —7°. The following morning the lean of both hams was quite soft and showed no ice crystals.

On cooling to —11° the lean of the hard-cured ham remained soft, while that of the mild-cured ham was completely frozen.

[Experiments with poultry at the North Dakota Station], O. A. BARTON (*North Dakota Sta. Bul. 217 (1928), pp. 93, 94*).—Two experiments are briefly noted.

Crate feeding.—Groups of cockerels fed 14 days in crates showed gains in weight of from 28 to 38 per cent at a cost per pound of from 18.3 to 10.3 cts. There was a variation of 6.66 to 14 per cent from live weight to market dressing, and from live weight to preparation for cooking a variation of 26.66 to 37.5 per cent.

Feeding yeast.—Continuing this study (E. S. R., 55, p. 568), it was found that hens receiving yeast laid an average of 69 eggs per head during 7 months as compared with 60.4 eggs for those receiving no yeast. The cost per dozen eggs was 3.4 cts. less in the group receiving yeast. The yeast group produced only 7.3 per cent of infertile eggs as compared with 49.4 per cent for the check group. The hatchability also was greater in the yeast group.

Cystine requirement of molting hens, C. W. ACKERSON, M. J. BLISH, and F. E. MUSSEHL (*Poultry Sci., 7 (1928), No. 4, pp. 170–176, fig. 1*).—In a study of the effect of adding cystine to a ration fed molting birds, two lots of White Leghorn hens were fed from August 2 to December 16 at the Nebraska Experiment Station. The basal ration used consisted of yellow corn, caesin, cod-liver oil, yeast, and ash mixture. The ash mixture was composed of bone meal, sodium chloride, and calcium carbonate, 2:1:1. The 21 hens in lot 1 were fed 112 mg. of cystine per head daily, furnishing 13 mg. of cystine nitrogen. The cystine was given in capsules every other day. The 20 hens in lot 2 received the basal ration only.

During the test the birds in both lots laid an average of 17 eggs per hen, and there was no significant difference in the weights of the lots. The progress of molt in both lots was practically identical, and at the end of the experiment there was no difference in the degree of completeness of molting.

These results led the authors to conclude that in the amounts fed cystine produced neither beneficial nor detrimental effects. The quantity fed may have been too small or the original amount in the ration too high to produce any effect. While a lack of cystine may prolong the period of molt, it was not observed that adding cystine to the ration hastened the completion of molt.

The rate of wing molt of hens, C. W. ACKERSON, M. J. BLISH, and F. E. MUSSEHL (*Poultry Sci., 7 (1928), No. 4, pp. 177–180, figs. 12*).—In connection with the preceding study a series of charts was prepared to show the progress of dropping and growth of primary flight feathers. A life-size outline of the primary flights of the left wing was prepared, and as the birds were examined each week a record was made of which feathers had been dropped and the length of the new feathers replacing them. The method used for arranging the results was to take the charts of each bird which showed the dropping of the first flight feather and average them. Thereafter, the charts were taken in natural sequence and weekly averages made. A series of graphs shows the results obtained.

Some effects produced by the hooding of birds, D. M. PATRICK (*Brit. Jour. Expt. Biol., 4 (1927), No. 4, pp. 322–326, pl. 1*).—In tests at the University of Birmingham, England, various birds were hooded with a black velvet hood that covered the eyes but not the beak. Most of the tests were made with pigeons, but a few were carried out with domestic fowls and with other birds. In all cases the birds became quite passive when the hood was in place, and very few showed any inclination to move thereafter. The hood induced a hypnotic condition in the birds, and the majority of them assumed a position resembling

that of death rather than that of sleep. Post-mortem examination showed no pathological changes in the brains or cerebella of the hooded birds.

The relation of the weight of Rhode Island Red pullets at four weeks to their subsequent rate of growth, D. C. HENDERSON (*Poultry Sci., 7 (1928), No. 4, pp. 181–185*).—The weights of 223 Rhode Island Red female chicks at 4, 8, 12, and 16 weeks from the time of hatching were obtained at the Illinois Experiment Station. Weighings were made in the morning before the birds had been fed and watered so as to eliminate as much as possible variations that would result from the contents of the crops in different birds.

The coefficients of correlation of the weights of chicks at 4 and 8 weeks, 4 and 12 weeks, and 4 and 16 weeks were from 35 to 50 times as great as the probable error. The variation in the weight of the chicks relative to the mean weight remained practically constant from 4 to 16 weeks. The results show that chicks that are relatively large at 4 weeks are relatively large at 8, 12, and 16 weeks, respectively.

Egg weight, day old chick weight, and rate of growth in Single Comb Rhode Island Red chicks, C. W. UPP (*Poultry Sci., 7 (1928), No. 4, pp. 151–155*).—This study at the Oklahoma Experiment Station was undertaken to determine whether or not heavier eggs produce heavier chicks at hatching time and whether or not heavier chicks grow more rapidly than those that are lighter in weight when hatched. The birds were hatched biweekly from November 16 to May 4 (E. S. R., 58, p. 468) and were all from pullets. They were weighed at 1 day old and every 2 weeks thereafter until sold, or if pullets were retained, until the end of the first year's production. The regular station growing ration, including green feed and buttermilk, was fed.

The chicks at 1 day old averaged 68 per cent of the weight of the eggs from which they were hatched. There was a very definite relationship between egg weight and weight of day-old chicks. While the size of egg largely determined the size of the chick at hatching time, the day-old weight was not a reliable index of weight at 2, 4, or 12 weeks of age, and the rate of growth was largely independent of size at hatching and indirectly of size of egg. Environmental conditions were believed to exert some influence on the results. There was no consistent variation in the relationship of day-old weights to rate of growth for chicks hatched at different dates.

The influence of vitamin D deficiency on gaseous exchange in chicks, F. M. BALDWIN, V. E. NELSON, and C. H. MCDONALD (*Amer. Jour. Physiol., 85 (1928), No. 3, pp. 482–488*).—The respiratory quotient of chicks on an adequate diet at the Iowa State College was found to be between 0.94 and 1. For chicks on a rachitic diet (E. S. R., 47, p. 565) the respiratory quotient was approximately 0.7. The normal interchange was maintained until just prior to the appearance of the characteristic symptoms of rickets. The respiratory quotient remained at the low level during the period at which rachitic symptoms were apparent, and during this period the body temperature of the chick was low, although there was but slight loss in appetite. Using cod-liver oil or irradiation to restore the antirachitic factor brought about a rapid rise in the respiratory quotient.

Rules and regulations for the fifth Utah intermountain egg-laying contest, B. ALDER (*Utah Sta. Circ. 74 (1928), pp. 4, fig. 1*).—General information and rules for the fifth Utah intermountain egg-laying contest (E. S. R., 57, p. 569).

Turkey production (*Nebraska Sta. Rpt. [1927], p. 29*).—It was found that turkey eggs lost on the average during artificial incubation from the first to the twenty-fourth day 12.7 per cent of their initial weight. Sand tray moisture

pans proved the most satisfactory method of supplying moisture to turkey eggs during incubation. Under optimum conditions poults averaged 66 per cent of the weight of the eggs from which they were hatched.

DAIRY FARMING—DAIRYING

Effects of fasting and the method of preparation of feed upon the digestive process in dairy cattle, W. B. Nevens (*Jour. Agr. Research [U. S.], 36 (1928), No. 9, pp. 777–794, figs. 4*).—The experiments reported in this paper were undertaken at the Illinois Experiment Station to determine the effect of fasting and the method of feeding upon the digestive process, with particular reference to the course of feed through the stomach of dairy cattle. All of the animals used were 2 years old or older. Two groups were fed during preliminary periods of 10 to 14 days, respectively, and others as long as conditions permitted. Three cows were milking heavily and were fed a ration of silage, hay, and a grain mixture, while the others were fed whole or finely ground alfalfa hay as the sole feed. One group of animals was fasted 4 to 6 days, and then with the exception of two controls given feed prepared in various ways immediately before being killed. The other group was not fasted. The time elapsing between feeding and slaughter varied from 1 to 14 hours.

After slaughtering, the contents of the four stomachs were removed and held separately. Where the contents of the rumen were so liquid that the liquid portion separated on standing, this liquid was removed from the solid portion. The intestines were cut into sections and the contents pressed out and saved. In most cases the entire contents of the various parts were retained. Only in the rumen and omasum contents, and the intestine contents of the full-fed animals were smaller samples saved. The dry matter and crude fiber contents of these samples were determined.

It was found that the gastrointestinal tract of animals fasted 4 to 6 days contained from one-fourth to two-thirds as much dry matter as that of animals full-fed up to the time of slaughter. The rumens of fasted animals contained large amounts of free liquid, while little or none was found in the rumens of full-fed animals. Digestion appeared to have proceeded normally, except for quantity, in the fasted animals, as judged by the proportions of dry matter and total content found in each section of the tract and by the output of dry matter in the feces. From the amount of dry matter in the rumens it was apparent that the form in which the hay was fed exerted no influence. Most of the corn, fed just previous to slaughter, whether ground or shelled, was recovered in the rumen thoroughly mixed with the other material present. Small amounts were found in the reticula, and in a few cases some in the omasums. The preparation of the corn had no apparent effect upon its passage.

Crude fiber formed a high percentage of the dry matter in the stomachs of animals fed alfalfa hay and a much lower proporation in the rumen and reticulum of animals fed corn just before killing. On account of the fiber content found in the stomach of the alfalfa-fed animals, it was supposed that the more digestible and soluble portions of the alfalfa were removed in the rumen.

Foreign materials were found in the reticula and abomasums of animals from which these materials were separated, indicating a movement of the matter through the digestive tract. One function of the rumen seems to be that of a storehouse retaining a fairly constant proportion of the dry matter of the total content of the digestive tract even with a highly variable feed intake.

Test of economic efficiency of alfalfa hay as a sole ration for dairy cattle and its relation to sterility, F. B. Headley (*Nevada Sta. Rpt. 1927, pp. 25,*

27).—Cows fed grain in addition to high-quality alfalfa hay showed a decided gain in milk production over cows fed alfalfa hay alone. The latter cows, however, showed a slightly higher net profit than the former. The feeding of 50 lbs. of grain resulted in a saving of only 34 lbs. of hay. Feeding silage in addition to the hay had little or no effect upon the quantity of hay consumed. The relation of the all-hay ration to sterility remained obscure.

[Experiments with dairy cattle at the North Dakota Station], J. R. DICE and C. JENSEN (*North Dakota Sta. Bul. 217 (1928), pp. 57, 58*).—The results of experiments, one of which has been previously noted (E. S. R., 55, p. 570) are reported.

Home grown feed.—Cows receiving alfalfa hay as a roughage produced 5 per cent more milk and butterfat than when receiving prairie hay. When fed corn silage cows produced 4 per cent more butterfat than when fed corn fodder.

Beet tops.—Cows consumed on the average 28 lbs. of beet top silage and 20 lbs. of corn silage per day, but production was no greater than when the animals were on a full feed of corn silage. Even though they consumed more total digestible nutrients when receiving the beet top silage, aside from the laxative effect the beet tops exerted no special influence on the cows.

Sweet clover screenings.—Two trials were conducted to determine the value of sweet clover screenings. Corn silage and alfalfa hay formed the roughage portion of the ration, while the grain mixture consisted of oats, barley, and corn. In the first trial an equal weight of sweet clover screenings was compared with wheat bran, and in the second trial equal parts of screenings and the grain mixture were fed. All rations were eaten with the same degree of relish, and the production of milk and butterfat was approximately the same in each trial. Because of the bulkiness of the screenings it is recommended that they form not over one-half of the grain ration.

Influence of environment and breeding in increasing dairy production, III, E. WEAVER, C. A. MATTHEWS, and H. H. KILDEE (*Iowa Sta. Bul. 251 (1928), pp. 283–328, figs. 32*).—The data for this study (E. S. R., 41, p. 182) on the improvement of Arkansas dairy cattle has been brought up to date in this report. The results obtained with the first and second generation grades of Guernsey, Holstein, and Jersey breeds have been noted. The later work has been with Holstein grades only. No crossbreeding has been practiced in this test and in only two cases was inbreeding followed. The culling of low producers has not been practiced.

It has been found that the use of purebred bulls is an effective way of building up a good grade herd from a scrub foundation. Of the 14 purebred bulls used in the work, 3 were useless for increasing production, 4 were exceptionally valuable, and the remainder justified their use. The daughters of a scrub bull showed no improvement over their dams that could not be accounted for by the improved conditions under which they were raised. The scrub animals that were young when they arrived at the farm produced at a higher level throughout their lives than did the animals that were mature. The 4-year-old scrubs increased in production more each year after the improvement in environment than could be accounted for by the maturing of the animals. The mature scrub animals did not increase in production after the first year.

In persistency of production the third generation Holsteins ranked highest, while the scrubs were lowest. The first and second generation grades gradually increased in persistency, but the fourth generation fell short in relative persistency. As the grading up progressed the animals also became more economical in the use of their feed and returned a greater profit over feed cost, except for the fourth generation which was inferior to the third in these

respects. A great variation was found in the production of individuals of the same or similar breeding.

Effects of environment on the dairy cow and its relation to housing, M. A. R. Kelley (*Agr. Engin., 9 (1928), No. 6, pp. 186–188, fig. 1*).—In a contribution from the U. S. D. A. Bureau of Public Roads a summary of data on the subject is presented, together with a bibliography of 15 references.

The change of form during growth of the dairy cow, J. H. W. T. Reimers (*Ann. Univ. Stellenbosch, 5 (1927), A, No. 2, pp. 42, figs. 11*).—These changes have been observed in the Netherlands by measuring 200 calves of the Friesland breed in groups of males and females according to ages. All the animals received practically the same feed and management. The groups were arranged to include animals differing one month in age, and the measurements were of 11 different parts of the body. The male calves were measured only during the first year, since most of them were sold as yearlings, but the females were measured until they had had their first calf.

In order to illustrate the changes the different parts of the body undergo in proportion to each other during growth, the measurements of these parts have been expressed in percentages of the length of body and percentages of the height at withers. When the length of body is used as 100 per cent, the height at withers and height at rump at birth are larger than 100 but decrease up to maturity when they fall below 100. Depth and width of chest, width between hips and between pin bones, and width of thurl are all less than 100, gradually increasing with maturity. Length of rump and distance from knee and hock to ground gradually decrease in proportion to length of body with increase in age. Using the height at withers as 100, only one measurement, height at rump, was greater than 100 at birth, and this gradually lessened with age but never dropped below 100. Length of body was less than 100 at birth but gradually increased with age until it was considerably more than 100 at maturity. The proportion of the other measurements acted in a similar manner, as when compared to length of body, except length of rump, which gradually increased in proportion.

At the age of 2.5 years the parts measured were considered to have reached their maximum growth, and the size of the parts in different periods is expressed in percentages of this size. At birth the width between the hips is approximately 33 per cent of the total development. The chest has about 40 per cent, the length of body and width of thurl 45 per cent, length of rump 48 per cent, and height at withers 55 per cent of their total development at birth. When the change in height of the animal is taken as 100, the changes in the other parts are calculated to be relatively as follows: Length of body 126 per cent, height at rump 99 per cent, depth and width of chest 138 per cent each, width between hips 164 per cent, width of thurl 128 per cent, width between pin bones 200 per cent, length of rump 114 per cent, distance from front of knee to ground 80 per cent, and distance from hock to ground 81 per cent.

The use of water-bowls: Influence on milk yields (*Jour. Min. Agr. [Gt. Brit.], 34 (1928), No. 10, pp. 914–922*).—During the winters of 1925–26 and 1926–27 cooperative experiments were carried out at certain agricultural colleges and farm institutes in England to obtain information on the effect upon milk yield of watering cows from water bowls. At each place 2 lots of 5 or 9 cows each were fed and treated alike except that 1 lot of cows had continuous access to water from bowls, while the other lot had access to water only once or twice a day when all animals were turned out for exercise according to the custom of the region. The trials extended over two experimental periods of 5 weeks each, with an interval of 1 week, in which first one and then the other lot had access to the water bowls.

There was a total net increase in yield of approximately 1 per cent when the cows had access to the water bowls. The use of bowls had a decided advantage in that they saved labor and gave a cleaner and more wholesome supply of water. They are recommended where practical, and especially for sections where a sufficient and clean supply of water is not available when the animals are turned out to drink.

The electrical conductivity of milk as one of the chief indicators of the "inner" of the cow [trans. title], S. S. PEROV (PEROFF) (*Trudy Vologodsk. Moloch. Khoz. Inst.* (*Arb. Milchw. Inst. Wologda*) *Bul. 52* (*1925*), *pp. 39, figs. 6*).—In this report from the Vologda Dairy Institute, Russia, the author presents studies of the conductivity of the milk of 28 cows during their entire lactation periods in order to ascertain some of their internal reactions. The conductivity varied but little during any part of the period, and it was found that variations in conductivity were greater between indivduals than between breeds of cattle. Observations on the effect of age on conductivity seemed to show that the organs of the cow function normally during middle life. Weight had no effect upon conductivity, but cows producing at a low level had a somewhat lower conductivity than those producing at a high level. Tubercular cows did not differ in conductivity from healthy cows. Work with another set of cows showed a tendency toward an increase in conductivity as the lactation period progressed.

The determination of the "freshness" of milk [trans. title], G. S. INIKHOV (INICHOFF) (*Trudy Vologodsk. Moloch. Khoz. Inst.* (*Arb. Milchw. Inst. Wologda*) *Bul. 57* (*1926*), *pp. 42*).—A method devised by the author at the Vologda Dairy Institute, Russia, to check the Morres method (E. S. R., 22, p. 414) for determining the quality of milk is described. During a 2-year period 12,000 samples of milk were analyzed, and the results are summarized as follows:

The limits of variation in the degree of curdling of milk during monthly periods of lactation are so great (from 56.8 to 95) that it is impossible to establish average values for normal milk. Daily samples fluctuated from 32 to 149 in degree of freshness. The degree of coagulation seldom goes below 50, and a value of 70 was observed in 22.19 per cent of all the daily samples analyzed. In a 7-day period the samples showed fluctuations in degrees of acidity, freshness, and curdling equal to 9 points on the Morres scale. The degrees of freshness, acidity, and curdling are low in summer and high in winter. Diluting with water decreased the various indexes 0.1 for each 10 per cent of water, but preservatives exerted no influence. Heating to 65° C. decreased the degree of curdling, but freezing had little influence.

The author believes that the Morres method is not suitable for determining the sanitary value of milk.

A modification of the alcohol test as an index of the bacterial count and keeping quality of milk, C. H. CHALMERS (*Jour. Bact., 15* (*1928*), *No. 2, pp. 93–104, fig. 1*).—Tests at the University of Leeds, England, were undertaken to find a modification for the present alcohol test for determining the bacterial content and keeping quality of milk, which does not indicate the concentration of acid and rennet present. The modifications suggested involve incubation of the milk for a definite period at a specific temperature before adding the alcohol, an alteration in the concentration of the alcohol, and the addition of an indicator to the alcohol.

Tests indicated that incubating the milk at 37° C. for a minimum period of 8 hours gave best results. The use of 83 per cent (by volume) of neutral alcohol containing 0.02 per cent methyl red completed the modifications that produced satisfactory results. The author points out that abnormal flavors

and odors can be detected by taste and smell only, and that there are a number of factors that affect the keeping qualities of milk that can not be taken into consideration by any one method.

The production of milk in Denmark, P. Coche (*La Production Laitière en Danemark. Paris: A. Pedone, 1928, pp. 172, pls. 8, figs. 6*).—An interesting treatise on the dairy industry of Denmark. Part 1 deals with the breeds of cattle found in the country and with the methods of care and management. Part 2 is a discussion of the milk and its utilization in various forms.

A case of cream feathering, P. H. Tracy and H. A. Ruehe (*Creamery and Milk Plant Mo., 17 (1928), No. 5, pp. 21, 22*).—Samples of 22 per cent cream, some unhomogenized and some homogenized at from 200 to 300 lbs. pressure and others at 2,000 lbs. pressure, were tested for feathering at the Illinois Experiment Station by placing 18 gm. of cream in a teacup and filling the cup with boiling water. The average acidity of the cream used was 0.17 per cent. The unhomogenized cream showed no curdling. The cream homogenized at low pressure showed a slight curdling, while that homogenized at high pressure showed a pronounced feathering.

Cream homogenized at high pressure was divided into four parts and in each part a variable was introduced. When 2 cc. of a 10 per cent solution was added to 18 gm. of cream the tendency to feather in hot water was reduced. Adding calcium chloride increased the tendency to feather, while adding enough sodium hydroxide to neutralize the acidity reduced the feathering tendency. In these three lots hard water was used in testing. In the fourth lot the use of soft water removed all tendency to feather.

The authors believe the feathering to be due to the fact that heat causes the calcium casein of the cream to precipitate, and that the addition of calcium chloride further increases the precipitation upon application of heat. Hard water usually contains calcium salts, its use bringing about a disturbance of the salt balance and causing feathering. This is further substantiated by the fact that sodium citrate reduced the tendency to feather when hard water was used. Seasonal variations in feathering are believed to be due to the fact that just after freshening and toward the end of lactation cows produce milk with a high mineral content, especially the proportions of calcium and phosphorus, and at this time the milk contains smaller amounts of citric acid. Neutralizing had the effect of increasing the secondary phosphate (HPO_4) present and decreasing the amount of primary phosphate (H_2PO_4). The secondary phosphates are capable of offsetting the excess calcium. It was supposed that homogenization removed some of the casein and possibly some of the phosphates from colloidal solution and fixed them to the fat globules. There would thus remain a calcium excess in the serum.

Finnish butter (*Helsingfors, Finland: Finnish Min. Agr., 1928, pp. 31, figs. 35*).—This booklet contains a description, in English, of the dairy industry of Finland. The conditions existing on the dairy farms and in the dairies and the Government control of butter for export are also explained.

VETERINARY MEDICINE

[Report of work with animal diseases at the Nebraska Station] (*Nebraska Sta. Rpt. [1927], pp. 9, 10*).—The results of examinations of a considerable number of tubercular lesions to determine the distribution of avian tuberculosis infection in farm animals and man are reported upon in tabular form. Thus far, the experiments have failed to furnish any evidence of avian tuberculosis infection in the human material examined.

The loss of a large number of horses in certain sections of the State led to cooperative work with the State department of agriculture. The studies conducted indicate that the affection is not of parasitic origin. A review of the literature led to the conclusion that the disease is similar to one occurring in widely distributed areas of the world. It is marked by severe degenerative changes in the liver, which in some cases is almost completely deteriorated as a gland. All changes found in other organs are merely subsidiary to the elimination of the liver function, and the most characteristic symptoms merely express the intoxication arising whenever this gland ceases to perform its physiologic function. Cattle were also found subject to the disease. Feeding experiments indicate that lupines have no relation to the affection.

Investigations on animal pests and diseases [in Australia], A. C. D. RIVETT and G. LIGHTFOOT (*Aust. Council Sci. and Indus. Research Ann. Rpt., 1 (1926–27), pp. 29–33*).—This account discusses investigations at the veterinary research institutions in Australia, the Kimberley horse disease, poisonous plants, the dingo pest, and the flying fox pest.

[Research in] veterinary science, J. MCFADYEAN (In *Agricultural Research in 1925. London: Roy. Agr. Soc. England, 1926, pp. 136–174*).—Reviews are given of research work and the status of knowledge of the following subjects. The causes of sterility in cows (pp. 136–145), contagious or epizootic abortion (pp. 145–154), milk fever in cows (pp. 154–160), foot-and-mouth disease (pp. 160–165), vaccination of cattle against tuberculosis (pp. 166–168), Johne's disease (pp. 168–171), and liver rot in sheep (pp. 171, 172).

A text-book of general bacteriology, E. O. JORDAN (*Philadelphia and London: W. B. Saunders Co., 1928, 9. ed., rev., pp. 778, pl. 1, figs. 190*).—In this new edition of the work previously noted (E. S. R., 49, p. 125), the chapter on parasitic protozoa has been entirely rewritten with the assistance of W. H. Taliaferro, and several other important sections have been revised and amplified.

The normal blood of some domesticated animals, C. E. HAYDEN and P. A. FISH (*Cornell Vet., 18 (1928), No. 2, pp. 197–203*).—This is a report of work in which determinations were made for sugar, urea, uric acid, total nonprotein nitrogen, creatinine, chlorides, calcium, inorganic phosphates, acid soluble phosphates, refractive index, and the serum protein of the blood of the cow, goat, and chicken, as well as the hemoglobin, erythrocyte, and leucocyte counts, including the differential count of the leucocytes.

The regional lymph glands of food animals, J. S. BUCKLEY and T. CASTOR (*U. S. Dept. Agr. Circ. 32 (1928), pp. 31, figs. 15*).—This is a revision of an article previously noted (E. S. R., 27, p. 180).

The greasewood as a range plant poisonous to sheep, C. E. FLEMING, M. R. MILLER, and L. R. VAWTER (*Nevada Sta. Bul. 115 (1928), pp. 22, figs. 4*).—This is a report of studies made of *Sarcobatus vermiculatus*, feeding tests with which were commenced in 1918. The bulletin includes a description of the plant, the results of experimental feeding tests with sheep, a description of a fatal case of poisoning in detail, feeding greasewood with a mixture of grasses and weeds, feeding of leaves at definite intervals, daily feeding tests to determine the injurious effects of the leaves, length of time for the appearance of symptoms of poisoning, symptoms of poisoning, autopsy findings, and practical suggestions for avoiding greasewood poisoning.

The experiments have shown that it requires an average of about 3 hours 25 minutes for the first visible symptoms to develop after the animal is fed a toxic or a fatal amount of the plant, although in a few of the experimental sheep the symptoms appeared in less than 2 hours. The time that elapsed between the detection of the first symptoms and the death of the animal varied greatly, it being from 12 to over 20 hours. It is pointed out that under normal range and

feeding conditions the greasewood is a safe plant for sheep to browse, but that if hungry sheep are permitted to satisfy their hunger quickly and completely on it then poisoning and death may be expected.

Part 2 (pp. 17–22) consists of a report of chemical studies of greasewood, particularly the oxalic acid content of the leaves. It is said that there can be but little doubt that the poisonous character of the plant is due to the presence of salts of oxalic acid.

An account of studies by Marsh, Clawson, and Couch has been noted (E. S. R., 50, p. 77), as has an analysis by Forbes and Skinner (E. S. R., 15, p. 889).

Poisonous range plants, C. E. Fleming, M. R. Miller, and L. R. Vawter (*Nevada Sta. Rpt. 1927, p. 22*).—The work on this project was concentrated largely upon poisoning due to the common greasewood (*Sarcobatus vermiculatus*), a bulletin relating to which is noted above. The work with this plant showed that the excessive rainfall in the spring of 1927 produced a moist and sappy condition of the slender fleshy leaves, rendering them devoid of any discoverable poisonous properties. Thus the work has shown that in wet spring weather the greasewood loses its poisonous properties, while in years of drought the sap is so much more concentrated that it is apt to cause the fatal poisoning of sheep that feed heavily on the leaves.

The influence of low temperatures on the eggs of Ascaris megalocephalus [trans. title], M. M. Zavadovskiĭ (Zawadowsky) (*Trudy Lab. Èksper. Biol. Moskov. Zooparka* (*Trans. Lab. Expt. Biol. Zoopark, Moscow*), *2 (1926), pp. 217–223; Ger. abs., pp. 228–233; abs. in Rec. Méd. Vét., 103 (1927), No. 19, p. 847; North Amer. Vet., 9 (1928), No. 4, pp. 25, 26*).—It is pointed out that the eggs of *A. megalocephalus* will undergo segmentation only between temperatures of 45 and 104° F. When the eggs of this round worm are exposed to a temperature of 39 to 43° for 5 months they are still able to segment if exposed to room temperature, as is also the case with eggs exposed to 23° for 1 month, —4° for 30 days, —11° for 75 days, and 14° for more than 15 months. Many of the eggs exposed to these low temperatures will not hatch.

The host relationship of the trematode genus Zygocotyle, E. W. Price (*Jour. Agr. Research* [*U. S.*], *36 (1928), No. 10, pp. 911–914, fig. 1*).—A brief historical review is followed by a description of *Z. lunata* from the cow and a comparison with specimens of Zygocotyle from bird hosts, including a table giving comparative measurements.

Apparently normally parasitic in water birds, a species of amphistome, *Z. lunata*, is here reported for the first time in a domestic ruminant, *Bos taurus*. This record is said to be the second reporting this species from ruminants, the first having been from a deer, *Cervus dichotomus*. Several new bird hosts are recorded for this trematode, including *Anser anser domesticus*, *Gallinago delicata*, *Marila americana*, and *Nettion carolinensis*. A comparison of specimens from the cow with specimens from water birds indicates that they are specifically identical, and that the recognition of *Z. ceratosa* as a distinct species is not justified. *Z. ceratosa* is, therefore, regarded as a synonym of *Z. lunata*.

Mollusks of importance in human and veterinary medicine, I, II, J. Bequaert (*Amer. Jour. Trop. Med., 8 (1928), Nos. 2, pp. 165–182; 3, pp. 215–232*).—The subject is dealt with under the headings of parasitic diseases of man and domestic animals in which mollusks are known to act as intermediary hosts, the molluscan intermediary hosts of helminth diseases, and prophylactic measures against molluscan hosts of helminth diseases. A bibliography of three pages is included.

Concerning some comparative experiments made in Algeria with the Argentine and Algerian forms of Anaplasma [trans. title], J. Lignières

(*Bul. Soc. Path. Exot., 21 (1928), No. 5, pp. 378–380*).—The author is led to conclude that the proof of the identity of the Argentine and Algerian forms of Anaplasma is not yet complete.

On the vaccination of bovines against piroplasmosis, babesiellosis, and anaplasmosis [trans. title], J. Lignières (*Bul. Soc. Path. Exot., 21 (1928), No. 5, pp. 371–378*).—The author concludes that the vaccination procedure applied against these diseases in Algeria with good results is not applicable in protecting the improved race of cattle in Argentina and Uruguay.

Investigations on the method of propagation of foot-and-mouth disease [trans. title], C. Kling and A. Höjer (*Compt. Rend. Acad. Sci. [Paris], 186 (1928), No. 21, pp. 1450–1452*).—It is pointed out that the authors, after having studied the epizootics of this disease occurring in Sweden since 1875 and particularly from 1924 to 1926, have found that man may be the principal importer and propagator of the virus. The experiments demonstrated that the monkey *Cercocebus fuliginosus*, which may not manifest symptoms after infection with the virus, may be a carrier of the germ on its mucous membranes (nose, mouth, pharynx, intestines) and eliminate a virulent form after the lapse of a period as long as 49 days.

Physiological and pathological changes in the ovary of the cow and their clinical recognition, W. W. Williams (*Cornell Vet., 18 (1928), No. 2, pp. 116–134*).—In this account the author deals with the ovarian cycle, duration of heat, rupture of the follicle, formation of the corpus luteum, detection of heat, regulation of the oestrual cycle, ovarian pathology, infection of the ovaries, functional diseases of the ovary, indications of diseased follicle, ovaries alternate in functioning, relation of corpus luteum to abnormal heat cycle, contributory factors influencing periodicity of heats, and nymphomania or cystic ovaries.

Correlation of the rapid and the long agglutination tests for infectious abortion of cattle, H. F. Lienhardt and C. H. Kitselman (*Jour. Amer. Vet. Med. Assoc., 73 (1928), No. 3, pp. 328–330*).—In investigations at the Kansas Experiment Station, the rapid method of conducting the agglutination test gave 172 reactors and the long method yielded a like number, thus showing 100 per cent agreement. The number of negative cases were likewise equal by both methods. In work in the laboratory the authors have found the short method to prove highly satisfactory, and because of the ease with which the test can be performed and the speed with which a diagnosis can be made it is to be preferred. They predict that it will become a permanent diagnostic method in the testing of all routine bovine sera for Bang's abortion disease. However, in work demanding greater accuracy both methods should be employed.

Summary of some Brucella abortus studies, C. M. Carpenter and R. Boak (*Cornell Vet., 18 (1928), No. 2, p. 204*).—In determining the thermal death point of *B. abortus* in milk, human, porcine, and bovine cultures of *B. abortus* grown in milk were exposed in Sternberg bulbs at temperatures of 140, 142, 145, and 160° F. for various intervals in an electrically controlled water bath. No cultures were viable after exposure for 20 minutes to a temperature of 140°.

In an examination made of 3,053 samples of blood serum from the Wasserman Laboratory of the Bureau of Health, at Syracuse, N. Y., for *B. abortus* agglutinins, 209, or 6.8 per cent, of the samples showed either slight or complete agglutination of the abortus antigen. Fifty-two gave slight agglutination at a 1:15 dilution, 99 gave complete agglutination at a 1:15 dilution, 27 gave complete agglutination at a 1:30 dilution, 23 at a 1:45 dilution, 1 at a 1:90 dilution, 4 at a 1:135 dilution, 2 at a 1:270 dilution, and 1 at a 1:1,215 dilution.

The epizoology of bovine coccidiosis, L. M. Roderick (*Jour. Amer. Vet. Med. Assoc., 73 (1928), No. 3, pp. 321–327*).—This contribution from the North

Dakota Experiment Station contrasts the influences in North Dakota which may govern the occurrence of the disease with those reported elsewhere.

Milk sickness, the result of richweed poisoning, J. F. COUCH (*Jour. Amer. Med. Assoc., 91 (1928), No. 4, pp. 234–236, fig. 1*).—This is a contribution from the U. S. D. A. Bureau of Animal Industry summarizing the status of knowledge of milk sickness.

Damaged or spoiled sweet clover hay and silage disease in cattle, A. F. SCHALK, L. M. RODERICK, and H. L. FOUST (*North Dakota Sta. Bul. 217 (1928), p. 96*).—This is a brief summary of the status of knowledge of this disease based upon studies conducted, accounts of which by Schalk (E. S. R., 54, p. 775) and by Roderick and Schalk (E. S. R., 59, p. 272) have been noted.

Red water disease of cattle (Bacillary hemoglobinuria), E. RECORDS and L. R. VAWTER (*Nevada Sta. Bul. 113 (1928), pp. 12, fig. 1*).—This is a practical summary of information on this disease, presented under the headings of occurrence of the disease, economic importance, diagnosis, treatment, and prevention. In referring to vaccination, it is stated that the vaccine now available will prevent serious losses for at least six months. In reporting upon treatment of the disease, it is stated that the administration of the curative serum prepared at the station following the isolation of the causative organism in 1923 resulted in recoveries averaging about 75 per cent as compared with the death rate of those not treated of about 100 per cent.

An unidentified hemorrhagic disease in cattle, E. RECORDS (*Nevada Sta. Rpt. 1927, pp. 21, 22*).—A report is given of further work conducted with this disease (E. S. R., 58, p. 73), particularly the preparation and perfection of preventive vaccines prepared from cultures of *Clostridium hemolyticus bovis*, an account of which organism has been noted (E. S. R., 54, p. 677). The vaccines were largely suspensions of phenol-killed whole cultures of the organism. The total number of vaccinated cattle in 17 herds was 1,636. Those not vaccinated numbered 354. None of the vaccinated animals developed the disease, while there were 8 cases of the disease and 4 deaths among those not vaccinated. A brief summary of the work is given in the bulletin noted above.

Investigations on the transmission and etiology of hog flu, C. N. MCBRYDE, W. B. NILES, and H. E. MOSKEY (*Jour. Amer. Vet. Med. Assoc., 73 (1928), No. 3, pp. 331–346*).—This is a contribution from the U. S. D. A. Bureau of Animal Industry.

The authors point out that hog flu is an affection of the respiratory tract and that the causative organism does not appear to circulate in the blood. It is, however, present quite regularly in the tracheal and bronchial mucus and in the nasal secretion of flu hogs. "The disease may be readily conveyed by dropping suspensions of the tracheal and bronchial mucus of flu hogs in the noses of well hogs and also by transferring the nasal secretion of sick hogs to the noses of well hogs. Hog flu may be transmitted by contact exposure from sick hogs to well hogs and when so conveyed is probably transmitted through the nasal secretion. The causative agent of hog flu does not appear to be a filtrable virus, and is probably an organism which is present in the respiratory tract of hogs under normal conditions and assumes pathogenic properties when the bodily resistance of the animals is lowered. A pleomorphic Gram-positive bacillus was recovered from the respiratory tract in over 50 per cent of the cases of hog flu which were studied bacteriologically, and a similar study of the respiratory flora of 19 normal hogs revealed the same bacillus in 26 per cent of the cases."

Bacillary white diarrhea and the agglutination test, J. F. OLNEY and O. BEDERKE (*Jour. Amer. Vet. Med. Assoc., 73 (1928), No. 3, pp. 350–355*).—This is a report of studies conducted at the Nebraska Experiment Station.

Post-mortem examinations made of birds giving positive and negative reactions to the macroscopic agglutination test for bacillary white diarrhea show a great majority of infection carriers to react. That repeated yearly tests of breeding stock, together with proper sanitation and a vigorous culling of unthrifty chicks, will control the disease is considered almost beyond question.

Transmission of Bacterium pullorum infection among mature chickens, E. L. BRUNETT (*Cornell Vet., 18 (1928), No. 2, pp. 135–149*).—In transmission experiments in which 17 mature nonreacting hens were kept in a pen with 20 reacting hens for 7 months the infection failed to be transmitted, as was determined by the agglutination test. The reactors maintained their titers throughout. The addition of 3 nonreacting mature male birds resulted in a number of the nonreactors becoming reactors. One-half of the surviving original nonreactors were found to harbor *B. pullorum* infection in the ovaries. The male birds did not react to the agglutination test or show any evidence of infection on autopsy.

A pen composed of 3 mature reacting male birds and 26 nonreacting mature hens failed to demonstrate the transmission of the virus. The high titer of the blood serum of the males indicated an infection. This was not proved, although the pericardial lesions suggested a localization of the infection about the heart.

Avian tuberculosis, A. F. SCHALK, L. M. RODERICK, and H. L. FOUST (*North Dakota Sta. Bul. 217 (1928), p. 95*).—In reporting upon transmission and sensitization experiments it is pointed out that very few cattle become infected with avian tuberculosis under ordinary barnyard conditions, as evidenced by manifest tuberculosis lesions. Young cattle can readily be sensitized to avian tuberculosis by cohabitation with tuberculous fowls under ordinary barnyard conditions. Sensitization in the absence of visible lesions is of a temporary nature, fading out within 2 to 5 months after removal from avian tuberculosis cohabitation. Sensitization does not immunize cattle sufficiently to prevent subsequent resensitization under similar cohabitation conditions. Cattle sensitized to avian tuberculosis in this manner do not react positively to bovine tuberculins.

Referring to the longevity of avian tuberculosis germs in barnyard soils, it is pointed out that both pigs and chickens will contract avian tuberculosis from contaminated barnyard soils after North Dakota winter weather exposure.

With reference to the susceptibility of young chicks to avian tuberculosis, it was found that chicks 4 to 10 weeks of age in constant cohabitation with tuberculous birds from 1 to 5 months developed less than 1 per cent of tuberculous infections. Chicks can be quite readily infected by feeding relatively large quantities of avian tuberculous organs or culture.

Rats fed upon fowl organs infected with avian tuberculosis transmit the disease to healthy chickens through their droppings.

Cattle can be sensitized to avian tuberculosis either through the scarified skin or by simple installation into the conjunctival sac of the eye by 0.0001 mg. of the culture.

With regard to control of this form of tuberculosis in farm flocks, it is stated that work continued over a period of several years in the testing of flocks with annual and semiannual tuberculin tests shows that while it is possible to reduce the infection and loss materially it is impracticable in eradicating the disease.

Blackhead in turkeys, A. F. SCHALK, L. M. RODERICK, and H. L. FOUST (*North Dakota Sta. Bul. 217 (1928), p. 96*).—A mixture of 1 lb. of tobacco dust with 16 lbs. of ground grain fed in mash daily has been used cooperatively in over 30 farm flocks for the last 3 years in combating blackhead. The feeding begins when the poults are a few days old and is continued 4 or 5 months and

in many cases to market time. In more than one-half of the flocks there has been no loss of birds, and in no year has the loss exceeded an average of three birds per flock.

An acanthocephalid, Plagiorhynchus formosus, from the chicken and the robin, M. Jones (*Jour. Agr. Research [U. S.], 36 (1928), No. 9, pp. 773–775, figs. 2*).—The author records the occurrence of this acanthocephalid in the small intestine of a chicken collected at Vineland, N. J. *Gallus domesticus* is considered an accidental host, although the parasite was later collected from a cockerel. It is also recorded from the robin, another new host, three specimens having been collected from a robin found paralyzed on the poultry farm at Vineland from which the infected chicken had come. A brief description is given of the specimens and comparison made with the type material. The species has previously been recorded from the flicker, collected at Bowie, Md., and from the crow at Washington, D. C.

It is pointed out that what is at first an accidental and economically unimportant transfer of a parasite of wild birds to poultry in time may result in the parasite's adaptation to the new host and its subsequent widespread distribution. Such an adaptation has happened with such economically important parasites as *Thysanosoma actinioides, Fasciola magna, Oesophagostomum columbianum,* and other worms.

AGRICULTURAL ENGINEERING

[Agricultural engineering studies at the Nebraska Station] (*Nebraska Sta. Rpt. [1927], pp. 8, 9*).—The progress results of studies on poultry house ventilation and construction indicate that the addition of neither a small house fan nor an exhaust fan to the ventilation system resulted in increased egg production. There was a general falling off of egg production in all houses during extremely cold weather and only a slight increase where houses were artificially heated.

Brief data are also reported on the farm use of wind-driven electrical plants.

[Agricultural engineering studies at the North Dakota Station], R. C. Miller (*North Dakota Sta. Bul. 217 (1928), pp. 63–75, figs. 14*).—Progress results of various agricultural engineering studies are reported.

In experiments with rammed earth in which tests were made of rammers, forms, and thickness of layers, it was found that wedge-shaped rammers gave the most uniform wall. The flat rammer tended to harden the top crust and leave the lower part of the layer of much looser consistency. Placing only thin layers, from 1 to 2 in. thick, in the form at one time gave a much more uniform wall than where thicker layers were used. The addition of sand up to 25 per cent greatly reduced the checking of blocks when drying. About 12 per cent of moisture in the soil seemed to form a good consistency for packing.

In trench silo investigations the results indicated that whole bundle corn can be stored successfully in trench silos. Silage was preserved satisfactorily through a summer season. It was found that in a drought year a trench silo large enough to hold several years' feed supply was successful in providing silage when no other feed was available.

In horse pulling investigations shod horses in several cases pulled 200 lbs. more than when barefooted. The use of too tight collars was found to be a common fault in fitting harness.

Detailed data are also given on portable cots for hogs, roughage roll-in, bee housing, grain cleaning tests, and the use of combine harvester threshers.

The development of water supplies for irrigation in Nevada by pumping from underground sources, F. L. Bixby and G. Hardman (*Nevada Sta. Bul. 112 (1928), pp. 38, figs. 16*).—This bulletin presents general information concern-

ing the pumping of water from wells for irrigation in southern Nevada. The material is nontechnical in character, being more a statement of the general principles governing the development of underground water supplies.

Progress in earth wall construction, J. D. LONG (*Agr. Engin., 9 (1928), No. 6, pp. 183–185, figs. 5*).—The progress results of studies being conducted at the California Experiment Station on earth wall construction are presented and briefly discussed, together with a summary of the results of similar work elsewhere.

The California experiments indicate that heavy clay soils, particularly adobe and gumbo soils, are not suitable in any method of earth wall building unless mixed with sand or some lighter soil to counteract their tendency to excessive shrinkage.

In specimens from six soil series which were mixed to various moisture contents and tamped damp into the molds, the mean unit compressive strength ranged from 60 to 785 lbs. per square inch. In but one series was the strength developed by the rammed earth specimens greater than that of specimens molded from a mud consistency.

Effect of pavement type on impact reaction, J. T. THOMPSON (*U. S. Dept. Agr., Public Roads, 9 (1928), No. 6, pp. 113–123, figs. 17*).—Studies are reported which indicate that bituminous pavements of the nonrigid type, such as surface-treated water-bound macadam, may substantially cushion the effect of impact forces.

Bituminous-surfaced pavements, such as sheet asphalt laid upon concrete bases, show, in general, some indications of cushioning impact forces, but the magnitude of this effect appears to be relatively small.

In general, the impact reactions of bituminous-surfaced pavements on rigid bases fail to show any marked or consistent change with changes in pavement temperatures up to 106° F. The permanent deformation due to successive impact forces upon bituminous-surfaced pavements on rigid bases increases only slightly with increasing temperatures up to 106°. The limited tests of nonrigid types, however, show a marked tendency toward greater permanent deformations with increasing temperatures. The impact reactions of bituminous-surfaced pavements on rigid bases show no tendency to increase as the section becomes more compact, due to repeated impact blows.

Within the range of thicknesses studied, impact reactions of uncovered concrete pavements do not appear to be affected materially or consistently by variations of slab thickness.

Brick types in which the brick wearing surface was bituminous filled and rested upon a sand or sand-cement bedding course on a concrete base show no marked tendency to cushion impact forces. The reactions of brick types with plain sand bedding are practically the same as those of types using sand-cement bedding. The results with the impact machine were confirmed by tests with a motor truck equipped with an accelerometer.

Public Roads, [July–August, 1928] (*U. S. Dept. Agr., Public Roads, 9 (1928), Nos. 5, pp. 93–112+[2], figs. 12; 6, pp. 113–128+[2], figs. 18*).—These numbers of this periodical contain the status of Federal-aid highway construction as of June 30 and July 31, 1928, respectively, together with the articles following:

No. 5.—The Effect of the Length of the Mixing Period on the Quality of the Concrete Mixed in Standard Pavers, by J. L. Harrison; and Lip Curb for Concrete Pavement, by St. C. T. Thomas.

No. 6.—Effect of Pavement Type on Impact Reaction, by J. T. Thompson (see above); Truck Is a Big Factor in Fruit Transport; and The Design of Pavement Concrete by the Water-Cement Ratio Method, by F. H. Jackson.

The combine, J. G. Taggart (*Canada Expt. Farms, Swift Current (Sask.) Sta. Rpt. Supt. 1927, pp. 18–23, fig. 1*).—The results of experiments with the combine during 1927 are briefly reported. It was found that in general the combines worked well in heavy, lodged crops. Crops that were partially destroyed by hail or frost were harvested economically by the combine when otherwise the cost of harvesting and threshing would have amounted to more than the gross return.

In experiments with a heavy crop with a rank growth of straw which was twisted, tangled, and lodged, the combine-harvested portion yielded 36.02 bu. per acre and the binder-harvested portion 30.3 bu. With a crop which was short, thin, and low, due to ravages of wireworms, it was impossible to harvest cleanly with the combine.

A study of experience with 770 combines in western Canada during 1927 showed that unfavorable weather was the principal factor interfering with their continued operation.

The most noteworthy development in the use of the combine was the introduction of the swather attachment. The object of this attachment is to eliminate a portion of the waiting period between binder harvesting and combine harvesting. The crop is cut and laid in swaths, each of which contains the straw and heads of a strip from 16 to 24 ft. wide. The cutting mechanism may be either the combine knife and a table or one or more headers. Threshing is performed by means of the combine equipped with a special pick-up device.

It was found that a crop containing a quantity of green weeds could be better harvested by the swather than by the straight combine.

Cutting ensilage with electric motors, E. A. Stewart (*Agr. Engin., 9 (1928), No. 6, pp. 175–179, figs. 3*).—In part 1 of a contribution from the Minnesota Experiment Station a discussion is presented of elevation theory and practice. Part 2 reports the details of tests on the cutting of silage with electric motors.

Turretfield automatic sheep-feeder, F. E. Waddy (*So. Aust. Dept. Agr. Bul. 213 (1927), pp. 7, figs. 5*).—An automatic sheep-feeder, developed at the Turretfield Demonstration Farm in South Australia, is described and illustrated.

Farm buildings, W. A. Foster and D. G. Carter (*New York: John Wiley & Sons; London: Chapman & Hall, 1928, 2. ed., pp. XVIII+358, figs. 300*).—This is the second edition of this book (E. S. R., 47, p. 91), which has been rewritten and reset and the subject matter revised to conform to the newer knowledge in the field of farm structures. Many chapters have been entirely rewritten. Chapters are now included on plan drawing, farmstead planning, wood and frame building materials, cement and concrete, other masonry materials, cost estimating, farm building construction, framing and roof construction, mechanics of farm buildings, poultry houses, hog houses, hog-house sanitation, storage buildings, silos, implement and machine shelters, farm barns, the dairy barn, the horse barn, other special-purpose barns, general-purpose barns, ventilation, the farm home, built-in equipment and home utilities, planning the farmhouse, farmhouse construction, specifications and codes, and reference tables for farm-building design.

The appendix includes a selected list of references.

RURAL ECONOMICS AND SOCIOLOGY

Cost accounting applied to agriculture, J. S. King (*London: Oxford Univ. Press, Humphrey Milford, 1927, pp. XIII+182*).—Chapter 1 (pp. 1–45) discusses the methods of cost accounting and the use of cost accounting data from the standpoint of the farmer. Chapter 2 (pp. 46–78) discusses the limits within

which such data may be applied for comparative purposes in affording some criteria by which farmers may judge the efficiency of their organization and for providing information as to comparative costs under different systems and scales of farming. The conclusion is reached that the determination of the individual product cost is not the avenue of approach to the analysis of the farm business.

Chapter 3 (pp. 79–173) makes suggestions as to how the farmer may obtain and use cost data in making adjustments within his present farming system and in adapting his practices to new conditions. An appendix (pp. 174–177) includes the rules drawn by the Agricultural Economics Committee of the Ministry of Agriculture of Great Britain for the guidance of agricultural accountants.

Farm budgeting, J. B. HUTSON (*U. S. Dept. Agr., Farmers' Bul. 1564 (1928), pp. II+22*).—The method of procedure in making a farm budget, including forms, and the use of such budgets in formulating future farming plans are described. The information needed in making a budget and some of the sources of such information are listed.

Taxation and the farmer: A selected and annotated bibliography, compiled by M. T. OLCOTT (*U. S. Dept. Agr., Bur. Agr. Econ., Agr. Econ. Bibliog. 25 (1928), pp. V+190*).—This is a mimeographed selected and annotated bibliography of books, reports, and articles published from January 1, 1900, to March 31, 1928, on taxation directly affecting the farmer. For the United States, only State and local taxation is considered. Many references to administration and expenditure of taxes, some to school finances, reports of special tax commissions, descriptions of the tax systems, and reports of State tax commissions are included. References to State income and inheritance taxes in the United States, forest taxation, land valuation, and popular articles are omitted. Some references to articles in farm papers are given in a special section.

Report of the committee on land settlement in Scotland, J. G. NAIRNE ET AL. (*Edinburgh: Govt., 1928, pp. 83*).—This is the report of the committee appointed by the Secretary of State for Scotland in May, 1927, to inquire into the settlement of small holders under the Small Landholders and Land Settlement (Scotland) Acts. A brief history of the legislation, the committee's findings as to the cost and the economic and social value of the settlement of small holdings, the defects in the procedure under the acts, and the committee's recommendations are included.

Appendixes give statistics and suggested amendments to the Small Landholders (Scotland) Act, 1911, and the Land Settlement (Scotland) Act, 1919.

The agricultural situation in California (*Calif. Agr. Col. Ext. Circ. 18 (1928), pp. 30, figs. 9*).—This circular "reproduces, as faithfully as possible, the addresses delivered at the economic conferences held in connection with the visit of the demonstration train, known as the 'California Agriculture Special,' to 24 communities of the interior valleys of California during the last two weeks in March, 1928."

It includes the following sections: The Fruit Situation, by H. R. Wellman, W. L. Howard, and R. W. Hodgson (pp. 3–13); The Livestock Situation, by E. C. Voorhies, G. H. Hart, and C. M. Haring (pp. 13–20); Remedies and Adjustments, by R. L. Adams, C. F. Shaw, and F. Adams (pp. 20–25); and Local Progress, by C. W. Rubel, L. B. Smith, and T. C. Mayhew (pp. 26–30).

[Investigations in agricultural economics at the North Dakota Station, 1925–1927], R. E. WILLARD, O. M. FULLER, G. P. WOLF, and G. G. GARDNER (*North Dakota Sta. Bul. 217 (1928), pp. 81–84*).—Besides investigations previously noted, indexes of North Dakota farm prices were compiled. Tables are given showing for 1926 the index numbers for the United States and for North

Dakota (average 1910–1914=100) of the prices of wheat, flax, oats, barley, rye, potatoes, cattle, hogs, sheep, lambs, wool, butterfat, chickens, and eggs. The North Dakota indexes for the crops varied from 82 to 274, being 152 for all 6, and those for livestock and livestock products from 121 to 204, being 145 for the 8. The index for all 14 products was 150, as compared with 136 for the United States. The index of prices for things bought by farmers in 1926 (including wages and taxes) was 167.

From 1920 to 1925 the volume of production per farm in North Dakota increased 2.9 per cent for cash grain and 35 per cent for livestock production.

Preliminary report on a study of cattle production costs in Nevada, C. A. BRENNEN and G. H. SMITH, JR. (*Nevada Sta. Bul. 111 (1928), pp. 14, figs. 3*).—This is a statement of the character and purposes of a study of the cost of producing cattle on ranch and range in Nevada, with an analysis of the factors that influence costs and profits. An illustrative application of these factors to a theoretical herd is included.

The economics of hog production, F. B. HEADLEY (*Nevada Sta. Bul. 114 (1928), pp. 29–46, figs. 12*).—Included are a series of 11 charts, based on results noted on page 867, for use in calculating feed and labor costs of gains of pigs with different rations.

Survey of the wheat situation, December, 1927, to March, 1928, M. K. BENNETT ET AL. (*Wheat Studies, Food Research Inst. [Stanford Univ.], 4 (1928), No. 6, pp. [1]+235–267, figs. 5*).—This is a continuation of a survey previously noted (E. S. R., 59, p. 484), and includes a study of the supply and demand for the crop year, international trade, marketing and stocks, wheat price movements, prospects for 1928 crops, and the outlook for trade, prices, and carry-overs.

The movement of Iowa's commercial corn and oats, R. C. BENTLEY (*Iowa Sta. Bul. 252 (1928), pp. 329–383, figs. 10*).—Tables and charts are included showing for corn for the crop years 1923–24 to 1926–27, inclusive, and for oats for the crop years 1924–25 to 1926–27 the total Iowa crop and amount of shipments by rail from the counties where grown; the production, shipments, receipts, and the net shipments and receipts by counties by years; the monthly shipments and receipts for the State and by counties (only shipments shown for oats) for the period; and the shipments to Iowa manufacturing plants, to Chicago, and to other points.

The shipments by rail from counties where grown varied from 13.2 to 18.8 per cent of the total crop for corn, and from 27 to 31 per cent for oats. In 1924–25 and 1925–26, 32 and 22 per cent, respectively, of the shipments of corn went to Iowa industrial plants, 36 and 28 per cent to Chicago, and 32 and 50 per cent to other points. The shipments received at local Iowa points for feeding were 23 and 3 per cent, respectively, of the total shipments. For the same period 20 and 27 per cent, respectively, of the total shipments of oats went to Iowa industrial plants, 27 and 18 per cent to Chicago, and 53 and 55 per cent to other points.

Of the corn shipped out of the counties where grown, 85 per cent was produced in one-third of the counties, chiefly in the central and northwestern part of the State. On the basis of the time of marketing corn, the State was found to be divided into three fairly distinct groups. The largest surplus oat area was found to center in the same counties covered by the surplus corn area, oats being primarily a cash crop in the north-central part of the State. The time of marketing oats did not vary in the different sections of the State.

Judging price risks in marketing wheat, R. M. GREEN and E. A. STOKDYK (*Kans. Agr. Col. Ext. Circ. 54 (1927), pp. 31, figs. 7*).—The various factors affecting the price of wheat are discussed. Graphs and tables based on the high prices of No. 2 hard winter wheat at Kansas City are included showing the

average monthly prices for the period 1893–1923, and for 13 of the 34 years when July prices were below and for 21 years when the July prices were above September or October prices; for the same periods the number of times the highest nominal price in any month was higher than that in the preceding month; and similar data by 10-day periods for 6 years when July prices were below and 9 years when July prices were above September or October prices.

The price trends, 1892–93 to 1923–24, show that the usual periods of strong markets were in the middle of July, middle of September, middle of October, late December, January, and the middle of April, and the periods of weak markets in late July, August, late October, early December, February, March, late May, and June.

In the 21 years in which the July price exceeded the September or October price, the July price was higher than the January price in 16 years and the following May price in 14 years. In the 13 years when the September or October prices were the higher, the July price was exceeded by the January price and the following May price in 11 years.

Tables comparing the unweighted average of monthly Kansas City prices with the yearly price estimated for the 17 years of downward price tendencies on the basis of the August-September average and for the 13 years of upward price tendencies on the basis of October-November-December-January average showed errors in the estimated prices of from 0 to 12.9 per cent, averaging 4.2 per cent, and from 0 to 10.7 per cent, averaging 4.3 per cent, respectively.

Graphic charts of commodity prices and shipments of principal [Florida] agricultural products ([*Jacksonville*]: *Fla. State Marketing Bur., 1928, pp.* [2], *pls. 44*).—Charts indicating the different markets by colors are presented showing daily the highest average range of prices for beans, cabbage (except 1921–22), celery, cucumbers, eggplants, lettuce (except 1926–27), peas (except 1921–22 and 1926–27), peppers, No. 1 white potatoes, strawberries, tomatoes, and watermelons (tables for 1923–24 and 1924–25) for the seasons 1921–22, 1923–24, 1924–25, and 1926–27; and for grapefruit and oranges for the season 1926–27. The markets considered are Boston, Chicago, Cincinnati, New York, and Philadelphia for all years, Baltimore, Pittsburgh, and St. Louis for all years except 1921–22, Washington for 1923–24 and 1924–25, and Cleveland for citrus fruits for 1926–27. The number of markets considered varied for the different products and for the same product for different years.

The 1923–24 and 1924–25 charts include symbols showing daily various factors affecting or explaining the quotations for each market. The 1924–25 and 1926–27 charts show the daily shipments from Florida and competing States. The 1926–27 charts also include tables showing the average monthly and seasonal prices and the highest and lowest price periods for that season, and the general average price and the highest and lowest price periods for the four seasons.

A chart showing the monthly wholesale average prices of hens, fryers, and white eggs on the Jacksonville market, 1921–1926, with a table showing the yearly averages of the prices, is also included.

Crops and Markets, [July, 1928] (*U. S. Dept. Agr., Crops and Markets, 5 (1928), No. 7, pp. 225–272, figs. 6*).—The usual tables, charts, reports, and summaries are given. Special articles are included on the pig survey, June 1; the hog outlook, July, 1928; farm returns, 1927; and income from agricultural production of the United States, 1927–28.

The article on farm returns, 1927, includes tables showing for the United States and by geographic divisions the size of farm, value of farm property, receipts by items, cash outlay by items, increase in inventory of personal property, interest paid, expenditures for farm improvements, value of food

produced and used on the farm, value of family labor, changes in the value of real estate during the year, and percentage of farmers having incomes of various amounts. The tables are based on reports of 13,859 owner-operators, and comparisons are made with the years 1922 to 1926 for the United States and with 1926 for the geographic divisions.

The article on income from agricultural production in the United States includes tables and charts showing for 1919–20 to 1927–28, inclusive, the gross value of farm production; gross income, total and by groups of commodities; net income available for capital invested; rates of return earned on all capital and rates received by the various owners of capital; reward per family for labor and management; income per farm; wage earnings of farmers, farm hands, and factory employees; net income per farm family, farm wages, and earnings per factory employee; and distribution of gross income from agricultural production.

"Considering the farm operations as a business enterprise, it appears that the average farmer earned as a reward for his capital and management during 1927–28 about 3.4 per cent on the market value of his capital."

Standardization of farm products, L. S. TENNY (*Ann. Amer. Acad. Polit. and Social Sci., 137 (1928), No. 226, pp. 205–212*).—A description is given of the work and methods of the Bureau of Agricultural Economics, U. S. D. A., in the standardization of farm products. The essentials of the standards for different kinds of products are included.

Agricultural standardization on the Pacific coast, P. E. HOLDEN (*Ann. Amer. Acad. Polit. and Social Sci., 137 (1928), No. 226, pp. 107–114*).—A brief description is given of the development, establishment, and results of standardization in harvesting, grading, packing, shipping, and marketing agricultural products in the Pacific coast section of the United States.

Special interest groups in rural society, J. H. KOLB and A. F. WILEDEN (*Wisconsin Sta. Research Bul. 84 (1927), pp. 110, figs. 30*).—This bulletin reports the results of a study of rural group organization on the basis of special interests present in contrast with former studies of locality relationships (E. S. R., 46, p. 894). The unit chosen for this study was the formal, organized, or intentional group. A case history study was made of 351 special interest organizations in Burnett, La Crosse, Racine, Rock, and Walworth Counties, Wis., an exhaustive study being made of all country organizations in the first three counties and less intensive work on representative samples in the other two counties. Organizations in villages of 800 population or less were included if essentially farm groups, and in every case in villages of 300 or less, and 75 per cent of the membership of the organizations studied probably lived in the open country.

The groups were classified into 12 interest classes as follows: Social enjoyment, better farming, help school and teacher, better business, young people's interests, health and social welfare, home improvement, public and civic affairs, general community betterment, unite locals, mutual improvement, and help church and preacher. The 12 interest classes occurred in 8 monofunctional forms and 49 different combinations, some being bi- and others tri-functional. Social enjoyment was recurrent in 7 of the 10 most frequent forms. Of all the organizations studied 24.8 per cent were inactive, the highest percentages being in the young people's interests class 56 per cent, better farming, better business, and social enjoyment from 21 to 25, and home improvement 17 per cent.

The characteristic structures and processes of the groups as a whole are analyzed and discussed. Graphs and tables are included showing for all organizations and for different groups the purposes for organizing; sources of

original motivation, actual promotion, and guidance and inspiration; occupation and sex of officers; membership, membership requirements, and attendance and participation of members and nonmembers; frequency, general nature, and place of meetings; features of programs and social periods; principal projects; accomplishments reported; present and future plans; difficulties and problems; changes since organization; length of life of organization; and the relations of certain factors to other factors.

Of the organizations reporting on the several questions, 90 per cent reported that sources of original motivation were outside the community; 59 per cent that sources of original promotion were by local farmers, 30 per cent by the agricultural extension service, and 25 per cent by local teachers; and almost 100 per cent reported that the sources of guidance and inspiration came from local people, the officers being indicated in 67 per cent of the organizations. The mode for size of membership was from 20 to 40 members, and the average 62. Of the membership only 53 per cent attended meetings on an average, only 42 per cent participated during the year in programs and other activities, and 30 per cent of the attendance and participation in meetings was by nonmembers. Sixty-nine per cent of the organizations had constitutions and by-laws.

The modal length of life of all organizations was found to be 2 years or less, over one-third falling in this group. Over one-half of the organizations had a life of 5 years or less. The mean life was 6.8 years, being 4 years for the 87 inactive and 7.4 years for the 264 active organizations. About 50 per cent of all the organizations had made changes during their existence in their organizations, activities, projects, etc. The mean length of life for those making changes was 9.2 years, as compared with 5 years for those making no changes. Only about one-fifth of the inactive organizations had made any changes. A high degree of relation existed between length of life of the organizations and the number of projects and the length of life and attendance, there being an average of 2, 2.4, and 2.6 projects, respectively, for the age groups of 3 years or less, 4 to 6 years, and 7 years or over; and an average of 2, 2.6, and 3 projects, respectively, for the organizations having an average attendance at meetings of 30 or less, 31 to 60, and 61 and over.

The distinguishing characteristics of the 7 classes of groups occurring most frequently are also discussed.

The natural life cycle of interest groups appears to consist of a period of rather hurried stimulation, one of rapid rise, and a rather lengthy carrying-on period varying in degrees of intensity of interest and support, followed by a period of decline occurring rather abruptly in some cases but most frequently being rather gradual and resulting in inactivity. The stimulation and rise of other groups were found to appear at any time, but usually can be expected at the first tendency of the old group to decline. Selected case histories are included to illustrate the more common processes going on in the lives of interest groups, how the more frequently occurring professional forms function, and the nature of inactive and active organizations.

The intergroup relations, forms, processes, and movements found are discussed. Of all organizations, 58.6 per cent attempted no relations with town people, but 27.5 per cent of town people took part on programs, and 39.3 per cent had no affiliations with other groups. In Burnett, La Crosse, and Racine Counties from 29.9 to 69.7 per cent, averaging 45 per cent, of the total population was included in the organizations studied. The mean area per active organization varied in these counties from 4.2 to 20.4 square miles, averaging 7.8 square miles, and the mean population from 127.5 to 227.5, averaging 172.1,

being roughly one organization for about 200 people and for each 10 square miles of area.

Methodology notes regarding the study as a whole and giving a synopsis of the field schedule used are included.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

Financing rural education, R. D. Baldwin (*Stevens Point, Wis.: Rural Service Press, 1927, pp. 210*).—This textbook on State school finance discusses the provisions in the several States for general aid to schools and special aid for the small school, consolidation, transportation and board, high schools, tuition of nonresident pupils, rural supervision, rural and consolidated buildings, and standard rural schools, and to stimulate teachers' salaries. The provisions for general aid are evaluated, and three plans suggested for State school financing.

Apportionment of State school funds.—IV, The Delaware plan, F. H. Swift (*Amer. School Bd. Jour., 77 (1928), No. 3, pp. 37–39*).—This article is the fourth of the series previously noted (E. S. R., 59, p. 487), and discusses the plan used in Delaware, the only State in the Union which endeavors to administer and support its schools as a single unit.

Geography of North America, G. J. Miller and A. E. Parkins (*New York: John Wiley & Sons; London: Chapman & Hall, 1928, pp. XV+605, figs. 296*).—This is a textbook for teachers' colleges, junior colleges, and senior high schools. The problem, topic, human-use regions, and other methods of preparing the subject matter have been used in different sections with a view to familiarizing students with different methods of attacking a problem and in organizing and presenting material. An introductory chapter on organizing geographic material and a selected list of references are included.

The potato: Its culture, uses, history, and classification, W. Stuart (*Philadelphia and London: J. P. Lippincott Co., 1928, 3. ed., rev., pp. IX+XV+518, pls. 5, figs. 267*).—This is a revised edition of the textbook previously noted (E. S. R., 48, p. 795). A job analysis of the potato enterprise for the use of instructors has been added.

Suggestions for teaching food-marketing courses, R. D. Blinks (*Jour. Home Econ., 20 (1928), No. 8, pp. 554–561*).—Suggestions are given for organizing and conducting a college course in food marketing. Specific details as to the organization of such a course in 123 colleges and universities were obtained from answers to a questionnaire sent out by the Iowa State College.

A bibliography for a marketing course is included.

Food industries, H. T. Vulté and S. B. Vanderbilt (*Easton, Pa.: Chem. Pub. Co., 1928, 5. ed., pp. X+367, figs. 84*).—This is the fifth edition of a textbook for high schools and colleges previously noted (E. S. R., 44, p. 660).

FOODS—HUMAN NUTRITION

Wheat flour and diet, C. O. Swanson (*New York: Macmillan Co., 1928, pp. XIII+203, pls. 9, figs. 10*).—Reliable information on the making of wheat flour and its place and importance in the diet is given in simple nontechnical terms with due emphasis on the deficiencies of wheat flour and the best means of supplementing these deficiencies. These points are discussed chiefly in the concluding chapters on the rational place of wheat flour in the diet and wheat flour in relation to health, which also include a discussion of the question of whole wheat v. white flour for bread making.

Experimental bread making with Arizona soft wheat flour, M. C. SMITH (*Jour. Home Econ., 20 (1928), No. 9, pp. 662–674*).—In this investigation at the Arizona Experiment Station the baking qualities of flour milled from the native Early Baart wheat were studied, first by obtaining information on the inherent baking strength of the flour by means of measurements of various physical and chemical factors and then by small and large scale baking tests, with adjustment of formulas to make allowance for certain factors noted in the preliminary study.

The values obtained for moisture, 12.53 per cent; percentage acidity, 0.098, calculated as lactic acid; ash, 0.61; crude protein, 9.84 per cent; absorption capacity of the dry gluten, 2½ times its weight of water; and reducing sugars, 180 mg. maltose per 10 gm. of flour, indicated that the flour should be ranked high as a soft wheat flour. A 0.1 suspension of the flour in water was found to have a relatively high buffer value, indicating the necessity of a relatively long fermentation period.

In the baking tests the straight dough method was first used. The mixing was done in an electric mixer, the dough fermented in Chidlow expansion jars in a thermostatically controlled electric cabinet, and the baking done in an evenly heated electric oven with thermostatic control. Humidity controls were provided at all stages of the bread-making process. The variations tested included proportion of water, percentages of yeast and sugar, and fermentation time. An absorption of 58 per cent was found to be the most satisfactory. Increasing the yeast from 2 to 6 and the sugar from 3 to 6 per cent resulted in a progressive increase in the volume of the bread, with corresponding increase in texture score up to the two richest formulas. Increasing the yeast without a corresponding increase in the sugar did not improve the quality of the bread. The most favorable concentrations were 4 per cent yeast and 6 per cent sugar.

Difficulty in reaching the optimum H-ion concentration of pH 5 in normal fermentation periods with the straight dough method led to a study of the possibilities in the sponge method, with superior results in both the volume and texture of the loaf. This was attributed to the more rapid increase in H-ion concentration in the slack sponge. A preliminary 2-hour sponge period, after which the dough was allowed to double its bulk twice before pan proofing, was adopted as the most satisfactory procedure.

Before applying the laboratory results to commercial practices additional experiments were carried out to determine the effect of various other factors. The substitution of local tap water for distilled water resulted in a smaller loaf volume and lowered acidity. With the use of a commercial flour improver it was found possible to shorten the fermentation period, but unless this period was very carefully controlled the results were not as good as without the improver. A high-speed mixer similar to that described by Swanson and Working (E. S. R., 55, p. 189) was tested with good results and a considerable saving of time.

In the large scale tests both the sponge method and the straight dough method, with the use of the flour improver, were tested with excellent results.

Breadmaking with Arizona Early Baart flour, M. C. SMITH (*Arizona Sta. Timely Hints for Farmers, No. 158 (1927), pp. 11, figs. 3*).—Practical directions, based upon the experimental work noted above, are given for the baking of bread in the home and in the commercial bakery from unblended Early Baart flour. The internal and external characteristics of a good bread made from this flour are described, with a score card for judging the quality of the finished loaf.

[Official methods for cooking meats], C. Leeby (*North Dakota Sta. Bul. 217 (1928), p. 85*).—In the development of standard methods for roasting rib of beef and leg of veal, the following recommendations have been made:

Beef ribs should be seared for 20 minutes at 275° C. and then roasted in an open pan at 125° to an internal temperature of 51° for rare, 61° for medium done, and 71° for well done. Veal should be seared at 275° for 15 minutes and roasted in a covered pan at 125° to an inner temperature of 71°. If a closed cooker is not used in roasting veal, it is recommended that after searing the surface of the roast be protected with a covering of fat meat such as salt pork or bacon or with a coating of dough.

The thirty-second report on food products and the twentieth report on drug products, 1927, E. M. Bailey (*Connecticut State Sta. Bul. 295 (1928), pp. 305–355*).—This annual report (E. S. R., 57, p. 591) contains, in addition to the usual routine analyses of foods and drugs, a special report on denicotinized tobacco noted elsewhere in this issue (page 831) and one on Cod Liver Oil by E. M. Bailey, H. C. Cannon, and H. J. Fisher. The latter contains a comparison of the vitamin A potency of several samples of cod-liver oil as determined by the U. S. Pharmacopoeia biological method and by a colorimetric method adapted from that of Carr and Price (E. S. R., 56, p. 10).

The color values checked closely on repeated tests, and a sample of a cod-liver oil extract shown by the feeding test to have a very low vitamin A value gave a negative color test. In general the higher color values were associated with higher vitamin A potencies, but the correlation was not entirely consistent. Two samples each with color values of about 5 gave vitamin A values of 250 and 500 units, respectively. In the opinion of the authors "it is premature to conclude that color tests thus far devised may be relied upon as indices of the relative concentration of vitamin A in cod-liver oil."

The nature of the foodstuffs oxidized to provide energy in muscular exercise.—II, In the phlorhizinized animal, D. Rapport and E. P. Ralli (*Amer. Jour. Physiol., 85 (1928), No. 1, pp. 21–32*).—Continuing the investigation previously noted (E. S. R., 59, p. 391), the authors have observed the metabolism of three female dogs made progressively diabetic with phlorhizin in order to determine whether a similar parallelism between metabolism in exercise and in rest obtains in the phlorhizinized animal, in which there is a slowly developing interference with sugar oxidation, as in the normal animal. Following the same technique as in the first study, observations were made of the respiratory quotient of phlorhizinized dogs in rest and in exercise, the experiments being performed following the administration of glucose.

In two of the three animals there was a close correspondence between the respiratory quotients in rest and in exercise, both showing a lowering of the capacity to oxidize sugar, but in the third animal the respiratory quotient of exercise was lower than that of the resting metabolism, approaching the theoretical value for fat.

"The results indicate that in the phlorhizinized animal, even though a hyperglycemia exist, there is a diminution in the oxidation of carbohydrate by the organism as a whole, the muscles sharing in this to at least an equal degree. Under these circumstances the fuel requirement in both rest and exercise is provided by the oxidation of fat to a greater extent than in the normal animal."

The amino-acid content of the blood of children in health and in disease, S. H. Edgar (*Biochem. Jour., 22 (1928), No. 1, pp. 168–172, figs. 2*).—Included in this paper are data on the amino acid content of the blood of 16 normal children (6 girls and 10 boys) between 10 and 13 years of age. The blood samples were drawn before breakfast from the basilic vein into oxalated tubes, and tung-

stic acid filtrates prepared by the Folin-Wu method for determinations by the Folin volumetric method (E. S. R., 47, p. 410).

The minimum, maximum, and average values obtained were 6.08, 9.52, and 8.32 mg. per 100 cc. of blood. These results are higher than those reported by Hoeffel and Moriarty, who employed the same method (E. S. R., 51 ,p. 265), and also than the figures reported in the literature for adults. A study of the principles of the method reported elsewhere (see page 806) has led to the conclusion that the results obtained by this method, although they may not be reliable as an absolute measurement of amino acids in a given sample of blood, are trustworthy for comparisons with other data obained under identical conditions.

Response of high protein diets and unilateral nephrectomy during reproduction in the rat, H. T. Parsons, A. H. Smith, and T. S. Moise (*Soc. Expt. Biol. and Med. Proc., 25 (1928), No. 8, pp. 681–683*).—This is a preliminary report of an investigation undertaken to determine the extent to which the task of excretion of nitrogen could be increased by simultaneous reduction of kidney tissue, reproduction with lactation, and high protein intake. The procedure followed consisted in performing unilateral nephrectomy on adult female rats, placing them immediately on the experimental rations, and mating them as soon as the oestrous cycle was reestablished.

Comparisons were made with nephrectomized control rats on low protein diets, some of the animals being killed after weaning of their first litters and others after 2 or 3 matings. The observations reported include the weights of litters at birth and weaning, the extent of renal enlargement calculated on the basis of increase in weight of the remaining (left) kidney over the normal kidney weight corresponding to the actual heart weight, blood urea determinations, and evidence of renal lesions. The high protein diet contained from 72 to 86 per cent, and the low protein 20 per cent of casein or cooked and dried egg albumen.

The degree of renal enlargement ranged from 219 to 29 per cent in the animal on the protein-rich diet and from 58 to 7 per cent in those on the low protein diet. The chief cause of variation aside from the protein content appeared to be the demands of lactation. The length of time on the ration after nephrectomy, the age of the animal, and gestation unaccompanied by lactation were of negligible effect.

The values for blood urea rose from a normal of from 23 to 44 mg. per 100 cc. to from 60 to 70 mg. during lactation on the low protein diet and from 66 to 130 mg. during pregnancy to as high as 188 mg. during lactation on the high protein diet, these changes being independent of the changes in blood concentration in general.

A few of the rats which had been subjected to the greatest reproductive strain and which were given the high protein diet for periods varying from 106 to 187 days showed renal lesions.

Iron in nutrition, V–VII (*Jour. Biol. Chem., 77 (1928), No. 2, pp. 769–775, 777–795, figs. 6, pp. 797–812, figs. 7*).—In continuation of the series previously noted (E. S. R., 57, p. 194), three studies are reported. In the first of these the authors had the cooperation of B. M. Riising and the second and third of E. Van Donk and Riising.

V. *The availability of the rat for studies in anemia,* J. Waddell, H. Steenbock, C. A. Elvehjem, and E. B. Hart.—It has been found possible to produce profound anemia in young rats in from 6 to 8 weeks by feeding them only whole cow's milk ad libitum. During this time the hemoglobin content of the blood is reduced from 10.83 gm. per 100 cc. to 4 gm. or less. The ease with which anemia is thus produced in the first generation is attributed in part

to the fact that the ration of the stock females (E. S. R., 50, p. 765) contains nothing in the way of table scraps or vegetable refuse and includes considerable quantities of whole milk. The milk used in the production of anemia came from a group of cows receiving wheat straw as their only roughage and a grain mixture composed of wheat and wheat gluten. In a few experiments mixed milk from the college dairy herd was given with essentially the same results.

VI. *Iron salts and iron-containing ash extracts in the correction of anemia*, J. Waddell, C. A. Elvehjem, H. Steenbock, and E. B. Hart.—It has been found impossible to increase the hemoglobin level of the blood of young rats rendered anemic as noted above by the administration of pure inorganic salts of iron (chloride, sulfate, acetate, citrate, and phosphate) in amounts furnishing 0.5 mg. of iron per rat per day. The ashed residues from dried beef liver, dried lettuce, and yellow corn, or the acid extracts of these materials, when fed at such a level as to introduce the same amount of iron as that furnished by the iron salts were, however, very effective in curing the anemia.

VII. *Copper as a supplement to iron for hemoglobin building in the rat*, E. B. Hart, H. Steenbock, J. Waddell, and C. A. Elvehjem.—An explanation of the results reported in the previous study has been found in the discovery that copper in minute amounts is capable of supplementing ferric chloride, in itself ineffective in the regeneration of hemoglobin. Following this it was demonstrated that the ash of liver extract prepared by the method of Cohn et al. (E. S. R., 58, p. 92) contains 0.016 per cent of copper. These results are thought to point to the necessity of copper for the effective utilization of iron in hemoglobin building.

Copper in nutrition (*Jour. Amer. Med. Assoc., 90 (1928), No. 23, pp. 1872, 1873*).—In this editorial discussion of the significance of the above-noted discovery of the association of copper with iron in the prevention and cure of simple nutritional anemia, a warning is sounded against unwarranted generalizations concerning copper as a cure for all anemias.

The arrest of dental caries in childhood, J. D. Boyd and C. L. Drain (*Jour. Amer. Med. Assoc., 90 (1928), No. 23, pp. 1867–1869*).—In the routine examination of patients in the dental division of the children's clinic at the State University of Iowa College of Medicine, it was noted that the 28 children who for 6 months or more had been under careful dietary treatment for diabetes (E. S. R., 56, p. 92) showed arrested caries, although 82 per cent of them had shown definitely progressive caries before the dietary treatment. These findings are considered of significance in indicating the dependence of dental caries in children on recent dietary inadequacies, and the possibility of checking or preventing caries by adequate diets such as are used in the authors' system of dietary control of diabetes.

Growth studies of children with diabetes mellitus, J. D. Boyd and M. V. Nelson (*Amer. Jour. Diseases Children, 35 (1928), No. 5, pp. 753–761, figs. 2*).—Observations are reported on the height and weight gains for periods of from 3 months to 4.5 years in 32 diabetic children who had been under diabetic control for some time before the first measurements were taken and had followed the dietary régime established by the authors (E. S. R., 56, pp. 92, 93). The gains were compared with standards recommended by Baldwin, using as values for the preschool children those of the younger children, and for children over 6 years of age the Horace Mann School measurements. From these values the deviations in months of the predicted chronological age from the patient's actual age and of standard weight for height from the actual weight were calculated.

In the entire group the average deviations in age and weight at the beginning were +3.4 months and —4.0 per cent, respectively, and at the end +4.7 months

and +5.8 per cent, respectively, thus showing that the growth response of these diabetic children was greater than that of the so-called superior groups of nondiabetic children. This is attributed to the careful dietary management

Anhydraemia in rats suffering from lack of what has been called vitamin B, W. B. Rose and C. J. Stucky (*Soc. Expt. Biol. and Med. Proc., 25 (1928), No. 8, pp. 687, 688*).—It is noted in this preliminary report that adult rats on a vitamin B-deficient diet and control rats receiving on an average the same amounts of food and water as were consumed by the rats on the vitamin-deficient diet showed corresponding increases in hemoglobin followed by a distinct drop on the return to the normal diet. These results and similar data obtained on dogs are thought to indicate that diminished food and water consumption during vitamin B deficiency is responsible for the observed anhydremia.

Gastric motility in relation to anhydraemia, W. B. Rose and C. J. Stucky (*Soc. Expt. Biol. and Med. Proc., 25 (1928), No. 8, p. 688*).—The anhydremia noted above has been found in dogs to be accompanied by complete gastric atony, which is relieved by liberal administration of water.

Relation of vitamin "B" to infection and immunity with special reference to Bacillus welchii, W. B. Rose (*Soc. Expt. Biol. and Med. Proc., 25 (1928), No. 8, pp. 657, 658*).—In this preliminary report it is noted briefly that the immunity of dogs to *B. welchii* can be raised or lowered at will by alterations in the vitamin B content of the diet. Chronic inanition as the cause of the lowered resistance has been ruled out by the demonstration that the immunity is lowered on diets containing sufficient vitamin B to maintain the appetite and some gain in body weight, but not on diets furnishing optimal amounts of the vitamin.

Vitamin requirements of nursing young.—II, The production of beriberi in the nursing young (Mus norvegicus albinus) associated with hemorrhages, B. Sure and S. J. Schilling (*Amer. Jour. Diseases Children, 35 (1928), No. 5, pp. 811–822, fig. 1*).—In continuation of the investigation previously noted (E. S. R., 58, p. 195), the authors, with the technical assistance of D. J. Walker, have made a further study of the effect of inadequacy of vitamin B on fertility and lactation, particular attention being paid to the symptoms of this deficiency in the nursing young—the quantity of milk in the stomach and the appearance of hemorrhagic conditions in various parts of the body. With six comparable rations varying only in their content of defatted wheat embryo as the source of vitamin B, feeding experiments were conducted on 18 female rats for a period of 244 days, during which time 30 litters consisting of 258 young were under observation.

The smallest amount of wheat embryo, 10 per cent, furnished sufficient vitamin B for good growth, but lactation was inadequate on the levels up to 30 per cent of the ration.

In the young on deficient diets partial to complete loss of control of the rear limbs was observed with great regularity. The stomachs of 32 out of a total of 35 young were found to be well distended with curd, thus indicating that the failure of lactation was due to poor quality rather than deficient quantity of milk.

Hemorrhagic conditions were present in the osteogenetic tissues along the junctures of the cranial and facial bones and in the interior structures of the tibias, femurs, vertebrae, sternum, digital bones, and ribs, the most common seat of disturbance being along the junctures of the cranial and facial bones and in the tibias and femurs. Hemorrhages in the internal organs were also encountered, but with less regularity than in the bones.

Beriberi ("maladie des jambes") in Louisiana, L. C. Scott and G. R. Herrmann (*Jour. Amer. Med. Assoc., 90 (1928), No. 26, pp. 2083–2090*).—A description is given of a nutritional disturbance frequently encountered among the rice farmers of Louisiana and known locally as maladie des jambes. This seems to be identical with the wet type of beriberi in oriental countries or the sporadic outbreaks of neuritic edema in prisons, asylums, on shipboard, or in war. It is stated that during the months of greatest prevalence of the disease the people live almost exclusively on polished rice, a mixture of which with bacon grease is eaten three times a day. After the fall butchering rice is replaced to a great extent by fresh meat, with some potatoes and bread.

An outbreak of beriberi occurring in September and October, 1927, in a prison in Louisiana is also reported. The diet in this case had consisted of a stew of salt pork or beef and boiled hard cowpeas or beans or carrots, soup, white bread, and molasses, with no milk, fresh vegetables, or fruit. None of the prisoners who received food from the outside was affected.

A dietary deficiency canine disease—further experiments on the diseased condition in dogs described as pellagra-like by Chittenden and Underhill and possibly related to so-called black tongue, F. P. Underhill and L. B. Mendel (*Amer. Jour. Physiol., 83 (1928), No. 2, pp. 589–633, pls. 2*).—In the first paragraph of the previous abstract of this paper (E. S. R., 59, p. 394) the word "carotin" should be substituted for "carbon."

Rickets in rats.—IV, The effect of varying the acid-base content of the diet, A. T. Shohl, H. B. Bennett, and K. L. Weed (*Jour. Biol. Chem., 78 (1928), No. 1, pp. 181–199*).—In this continuation of the series previously noted (E. S. R., 58, p. 91), the question as to whether the healing of rickets observed on the addition of sodium hydrogen phosphate to a rachitic diet (E. S. R., 57, p. 490) is due to the alteration of the Ca : P ratio or to alterations in the acid base balance was investigated by observations of the effect upon the healing of rickets and tetany of varying amounts of acid and base in the diet. In each case sufficient phosphate was added to the rachitic diet to change the ratio of Ca : P from 4.25 to 0.95, the additions being made with Na_3PO_4, NaH_2PO_4, H_3PO_4, and H_3PO_4 plus HCl in order to have varying acid-base balances from alkaline to acid.

As judged by histological studies, cure of rickets resulted in all cases. The composition of the blood serum showed the characteristics of tetany with the alkaline diets and of rickets with the acid diets. The clinical picture showed the characteristics of tetany occasionally on the alkaline diets, always on the neutral diets, and never on the acid diets. The greatest deposition of ash in the bones was with the neutral diets and the least with the acid diets. The metabolism studies showed an increase in both phosphorus and calcium absorption, which was greatest with the neutral diets.

In discussing these results attention is called to the fact that the conditions which produced the best final results caused the worst immediate effects, the cure being so rapid that death often resulted from too rapid assimilation of phosphorus. The necessity is emphasized of a gradual change to the neutral diet.

Rickets in rats.—VI, Effect of phosphate added to the diet of non-ricketic rats, A. T. Shohl, H. B. Bennett, and K. L. Weed (*Soc. Expt. Biol. and Med. Proc., 25 (1928), No. 8, pp. 669–671*).—In continuation of the series of studies previously noted (E. S. R., 59, p. 494), a comparison has been made of the effect of moderate phosphate additions to the diet of rachitic and non-rachitic rats on the calcium and phosphorus content of the serum and the ash of the fat-free bones. As was noted in the second paper of the series (E. S. R., 57, p. 490), the rachitic rats developed tetany and had a high phosphorus and

low calcium content in the blood serum on moderate amounts of phosphate. Rats fed the same diet with various sources of the antirachitic vitamin showed neither tetany nor an alteration in the blood calcium or phosphorus and had a normal content of ash in their bones.

Scurvy with reference especially to adults, G. C. SHATTUCK (*Jour. Amer. Med. Assoc., 90 (1928), No. 23, pp. 1861–1864, fig. 1*).—Included in this survey of adult scurvy as seen in the author's private practice and in observations of cases at two hospitals in Boston is a special discussion of the characteristics of a group of 17 adult cases at the Boston City Hospital. All of these patients had lived alone and were in the habit of getting cheap meals in restaurants or preparing inadequate meals at home. Commenting upon this the author states: "In our highly developed modern civilization the use of preserved or 'ready-to-serve' articles of diet and dietary fads is playing an ever increasing rôle. May we not expect, therefore, to see scurvy increasing among the ill nourished poor, and even appearing occasionally among those in easy circumstances?"

Sunlight: Its effect on the growth of children and resistance to disease, A. BROWN (*Pub. Health Jour. [Toronto], 19 (1928), No. 9, pp. 401–409*).—In this address, delivered at the 1928 meeting of the Canadian Medical Association, the author summarizes the series of studies conducted by himself and Tisdall, and by Tisdall and Price on the rôle of sunshine in the control of rickets (E. S. R., 58, p. 495; 59, p. 193). The final series of observations, in which the authors had the cooperation of C. A. Chant, had to do with the relationship of the altitude of the sun to the development of rickets.

The exposure of rachitic rats to sunlight of different known altitudes led to the discovery that the sun's rays are most effective in the cure of rickets at an altitude of 35° and over. Comparison of the geographic distribution of rickets with the minimum seasonal altitude of the sun showed that in localities where rickets is either unknown or exists only in a mild state the minimum seasonal altitude is from 30 to 35°. Places where rickets is prevalent include Glasgow, Scotland, with the minimum seasonal altitude of the sun at 11° and an altitude below 35° for 6 months of the year, and London, England, with a minimum altitude of 16° and an altitude below 35° for 5 months of the year. In Boston, Mass., the minimum altitude is 23° and below 35° for 4 months of the year, and in Baltimore, Md., the minimum altitude is 27° and below 35° for only 3 months of the year.

It is thought possible to predict for any city the period of the year during which rickets will probably develop from calculations of the altitude of the sun at different times during the year. It is noted, however, that the duration of this period may be altered by inclement weather or other factors preventing exposure to sunshine during the effective periods.

A practical window for transmitting ultraviolet rays, A. H. PFUND (*Jour. Amer. Med. Assoc., 91 (1928), No. 1, pp. 18, 19, figs. 2*).—The window described is made of two light wooden frames connected by hinges. Coarse chicken wire is nailed to the inner side of both frames, a sheet of cellophane is placed over one frame, and the other frame is folded over and screwed to it. The cellophane window can be used like a screen in an open window.

A comparison of the degree of transparency of such a window after continued exposure to sunlight, wind, and rain for a year showed a drop from 70 to 60 per cent in the curative region near the wave length of 3,000 angstrom units. It is thought that if used only when the sun is shining the time of usefulness would be considerably over a year.

TEXTILES AND CLOTHING

Studies of quality in cotton, W. L. Balls (*London: Macmillan & Co., 1928, pp. XXVII+376 [pls. 18], figs. [107]*).—An outline is presented of the relationships connecting the properties of cotton yarn with those of the raw material, supplementing an earlier work (E. S. R., 35, p. 230). Part 1, The Cotton, deals with the grader's judgments, microscopic structure of the fiber, moisture relations, size and variability of the fiber (hair), and fiber tests. Part 2, The Yarn, is concerned with the study of cotton in yarn, machines, drafting, the product of sorted cotton, arrangement of twist, fiber adhesion and yarn rigidity, yarn strength, and tests made with 13 samples of American cotton. Part 3, Cotton Growing for Quality, discusses the relation between cotton growing and spinning. The appendix treats of various aspects of research, the experimental department of the Fine Cotton Spinners' Association, and special apparatus for testing fiber and yarn.

Is ramie a coming principal fiber? H. Jefferson (*Textile Colorist, 49 (1927), Nos. 580, pp. 254–256, figs. 6; 585, pp. 599–603, figs. 4; 586, pp. 677–679, 682; 587, pp. 747–750*).—The characteristics and textile qualities and uses of ramie fiber and fabrics made therefrom are discussed, and a detailed account is given of the methods and effects of mercerizing ramie.

Studies on classification of raw silk (*Textile Mercury, 79 (1928), No. 2055, p. 40*).—Extensive tests by the Silk Conditioning House of Yokohama on sample skeins of 13/15 and 20/22 denier, including superior, medium, and low grades, showed that the number of very fine and very coarse threads are remarkably less than the coarse or fine threads. The evenness defects are generally less as the length continues long, especially with very fine threads which exist more in threads less than 50 meters. Coarse threads appear less in the length of 50 to 100 meters than below 50 meters, but increase in number when threads are above 100 meters. Very coarse and very fine threads are fewer in 20/22 denier than 13/15 denier.

The existence of cleanness defects varies in accordance with the grades of raw silk, especially in the case of major defects, which are very few in superior grades in comparison with low grades. The cleanness defects, particularly the minor ones, occur more in 20/22 denier than 13/15 denier raw silk.

Eri silk, F. Grove-Palmer (*Amer. Dyestuff Rptr., 17 (1928), No. 14, pp. 523–525, 549, 550*).—An account of the origin, characteristics, and preparation of eri silk supplied by *Attacus cynthia* and *A. ricini*.

Textile colour mixing, D. Paterson (*London: Ernest Benn, 1927, 3. ed., pp. XIII+137, pls. 7, figs. 41*).—This manual is designed for the use of dyers, calico printers, and dye chemists.

Delustering rayon, C. E. Mullin and R. M. Stribling (*Textile Colorist, 50 (1928), No. 594, pp. 377–380*).—The methods, processes, patents, and literature on the delustering of the rayons are discussed briefly.

Manufacturing stains produced on vegetable fibers, J. Fitzgerald (*Textile Colorist, 50 (1928), No. 594, pp. 398, 399*).—Ways of removing oil, paraffin wax, iron, and mildew stains from cotton and linen fabrics are outlined.

The prevention of mildew in cotton goods, J. V. Killheffer (*Amer. Dyestuff Rptr., 17 (1928), No. 14, pp. 526–532, 543, figs. 4*).—Under favorable conditions molds will attack cotton fiber, and particularly after the sizing and finishing of the yarn or fabric with materials favorable to fungus growth. The only control method held practical is the addition of a suitable antiseptic to the size or finish. Investigation at the Lowell Textile Institute involving various antiseptic substances revealed that while the brominated beta-naphthols and their naphtholates are highly toxic toward molds, they are objectionable in tex-

tile work. The sulfonic acids of the brominated beta-naphthols and hexalin were found to have no antiseptic value under the test conditions. While neomerpin and neomerpin O inhibited fungus growth, it seemed that the mold must begin growth before they are effective. Both of these substances seemed suitable for textile antiseptics except for their cost, which is about 13 times that of zinc chloride.

HOME MANAGEMENT AND EQUIPMENT

Standardization in the household, A. L. EDWARDS (*Ann. Amer. Acad. Polit and Social Sci., 137 (1928), No. 226, pp. 213–219*).—This is a brief description of the home maker's attitude toward simplification and standardization, and of the progress in investigations in the standardization of housing, household equipment, household work, clothing, and food products.

The Nebraska farm kitchen, G. GRAY (*Nebraska Sta. Bul. 226 (1928), pp. 14, fig. 1*).—Tables are included analyzing scores of 371 kitchens made in 1924–25 by women in the home management extension classes, each woman scoring her own kitchen. Of the kitchens scored, 7 per cent were in small towns. Some data are included regarding water supply, equipment, and sewage disposal taken from 483 kitchen scores secured in 1926–27.

The percentages of kitchens receiving perfect scores on various items were for screening 73, work surface 68, two good stoves 66, sanitation of walls and floors 63, natural light 61, storage space 54, attractiveness of walls and floors 52, artificial light 51, refrigerator 44, arrangement 42, transom or window board 42, stool 38, and equipment for water supply and waste disposal 11 per cent on 1924–25 scores and 20 per cent on 1926–27 scores.

MISCELLANEOUS

Report [of] Raymond Branch Experiment Station, 1927, H. F. WALLACE (*Mississippi Sta. Bul. 252 (1927), pp. 23*).—The experimental work reported is for the most part abstracted elsewhere in this issue.

Forty-first Annual Report of [Nebraska Station, 1927] (*Nebraska Sta. Rpt. [1927], pp. 43*).—This contains the organization list, a report of the work of the station, and a financial statement for the fiscal year ended June 30, 1927. The experimental work not previously reported is for the most part abstracted elsewhere in this issue.

Annual Report of [Nevada Station], 1927, [S. B. DOTEN] (*Nevada Sta. Rpt. 1927, pp. 29, figs. 4*).—This contains the organization list, a financial statement for the fiscal year ended June 30, 1927, lists of station projects and publications, and a report of the director discussing the work and problems of the station during the year. The experimental work reported is for the most part abstracted elsewhere in this issue.

Experiment station progress: Report for the biennium July 1, 1925, to June 30, 1927, P. F. TROWBRIDGE ET AL. (*North Dakota Sta. Bul. 217 (1928), pp. 102, figs. 39*).—This contains the organization list, a report of the director and heads of departments on the work of the station and the various substations, and a financial statement for the biennium ended June 30, 1927. The experimental work reported is for the most part abstracted elsewhere in this issue.

Annual summary of publications, B. C. PITTMAN (*Utah Sta. Circ. 73 (1928), pp. 12*).—This contains a summary of publications issued by the station since July 1, 1927, including abstracts of scientific and technical papers published outside the station series.

NOTES

California University and Station.—Two new major buildings were dedicated at the university farm at Davis on November 12, the agricultural engineering building erected at a cost of $140,000 and the animal science building, just completed at a cost of $300,000. The speakers at the respective dedications were L. J. Fletcher, formerly chief of the division of agricultural engineering, and C. B. Hutchison, recently appointed director of the Giannini Foundation for Agricultural Economics and formerly director of the work at Davis.

Dr. H. Hucket Cole has accepted a position as professor of animal nutrition.

Colorado College and Station.—The resignations are noted of Charles N. Shepardson, associate professor of animal husbandry and in charge of dairy manufactures; Justus C. Ward, assistant chemist at the Rocky Ford Substation; Marjorie J. Peterson, in charge of home economics investigations, who is continuing her studies for the doctor's degree; and Dr. Rudger H. Walker, assistant professor of agronomy and assistant agronomist, to become assistant chief in soil bacteriology in the Iowa Station. Miss H. Margaret Perry has been appointed assistant in veterinary pathology.

Illinois University and Station.—K. E. Wright, assistant in dairy bacteriology, has resigned to become assistant research professor of dairy manufactures in the Massachusetts College and Station. *Science* notes that Dr. Robert D. Glasgow, associate in entomology, has been appointed State entomologist of New York vice Dr. E. P. Felt, who retired April 1 after 33 years' service.

Kentucky University and Station.—Clarence Wentworth Mathews, head of the department of horticulture since 1892, died September 23 at the age of 67 years. Prof. Mathews was born in Lawrence, Mass., February 10, 1861, and was graduated from Cornell University in 1891. His long professional career was spent entirely in Kentucky, first as professor of botany and horticulture from 1892 to 1910 and as professor of horticulture thereafter.

Maine Station.—Dr. Karl Sax, biologist in charge of plant breeding, has been appointed associate professor of plant cytology at Harvard University.

Maryland University.—A sheep improvement special train traversed the State October 3, 4, and 5 under the management of the Baltimore & Ohio Railroad, the university, and the U. S. D. A. Bureau of Agricultural Economics. The university's exhibits dealt with sheep and lamb production and those of the bureau with wool standards and marketing. Unusual interest in the demonstrations is reported.

Missouri University and Station.—Dr. F. F. McKenzie, director and professor of agriculture at the International College, Smyrna, has been appointed assistant professor of animal husbandry and assistant animal husbandman.

Montana College and Station.—J. Wheeler Barger, assistant professor of economics and assistant rural sociologist, has resigned to take up advanced work in Leland Stanford Junior University, but continues his connection with the station until January 1, 1929, to complete certain publications. John P. Lewis, assistant in the State Grain Inspection Laboratory, resigned September 20 to accept a commercial position.

E. J. Bell, jr., assistant in agricultural economics, has been granted a year's leave of absence for study at the University of Wisconsin. Dr. A. H. Johnson, assistant chemist, has returned from a year's study in Europe.

Recent appointments include S. S. Sutherland and O. W. Monson as assistants in agricultural engineering in the station and instructors in the college.

Rutgers University and New Jersey Stations.—Dr. Sante Mattson, formerly associate chemist of the Bureau of Chemistry and Soils, U. S. D. A., has been appointed associate professor of soils and associate soil chemist, and since July 1 has been studying colloids, base exchange, and physical properties of soils. Dr. H. C. McLean, soil bacteriologist, has been released from his duties in the department of chemistry and microbiology to study arsenical spray residues on fruit.

Allan V. King has resigned from the synthetic nitrogen products fellowship to become assistant in chemistry in the university. Ernest L. Spencer has accepted the William P. Jenks fellowship and will study the influence of soil reaction on ericaceous plants.

Ohio State University.—A new farm house, designed as suitable for the average farm, is to be erected at a cost of $10,000, as is also a new three-story barn, 40 by 120 ft., to cost $15,000.

Dr. Alvah Peterson, of the U. S. D. A. Bureau of Entomology, has been appointed professor of zoology and entomology. L. P. McCann, associate professor of animal husbandry in the Colorado College, has been appointed specialist in extension work in animal husbandry vice Paul Gerlaugh, whose resignation has been previously noted.

Washington College.—Burt A. Slocum has resigned as specialist in apiculture to become extension instructor in apiculture in Cornell University.

Ontario Agricultural College.—A. Leitch has resigned as professor of agricultural economics to engage in commercial work.

Dominion Illustration Stations in British Columbia.—A chain of 12 stations is now in operation in the Province of British Columbia, supervised from the experimental farm at Agassiz and financed by the Dominion Government. These stations are termed illustration stations and are comparable to some of the demonstration farms in the United States. Tracts of from 12 to 40 acres are used, for which $5 per acre is paid annually by the Dominion Government to compensate the owner for time in record taking and similar extra work. Seed is supplied at least the first year, but the crop belongs to the operator.

Three of the 12 stations were selected in the fall of 1927, but the others are of older date. Seven stations are located in central British Columbia along the line of the Canadian National Railway, 3 are on Vancouver Island, and 2 in the southern interior.

While the primary function of the stations is that of demonstration, some experimental work is undertaken, particularly in central British Columbia, where acre tracts are set aside for plat testing and other trials of crops to determine adaptability to the interior conditions. Weather and cost records are also kept.

The bulk of the demonstration work has been in the growing for sale of improved seed. Livestock improvement is another important phase, purebred poultry flocks being kept at 10 of the 12 stations, purebred pigs at 8 stations, and purebred dairy sires at 6 stations. Considerable work is also done with crop rotations, the introduction of clover and alfalfa, and tests with other forage crops.

Field days are held at the stations during the growing season, at which the University of British Columbia, the Dominion Department of Agriculture, and the provincial district agriculturists are represented. The farmers' institutes are actively cooperating in these gatherings.

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