THE AGRICULTURAL COLLEGE

FRANK A. WAUGH

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THE AGRICULTURAL COLLEGE

A Study in Organization and Management and Especially in Problems of Teaching

By FRANK A. WAUGH

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Inscribed
To the Memory of

GEORGE THOMPSON FAIRCHILD
Personal Friend and Teacher
Pioneer and Leader in Agricultural Education

PREFACE

NEARLY all the books dealing with college problems have been written by college presidents. They are good fellows, those college presidents, and their point of view is important. But the teacher's point of view is important, too. The teacher is the man who stands closest to the real college problem—the problem of teaching.

So the teacher ought to know what he is doing, and why. And he ought to see his work in relation to all the other work of the college. This means that he should have a clear conception of college policies. I hope that this book will make it seem worth while to look at college questions from the teacher's point of view; and most of all, I wish that teachers might awaken to the necessity of broadening their views of such questions. Too many teachers are content to know nothing outside their own departments.

Perhaps this is peculiarly true of the ag-

ricultural college with its faculty of specialists, each one comfortably ensconced in his own fascinating department. At any rate, the special problems of the agricultural college have not been sufficiently studied, most of the books on college and university management having come from other quarters. This fact offers an additional reason for the appearance of the present book.

Most students of education now believe that agriculture is destined to play a large role in the future of general education. Certainly the rapid extension of agricultural teaching into the secondary and primary schools is one of the striking educational movements of the day. In any such movement for general agricultural education the agricultural colleges obviously ought to exercise a wise and influential leadership. At the moment it seems possible that they may fail measurably in this opportunity. Such failure as may come will be due chiefly to a lack of understanding, on the part of the colleges, of the broad questions of agricultural education. For this reason also it is greatly to be desired that all men in

the agricultural colleges should develop clear and correct ideas in educational policy, first as to internal college policy, and then as to the larger policies of agricultural education as a part of a national school system.

The author has not hoped to say the last word on the subject. For this reason he has aimed at a suggestive rather than an exhaustive treatment. Some of the positions taken are frankly controversial, but on all such points it seems desirable that the unorthodox point of view should be pressed. Education in general is ruled too much by tradition, and the agricultural colleges, of all academic institutions, should be free to take the radical course wherever tradition is called in question. The agricultural college is, from the nature of the case, a radical, not a traditional, institution.

Every college teacher or administrator should consider these questions with an open mind; and if there are some whose minds are not open, why a little dynamite is the plain prescription.

FRANK A. WAUGH.

MASSACHUSETTS AGRICULTURAL COLLEGE, 1916.

PROGRAM

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2. College Organization.
3. Physical and Financial Problems.
4. Organization of Instruction.
5. Specialization in Agriculture.
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7. Course of Study—Arrangement.
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CHAPTER I

PURPOSES AND IDEALS

IN ORDER to reach any intelligent notion of the methods to be pursued in teaching agriculture, horticulture and domestic arts, it is obligatory to determine first what are the purposes and ideals of such teaching. Much of the misunderstanding which prevails in this field is due solely to a lack of agreement in purpose, and much discussion is rendered futile by a failure to define clearly the ideals of agricultural education. Such a definition, however, is not especially difficult.

The most cursory study discloses the fact that there are two main purposes in the minds of those who conduct the schools, high schools and colleges of agriculture and courses in domestic arts. The first of these is the purpose of vocational training; the second is the purpose of personal human culture. In the minds of different men these purposes are variously combined and

modified, yet they seldom lose their specific character.

The former purpose, to train the young man or young woman for a vocation or profession (it is sometimes nicer to call farming and home-making professions), has obviously been the distinctive, creative and determining idea in the public mind. Personal culture was always sufficiently available in other schools. It must be recognized, without the slightest qualification, that the men who created these schools and appropriated public funds to their support did so primarily for the promotion of vocational training. It would seem a necessary inference from this fact that, whatever emphasis in particular schools may be given to the ideals of personal culture, this emphasis must not obscure nor seriously interfere with the primary purpose.

The second purpose, that of personal development, is by no means negligible, however. This ideal, sometimes spoken of as culture, sometimes as personal character development, sometimes as the development of humanitarian impulses, sometimes as prep-

aration for citizenship, is of vital importance to the pupil and to the state. A full, rich, efficient life is more valuable to the individual than pecuniary success in a vocation; and a generous serviceable citizenship is more valuable to the state than proficiency in growing corn or making cheese.

The mere statement of these ideals, however, does not by any means exhaust this part of the subject. The interpretation of these ideals into the primary terms of educational policy is of vital significance; and it is precisely at this point that the most radical divergencies occur.

IDEALS OF VOCATIONAL EDUCATION

Training for the agricultural and homemaking professions may be given in a variety of ways. While these are considered in detail in Chapter VII, we may notice here in passing that the two methods now most prominently discussed are the scientific and the technical. The former proceeds on the assumption that science is able to explain and illuminate all the multitudinous details

of practice. Many sober persons claim indeed that it is the only key to practice. From such premises it is argued that the proper training for agricultural vocations is based upon and chiefly consists of training in the sciences.

The latter plan of technical training believes first in "learning by doing." It believes that the educational process is more natural and effective when it proceeds from manual experience and personal observation to scientific generalization instead of moving in the opposite direction. It therefore bases its scheme of instruction on observation and practice instead of on science.

Whenever these two ideals can be clearly defined they meet in a head-on collision. The constant compromise of the two in the schools and colleges today proves chiefly the vagueness of educational ideals and the common and inexcusable neglect of pedagogic principles.

IDEALS OF CULTURE

Just at present, however, we need to give more particular thought to the ideals of cul-

ture which should never be absent from the educational policy. We can afford to give the subject this special attention because we shall not discuss it in detail in any other connection.

Men's ideas of culture are exceedingly diverse, but when driven home they all come to two principal conclusions; first, the development of personal character for personal satisfaction; and second, efficiency in service to society. Emphasis upon the second factor is comparatively recent.

When one looks upon education from the point of view of developing one's personal resources in life—cultivating one's field of personal enjoyment—it should be clear that different people enjoy different things—even cultured people. Men who have found their own pleasures chiefly in books naturally emphasize bookish culture; and as these men have a wide hearing in the world and a large influence in the institutions of learning, this idea of culture as something coming chiefly from books has had a very wide currency. It has received notice out of all proportion to its value.

It is easy to observe that many men find their daily enjoyments largely in the company of other men. This fact has led, in recent times, to considerable stress on the social qualities of culture.

Without stopping to characterize other ideas of personal culture, let it be quite clear that the man of agricultural vocation has wide and adequate and satisfying sources of enjoyment in other fields. He has the joy of accomplishment in his calling, which for most men in most vocations of life is one of the deepest satisfactions of daily experience. Then he has ever before him the infinitely varied and infinitely interesting phenomena of nature. With these he comes into a very intimate and benign contact. He lives with and is a part of the immeasurable beauties of the fields, the landscape and the sky. These all speak to him in a language which he understands quite as well as anyone understands the languages of past civilizations.

Let us turn now to the ideals of citizenship, which may be more clearly stated as efficient service to society, that is, to the com-

munity and the state. This thought has obviously been well to the front with those who have pressed for education in "the humanities," so-called. It is quite cogently argued that, to be a good citizen, one must know something of civilization, its past, its ideals, its present currents; and these are to be gained most naturally by the study of languages, literature, history, economics, sociology and civics. Practically all educators agree that some such training is obligatory upon all schools, and especially upon colleges founded and supported by the state.

VOCATION AS SERVICE

Accepting fully the general principle here involved, I would point out certain considerations which bear an important part in making up the sum of education for social service.

First, and of the very greatest significance, is the fact that each man's principal contribution to the general welfare, i. e., his chief social service, lies precisely in his vocation.

This far outweighs all else. The common man works at his vocation (for the good of society) with all his energy and enthusiasm six days in the week, and perfunctorily teaches a Sunday School class for thirty minutes on Sunday. The most vicious mistake that can be made is to assume that the Sunday School class represents his social service, while his week's work on his farm is wholly for his own selfish benefit.

This perfectly damnable assumption is constantly made, however, in the churches and oftener in the colleges. It is often said that the presence of "purely utilitarian"—that is professional—subjects in the curriculum makes it necessary to offset their effect by large doses of "humanitarian" or "cultural" subjects. This whole line of argument is at once the most evil and the most fallacious ever brought into the discussion of educational questions.

I speak here, not from pedagogic theory, but from long, personal experience. In this matter I am able to add my own college experience to twenty years of intimate association with college students, the great majority

of whom were following courses in which professional studies were combined with a liberal allowance of the approved cultural subjects. In considering the value of this testimony it should be borne in mind that, during the past twenty years, the cultural subjects have nearly always been much better taught and their cultural value much better presented than the professional subjects. Yet any teacher who has thoughtfully observed students of this sort will have been fully convinced that the great majority of them "find themselves" in their professional subjects. Here their imaginations are awakened, here life begins to have a meaning, and (what is the precise point) life seems larger and less self-centered.

And so I argue, with all possible emphasis, that, *for the purposes of culture, professional subjects are more effective in the educational program than the conventional "cultural" subjects.* They do more for both phases of culture—more to open the pupil's way to a satisfying contact with his own environment, and more to develop in him the impulses of altruism. Not only do the pro-

fessional (vocational) studies fix these tendencies, but they offer the best possible outlet for those tendencies.

The humanitarianism of the classic studies is apt to be wholly academic and reflective. The humanitarianism of the vocational studies is likely to be practical and active.

This argument is not designed to throw discredit upon the classic studies, which will always have a commanding value *for some men;* but simply to controvert the common and wholly iniquitous idea that the professional studies have no cultural value and must therefore be supplemented by extensive courses in languages, literature, history, etc.

CULTURE AND THE TEACHER

Necessarily it follows from this argument that the vocational subjects should be taught with their cultural values in mind. The teacher should present this phase of his work with enthusiasm; and as culture, so far as it is a product of school or college work, is after all very much more a matter of teacher

than of subject, it is of first importance to secure the proper teacher.

But even the most rigidly technical courses need a bush. It is possible (though at present it very rarely occurs) for the student to specialize too closely. He should get a broad outlook on life—the broader the better—and for this purpose should study as many subjects as practicable outside his professional field. Here economics, sociology and history seem to have chief value. Some science not definitely required in the chosen vocation may well be included. Languages, ancient or modern, as commonly taught, have very little cultural value and no practical application whatever.

In the case of any particular student, however, facing the problem of making out his course of study in some particular school, it will always be better to choose teachers rather than subjects. For, as we have already said, teachers count for more than subjects—much more! It will then be desirable to find some variety amongst one's teachers—to elect some who have the most approved classical culture, some who are

bookish, some who are alive with the ideas of current politics, occasionally one who is deadly dull but impeccably sound, perhaps one who is athletic or sporty. Association with real live men in many fields is the best of all curricula for the development of personal outlook or inlook. As far as any college can give culture this is where it will be found.

SUMMARY OF CONCLUSIONS

Summarizing the arguments of this chapter we may say:

1 The agricultural schools and colleges follow two main purposes: (a) to give technical (vocational, professional, practical) training, (b) to give personal development in character, sometimes called culture.

2. The former purpose is the primary one, and must never be obscured by the other, no matter how important the second may appear to be.

3. There are two principal methods of providing the technical training. The first offers a broad foundation of science upon

which it is expected a superstructure of technic can be built. The second begins with observation and practice and calls upon science for necessary explanations. The two methods are essentially antithetical, but are often confused in current teaching. The former has been the commoner in the past, but is pedagogically and practically inferior to the second.

4. Culture aims at two principal objects: (a) personal development for personal satisfaction, (b) personal service to society. Both these objects are reached to a large extent in purely technical training. They can be much more fully met when technical training is alive to these opportunities. But these purely technical studies should be supplemented by a broad outlook on other fields, particularly science, economics and sociology.

CHAPTER II

COLLEGE ORGANIZATION

UNDER the stimulus of federal appropriations there has now been organized in each state of the United States and in each province of Canada an agricultural college. These institutions usually include departments devoted to research and to extension work, as well as faculties especially organized for college teaching. In a number of southern states it has been found expedient to establish two colleges, one for whites and one for negroes, but with this exception there appears to be no adequate reason for any division of the grants; and in general it seems to be fully proven by experience that each state will be much better served by one strong central institution directing affairs in agriculture and home economics than by two or more smaller colleges.

Several years ago there was warm discussion as to whether these special interests

could best be served by a separate agricultural college or by an agricultural school organized in a state university. Today this controversy has hardly more than historic interest. The question has been variously decided in different states, always with reference to local political conditions and accomplished facts, never with respect to academic principles. Wherever the question may be opened again it will always be possible to show advantages and disadvantages on either side. Certainly conditions are so different in different states and provinces that no one form of organization is possible for all. Massachusetts Agricultural College and Ontario Agricultural College, which are purely agricultural, have their problems much simplified by their singleness of aim. On the other hand, the great universities, like Wisconsin and Illinois, have demonstrated their ability to provide for the agricultural needs of their states without difficulty or prejudice.

A related problem has come to the fore in a few states in recent years. It has usually emerged in the form of a proposition to con-

solidate two or more existing state educational institutions, though sometimes the legislation urged has contemplated only the consolidation of the engineering schools, the agricultural schools, or the work in domestic economy of two separate institutions. Montana, Kansas and Iowa may be mentioned at random and without prejudice as states in which this scheme has risen to the hight of a real issue in recent times.

One argument is pressed forward before all others in support of these plans, viz, economy. It is roundly asserted to be a great waste of public money to duplicate in two or three colleges in the same state the expensive equipment needed for instruction in engineering or agriculture; and whenever a merger of two or more whole institutions is advocated economies are promised all along the line. It is said that one library takes the place of all, that the entire college plant of one college will answer for all—and similar economies are foreseen in personnel and in the work of administration.

All this sounds convincing, at least until one begins to look up accomplished facts.

If this line of argument were generally sound it would follow that the cost of instruction and administration would fall, *pari passu,* as each college or university grows in size. The cost for each student should be proportionately lower in large universities than in small colleges. But it is a notorious fact that this never happens. If anything, the reverse is true. Experience, therefore, offers no foundation for the expectation that a consolidation of institutions will decrease the cost of maintenance.

It seems a fair criticism, however, to remark that many state institutions have invited these troubles by extravagant equipment and over-organization. It is more than doubtful whether the enormous and expensive plants now collected in many places have any proper justification in honest pedagogy. It may well be believed that plainer furnishings and scantier equipment would yield better results in manhood and womanhood—the more certainly so if the difference in cost of materials could be spent for stronger teachers.

There are yet other reasons, moreover, for

questioning the wisdom of the consolidation propaganda. Without reference to cost per pupil it is frequently said, and widely believed, that undergraduate students fare better in the small college than in the large one. Contacts are more direct, responsibilities plainer, instruction more intimate, and the results generally better. This principle, widely accepted, would point to segregation of units into more and smaller institutions instead of toward consolidation into fewer and larger universities.

Further than this is to be considered the value of localized college work. Any institution attracts the bulk of its students from the immediate vicinity. It is easy to show that the majority of pupils, even in great and famous colleges, come from within a very short radius. For this reason, also, several smaller colleges in several parts of a large state are more serviceable than one big central cyclopean university. In the big western states particularly, where the consolidation idea has been most frequently urged, it would seem that real colleges are still too few and too far apart.

Consolidation of management under a single board of administration, as is now being tried in Kansas and other states, seems to have few valid objections and some material advantages. Perhaps this offers the best line of compromise and of development.

THE TRUSTEES

All these institutions are alike in deriving their principal income from federal and state (or provincial) grants. While the federal appropriations are a very substantial part of the income of most institutions, the institutions are nearly always managed and the funds spent by boards of trustees appointed solely by the state, and subject only to certain mild inspections from federal officers. On the whole, this system has proved practical and satisfactory, and seems to rest upon a basis of sound public policy.

A few instances still exist, however, in which the institutions designated as beneficiaries of federal and state funds are managed by boards appointed in whole or in part from private sources. It is very gener-

ally understood, however, that, as a matter of public policy, this is wholly indefensible. It may be laid down as a sound principle, without exception, that state or federal funds should be granted only to institutions wholly under public control.

The trustees of these state colleges or universities are usually appointed by the governors of the several states. This is the satisfactory and theoretically the best way. It has sometimes been proposed to elect them by popular vote, like congressmen or members of the legislature; but present tendencies toward shorter ballots, and the formation of state governments more in the commission form of centralized authority, are against such a method of naming university trustees.

Objection has often been made to the method of naming trustees by gubernatorial appointment on the ground that it opens the way to political traffic. While this is always true, and while there have been many notorious cases in point in the past, the situation is rapidly and notably improving. Furthermore, it may fairly be doubted

whether any other method of naming trustees would have greatly changed results in those states where the worst political abuses have occurred. On the whole, appointment by the governor seems to be generally the best way of making up a governing board for any state institution.

It goes without saying that much depends on the personnel of this board of trustees (or regents). They should be men and women of unimpeachable character, of sound judgment, and of experience in public affairs. Some of them ought to be farmers, some college graduates and some chosen from other walks of life. Once a man has shown an interest in a particular college and the ability to serve effectively, he should be given practically a life tenure of the office by reappointment. Continuous touch with the affairs of the institution and long experience in the work are invaluable.

THE COLLEGE PRESIDENT

The college president occupies an anomalous position in American college organi-

zations, being often a member, both of the board of trustees and of the college board of instruction or faculty. This position has been justified by results in a surprisingly large number of cases, considering how essentially bad it is. All the tendencies of recent times have been toward great centralization of executive power. In this the universities have merely followed the same trail as the big industrial organizations; and during the period when the universities have been making their enormous growth almost wholly in material equipment and financial resources, this autocratic direction has had the justification of efficiency. It is, however, wholly foreign to the essential nature and proper atmosphere of the university, which should be purely democratic, and it is subject to so many limitations, even to thoroughly respectable abuses, that the system ought to be changed. It is as yet impossible to say just what the working relationships ought to be. The situation must develop considerably further before that will be possible. The writer is willing, however, to offer the opinion that the president

should not be a member of the board of trustees. The fact that the president himself is the employee of the same board suggests at least the ethical impropriety of his position.

It is also not without significance that the great German universities have attained their world-wide influence with an organization in which no such an officer as a college president is known, while the universities of Great Britain are almost equally innocent of any central executive authority. It is fair to guess that the monarchial form of university government has reached its zenith in America, and that from the present it will gradually decline.

It is an open question whether the college president should be a member of the faculty or not, sitting and voting with them. Probably he should not be; and if he is also a member of the board of trustees he certainly should not be. This whole question, however, is of little practical interest in view of accomplished facts.

In universities where the agricultural organization forms one of many schools, the

head of the agricultural school, usually called the dean, occupies practically the same position as the president of the independent agricultural college. He is not handicapped, however, by being a member of the board of trustees.

THE FACULTY

Traditionally the faculty is the governing body of the college and the embodiment of all power. Practically it is a negligible congress of unorganized whims and prejudices. Its status in different colleges, of course, varies enormously. In some it has preserved its dignity and reputation; in some it has retained vestiges of its earlier powers; in some it is plainly obsolescent; in some it has no sound parliamentary organization, no charter of rights nor bill of responsibilities nor constitution of government.

Business affairs are almost wholly and universally transferred from the faculty to safer hands. The necessary administrative duties are largely parceled out to com-

mittees or to special executive officers, which committees and officers are practically never appointed by the faculty, even when they are chosen from the faculty.

The one field in which a majority of faculties still hold sway is the curriculum. It is still considered necessary for the course of study to be made up by legislative performance of the faculty. This is curious, especially in view of the fact that this is precisely the field in which the faculty is most utterly helpless and worse than useless. The preparation of a course of study is a complicated and very difficult problem in pedagogical engineering. But there is hardly one member of any agricultural faculty who knows the most elementary principles of pedagogics. Each man has been chosen to his position because he was an expert in market gardening, or in soil physics, or in dairying, or in sanitation. Not one in a hundred of these men has ever had the slightest training in teaching nor the simplest introduction to the fundamental principles of education.

It has often been observed that the whole

idea of such men when engaged in making a course of study is to have all their own courses put in the required list. What becomes of the other subjects is no concern of theirs; and what becomes of the curriculum itself is equally a matter of indifference.

It seems clear that the old-fashioned notion of the faculty as a democratic legislative body ought to be abandoned. The administrative work of the college should be done by special officers specially trained for those duties. Matters which require investigation or deliberation should be sent to small, compact, working committees; and the findings of these committees should usually become operative upon approval by the dean or president, rather than after review by the faculty. The course of study, which is the largest and most vital of such problems, ought to be committed to a small board of experts. Minor changes which are necessary from term to term ought to be approved by this board, then by the president.

In any growing institution the curriculum ought to be thoroughly restudied from time to time, at most once in ten years. When-

ever any radical changes are to be made the local board of specialists, more or less trained in the problems of education, should be supplemented or wholly superseded by genuine educational experts from quite outside the college organization. If any man were designing a bridge across the Mississippi River, would he leave his plans to a committee of fifty, no one of whom had ever studied bridge construction, but some of whom were genuine experts in floriculture or physiological chemistry or French? Yet that is the method widely followed in designing college curricula. It is small wonder that the result is the laughing stock of the community.

DEPARTMENT ORGANIZATION

In practically all colleges the unit of organization is the department. It is by all odds the most important unit. A good college organization in fact consists of just two things; a series of strong, aggressive, effective departments with some central power of co-ordination. This central co-ordinating

power will naturally determine very largely the policies of the institution.

A good college department consists of a good man plus a reasonable equipment, these two factors having a relative value of about ten to one. When an able man has been secured to lead a certain line of work the proper organization of his department should be very simple—the simpler the better. It is necessary merely to insure the independence of the man, that is, to give him full control of his department. In fields where considerable equipment is required, especially land and buildings, and where productive enterprises are in progress, it is essential that these shall be under the free control of the head of the department. The more his action is hampered by other officers or by committees of any sort, the worse it is for the college.

The importance of this full control has frequently been obscured in the past—often quite lost to view—through the large development of its disadvantages. Many heads of agricultural or horticultural departments, through mistaken zeal or through pressure

from above, have undertaken to manage large business affairs, perhaps under the insuperable handicap of committees of control, and at the same time to teach large classes, carry on experimental work and give numberless lectures throughout the state. This could never be done by J. Pierpont Morgan, Mark Hopkins and William J. Bryan all rolled into one. A considerable number of men who have successfully managed large departments have shown how it can be done. Such a department administrator retains full control of his department affairs, keeps in quick touch with general college policies, holds an open outlook on the outside world, and finds loyal and capable assistants to carry on the various lines of work.

In all large institutions the problem of correlating the work of departments now looms large. The difficulty is greatly emphasized with the necessary subdivision of the old departments of agriculture and horticulture and must soon make itself felt in the growth of departments of domestic economy. When, for example, an old-time de-

partment of horticulture divides into the modern departments of pomology, forestry, market gardening, floriculture, landscape gardening, etc., the question arises whether these new units shall continue to use the same old land and buildings in common, or whether each shall be provided with a separate outfit. The question which thus promptly arises in respect to physical equipment presently makes itself felt also in the fields of teaching and research, and some scheme of harmonizing all these interests must be provided.

Three principal methods of harmonizing the work of related departments have been generally tried. Naming these somewhat arbitrarily, we may call them the Illinois, the Massachusetts and the Cornell methods.

THE ILLINOIS PLAN

The Illinois plan consists in the formation of a large department with one administrative or business officer. This is the most natural possible line of development. As a department grows and new assistants be-

come necessary each one is chosen as a specialist. Thus a department of home economics will acquire expert assistants in invalid cookery, sanitation, house furnishing and decoration, etc. These assistants are burdened with a minimum of business affairs and administrative duties, and so are able to give undivided attention to their technical specialties. The system works well.

The point has often been raised whether such a large and centralized department should add specialists for work which might be done by other departments. For example, when the agronomy department meets a problem in soil chemistry, shall it take on a chemist and put him to work, or shall the problem be turned over to the central department of chemistry? In dealing with problems of technical agriculture, horticulture and domestic economy, emphatically the former practice is better. Every technical problem should be approached from its technical side. The results must be interpreted and the practical application made by the technical man. The most con-

spicuous wastes of our American institutions in the past twenty years have been due to the opposite practice. It is worth while here to quote the report made in 1908 by the special commission on agricultural research appointed by the Association of American Agricultural Colleges and Experiment Stations. One of the principal recommendations offered by this able committee (Dr. David Starr Jordan, Dr. Carroll D. Wright, Dr. Henry P. Armsby, Dr. W. H. Jordan, Mr. Gifford Pinchot) was that "Whenever possible, the organization of research agencies should be on the basis of problems to be solved and not of processes used in their solution. In other words, the subdivisions of an agricultural research agency for administrative purposes should correspond with the recognized subdivisions of the subject of agriculture itself, and not with the classification of the pure sciences."

Concretely stated, this means that the research work in horticulture should be organized as fruit growing, market gardening, floriculture, etc., perhaps still better in specific projects, such as control of the San Jose

scale, development of blight-resisting strains of muskmelons, or fertilizers for roses, rather than as entomology, botany and chemistry. Just the opposite practice has usually been followed.

This principle, here stated in reference to agricultural research, is doubly important in agricultural teaching and triply indispensable in extension work.

THE MASSACHUSETTS PLAN

Similar in practice but different in theory is the plan first used in Massachusetts, but now successfully adopted in Oregon and elsewhere. Following this system new departments are differentiated from the old ones as soon as new specialties become established. Thus a department of agriculture will split up into departments of agronomy, live stock husbandry, poultry husbandry, dairy husbandry, farm engineering, farm administration, etc., as growth may require. Each new department will be given its autonomous existence. The specialist in charge will be independent, will have his

place in the college faculty, his department will be on a par with others. These features usually prove attractive to ambitious men, and it seems easier, therefore, under this plan to hold together a number of capable specialists.

But as stronger men are engaged and placed in positions of relative independence it becomes rapidly harder to preserve an effective esprit de corps, a unity of purpose and action, a harmony of personal interests and an economical use of the physical equipment. The central feature of the Massachusetts plan is the grouping of closely related departments into "divisions." (The nomenclature is unsatisfactory, but the idea is sound.) Each division has an administrative officer, who is usually also the head of one of the unit departments, and whose business it is to harmonize and unify the interests of the group. Actually there is considerable difference between the duties of a Massachusetts head of division and the Illinois head of department. The Illinois position requires the strong, self-reliant business ability of the modern "captain of

industry"; the Massachusetts job, on the other hand, requires chiefly a large human sympathy and an adroit diplomacy. The Illinois method is better as a business proposition. The Massachusetts method is better in developing the human resources of the institution.

THE CORNELL PLAN

A wholly different theory of organization has been followed, more or less consistently, at Cornell. Perhaps a better exemplification of it could be found in the United States Department of Agriculture. The plan here is to focus attention on problems or "projects," rather than on departments, which should be at best merely the means of solving problems. The purpose is to diminish the tendency to mere organization—the "red tape" into which all large organizations inevitably drift. There are many sad examples of departments so wound up in their mechanical affairs and departmental jealousies as to have no strength left for real service.

As new problems arise under this system they are outlined and defined as "projects," and each project is assigned, not to some department, but to some man. Even at the best, however, conflicts and jealousies arise; and the weak point in this scheme has usually developed in the lack of a sufficiently strong and sympathetic central power to harmonize these interests and to weld them all into an aggressive and effective whole. At its best this system is superior to all others; but it is very hard to supply continuously the presiding and unifying force to make it go. It seems to be better suited to a research organization than to one engaged chiefly in teaching. Taking into account the human frailties of college men and other practical difficulties of administration, it is probably safer for most institutions to attempt a less flexible organization.

Whatever the system of organization adopted, the subdivision and specialization of subject matter is a great aid to progress. The rapid separation of agriculture and horticulture into workable component parts has been the most fruitful achievement of

the past decade. Similar specialization should come promptly in all the larger departments of domestic economy.

THE CENTRALIZING TENDENCY

This seems to be the best point at which to discuss certain fundamental tendencies in organization which have been almost wholly overlooked in recent years. In the business world our time has been characterized by the rapid consolidation of small concerns into larger ones, and the further merging of these big units into trusts or continental monopolies. The universities, which have made their recent phenomenal growth chiefly in the lines of big business, have freely copied the current business methods and have been actuated by the prevailing business spirit. Yet even in the business world men are now suspecting that this centralizing tendency has gone too far, and are trying to get back to smaller units and more direct contacts. And if the centralizing tendency has gone too far in manufacturing and commerce, it has more obviously over-

run its usefulness in the educational field. In college work simplicity of method and directness of contact are of paramount importance.

It has long been observed that the famous men whose names grace the catalogs of the big universities are seldom seen by students. The students themselves know only a few small groups among their classmates, the others remaining as much strangers as though they were coolies in the plantations of Formosa. The intimate and infinitely stimulating relationships of the little old-fashioned college have been lost, and there are few experienced educators who do not feel that this loss has never been offset by any substantial gain in the new order of things.

Remedial measures which have been frequently proposed have mostly been designed upon the theory of more organization. Accepting the big central plant as a fixed necessity, they have proposed to form smaller organizations within the big one in which some of the old intimacy might be restored.

This problem, which seems thus far never

to have occurred to agricultural college authorities, is now imminent here also; but it would seem that the method of its solution is here much readier to hand than in general university administration.

The problem, simply stated, is to combine the momentum of a strong central administration with the simplicity of the small unit —the business efficiency of one with the human efficiency of the other. In other words, there must be some decentralizing movement to balance the vast centralization of the past twenty years, but these centrifugal movements must come in a way not to destroy the good accomplished by the centripetal movement.

THE TEACHER'S PROBLEM

Now, every teacher seriously devoted to his students in any department of dairying or stock breeding or floriculture in any college in the country—certainly in any large college—has long ago made up his mind that he could do a great deal more for his men if he could separate them completely

from the ruck of college life and could go with them to some out-of-the-way place where he and they could live with the problems they are studying. If he is teaching floriculture he would remove to that district where flowers are grown; if he is a dairyman he would go to the dairy district.

This feeling, born first from an interest in a professional specialty, will bear the closest scrutiny in the interest of the students themselves as men. The whole result of such a separation of the student group from the big university is as agreeable on its human side as on its technical side. The scheme works. It has been tried and has succeeded, and should be widely and systematically adopted. The thing to be done is simply for the agricultural college to resolve itself into several camps, more or less permanent, and for longer or shorter periods of the year. The pomologists would go to the orchards, the foresters to the woods, the live stock students to the big stock farms and markets and the market gardeners to the best truck districts. Should they be obliged in these localities to make their own camps, cook their

own meals and provide their own sanitation, the educational value of their experience would be definitely and largely increased.

The gang of standpatters which makes up the majority of nearly every college faculty would stand aghast at such revolutionary proceedings. They will quickly say it can't be done. But anyone who is looking for human results and not for the perpetuation of an old machine—anyone for whom men are more valuable than rules—will have no difficulty whatever in such an undertaking. Some readjustment of this sort is long overdue. Simplification must soon succeed upon centralization.

Stated in more general terms, it would seem to be the best plan to combine the advantages of central administration with personal contacts of small units by dividing the student body into small groups, making the division on the basis of major technical subjects, placing each group in the immediate charge of a few good instructors, and sending these groups to various localities for work. At the beginning it will certainly be found impracticable to send all the students

of all groups out into the field for all their college time. The plan is bound to be tried, and probably at first with upper classmen. Yet, theoretically at least, it is equally desirable for freshmen. Students entering Yale Forestry School, for example, begin by a summer term in the woods. It is absolutely sound doctrine, too, that an agricultural course ought to begin on the farm and a cookery course in the kitchen, rather than in the chemistry lecture room.

At the outset these colonies of students will be placed principally upon private farms; but it is easy to foresee the time when the agricultural college will have its own separate fruit farm, its dairy farm, its poultry farm, etc., all more or less detached from the central plant and each located in the district where the particular industry is best developed.

SUMMARY

The principal points discussed in this chapter may be briefly recapitulated as follows:

1. Different forms of organization are required in different states. While the separate colleges of agriculture seemed at first to have the advantage, the large universities are now doing very well by their agricultural colleges.

2. The board of trustees should be small, and should be made up of men and women of ability, who should enjoy a long tenure of office.

3. Under our American system everything depends on the character of the college president. Unquestionably the tendency to concentrate all powers in this one officer has gone too far. In particular the common practice of making him a member of the board of trustees seems injudicious; and it seems better in most cases also for the president not to sit with the faculty, but to occupy toward that body a relation more like that of the President of the United States toward Congress.

4. The traditional faculty legislature, however, has outlived its usefulness and should be abandoned. Routine administrative duties should be assigned to small com-

mittees or to special executive officers. Problems like the course of study should be left to specialists, whose findings can be sufficiently checked by the president and trustees.

5. The most important unit of college organization is the department, and the most important element in the department is the man who heads it. Everything should be done to maintain the integrity of departments and to preserve the independence and initiative of department heads.

6. Correlation of departmental work is a problem in every institution, and grows rapidly in difficulty with the growth of the college. Three principal methods are in vogue for securing such correlation. They are: (a) The formation of large departments with many specialist assistants; (b) The grouping of related departments into larger divisions, headed by deans or division chiefs; (c) The obliteration of department lines and the organization of the work about men or problems.

7. A very strong centralizing tendency has been operative in all college organiza-

tion during the past twenty years. This has some important advantages, and some very obvious defects. A counter movement toward decentralization must be expected soon, and may be welcomed and guided so as to secure many of the benefits, both of the large and the small institutions. The simplest plan for use in agricultural colleges appears to be to divide the student body, during at least a part of the course, into separate groups, based on the major lines of professional work. Such methods have already been tried to a limited extent with marked success.

CHAPTER III

PHYSICAL AND FINANCIAL PROBLEMS

A MODERN college is a very expensive plant. It requires a lot of money to run one. Probably the agricultural college is the most expensive type of school yet established in considerable numbers. Problems of raising and using money must therefore be of great interest.

There is a very general feeling that financial problems have loomed too large during recent years on the horizon of many colleges. There has been too stressful a campaign for funds, in which other valuable interests have been neglected. Certain college presidents have been chosen chiefly for their skill as beggars. They have naturally given their strength largely to increasing endowment, often overlooking problems of internal development, of sound scholarship and of permanent influence. Money is important, but it is not an end in itself for any self-respecting college.

FINANCIAL POLICY

College finance has been seriously studied in many quarters. We need not try to make even an extended review of this part of the subject here. There are, however, one or two matters of special significance to the land-grant institutions which ought not to be passed over.

First of all we may notice that these state-supported colleges have received very few gifts from the millionaires. For this we may be profoundly thankful. It is altogether best that they should remain public institutions in every sense of the word—supported by the people and beholden to no private interests.

Secondly, we may observe that there are two principal methods in vogue of meeting the financial requirements of these colleges. The first is by direct special legislative appropriations, such appropriations being of both federal and state origin, though the federal appropriations (Morrill funds, Hatch funds, Adams funds, etc.,) usually continue from year to year. The second is

by a continuing tax (usually called a "mill tax"), or occasionally by continuing appropriations. The former method has the advantage of requiring the institution to pass its plans in public review and to some extent to give a public accounting of results. This much is wholly salutary. The second method, however, has the great advantage of promoting a fixed and foresighted financial policy. It enables an institution to plan its development several years in advance. This can be done, too, without depriving the college of its direct accountability to the state.

Thirdly, we may indicate that all colleges should adopt the principle of the budget system, and should constantly study to perfect the details of its application. No haphazard system of making up financial estimates should be tolerated in a public institution.

Lastly, it is not unfair to record the suspicion that some state colleges have got their appropriations too easily. They have had more money than they knew how to use wisely. There have been extravagances at some points; and extravagance in a public

institution is deadly. The discipline of hard times may be made of real value, but the uses of prosperity are sometimes cruel. The support which some states have offered to their colleges has been niggardly, weak, precarious or irregular. Some institutions have suffered sadly under such treatment. It is much harder, however, to find sympathy for those colleges which have suffered from too much money.

LAND PROBLEMS

An agricultural college is necessarily attached to the land. It should exist on, of, and for the soil. Land is as natural and necessary to an agricultural college as water to a fish. It is a matter of wonder, therefore, that the pinch of the land problem has not been more keenly felt before now. The comparatively small part which this problem has played in agricultural college policy up to the present time is to be explained only by the fact that most colleges have been classical or scientific schools, rather than agricultural institutions. As

agriculture comes more and more into prominence in them the question of land grows rapidly in urgency. The University of Illinois has recently paid $236,000 for 320 acres of land for a single department; the Kansas Agricultural College has bought several farms near to or adjoining its original plant and has come into possession and effective use of 4,000 acres in one block, where only farming experiments and demonstrations are conducted; all this in addition to more than 1,500 acres in other areas; the Massachusetts Agricultural College is just now adding a tract of 735 acres to its holdings to be used as a laboratory for teaching forestry. These instances are clearly symptomatic of present conditions.

In practically all state agricultural colleges the original land allotments were highly accidental. Considerations of local politics usually determined the site, the choice of land distinctly suited to the work of the college being the last matter of attention. Under these circumstances several of the state colleges have found themselves seriously handicapped, both as to quantity

and quality of their land equipment. Some have already been forced to heroic measures for the correction of early mistakes; others have their problems yet to solve.

Quite clearly every college which cultivates an ambition for an agricultural future will find the land problem urgent for some years to come, and until our policy in the use of land for teaching, experiment and demonstration is much more clearly realized than at present. It is a matter of the greatest urgency at the present time that every institution should make a thorough-going inquiry into its future land needs, and into the policies which determine these needs. These policies should be brought out of the limbo of vague dreams into the form of clear and definite working plans, and in line with such well-studied plans every institution should set about the acquisition of such tracts of land as will insure an unhampered development for the future.

While it is already clear that every successful and growing agricultural college will need more land—usually a great deal more—it is by no means so easy to say how

that land shall be selected. The plan of buying all the land adjoining will rarely work. Frequently the land cannot be bought at any price; almost as frequently it is not worth having at any price. It is the conviction of the writer that future purchases will be chiefly in the form of detached parcels scattered in various parts of the state to be served.

This raises immediately the question of all detached enterprises. Up to the present time there has been a strong prejudice against them. In some institutions, unquestionably, experiment station and college funds have been frittered away in little local substations, a considerable number of which were established principally for political purposes. There has been the presumption, also, that scattered projects could not be so effectively used nor so economically administered.

These objections, however, are not fundamental. They can be eliminated by wise management. It is increasingly evident that many problems are distinctly local, inasmuch as all intensive farming industries

tend to emphatic localization. In the little state of Massachusetts it has been found necessary to develop a cranberry substation in the highly specialized cranberry district; an asparagus substation in the asparagus district; a detached forest tract was found to be the only answer to the needs of the forestry instruction; and a specialized outstation, maintained by the department of market gardening in the market-gardening section, is now projected. Every agricultural college must get nearer to its problems; and the only way to do it is to go where the problems exist.

It will be observed that this migration of the college to the fields where its problems exist grows in intensity with the shift toward a basis of technical agriculture—which is precisely the central change going on in all progressive institutions. A chemical problem, a bacteriological problem, even an entomological problem, can usually be solved in the home laboratory, with its expensive equipment. Problems in peach culture, however, or in forestry, can be solved only where peaches grow or forests flourish.

Elsewhere consideration is given to the conflict now emerging between the centralizing and the decentralizing tendencies in agricultural college policy. This conflict promises to be a large and extended affair, covering the whole area of college policy. It seems fair to predict that, while the former tendency may prevail in administration and accounting, we shall see in the future a much wider scattering of institutional activities. This change will necessarily involve the ownership and control of scattered land holdings. The college land policy for the future must inevitably run in this direction.

BUILDINGS

The most obvious and ghastly mistakes in most colleges are advertised in brick and mortar. Of course there may be deeper and more serious errors of a spiritual nature, but they do not stare one in the face so continually. Buildings are big and visible. For this very reason they are comparatively easy to get, so that, as a rule, with only a few exceptions, every institution is more nearly

equipped in buildings than any other point. The ease with which legislatures and men of wealth give buildings to colleges and the difficulty with which they give money for maintenance or salaries have often been sorrowfully compared. So it has been inevitable that a good many colleges have gone astray in their building programs.

More often, perhaps, in their lack of program. One huge and ugly building after another has been erected while the money was coming. To sit down quietly and think and to make a coherent, logical, artistic, businesslike building program for the future has been impossible. In many cases, apparently, even the thought of such a program has not crossed the campus borders.

Yet the time has now come when three good men can make a very good plan for the physical development of any college. The first man must be the college administrator, who knows the spiritual college—who knows the life within, which should determine the physical form—and who has the vision to forecast the growth of the institution in hand. The second should be the

architect—a man who knows building problems in the large—not merely an estimator of brick and plumbing. The third should be the landscape architect, who can assemble buildings into groups, who can manage the approaches and the circulation of traffic, who can provide the necessary open spaces and the backgrounds of lawn, trees and landscape. This committee can render the most important service which it is possible to give to the physical plant. Their plans must be widely studied and criticized by others, and revised in the light of abundant suggestions; but a critical, comprehensive, physical plan prepared by experts is, in its field, the first and greatest need of every college. Any institution which is running without such a plan should proceed forthwith, through prayer and fasting and months of hard study, to supply the lack.

Such a study will yield, amongst other benefits (a) a proper grouping of buildings, enhancing their artistic effect and their practical utility; (b) a consistent style of architecture, now disgracefully lacking on many campuses; (c) a provision for the con-

venient circulation of traffic; (d) the reservation of open spaces which, in the lack of a plan, are continually sacrificed for the expedient location of some ill-considered building; (e) the development of a sense of unity; (f) substantial financial economies, especially in preventing sad and expensive mistakes.

Examination of the usual college campus reveals flagrant building errors of two sorts; first, in the location of buildings—errors due to lack of a ground plan—and second, in the use of diverse and incongruous architectural styles—often freak styles and buildings of no style whatever—wholly nondescript and alien to every form of civilization. Serious blunders have been made, too, in the erection of buildings unsuited to the college needs. Though this case is harder to prove and is seldom admitted by college authorities, still there need be no surprise at the fact considering how rapidly and blindly we have all been experimenting in our college work. If we have not yet found out what subjects we are going to teach nor how we are going to teach them, it can hardly be

expected that we shall have designed our buildings in every instance exactly to fit the unknown need. The situation ought to be frankly faced and corrected as fast as possible; by which I mean, not as fast as we can get the money, but as fast as we can develop the ideas. We need ideas much more than money in building up an agricultural college; and at no point does this principle apply more forcibly than in the matter of buildings.

In all probability the future will show that in the last decade we have erred in building too large. Our typical teaching building is an architectural hybrid between a shirt factory and a Carnegie library. Looking at our dormitories a visitor would be wholly uncertain whether this is a college, a lunatic asylum or a home for inebriates. The dormitories in all these institutions have all the same hard, inhuman, institutional look, except that the tuberculosis hospitals and the homes for drug wrecks are leading the colleges in the use of cozy cottage dormitories in place of the ugly and immoral traditional jail type. Certainly college stu-

dents ought to live in a more human, homelike way during these most critical years of all. It is a well-known scandal that some agricultural colleges have provided better for their pigs than for their pupils.

While the best college thought is turning strongly, even though wistfully and with unnecessary doubts, toward the smaller dormitories, it is not so generally felt that the big factory-like buildings are unadapted to the needs of college teaching, research and administration. Here again we are doubtless misled by the current tendencies toward centralization, toward big units of organization and toward the glamour of big business. But a college is not a steel trust nor a typewriter factory, where endless machines, human and metallic, run an endless routine. A college ought to be a broad democracy in which scores of departments preserve their own invaluable unity of character, and where hundreds of men in their own integrity freely express themselves. The modern method of forcing forty unrelated departments into a million-dollar palace may provide glorious laboratories for a few and sumptuous offices

for all, but it inevitably builds up the factory spirit and cramps the free initiative of officers who should first be men on their own feet. This spiritual injury is emphatic and serious in many cases. The plain and simple remedy is to build much smaller, simpler, detached or semi-detached buildings. The ideal arrangement, perhaps, is to supply one individual building for each department, though, of course, this rule cannot be followed very strictly.

Picturing the physical college as a whole, I like to see it as a model village, made up of small, comfortable, homelike, detached buildings, some for residence, some for business, some for work, some for social greeting, recreation and worship. All should be simple, dignified, democratic and suited to the day's work. It is a very different picture from the one that meets the visitor on most modern campuses where the crowded and splendid piles of masonry give the effect of a great Imperial Institution. Personally, I have a deep belief in the spirit of the college; and I believe that a truly living and effective spirit must express itself in physi-

cal forms. This is why I demur to the modern building program. I hope that the college spirit is one of democracy, of simplicity, of service, and not the spirit of combination, of imperialism and of luxury. And so, instead of being thrilled at the grand big buildings, with marble columns, of which our agricultural colleges boast, I find myself sad with misgivings. Most profoundly do I hope that the next few years, with more radical consideration of these questions, will bring a sound reform.

EQUIPMENT

Many circumstances have conspired to over-emphasize the science work as compared with the technical and purely agricultural work in all agricultural colleges. These circumstances need not be reviewed here, but the compound microscope may fairly be mentioned as a typical disease. Without impugning anybody's good intentions it is fair to say that the compound microscope has been one of the most serious handicaps which agricul-

tural education has had to carry. Imagination could hardly suggest anything less apropos to a professional training in floriculture or fruit growing or general farming, yet the students in all such subjects have spent months on end with these fascinating instruments. Every bright boy of college age is naturally attracted by instruments of precision; and the mere fact that those instruments have nothing whatever to do with his profession is small concern of his. But it should be the large concern of his teachers. Yet the teachers, too, have listened to the same siren. With all humility I remember that when I equipped my first department of horticulture the very first thing I bought was a set of compound microscopes.

Students and teachers alike, in the technical departments of agriculture, horticulture and household economics, have been infatuated with the big laboratories and the beautiful apparatus of the science departments, and have exerted themselves endlessly to secure the same sort of equipment for themselves. One may fairly suspect that a good many of the science departments have been

over-equipped—that the provision of machinery has quite outrun the equipment of brains—that the apparatus has been a great deal more refined than the men who tried to use it. But in the technical departments we need have no suspicions—we know. We know that a department of horticulture outfitted chiefly with compound microscopes is teaching a very poor brand of botany in place of a live line of modern horticulture. We know that a department of animal husbandry which emphasizes a fully developed chemical laboratory is substituting a superficial course in physiological chemistry for real work in stock feeding.

Simpler and cheaper equipment would be a great improvement in many science departments, perhaps in a majority of them. It is only ridiculous to see every sophomore outfitted with instruments and accessories which only an expert could use—with better equipment very often than the greatest discoverers have used in their epoch-making experiments. If pupils could improvise some of their own equipment and could overcome some difficulties it would stand

more to their education than to have all contingencies so amply foreseen by the teacher and the instrument vendor.

In the technical departments the problems of equipment are very different, or at least they will be as soon as these departments find themselves. When they discover that they have something of their own to teach, and have done stealing the matter and aping the methods of the science departments, they will be able to give up their chemical laboratories and their compound microscopes and to find something very different in their room.

We are now at a point where we can just begin to see what the future equipment of these technical departments is to be. A department of animal husbandry will require a representative collection of animals of the principal breeds; it will require to have them housed and kept according to modern farm methods; it will require whatever land and buildings are necessary to this end. A department of farm crops will require land on which to grow, in fields of reasonable size, all the commercially important crops;

it will usually maintain sample plots of the unimportant crops; it will have separate fields which can be used for experimental purposes; and it will have the barns, storage houses, seed rooms, etc., incident to the field work. A department of pomology will have orchards and nurseries producing the principal fruits in quantities sufficient for class use, and area enough for class work in pruning and spraying; it will have a suitable storage plant for fruit; it will have separate grounds for experimental work. Other departments will be developed in like manner. Emphasis will be placed on the fields, the crops, the farm animals. As these happen to be the very things emphasized in the farmer's mind by the daily routine of his business, the education thus given will be a much more truly agricultural training than anything we have achieved in the past. Anything except what has been done by a few especially progressive teachers. There are always a few leaders who are far enough in advance to show the rest of us the way.

Household economics has its own problems of equipment somewhat like those of

agriculture and horticulture, but also somewhat different. There is visible in some quarters the same tendency to build chemical laboratories rather than practical kitchens, and to install thermostats, steam sterilizers, bacterial culture apparatus and microtomes. Doubtless the most serious difficulty is the pressure toward institutional equipment and institutional methods in place of typical home equipment and domestic methods. Unfortunately, the college is an institution and not a home. Perhaps when we get a more highly decentralized and individualized organization, when we get cottage dormitories in place of barracks, we can bring in the simpler and better methods. Perhaps each cottage dormitory can have its own menage, can maintain its own domestic kitchen and laundry, can study its own dietaries and make its own menus, and thus can constitute a more effective laboratory for home economics than anything now possible where colleges are operated on the factory plan.

The ambitious head of a department will naturally seek elaborate equipment for his

work, but the thoughtful teacher must see that, in the teaching process, material equipment is a highly incidental feature, and that too much machinery positively deflects the student's attention from vital issues and actually impedes the main line of march.

SUMMARY

In this chapter attention has been called to the following matters:

1. Agricultural colleges receive their funds in various ways; by federal appropriation, by grants from state legislatures, by direct taxes, very rarely by gifts. The major portion of the income is usually in the form of continuing appropriations. Careful study of financial needs, preparation of annual budgets and careful accounting are much to be desired.

2. Land is indispensable to an agricultural college, and the needs of the future will doubtless be greater than of the past.

3. Every college should make a critical study of its future land needs, based upon equally critical studies of future policy.

4. Detached tracts of land will probably be required much oftener in the future than in the past.

5. Buildings are essential and the problems connected with their design, location, grouping and management are manifold. Great mistakes have been made everywhere in the matter of buildings, most of which mistakes can be avoided in the future by foresighted studies of building needs. These studies should reach the stage of presenting definite policies, with general architectural motifs and groupings.

6. Similar studies should be made of the entire physical plant—ground, roads, buildings and all other features.

7. Probably we shall find that good building policy will lead to the erection of smaller and simpler buildings in the future than in the recent past. The tendency toward very large, factory-like structures has evidently gone too far. Such buildings are objectionable in many ways and have very meager advantages.

8. It is possible that the ideal layout will resemble to a considerable extent the usual

rural village with its streets, open spaces, dwellings, business houses and public buildings in simple and convenient arrangement.

9. Circumstances have led to many serious faults in equipment. A principal error lies in copying the agricultural and horticultural equipment from the science departments.

10. Simpler equipment should be the policy in most lines, including the science departments.

11. Departments of animal husbandry will require chiefly good stock; departments of pomology will require orchards; and other technical departments will need chiefly the materials used in actual practice.

12. Emphasis must not be placed on buildings or equipment, but upon teachers. Buildings and equipment are only incidentals, and instead of compensating for any lack of human ability they only make more apparent the deficiencies of poor instructors.

CHAPTER IV

ORGANIZATION OF INSTRUCTION

LARGE problems exist in every agricultural college with respect to the general plan of instruction. Fortunately, no serious misconceptions are current with regard to these problems as in several other fields of agricultural education. Yet no single agricultural college has yet met these problems with a frank and adequate solution.

Instruction of several different types and grades is now being given in every college. The principal types may be rather accurately summarized under the following heads:

1. The graduate school.
2. The four-year course, leading to the degree of Bachelor of Science.
3. A two-year course, in some colleges.

4. The short courses, usually six to twelve weeks.

5. Extra-mural teaching—college extension.

Some colleges also have on their hands serious labors with preparatory grades of one or two years. These should be eliminated from the college scheme as rapidly as possible, and all institutions seem to be following that policy.

EFFICIENCY DEMANDS CLEAR DIFFERENTIATION

Almost without exception these various types of teaching have grown up, often quite rapidly, in response to definite needs, but without any very definite plans, and always without any critical study of their place in the educational program. The inevitable result is that, in a large majority of cases, the whole undertaking is still a makeshift, often a very poor and wobbly one. Yet we have gone far enough to know quite positively which forms of instruction are valu-

able and ought to be incorporated into our permanent plan.

Doubtless the greatest difficulty arises with the teaching force. Everywhere we see individual teachers trying to cover the whole range, from graduate school to extension teaching. Not infrequently we find a man giving the same lectures and demonstrations to post-graduates, four-year men, short-course students and farmers' institutes. Everybody knows this is wrong, but only a few colleges have had the money and the grit to face the situation.

The breaking point seems to be usually with the winter short courses. Teachers already loaded to their utmost capacity wake up some cold morning in December to find their classrooms overrun with fifty or one hundred raw recruits of all ages, sexes and stages of preparation, which in six weeks' time have to be drilled into some unity of thought and filled with the latest information on some technical specialty. The situation is absurd, impossible, sometimes pitiable.

Relief obviously should come through the

employment of a separate teaching force for the short courses. Only in rare instances should the regular instructors from the four-year course be permitted to teach in the short winter courses. Usually the practical line of development lies in using the extension staff on the short courses.

A similar correlation can often be made between the graduate school and the research staff. Men doing research work can often handle a few graduate students to the advantage of all interests.

Some plan, however, of providing fairly and in a specialized way for the various types of instruction is greatly needed in every college. It is unfair to teachers, to pupils and to the public to allow matters to drift as they have done in the past in nearly every college in the country.

THE GRADUATE SCHOOL

While the undergraduate school of agriculture has been modeled largely on the classical college the graduate school has been utterly under the control of the scien-

tists. The classical colleges, so far as now appears, never made any respectable attempt to found graduate schools on their own account. The studies in Old French or in philology, or in the Shakespearean concordance, which have brought their Ph. D.'s to many American literary students, were really founded by the returning troop of pupils from the German universities, and were closely patterned after other investigations in chemistry and botany.

In the field of agriculture the situation has been the same. Though a few graduate degrees have nominally been given in agriculture, the studies pursued have in fact been as distinctly scientific as any others, and the whole plan of study, tests and degrees has been provided by the science staff. The teachers of agriculture and horticulture themselves have mostly walked in a dream of science. They have aspired to make their work scientific, and failing to see the great untouched field of technical study, they naturally have not sought to occupy it.

Today, one of the most serious needs in the entire world of agricultural education is for

two or three strong graduate schools which shall teach professional specialized agriculture as distinct from agricultural science. Such a school would be a radical innovation, and heroic measures would be required to put it into working order, but the result would be worth the cost.

The nearest approach to professional graduate work in agricultural lines which can be cited is found in the forestry schools at Yale and Harvard. Here strictly technical work is given from the strictly professional point of view. It would seem practicable to establish similar graduate courses in animal husbandry, general agriculture, fruit growing and other lines of practical agriculture.

The first purpose of these courses would be to train teachers, investigators and administrators of agricultural enterprises. Eventually they might be made so useful as to be worth the while of young men who are entering productive agriculture on their own account. At the present time, however, the need for men of better training in college and station work is deplorable. It is practically impossible to get a man to head

a department of market gardening or agronomy who is as well trained as the assistants and second assistants in chemistry or zoology.

Inasmuch as the graduate school in agriculture, whenever it may be opened, will at first train mostly teachers and investigators, it would seem to be highly desirable that the curriculum should include some thorough work in the principles of education. If training in the art of teaching—some genuine normal school work—could be added, so much the better.

Question has arisen in certain quarters as to the graduate degrees to be conferred on those who complete advanced courses in agriculture. Thus far the Master of Science and Doctor of Philosophy have almost always been given, though, of course, for work which was scientific rather than professional. The graduate schools of forestry and landscape architecture referred to give special degrees, Master of Forestry and Master of Landscape Architecture. To follow the analogy the graduate school of agriculture should brand its men Master of

Agriculture, or, specializing further, call them Masters of Floriculture or Farm Engineering or Poultry Breeding or Cookery.

Such titles sound ridiculous, and it will be desirable to avoid them if possible. The multiplication of degrees is in itself a nonsensical pedantry to which the agricultural colleges should offer a solid resistance. But the exact title to be conferred is of such negligible importance beside the work to be done that it will not do to quarrel long about it. By all means let the work begin!

THE FOUR-YEAR COURSE

The leading problems of the four-year course are, first, the teacher, and second, the course of study. As these are discussed in separate chapters we may here give attention only to certain other secondary but important questions.

It was formerly a grave question of policy in many states whether the four-year course should be of college or high-school grade. It is probably true that most states need agricultural high schools more than they do ag-

ricultural colleges. Many states are now organizing these high schools, thus leaving the colleges free to do college work. But whether the high schools are ready now or not it would seem to be sound policy for the state agricultural college to assume the college standing. Those institutions which have held out most vigorously and conscientiously against the college standards have hardly justified their policy by actual results. At the present time it can be put down as practically settled that the four-year agricultural courses should be given the same academic standing as other college courses in classical or scientific institutions. This is not because the agricultural colleges are not strong enough to live up to their own ideals, but for reasons much deeper and sounder than that.

According to the current educational jargon this means that the four-year course shall be based on an entrance requirement of fourteen or fifteen "Carnegie units."

Two special problems come up in administering entrance requirements. The quanti-

tative measure once established there may be some quarrel over the qualitative requirement. Shall the college require modern languages or a minimum of mathematics, or this or that particular subject? Apparently the answer of the best educators is to require a reasonable use of the English language and four years of honest high-school work, saying nothing further about particular subjects. In this matter the agricultural colleges and state universities should be especially liberal when they are asked to join hands with the high schools, which are public institutions like themselves.

The second problem, though merely a specialized form of the first, is decidedly more difficult. As the agricultural high schools get under way they will inevitably be sending a few of their graduates to the agricultural colleges where they will surely find repeated some of their high school subjects. It is very difficult to deal with such cases. Even when the ground covered in a college course in agronomy, for instance, is practically the same as that covered in a high-school course, the quality and method

of instruction and the student's ability may be very different. The presumption is wholly against the high-school course being the equivalent of the college course. Yet wherever possible the college policy should still be to give whatever credit can be given to the high-school work. Credit for entrance, however, may be given much more freely than credit for advanced standing.

Every effort should be made to prevent the agricultural high schools from becoming preparatory schools for the agricultural colleges. They have quite another and more serious function to perform. And the agricultural colleges should make it clear that the best preparation for their four-year courses lies in the high schools where mathematics, science and civics constitute the bulk of the work.

THE TWO-YEAR COURSE

Several agricultural colleges maintain a two-year course differing materially, at least in theory, from the four-year course. The significant differences are: (a) The two-

year course is only half as long. (b) Lower entrance requirements are allowed. (c) The curriculum includes less language, mathematics and literary material and relatively more "practical" instruction. (d) No degree is given on graduation, though a certificate is usually issued, which outside college circles cannot be distinguished from a genuine B. S. or A. B. In a number of institutions the two-year course is further differentiated by beginning and ending at different times of the year.

Theoretically this two-year plan is a good one and represents a genuine service which the agricultural college ought to offer to its clients. Practically the results have been so unsatisfactory that many colleges have completely rejected the idea.

Objection has been made that the students who complete the two-year courses pass themselves off as graduates of the college, thus defrauding their employers and injuring the reputation of the genuine bachelors of science. Such misunderstandings undeniably occur, and with relative frequency; but this hardly furnished adequate reason

for abolishing a system which is in itself serviceable.

The real troubles with the two-year course are two: First, the overloading of teachers; and second, the failure to differentiate the course of study.

As a rule the work of the two-year course has simply been loaded upon teachers already fully occupied with four-year and short-course work—even also with experimental and extension work. If the two-year course is to be maintained it should be fully equipped with teachers, and a considerable number of these should be employed primarily and chiefly in this particular enterprise.

The second difficulty grows partly out of the first. Teachers already overwhelmed with teaching four-year pupils have no time to prepare fresh courses purposely for the two-year men. Thus it has very frequently happened that the same courses have been given to both groups. Indeed, in some instances the two-year curriculum is principally a patchwork of scraps brought together from the dissected long course.

The two-year course, however, being wholly different from the four-year course in its fundamental purposes, should be equally different in its content and methods. Very briefly it may be pointed out that while the four-year course holds ever distinctly in view two ideals, the cultural and the vocational, the two-year course throws all emphasis upon the latter and touches matters of personal culture only in the most incidental way. The two-year course has the ideals and should have the methods of the trade school. The four-year course combines the ideals of the university and the professional graduate school, and must employ the methods of those schools. To make up a two-year program, therefore, along the lines of the four-year work is an educational solecism and hardly excusable.

THE SHORT COURSES

Nearly every aggressive agricultural college has experimented extensively with various short courses. General experience now inclines to a school of six to ten weeks

in the winter, at which time a considerable list of courses is opened and a pretty free election allowed. Practically no entrance requirements are enforced for these courses, and no special credit given for their completion.

Special provision is frequently made for other short courses at other seasons in specific subjects, such as beekeeping, poultry husbandry, road making, corn judging. Where wisely organized and aggressively conducted these special short courses are quite effective, and represent a real popular service.

The first thing to be done to make short courses effective is to place their management in the hands of a special executive officer. All experience shows that the general faculty will not give the energy, enthusiasm and unity of purpose to this enterprise which it demands. This director of the short courses may be also the director of the extension service, or other possible shifts of college organization may be made. But an independent, aggressive director the short courses must have; and where they are of

considerable importance it will be much better to assign one good man to this exclusive duty.

Separate teachers are also greatly needed for the short courses. The common custom of piling the short-course work on to the long-course teachers is burdensome to the teachers and wholly unfair to the pupils. The short-course work ought to be given by men of a different type, working from a wholly different point of view. Generally speaking, the great present need of the short courses is that they be wholly restudied as an independent, educational enterprise, and that they be put on a sound, pedagogic basis. This would probably lead to their radical reorganization; but in many colleges they seem to be of such large and permanent importance as fully to justify such revolutionary improvement.

Short summer courses are now being conducted by several colleges. The pupils in these summer schools are largely school teachers, and under any circumstances the makeup of the student body is very different from that of the winter short courses. The

same general principles, however, govern the management of the summer school. It is necessary to have a strong executive officer in charge (dean or director), specially chosen teachers, and a program carefully designed to meet the specific purposes for which the school exists.

THE EXTENSION SERVICE

Strictly speaking, the extension service represents a separate branch of the college organization, co-ordinate with the experiment station and the resident teaching establishment. It is, however, essentially a teaching enterprise, and in any given college its scope and character are largely determined by the makeup of the local faculty. Such work as the correspondence courses falls largely on the resident faculty, and is in fact separated from the general short courses and other forms of teaching only arbitrarily.

Here again the great need is for more clear differentiation of the work. Separate men wholly devoted to extension service are

almost indispensable. It is also highly important that the distinctive purposes of the extension service shall be clearly understood and methods appropriate to those purposes adopted. To a large extent this work has been an outgrowth of other college activities, often a mere relocation of propaganda earlier undertaken by the experiment stations. In only rare instances has it been given fundamental study as a separate educational enterprise.

A fuller discussion of the extension service is given in another chapter, but the pedagogic aspects of the work deserve a few further notes in the present connection.

While the college world is only slowly discovering that all agricultural teaching should be done much more from the technical and much less from the scientific point of view, the constant necessity for putting practice ahead of science is generally quite clear in the field of extension work. Whatever need there may or may not be for botanists, physicists and chemists in the research laboratories, there is certainly no place for

them in extension teaching. The extension man must be alive to the technical problems of dairying, market gardening, stock feeding or soil improvement, and the more science he talks the worse for everybody. He needs to be a well-trained man, of course; and he cannot know too much science of any sort, but his science must never get the upper hand.

With the present demand for county advisers and for extension men in college employ there arises a crying need for a thorough-going training school where men can be fitted for such exacting duties. The usual graduate school, especially as now organized primarily in the interest of scientific research, is almost useless to this purpose. What is needed is something more in the nature of a normal school.

Finally, it must be realized that up to the present time the extension service has been largely an experiment. All sorts of schemes are being tried. The colleges, through their extension branches, have attacked every conceivable sort of problem—the growing of potatoes, the control of insect

pests, the elimination of unprofitable roosters, and the reorganizations of the schools and churches. The work has been too scattering. It has covered too wide a field. Experience will certainly lead to concentration. A few problems will be chosen and all the various forces at command will be directed upon them. In these concentrated efforts there will be new methods employed not yet even tested. For one thing, this concentration will lead to much longer and more patient work on the adopted problems. Instead of a single evening lecture on the selection of seed corn, this subject will be touched fifty or one hundred times in a year, and from many points of view. Carefully planned routine drill on selected points will take the place of the transient exhortation on all mentionable subjects.

It seems safe to predict another change toward less talk and more doing things. Exhortation is soon exhausted. It is much better to show men how to candle eggs, how to test seed corn, how to pack apples, how to mix fertilizers, than to tell them any sort of tale from the platform. Practical demon-

strations will largely supplant lectures and even bulletins.

SUMMARY

Teaching is the primary function of all the colleges, but the teaching enterprise is a complicated one. Surveying the field we find:

1. That every agricultural college has under way several quite different forms of instruction, the most important being, (a) graduate teaching, (b) the bachelor's or four-year course, (c) the two-year course, (d) the short course, (e) extension teaching, in correspondence courses and the like.

2. These different forms of teaching should be much more clearly separated than they have been in the past. Each one should be independently studied as a separate educational enterprise, its specific purposes clearly understood, and its curriculum and methods worked out to meet those specific purposes.

3. Existing graduate schools are adapted to science teaching. Graduate work in technical agriculture, now greatly needed,

should be organized on a different basis and pursued by quite different methods. Such graduate schools, for the immediate future, should give considerable normal school work.

4. The four-year course must be of college grade. Entrance requirements should be high and strict, but full credit should be given to all honest work in the high schools.

5. Two-year courses have not always succeeded. If they are to be given they should be fully separated from the four-year courses and should be given a much larger proportion of technical or "practical" instruction.

6. Short courses, usually of six to ten weeks, are of proved value. They should be wholly separated from other courses, under direction of a special executive officer, and, as far as possible, with an independent corps of teachers.

7. In the extension service we find a very special form of public instruction, and one which requires special teaching methods. A separate and peculiar organization is obviously required. The forms of teaching

will be highly professional, dealing with the actual problems of practical agriculture, and seldom or never entering upon formal science.

CHAPTER V

SPECIALIZATION IN AGRICULTURE

ONE of the most obvious advances of the past twenty-five years in the field of agriculture has come from subdivision and specialization of the work. In the beginning there was one chair of agriculture. Presently this was divided into two chairs, agriculture and horticulture, and for an appreciable time the college world rested there. The professor of agriculture was expected to know all there was worth knowing about farm crops, fertilizers, rotations, practical feeding, stock breeding, marketing, farm management, rural law and politics, farm buildings, and whole encyclopedias more. As we look back now it seems incomprehensible that some of the men assigned to this impossible field accomplished so much. There were great men in those days, whose reputations remain undimmed by the fact

that they were never specialists in the modern sense.

But recently agriculture, horticulture and domestic science have been rapidly differentiated. One man specializes in stock feeding, another in breeding, while others confine themselves not merely to breeds, but to breeds of one particular group, as swine or sheep. For purposes of investigation such specialization cannot go too far; but in the work of teaching it quickly passes from an advantage to a distinct defect. We will return to this point presently.

AGRICULTURE

The first break in agriculture always comes between plant life and animal life. This is usually followed by a separation of soil and fertilizer studies from plant life, leaving a three-fold subdivision of what was formerly all agriculture. Thus we have—

Animal husbandry.

Field crops.

Soils and fertilizers.

This does not last long, however. Animal husbandry soon becomes unwieldy, and

one man confines himself to feeds and feeding, while another studies breeds and breeding. The dairy industry, largely concerned with manufacturing and with marketing milk and milk products, soon finds room for separate development.

Next, there has to be careful attention given to subjects overlooked in the primary subdivision, such as agricultural engineering and farm administration. Perhaps farm marketing will be differentiated from farm administration and become an independent department. This brings us to the second stage (historically the third) of progress by subdivision, giving us the following subjects, possibly represented by separate departments, or at least by individual specialists:

Breeds and breeding.
Feeds and feeding.
Dairying.
Farm crops.
Soils and fertilizers.
Farm engineering.
Farm administration.
Agricultural marketing.

Beyond this it has not yet seemed wise to

go in the formation of new departments; but the employment of specialists has frequently led to much more minute subdivision. Thus we find experts dealing only with horses, poultry or dairy cattle; other specialists working with particular crops, as corn, cotton or tobacco; other men devoting themselves to such topics as cheese making, drainage, dry farming, farm buildings, etc., etc.

This latter type of specialization, represented rather by men than by burdensome departmental organizations, is particularly flexible and apt to be convenient and efficient—though we must not neglect to notice that this high degree of specialization is useful chiefly in research instead of in teaching.

HORTICULTURE

By every statistical test, horticulture is much less important than agriculture, of which, in the broad sense, it is only a branch. Yet for very good and sufficient reasons it has played a role in agricultural college development quite out of proportion to its

statistical weight. In general it has marched side by side with its co-ordinate agriculture. This is, of course, because it has been able to render an equal service in agricultural progress, and especially in agricultural college development.

In some of the agricultural colleges, as in the United States Department of Agriculture, the line has been drawn, not between agriculture and horticulture, but between animal industry and plant industry, leaving the whole of horticulture grouped with agronomy or field crops. In a way this seems more logical, but practically the difference amounts to very little. Either form of subdivision leaves two large groups to be still further subdivided; and it would be useless to argue whether forestry is more closely affiliated with market gardening than the manufacture of butter with the breeding of mules. Any institution which finds one line of analysis more conformable to its needs and circumstances than the other should feel free to follow its own desires.

Now horticulture in American colleges has usually meant pomology; and in the

northern states has in fact meant apple culture. But as the horticultural industries are the first to specialize in practice, so the subdivision of material in the colleges could not long be delayed.

Market gardening and floriculture were the first industries to assert their existence separately from pomology, and are now usually recognized as so widely differentiated as to require specialists and usually separate department organizations.

Forestry has been recognized almost from the first as a separate subject, and is in fact included with horticulture only arbitrarily. It is entirely capable of standing by itself, and deserves separate organization wherever trees grow and agricultural colleges flourish.

Landscape gardening has from the first been brought within the scope of horticulture. For this there is no logical foundation in fact. The subject is as distantly related to horticulture as forestry. Nevertheless, it is convenient to group it with horticulture, and the association has never proved disadvantageous to anyone. Perhaps it is proper to say here that, though the name is widely

used in departments of horticulture, landscape gardening is in fact taught in very few agricultural colleges. The courses commonly given deal with the plant materials used in landscape gardening, and have the same relation to the subject, therefore, as a study of paints and oils has to the art of painting.

Landscape gardening, however, is primarily an art of design; and it would seem to the writer, whose own specialty is here under discussion, that the best practice in agricultural colleges would be to introduce elementary courses in real landscape art, i. e., in the principles of design as applied to land improvement, perhaps replacing the present courses in ornamental plants. Such courses should confine themselves to a few type problems, such as the design of the farmyard, the design of the school grounds, the design of a playground; and should deal primarily with questions of structure and space arrangement. If to these ideas there could be added some plain instruction in civic art, such as the orderly improvement of public commons, cemeteries, roads and

roadsides, the agricultural colleges would be giving much more effective attention to the subject of landscape gardening.

Extended professional courses in landscape gardening need be given in only a few institutions in the country. The attempt to give such instruction in many places would be a sad waste of effort. Some academic discussion has developed as to whether the classical universities, the engineering schools, the architectural schools, or the agricultural colleges offer the best environment in which to develop such professional courses in landscape gardening. Theoretically, the schools of architecture would be the best sponsors; but such schools do not exist in America with sufficient strength to do the work. The engineering schools are theoretically and practically out of the question. And inasmuch as landscape gardening is a highly technical profession, it would seem to flourish better in the technical and professional environment of the agricultural colleges than in the reflective and non-technical schools of arts in the classical colleges. It is perfectly natural,

therefore, that the strongest work in landscape gardening should now be growing up in the colleges of agriculture.

There is, of course, the same opportunity and the same need for specialization in horticulture as in agriculture. Thus in pomology there may be one man who is an expert on small fruits, one whose field is systematic pomology, one who studies only the technic of spraying, etc. It may seem wise in certain cases to employ specialists also for particular crops, as cranberries, potatoes or roses.

The manufacture of fruit and vegetable products further calls for the service of well-trained specialists.

GENETICS

The subject of genetics, thremmatology, or the science of breeding, stands for the present in an anomalous position. The principles of genetics apparently apply with equal force in animal breeding and in plant breeding. Genetics, therefore, really classifies with the sciences. Yet the departments

of animal industry have been so deeply involved in the genetics of stock breeding that they have not been willing, nor indeed able, to turn the subject over to any department of pure science. Similarly the departments of crop production have been so keenly alive to the work of plant breeding that they have kept the study of genetics warm for themselves.

Under present circumstances it seems almost necessary to maintain a department of stock breeding in the division of agriculture, a department of plant breeding in the division of horticulture, and a department of genetics in the division of science. Where all these cannot be kept up it would seem best to begin with the department of plant breeding, allowing stock breeding to be handled along with types and breeds until such time as it can be wisely separated into an independent department, and leaving the erection of a science department of genetics to the last. The reason for putting plant breeding first is that it is the simplest field for the study of thremmatology, and the one in which the most concrete material is

available, either for teaching or research.

Genetics is a very satisfactory classroom subject, especially suited to the sophomore year of the college course. The popular theory is that it should precede specific studies in plant breeding or stock breeding. This theory, however, is fully examined elsewhere and the reverse conclusion reached, viz., that the concrete lines of study should precede the more abstract and generalized lines. The logical sequence, therefore, would seem to be to begin the sophomore year with a term of plant breeding, stressing the observational work and minimizing the theory; to follow this with a term of stock breeding, also giving prime attention to quantitative and observational studies; following this with a term of genetic theory, designed to synthesize and explain the observations of the preceding two courses.

DOMESTIC SCIENCE

In most of the agricultural colleges domestic science stands precisely on the same

footing as agriculture and horticulture, and faces exactly the same problems. It has been agreed by the teachers of domestic science that the field should be divided into four parts, viz.:

Food.

Clothing.

Shelter.

Household and Institution Management.

These subjects easily subdivide further; and such subdivision, accompanied by specialization, is, of course, necessary to efficient work on a large scale. Thus the subject of food has three outstanding subdivisions: (a) kinds and sources; (b) preparation, i. e., cookery; and (c) physiology of nutrition. Clothing subdivides into (a) textiles, (b) sewing, and (c) costume design. And so with the rest.

All these fields offer still further opportunity for the specialization of individuals, just as in agriculture and horticulture. One teacher or investigator may attend only to cereals; another to invalid cookery; another to the computation of rations, etc., etc.

LIMITATIONS OF SPECIALIZATION

Reference has already been made to the principle that specialization may go much further in the research organization than in the field of teaching. In the former there is hardly any limit to the extent of specialization. The more a man narrows his field the deeper he can go, and depth (with thoroughness) is the quality most to be desired in investigation. But in teaching, breadth is more to be regarded than mere profundity. Here specialization may easily go too far.

How far should it go, for example, in the four-year course? To this question a fairly definite answer can be given. The four-year course should prepare men to enter upon definite lines of productive agriculture or upon definite agricultural professions. Examples of the former would be poultry raising, fruit growing, general farming. Examples of the latter would be research in soil physics, landscape gardening, estate management. Thus when we ask how far a

man should specialize in college, if he proposes to take up practical poultry growing, we are able to answer with some confidence. He may, indeed, intend to specialize within this field, as in growing ducks or producing heavy roasters; but he will at least want to know all the best that can be shown him about modern poultry culture. This field he will want to examine broadly, learning about breeds and breeding, feeding, exhibiting, egg production, meat production, incubation and brooding, diseases, storage of products and marketing.

On the assumption that the four-year course consists of forty term courses of three credits each—the common standard—the student will want from seven to ten courses in the poultry subjects here outlined. The field can be fairly covered, but not exhausted, in this time. But the teacher should avoid exhaustive treatment of any subject in the undergraduate school, aiming rather at thorough drill upon selected type phases.

The pupil going into poultry husbandry should have these poultry courses fortified by several more general courses in animal

husbandry and a few in general farm management. These together should number six to eight additional courses.

Every student will have certain other semi-professional ideas of his own which will want room for development. One man will want to combine fruit growing with his poultry work, and will elect two or three courses in pomology. For another it will be market gardening. Another will have a leaning toward veterinary practice which will lead him to elect in that field. And so on. We may easily estimate these elections at two to five courses.

Summarizing these requirements by courses, we find the four years occupied somewhat as follows:

	Minimum	Optimum	Maximum
Specialized professional	6	10	15
Semi-professional	4	6	10
Collateral technical	2	4	8
Cultural, including science, civics and humanities	28	20	7
	40	40	40

From this summary it is easy to conclude that any teaching department has reached

the limit of practicable specialization when it offers ten separate courses. Even this program should be attempted only by strong, well-equipped, well-manned departments operating in fields of considerable importance. It should always be remembered, moreover, that it is infinitely better to give two sound, thorough courses, well taught, than ten sloppy, half-baked courses with nothing in them.

OVERLAPPING

One internal college problem remains to be considered in this connection—a problem which causes as much human trouble as anything within the whole range of college administration. This is the problem of overlapping.

As soon as we begin to add departments and to multiply specialists we inevitably find different departments and different men claiming the same field. For example, take the questions which are connected with the use of commercial fertilizers. The department of chemistry first puts in its claim, then

the department of soils, then perhaps farm management; while departments of pomology and market gardening and farm crops naturally feel license to prescribe all the fertilizers needed in growing their respective crops. Competition arises between these departments for men and equipment; also there is sometimes radical divergence of opinion on the technical questions involved.

These conflicts are not rare. They are frequent—universal to the college world. What is to be done about them?

As long as college staffs must be made up of human beings it is perhaps expecting too much to hope that these difficulties will ever be wholly removed. By wise management, however, they can be greatly ameliorated. First, and most of all, though not simplest of all, they can be mitigated by improving the esprit de corps. Keeping up a good spirit in a college staff is a great art, but one which no one yet knows how to teach. If all workers can be friendly to one another, loyal to their college, and enthusiastic for institutional success; and if they can be guided by wise, patient, tactful, executive

oversight, the best will be accomplished, and conflicts due to departmental overlapping will be reduced to the minimum.

The method outlined in another chapter of assigning particular problems or projects to individuals instead of trying to delimit large departments, has been offered mainly as a remedy of the overlapping evil. It has not proved an unbounded success. Jealousies and friction still inhabit the organizations where this system has been most fully introduced. On the whole, it seems better adapted to a large organization engaged in research than to a small staff whose work is principally teaching or extension.

In some institutions such questions are settled by arbitrary authority. The president, a director, or the trustees, undertake to designate the men who shall handle all matters pertaining to fertilizers, or nutrition, or spraying, or drainage, or any other disputed field. If such central authority is strong, just and tactful in its decisions, this method is probably the very best that can be devised.

One or two principles may be laid down, however, which may help in adjusting these

perennial conflicts. The first of these is that a certain amount of overlapping is inevitable and need not be injurious. For example, the entomologist must say something about spraying in his course on economic entomology; the botanist must also discuss it to some extent in his course on plant diseases; the market gardener and the florist must refer to spraying in connection with their crops; while the department of pomology must give elaborate courses in spray machinery, materials and technic. Moreover, it is impossible for every entomologist, botanist, market gardener and florist who goes through college to take the big spraying courses in the department of pomology. As long as these several departments refer to spraying only incidentally the propriety of their courses is clear enough; but it would be bad management to permit the departments of entomology, botany and pomology all to give full-term courses in spraying. For as soon as the student of entomology or botany elects an entire term in the subject he can take the work in the department of pomology as well as anywhere.

The second principle is that disputed questions should preferably be assigned to the departments of science, rather than to the technical departments, when research work is in hand, but should go by preference to the technical departments for teaching. In case of extension teaching they should go always and wholly to the technical departments, the science departments being eliminated entirely from the extension service.

When conflicts arise between two technical departments an arbitrary settlement is almost necessary. For example, shall the potato crop be studied by the agronomy or the market gardening department? In general, it will be good policy for any institution to decide such questions in favor of the stronger department, or else to strengthen the other department by adding a new man and assigning the disputed subject to him.

REVIEW

The discussions of the present chapter may be summarized as follows:

1. Specialization has been a great factor in the development of the agricultural colleges. The subject matter of agriculture and domestic science may be almost endlessly divided and subdivided.

2. Agriculture has been conveniently divided into (a) breeds and breeding of live stock, (b) feeds and feeding, (c) dairying, (d) farm crops, (e) soils and fertilizers, (f) farm engineering, (g) farm administration, (h) agricultural marketing. Occasionally other departments are recognized.

3. Horticulture has been partitioned into pomology, market gardening, floriculture, forestry, landscape gardening, with the manufacture of by-products and plant breeding often added.

4. Beyond these subdivisions, usually represented by departments, specialization is carried *ad libitum* by the employment of men for very narrow and specific problems.

5. Genetics belongs to the pure sciences; but animal breeding and plant breeding must be maintained in the technical groups. In teaching, the concrete study of plant and

animal variation and inheritance ought to precede the science of genetics.

6. Domestic science is authoritatively divided into (a) food, (b) clothing, (c) shelter, and (d) household and institutional management. These subjects are further subdivided according to need, after the method followed in agriculture and horticulture.

7. However, there are limits to specialization, especially in the field of teaching. As a rule no department should ever give more than ten undergraduate courses.

8. Overlapping is a constant worry and is apt to cause great trouble. The remedies are (a) better esprit de corps, (b) better organization, (c) arbitrary but just decisions by authority, (d) the recognition of certain controlling principles.

9. Finally, it should be the ideal of every college to have only as many departments as it can effectively support, and of each department to give only such courses as it can carry through with thoroughness and enthusiasm. It is much better to have a few departments well manned, well equipped,

well administered, than to have many departments undermanned, half equipped and heedlessly administered. The same principle applies with equal force to individual departments.

CHAPTER VI

THE COURSE OF STUDY—MATERIALS

THE importance of the course of study will bear heavy emphasis; in fact, almost any emphasis which does not overlook the only two things which are of greater importance in the teaching business, viz., the teacher and the methods of teaching. The character and work of the teacher transcend in influence every other factor; and the methods employed in teaching are often, perhaps usually, of more importance than the matter taught. In reality, no teacher can teach anything but himself. Instead of filling a student with Latin or cookery or poultry husbandry, all he can truly communicate is his own personality.

But these large considerations aside, it does make a great difference what subjects are included in a college or high-school

curriculum, and how they are arranged. On account of the fact that the agricultural faculties have been made up almost exclusively of specialists who had no interest in educational problems as such, the agricultural courses of study have been sadly neglected. There has been constant tinkering, to be sure, but rarely any intelligent and never any expert study of the curriculum. In the better developed colleges, however, the time is ready for a change. We are mostly willing to have a logical and effective course of study if only someone will show it to us. (Of course individually each will still insist that his own subject is indispensable and must be required, at least two or three years.)

MATERIALS

A brief review of the materials from which the curriculum is to be constructed shows that they may be readily grouped into three or four fairly distinct classes. These are (a) the humanities, so-called, including languages, literature, history, economics

and sociology, (b) the sciences, (c) the technical subjects, as all branches of agriculture, horticulture and household arts. (d) Mathematics are really so much different from the natural sciences that they ought to be considered by themselves. In order to find the place of any of these subjects in the course of study it is absolutely essential to decide what service each is to render, and this service must be looked at primarily from the standpoint of the student. For while the college exists distinctly for the service of the state, its teaching work can be made effective only in so far as it reaches and develops individual men.

As regards the agricultural material, it has already been pointed out that it serves two purposes, which are precisely the two purposes for which the college exists, viz, to train men and women for service in practical vocations and also to give them that personal development of character often called culture. The first purpose is very commonly emphasized to the detriment of the second, and yet the first purpose is often partially defeated for the sake of the sec-

ond. It is a curious perversion of ideas which so commonly exists at the very foundation of agricultural education.

For more than a century, and especially during the last forty years, the common world has been infatuated with the idea of vocational training in agriculture. Teaching agriculture in the public schools and in colleges has been a pet idea of farmers, editors and statesmen for two generations. In recent times leading educators, especially those in the swing of normal school work, have been pressing also for the same ideal. It must be confessed that agricultural college faculties generally have shown much less faith in this ideal than the outside world. The simple and adequate explanation of this surprising fact—for it is a fact—is that a large majority of such faculties have always been classically trained men and science-trained men. Even the teachers of agriculture, horticulture and household economics have been scientifically rather than vocationally trained. If the professor of dairying has had his training with a microscope and test tubes, instead of with cows and

churns and curd presses, he is practically certain to make of his college department a science laboratory, rather than a working dairy.

The vocational ideal in the teaching of agricultural and household subjects needs to be very greatly strengthened in American agricultural colleges. In the new high schools this ideal is now much more vivid and influential.

At the same time the cultural and humanitarian ideal in vocational training needs to be exalted. Teachers of agriculture and household arts must have much greater faith in their work, both for vocational efficiency and for personal culture.

The fact that agriculture and household arts are worth very much more for all the purposes of education than has yet been understood means that they should have a large place in the curriculum. The fact is, these subjects have grown rapidly in relative importance. When I was a student, about 1890, in the leading agricultural college of that day, the course of study included two terms of agriculture and one term of horti-

culture. Today in the same institution the agricultural student may secure fifteen to twenty terms of vocational work, and the actual vocational quality of the work has improved almost as much as the quantity. Twelve years ago there were five courses in horticulture in the Massachusetts Agricultural College; today there are thirty. In quality the courses have been rapidly professionalized.

As matters have gone during the past twenty-five years the quantity of agriculture in the curriculum has been increased just as fast as the material could be put into teachable form. As fast as any man has been able to develop a course place has been found for it. Indeed, many courses have been admitted which might be charitably called half-baked. In the near future much higher standards are going to be required.

Nevertheless, the quality of the teaching in agriculture and home economics has greatly improved, and this improvement has been directly in the line of more professional work. It hardly needs to be said that quality is more important than quantity in any

estimate of the value of any kind of teaching.

Yet this is not enough. One move more of a most radical nature remains to be made. Not only is it desirable to have more professional material in the curricula, not only is it important to have the professional teaching greatly improved in quality, but *the professional courses must be given a commanding position in the course of study.* Other courses must be made secondary and contributory to these.

In the curriculum provided for the training of men in agronomy, for example, the agronomy courses must have the right of way. They must be placed at the most advantageous points in the program. Then the men who are directing the agronomy work must be the judges who shall decide what supporting subjects are necessary. They must say whether chemistry or entomology, or electricity or psychology or theology is required by their students. Still further, they must decide, not only the names of the supporting subjects, but the actual matter taught. If botany is taught for the benefit of the agronomists, the professor of

agronomy knows much better than the professor of botany what parts of the subject his pupils need.

Now this means, indeed, a radical change in most colleges. Instead of finding agriculture in command of the curriculum it has been the usual experience to find it tolerated at the foot of the class—not seldom kicked about the college by the superior forces of science and the humanities. This situation, of course, has usually been the fault of agriculture. The teachers of agriculture and horticulture have not known themselves what they wanted. They have not had a sound teaching command of their own subjects, to say nothing of the sciences and other neighboring departments. No one need blame the scientists and the classical men in the faculties because they knew a great deal better than the agriculturists what they wanted, or because they had a mature and logical program, while the agriculturists had none. I hold it quite to their credit. Only it does seem that by this time the teachers of agriculture, horticulture and home economics ought to have gained command

of their own field—ought to know what they want, ought to have a working program of college teaching, and ought to be ready to direct the entire curriculum of those students committed to their special care.

This program will meet opposition from the teachers of the humanities, who feel that the personal culture of all students has been especially committed to their custody, and from the scientific staff, a majority of whom still insist upon the untenable premise that the sciences supply the foundation upon which agriculture must be taught, and add to this erroneous premise their very natural opinion that they know how to teach science better than the agriculturists do. They ought to admit, indeed, that the agriculturists know how to teach agriculture better than the scientists do (a proposition which will be true some time, even where it is not already). And here, let us repeat, we are concerned only in handling courses for students who are specializing in agriculture and home economics. Let the scientists control the work of men who are to be scientists; but the teachers of the technical subjects

must control the work, and practically all the work, of those men who are to be farmers, stock growers, dairymen, fruit growers, florists, foresters.

Times are improving rapidly, but even at the present day it is difficult, usually impossible, for the technical departments to secure any sympathetic support from the science departments—a condition due, not so much to human frailty, after all, as to radical differences in point of view. For example, botany has always been a required subject in the early years of every course, on the theory that it supplied a foundation for horticulture and agriculture. The sad fact is that it never gave any such foundation; that it has very rarely been of any direct benefit; that it has usually quite ignored the work of the technical departments which it was expected to support. Teachers of pomology or forestry or floriculture who have tried to influence the courses in botany toward the introduction of material needed in these technical fields have usually been summarily squelched. The botanist has controlled the courses in botany and he has always found it

inconvenient, at the least, to rearrange his courses to suit the whims of other departments, especially when those departments knew nothing about science anyway, and couldn't understand his scientific point of view. The botanist has said to himself, and sometimes to his friend the suppliant pomologist, that he knew better what ought to be taught to students in botany, and he has gone on his own sweet way unchanged. The same situation has prevailed quite generally between science and technical departments everywhere.

This condition, which we are now about ready to leave behind, rests upon just two things—one a fallacious theory and the other an unfortunate fact. The fallacious theory is that the sciences are the necessary foundation of agriculture (a superstition fully discussed elsewhere). The unfortunate fact is that the technical teachers are so very slow to understand the educational principles involved in their own teaching and to formulate a sound, educational basis for their curricula. As these two difficulties are progressively eliminated we shall see our

agricultural teaching put upon a very different footing.

While the whole teaching of agriculture and kindred subjects has altered amazingly in the past twenty years, the greatest and deepest change has taken place in the point of view from which the subject is taught. The first ideal was obviously the teaching of "practical" farming. This word practical was in constant use and abuse. The ideal was essentially one of manual training, and might be maintained in what is now known as a trade school in distinction from a college.

This manual training ideal was soon replaced by the classroom notion of giving quantities of text-book information about agriculture. Those who, like myself, can remember some of those curious old courses, made up of extracts from Xenophon, Columella and the superstitions of planting by the moon, and of "prenatal influences" in stock breeding, will understand that not much was gained by the change.

As the scientists continued their wonderful success in the realm of agriculture the

third ideal rapidly emerged. This was the science ideal purely and simply. The leading agricultural teachers endeavored, with considerable success, to cast their materials into scientific form and to teach them in the purely scientific method. One famous and representative teacher of this school used to say that practice could never be taught because practice is local, temporary and incidental; while principles only should be taught, because they are general, permanent and universal. This third ideal still very largely prevails, because it is relatively easy to realize, because it works well, but chiefly because the majority of agricultural teachers are scientifically instead of technically trained.

Anyone who is close to the teaching problem, however, must have noticed that the strikingly successful courses in recent days in the field of agriculture, horticulture and domestic economy have not been the most scientific courses, but precisely the opposite; that is, the courses which have been the most thoroughly technical. The men who have introduced strong courses, with a maximum

of practice and a minimum of lectures in apple packing, in farm motors, in greenhouse management, in poultry management, have got the students. And they have the students, not because of any passing whim, but because the courses are effective and the students are quite bright enough to know it.

The new ideal—and the coming one—in agricultural teaching may be called the technical or professional ideal. It is much more practical than the old-time notion of "practical" teaching, because it has a deeper foundation and a broader outlook. It views each branch of agricultural practice as a body of technic, wholly rational even when not scientific, wholly vital and worth while in itself, without the necessity of scientific affiliations to dignify it. It looks upon this body of technic as a closely knit, logical body of knowledge significant chiefly in the outcome. Such classified knowledge might indeed be called science; but science estimates knowledge in the abstract, one truth being just as valuable as another. Technical knowledge is judged wholly by results. A method of setting celery plants may be ca-

pable of a beautiful diagrammatic scientific explanation, but if another method will get the best crop of celery any lack of abstract merit will not help it. This technical point of view is almost antipodally removed from the true scientific point of view; and yet it is precisely this different ideal which now leads the way in the best agricultural teaching of the day.

THE SCIENCES

As matters stand at present the one overshadowing problem in agricultural education, at least in the colleges, is the radical readjustment of the relations between science subjects and science teaching on the one hand and technical subjects and technical teaching on the other. The present situation, which has been reached by a perfectly natural evolution, may be characterized as follows: The curricula of the agricultural colleges are controlled by the sciences; while, on the rear, the classics continue a losing fight for the ground which the sciences have taken from them, on the front,

the agricultural subjects press a winning fight for the command of the field.

Practically speaking, agricultural education began in this country with science. Agricultural chemistry and agricultural botany were about the only distinctive work which the colleges could muster. Economic entomology and agricultural physics were soon added, while a few heroic teachers tried to make something of agricultural geology.

Now, however, agriculture has a long list of subjects of her own—agronomy, farm administration, stock breeding, stock feeding, agricultural machinery, dairy husbandry, dairy manufactures, etc., etc., etc., almost without end. The original theory of the relation between the sciences and technical agriculture was that the former gave the necessary foundation for the latter. A good deal can be said in favor of this theory; but there are two fatal objections to it. The first is that it never did work; and the second is that a much better theory is now in sight.

Attention has already been called to the practically universal fact that, while the scientist has sincerely believed he was laying

the foundation for agriculture, the agriculturists and horticulturists have never been able to build on the foundations thus laid. While this may have been their fault in specific cases, it is radically the fault of the system.

The professors of education all insist that, instead of science being the foundation for agriculture, agriculture is the foundation for science. And this relationship seems to be especially significant in the realm of teaching. The pupil should have his practical work first—his observation, his active motor exercises, his physical contacts, his tests of judgment. These will raise questions in his mind which can be answered by science, especially (and this is very important) if science is taught for this purpose and from the point of view established in agriculture. Of course if the student is compelled, after the current manner, to relinquish his agricultural point of view before he can do anything in science, this plan fails. But it fails only because science will not cooperate with agriculture in the field which belongs to the latter.

Thus we have clearly indicated the direction in which science teaching must be reformed for application in the professional curriculum. Science, taught for science's sake, will continue to follow its old channels; but a wholly different kind of science, taught in a different way, from a very different point of view, applied at a different point is required for the present needs of agriculture, horticulture and home economics. This reform in the teaching of science will follow just as soon as the technical departments shall have found themselves. The technical teaching must be brought into line first· then the science must promptly follow.

Already the question has been raised whether pomological botany, for example, shall be taught in the department of pomology or of botany. I recently heard a prominent (but passe') educator declare that within ten years no agriculture will be taught outside the departments of physics, chemistry and botany. It seems much more probable that ten years hence no physics, chemistry or botany will be taught outside

the fields where students are enrolled for agronomy, pomology or market gardening.

The change to a different kind of science teaching is so imperatively needed that it will presently be roughly pressed against all resistance. While doubtless the ideal way of teaching college botany, for example, is to teach it in a department of botany with a botanist for teacher, the practical necessities of the technical courses will require the horticulturists to teach their own botany to their own students. The majority of them have indeed been doing this for years. Usually it has been done clandestinely and weakly—the half-concealed target of constant jibes from the botanists. Very soon it will be done boldly and effectively and to the rich satisfaction of students in horticulture. Most horticultural teachers have had considerable botanical training and can teach effectively all the botany required in an undergraduate course in horticulture. And it is quite indisputable that they can make this botany more effective for the purposes of horticulture than any scientist who

teaches botany from the science viewpoint.

Probably the best practical arrangement will be to have upon the horticultural staff a good teacher, trained primarily in technical horticulture, but who has also specialized in botany without losing his technical outlook, and to commit the horticultural botany to his charge. In the same way agricultural chemistry and agricultural physics may have to be taught in the departments of agriculture in order to secure for them the proper point of view. Such an arrangement will be all the more desirable wherever colleges adopt the plan of segregating technical students during parts of their courses for more intensive professional training.

MATHEMATICS

A very different position in the curriculum is occupied by the mathematics. These subjects have seldom pretended to be "practical." They have always been free from the hypocrisy of serving as a "foundation for agriculture." Their service is frankly disciplinary. They have had a definite pur-

pose, clearly understood, and splendidly fulfilled.

Some of the most advanced schools of agriculture, professionally, have practically dropped mathematics out of the course as being unnecessary. Such a move, in my judgment, is highly premature. Thorough classroom drill and sound mental discipline are still, and always will be, prime needs for every college student, yet these are the elements most conspicuously lacking from the present courses in practical agriculture. It is true that drill courses in crops and live stock can be made and bring good results in the hands of an occasional teacher; but it is exceedingly doubtful if any of them can ever supply the mental training of algebra and geometry.

In any college one of the most serious practical problems of teaching consists in grading up, during the first year, the material brought together from widely separated sources. Some of it is always unfit. There are always some students who will not work and others who simply have not the capacity for college training. Even that portion of

the material which is perfectly good has to be shaken down together, unified, and brought into a smoothly working class. For these indispensable duties nothing serves so well as mathematics.

There is, of course, the possibility of requiring too much mathematics—of making it a burden to the agricultural course. It is often asserted that a pupil may be apt in live stock or cookery, though very weak in algebra; and that such a student should not be thrown out of his professional course because he fails in an unnecessary subject. This specious argument has been greatly overworked. After twenty years of teaching in technical subjects I am prepared to say that the pupil who is weak in mathematics, and who cannot or will not (frequently the latter) understand quadratics or the translation of trigonometric functions, is not capable of sound, intelligent work in any field.

My own judgment is very clear that every agricultural college curriculum should include stiff work in pure mathematics throughout the freshman year.

THE HUMANITIES

Every professional student should take as much as possible of subjects outside his professional curriculum. It is impossible to get too much, unless indeed his professional interest is dulled and his ambition diverted to dubious and unprofitable channels. Such subjects, chosen to give him breadth of view and variety of interests, need have no practical connection with his major study. Perhaps the farther from it the better.

This broadening interest in other affairs, in other peoples, and in other times, is genuine culture. As such it is highly desirable to every man. We need only to guard against the foolish notion, elsewhere challenged, that this is the only kind of culture, or that it has to be followed in order to offset the "narrowing" effects of professional study.

Under this term, "the humanities," are usually included English, modern and ancient languages, literature, history, economics and sociology. These serve, how-

ever, rather different purposes in the course of study.

English is generally considered obligatory in every course of study. Some good people say it should be required throughout the college course and always throughout the high-school course. Such persons, however, usually have in mind a practical rather than a cultural result. They wish to give the college graduate a working command of correct English. How far current instruction falls short of the ideal is painfully known to every reader of examination papers. The business men who every summer are flooded with letters of application from new graduates are deeply disgusted with the gross ineptitude shown in the use of the mother tongue. The opinion is general amongst educators of all ranks that there is something radically wrong with present methods of teaching English, an opinion which I share without being able to suggest a remedy.

Under these circumstances, however, it seems hardly wise to require students in a professional course to take English during every term, seeing the result is so small. It

would seem a fair suggestion, however, that some of the English instruction be given in direct connection with the professional work. When a student has to report on the feeding and management of a pen of poultry he has something to say, and clean-cut, effective expression of his ideas has some importance to him. It is a situation very much more favorable to instruction than that in which the teacher requires the pupil to write 2,000 words on the Peloponnesian War.

A course in English literature which will awaken a living interest in good reading is invaluable; one which merely gives an encyclopedic conspectus of authors' names, works and dates is worse than useless.

MODERN LANGUAGES

French and German are taught in practically all the high schools and colleges. Italian and Spanish also are frequently offered. Obviously they are considered important.

In the high schools modern languages are important chiefly as a means for getting into

college. Pupils never gain a working knowledge of any foreign language by high-school study only, and the culture value of high-school French or German is as near zero as anybody can count.

In college French and German are often justified on the ground that they are necessary to the study of other subjects. This claim is pure moonshine. French and German are not necessary and scarcely helpful at any point in undergraduate work. What is more, not one student out of a hundred ever gets a working knowledge of these languages from his college study.

In graduate study and research, French and German are usually desirable, sometimes necessary. Universal experience shows that the working knowledge of modern languages required in these circumstances can be much more economically gained from other sources than from the high-school and college courses.

The fact that the schools of France and Germany secure much greater efficiency in their teaching of modern languages indicates that American methods of instruction

may be improved. It may be suspected that American teachers have aimed too much at "culture," and have sought too immediate results in that field.

The real service performed by the languages in school is neither in their alleged practical use in studying other subjects nor in the infinitesimal grain of culture which they yield, but in the daily classroom drill which they give. This constant grind of paradigms and vocabularies has a very salutary effect upon pupils of high-school and college age. Moreover, this helps to correct the deficiencies of the courses in agriculture, which are especially weak in effective drills.

In this field the languages serve the same purpose as mathematics, though not so well. Furthermore—and this fact should be emphasized—Latin and Greek are distinctly superior to French and German for the uses of mental drill. If languages are to be retained in the curriculum for the purposes which they actually serve, then Latin should be used instead of French and German.

On the whole it seems that there should be

no required language, other than English, in the undergraduate agricultural course; but that elective French, German and Latin ought to be offered, and that in general these should be taken by a few students who already have considerable proficiency in them. That is, a girl coming to college with a fair command of French—perhaps from a French-speaking family—might well study French in college. Or a boy who has already shown marked facility in Latin should continue that subject in school. In such cases it is quite desirable that the language work come in the first year. Postponement to the junior or senior year involves great waste of effort.

ECONOMICS AND SOCIOLOGY

The subjects of economics and sociology are important if not vital in all modern high-school and college courses. They are taught, however, from three very different points of view. Some teachers make a purely humanitarian or cultural appeal; others discuss the subjects wholly from the

scientific point of view; still others are interested primarily in the political result—in the development of good citizenship.

In the agricultural course of study all these things have a value. Probably the scientific treatment is least valuable; agricultural students can get their notions of science more clearly elsewhere. Their courses are apt to be already unbalanced in the direction of science. The cultural use of these subjects is important; but in state colleges and public high schools the endeavor to develop intelligent citizenship is most obviously proper.

It may be suggested here that the field of economics and sociology is badly infested with fads—current politics, half-baked religious doctrines, eugenics and what not. Such stuff should be wholly banned from the classroom. A few simple courses dealing with universal principles, developed preferably from concrete examples, and enforced by practical drills, would make these subjects indispensable.

History, when it can be taught by a live teacher, is an invaluable culture subject.

When taught by rote by a cheap, dull pedagog it is far worse than nothing.

SUMMARY

Reviewing this discussion of the materials of the course of study we may state our conclusions as follows:

1. The technical material (agriculture, horticulture, domestic arts) is essential for vocational training. Also it has a large cultural value.

2. These materials should have a considerably larger place in the curriculum.

3. Still more important is it that the methods of technical teaching be improved.

4. Furthermore, the technical subjects must command the whole curriculum. All other subjects must support them and be taught in sympathy with the professional point of view.

5. The whole theory of agricultural teaching has changed in recent times. At first the intention was to teach "practical" farming; then came the idea of teaching "book farming"; there followed the ideal of

agriculture as a science, to be taught as a science; there is now emerging the ideal of agriculture as a profession, to be taught as a body of technic.

6. Science is often offered as the foundation for agricultural teaching, and from this point of view would be required in the early part of the course. But this is false pedagogy. Science is not and never has been a practicable foundation for agricultural teaching. Science rather offers detached explanations of sundry observations in agriculture, and may become the correlating principle in agricultural practice. In either role it should follow agriculture in the curriculum.

7. Generally speaking, this correlation ought to be made by the teachers who lay the observational and technical foundations. In short, the science should be taught by the technical teachers.

8. Mathematical courses are not practically necessary to agricultural courses. They are exceedingly valuable, however, for purposes of discipline, and for this pur-

pose should be available through the freshman year in college.

9. Students of agriculture and home economics should take the largest possible amount of humanitarian subjects—as much as can be taken without interfering unreasonably with their professional courses.

10. English should be required in considerable amounts, but should be much better taught. It should be brought into more direct connection with the professional work.

11. Modern languages are now widely used in college curricula for cultural results and as a means of studying other subjects. For the former purpose their failure is relative; for the latter, complete. The one substantial service which they do render lies in the thorough classroom drill which they provide. For this purpose Latin is altogether superior to modern languages, and mathematics superior to either.

12. Economics and sociology are valuable especially in developing intelligent citizenship. In this field popular fads are to be avoided and instruction bent chiefly to fundamental principles.

CHAPTER VII

COURSE OF STUDY—ARRANGEMENT

HAVING now discussed the materials from which our agricultural course of study is to be constructed, we have to consider how these are to be arranged in order to secure the best results.

Mathematics as a required subject has been reduced to a minimum or wholly eliminated from the most advanced agricultural courses. This represents a distinct and logical line of progress, but the writer confesses to a belief in fairly large allowances of mathematics, at least for college men. It may be that women in domestic science courses have less need of mathematical training—perhaps also less capacity for it—but most bright college men find a discipline and a mental outlook here which no other subject can supply. The discipline of mathematics has a very high human value; and

if vigorously applied in the freshman year assists materially in weeding out the unprepared, lazy, incompetent and undesirable material which creeps into every annual entering class.

For this reason I believe that mathematics, including algebra, geometry and trigonometry, should be required of all agricultural students, that the courses should be thorough and stiff, and that they should continue through the freshman year.

Beyond the freshman year there should be some elective mathematics. Such work will be of practical service to certain students of chemistry, microbiology, landscape gardening, etc.; but mainly it will leave open an inspiring field of advanced study to a number of mathematically minded men. In universities all this elective mathematics can easily be secured from the engineering schools or other allied colleges. In straight agricultural schools only a limited number of elective courses can be economically offered.

English of some sort should be required during a considerable portion of the four-

year course. If the teachers of English could agree amongst themselves what the character of this work should be, or if there were more obvious efficiency in the work usually given, a mere outsider might feel more confidence in expressing opinions on this subject. In general, it may be said that a somewhat specialized effort is required in teaching English in any technical school. The situation is plainly different from what it is in classical schools. Probably the most effective methods will bring the English teaching into closer correlation with the professional courses. Instead of studying chiefly Shakespeare and Chaucer, the students will study to express themselves clearly, grammatically and forcibly in their reports on cover crops or cream separators.

While the principal effort should be spent to secure clean construction in writing and speaking, English literature should be by no means neglected. But it must be doubted whether the accepted courses, dealing chiefly with Elizabethan worthies and purely literary fancies, offer the best material for strictly literary studies for honest,

open-minded men interested primarily in live stock, improved grain farming, and the living, working world of today. It is a fair suggestion that the splendid modern literature of country life would find a heartier response and leave a deeper love of reading and of bookish culture.

Finally—to dismiss this subject very briefly—it is strongly suspected in many quarters that the meagerness of the results generally secured in the college teaching of English is largely due to an insufficient teaching force. There are usually quite too few teachers for the work, insomuch that ninety per cent of the themes written by the students are never even read by instructors. (This is a semi-official report.) Instead of such inexcusable negligence on the part of the college, each theme written by a student should be carefully discussed and criticized in detail by the instructor in personal conference with the student. If this means an increase of two hundred per cent in the teaching force of the English Department it still ought to be done.

Considerable additional expense ought to

be incurred, furthermore, in raising the grade of the instructors. At present the teaching staff in English is made up largely of raw and recent graduates from the classical courses. It would be quite easy—given a proper allowance of funds—to find men of greater maturity, preferably such as have had enough technical training in agriculture to have some sympathy for agricultural students, who could give their pupils the personal counsel and poise which they so sadly need at this point.

Modern languages should be within reach of all college students as elective subjects, but should by no means be required of all students in agriculture and domestic science. This judgment is now widely accepted by leading educators within and without the agricultural ranks. College students who are to take modern language should nearly always begin with it at the opening of the freshman year and continue without break until they are ready to drop the work finally. This will mean, of course, that there must be some opportunity for elective studies during the freshman year.

In advising students as to the election of modern languages, it should be the policy to place no student in any language except he has had considerable preparation in it before entering college and except he shows further some distinct love and aptitude for the language elected. College time is too precious to be wasted over a droning study of paradigms and juvenile vocabularies. This goes with the fact—now generally coming to light—that in the practical pursuit of professional courses in agriculture and home economics foreign languages have a wholly negligible value.

"THE HUMANITIES"

This rather vague but otherwise acceptable term, may be used to designate such subjects as history, civics, economics and sociology. They have a very definite purpose and place in the curriculum. That purpose is training for citizenship. Surely if any schools are under obligation to train men and women to be good citizens it is that group of colleges founded on the Morrill

acts and specially endowed by federal and state governments for public service.

But first, it needs to be emphasized that the good citizen is primarily the serviceable man, and that the prime service rendered by nearly every man lies in his daily labor in his vocation. If the farmer conserves the resources of his land and produces yearly full crops of grain and milk and meat to feed the nation he has done the greatest and most important thing which the world can expect of him. Moreover, when he does this the way is opened and made easy to the other fields of more purely altruistic service which people usually have in mind when they speak of good citizenship. The efficient farmer—the man who keeps good stock and grows good crops—is the man who exercises the best influence in politics, school improvement, grange work and the church.

To do his best, however, his mind should be directed to public affairs; he ought to know how such matters concern him and his family; and he ought to have a firm grasp of the principles of economics and sociology on which sound public policies are based.

Every man needs such training in the basic principles of citizenship, and the college is altogether the best place to get it. Three topics are especially desirable for college study, viz., (a) common law and principles of government, with special reference to local government; (b) principles of economics; (c) principles of sociology.

There ought to be ample opportunity in every good agricultural college also to study the special applications of economics and sociology now coming to be known as rural economics and sociology.

There is bound to be some heated controversy as to whether the courses in general principles should precede or follow the courses in rural economics and sociology. The theory generally recognized in science teaching would require the general courses to be given first; but the theory now held by students of education would place the more concrete topics first and the courses in general principles afterward.

This issue becomes more acute because in most curricula it will be desirable to include two or three required courses placed prob-

ably in the sophomore year, leaving all other courses in economics, sociology, history and government elective in the junior and senior years. My own view is that, providing the subjects of rural economics and rural sociology can be made very definite, very concrete as to matter, and can be thoroughly well taught by instructors who know the difference between sophomores and seniors, then these topics should be preferred for the sophomore required courses. But this is a big and an important reservation. If these conditions cannot be fully met it will be better to place in the sophomore year required courses in the simple fundamental principles of general economics, government and sociology.

MILITARY REQUIREMENTS

The law under which most of the agricultural colleges are supported requires the teaching of military tactics and the maintenance of military drill. And since the work has to be given it should be thoroughly well done. The law ought to be observed in perfectly good faith.

It has to be said, however, that this military training does not appeal to the judgment or conscience of the large anti-militarist world, that it is usually a hardship in the course of study, and that it is sometimes an intolerable nuisance. When any college is so unfortunate as to gain the assignment of a bumptious and bigoted military officer the situation becomes very trying indeed. On the other hand, a tactful and humanly sympathetic military officer can do the college to which he is attached a world of good. His influence with healthy boys, particularly in the way of solid discipline, can be made exceedingly valuable.

As a problem of course of study making, however, the military requirements are to be kept down to the minimum. Drill may be kept on the elective list for the benefit of those few men who like to wear gold braid and a sword.

GENERAL SCIENCE

Up to the present time agricultural courses have been designed upon a founda-

tion of general science, especially "natural" or biological science. Many persons have supposed indeed that the curriculum should consist mainly of science, and that the science teachers could make, in the course of their scientific discussions, all necessary applications of these scientific principles to agricultural practice. One reactionary educator has recently asserted that within ten years agriculture will be taught only in the laboratories of physics and chemistry.

A more modern view is that science is the foundation of agricultural practice and of household economics, and as such should precede all professional courses in the curriculum. This is probably the prevailing view of the moment in agricultural college faculties. The fact that this theory fails entirely in practice and that it is preposterous when viewed from the standpoint of modern pedagogy, is sufficiently discussed elsewhere. It is proper, however, to mention these erroneous ideas as we endeavor to place science in its proper place in the agricultural curriculum.

Our difficulty arises mainly in meeting

two contradictory tendencies, both of which are perfectly sound if taken by themselves. While from the standpoint of pedagogic theory the concrete courses in agricultural practice should precede the work in science, in actual present conditions the science can be more effectively taught in the freshman and sophomore years than the agricultural courses can. Any good teacher can give good snappy freshman courses in chemistry, physics or botany; but the teachers who can give solid, workable courses in farm practice to classes of two or five hundred freshmen are as scarce as wisdom teeth in poultry. Thus we shall probably continue for years to give considerable science work in the first two years, simply because it can be well taught and because it can be handled by students of those grades.

Two observations are to be made at this point: First, the particular courses are not very important, and because no student can or should cover every field of science, they should mostly be elective. Second, these science courses should be kept as free as possible of so-called "practical applications."

Practical applications are probably the best foundation for science in a closely co-ordinated course when science and practical agriculture are taught by the same teacher; but in our highly differentiated college organization it will be better for the technical departments to make all the necessary applications of science to practice.

The science of the first two years thus becomes, by hard necessity, a sort of general training not closely correlated with the professional work. The average student should take one such science course in each term of the first two years. He should be free to elect, under proper advice, from a list including physics, chemistry, botany, physiology, zoology and geology.

PROFESSIONAL STUDIES

This part of the subject must be introduced with the statement that the main problems in agricultural teaching have to do with teachers and methods rather than with the curriculum. In general, there is ample space in the curriculum for all agri-

cultural material needed, and no very serious difficulty in having this material placed at the most desirable points.

In reference to the course of study, the main difficulty has been a lack of pedagogic differentiation. No careful distinction has been made between professional material (agricultural, horticultural, and home economics) suitable to the freshman or the senior year. When agriculture is taught to freshmen about the same material and the same methods are used as in teaching seniors. At this point improvement is highly desirable. Let us therefore make a study of our materials to see what should be their proper distribution throughout the four-year college curriculum.

Every catalog from the leading agricultural colleges nowadays shows a wealth of material arranged in multitudinous courses. The materials at least have been highly differentiated, even when no thought has been taken to their proper position in the course of study. All these various courses, however, may be classified without great difficulty into the following groups, the arrange-

ment being made on the basis of their pedagogic requirements.

Group 1. Observation Courses. These are characterized by the direct observation of materials, combined usually with detailed description. The best examples of this group are the many highly effective courses in judging, such as stock judging, poultry judging, corn judging, fruit judging.

These observation courses may be advantageously divided into two groups: (a) Those which deal simply with materials. (b) Those which deal mainly with processes or phenomena. In the second group would come such work as testing farm machinery, dynamometer tests, simple work with farm motors, and in the woman's college, work with sewing machines, etc., etc.

These courses belong naturally in the freshman year.

Group 2. Handicraft Courses, characterized by the active motor participation of the student in some going project. This would include courses in propagation of plants, management of incubators, Babcock testing, garden work, greenhouse work. All

manner of instruction by the "project method" would belong characteristically to this group. This type of instruction is highly important, even though difficult, and will probably be much more extensively developed in the future.

Work of this kind is especially adapted to the sophomore year.

Group 3. Technical Science Courses, involving chiefly the direct application of scientific principles or scientific methods to problems of agriculture or household economics. Courses in stock feeding, in stock breeding and in silviculture may be mentioned as examples. In the woman's college most courses in sanitation and in cookery belong in this group.

In practice there will always be difficulty in drawing a distinction between courses of this character and those belonging to Group 5 following, but the theoretical difference is wide and important. Courses in this group deal with science methods and involve direct scientific reasoning, while those of Group 5 deal with practice and involve personal judgment—a quite different

mental process. It is exceedingly desirable that teachers should distinguish between these mental processes in their instruction, and desirable furthermore that each particular course should be given one character or the other. Courses of Group 3 belong properly in the junior year.

Group 4. Constructive Design. There are a number of courses in every college in which the characteristic mental process involves constructive design. Drainage problems and farm engineering, the design of farm building, machine designing, and most courses in landscape gardening offer good examples. In the woman's college costume designing, kitchen planning and household furnishing generally belong in this group.

Courses of this character should be placed preferably in the junior year.

Group 5. Professional Practice, involving a correlation of many factors, mainly about the problems of crop production; and characterized further by a heavy emphasis upon personal judgment. (The question of whether a certain orchard needs more nitro-

gen, or whether buckwheat should replace clover as a cover crop, or whether a certain piece of land would be better for strawberries or peaches, or whether a certain field is too dry or too wet to be plowed, is a question of judgment and not primarily one of scientific reasoning.) In this group would come all the leading farm practice courses, such as the courses in fruit growing, market gardening, crop production, live stock management, poultry husbandry, farm administration, etc.

These courses belong distinctively to the junior and senior years.

Group 6. Synthetic or General Courses. Every student before leaving college should have some one course which would give him a point of view high enough from which to see the correlation and meaning of all professional work. It is hard to express this in terms of materials. Such instruction depends almost wholly upon the teacher, on his breadth of view, on his liberality of sympathy, and on his ability to inspire pupils. In a general way it may be said that farm administration properly taught will

achieve this synthetic result. In the woman's college household management properly taught will serve the purpose. Certain courses in plant breeding or genetics serve very well, especially when they take the broad view of evolution and cosmogony. The course in genetics, however, serves better for the synthesis of scientific ideas than for establishing a proper point of view for professional studies.

It hardly needs to be said that only one or two courses of this character need to be included in a curriculum, and that they should be placed at the very end.

TABULAR STATEMENT

We will get a clearer idea of what this theorizing comes to if we will run over one or two catalogs of modern agricultural colleges and classify the courses on this proposed basis. The following list is made up in this manner, but only leading courses of fixed character have been included. They show the following results; the assignment to years is wholly ours, based on the peda-

gogic requirements of the courses and not on the arrangement shown in the catalogs consulted.

FRESHMAN YEAR

Group 1—Observation Studies

Stock judging
Butter and cheese judging
Fruit judging

SOPHOMORE YEAR

Group 2—Handicraft Courses

Seed testing
Testing dairy products
Buttermaking
Cheese making
Plant propagation
Sewing
Dressmaking

JUNIOR YEAR

Group 3—Technical Science

Farm soils
Soil physics
Soil surveys
Farm crops
Cereal crops
Forage crops
Agrostology
Systematic pomology
Stock feeding
Animal nutrition
Stock breeding
Types and breeds
Poultry anatomy
Poultry feeding
Horticultural manufacture
Plant breeding
Crop improvement
Climatology
(Home economics):
Foods
Dietetics
Textiles
Sanitation
Personal hygiene

JUNIOR YEAR

Group 4—Constructive Design

Farm machinery
Power machinery
Motors and tractors
Orchard machinery
Farm drainage
Farm mechanics
Farm buildings
Greenhouse construction
Landscape gardening
(Home economics):
House construction and decoration
Costume designing
Millinery
Basketry

SENIOR YEAR

Group 5—Professional Practice

Practical farm management
Live stock management
Management of dairy cattle
Poultry husbandry
Dry farming practice
Irrigation farming
Irrigation institutions
Crop production
Potato growing
Orchard practice
Fruit growing
Viticulture
Small fruit culture
Nut culture
Sub-tropical pomology
Forcing vegetables
Vegetable growing
Market gardening
Commercial truck gardening
Floriculture
Commercial pomology
Milk production
Dairy practice
Creamery practice
(Home economics):
Household administration
Catering
Home nursing and invalid cookery

It will be seen at a glance that the different groups are not equally filled, but this is not the fault of our classification, but the

deep and serious fault of agricultural instruction throughout the agricultural colleges of America. There is an abundance of material—probably too many highly specialized courses—for the senior and junior years, and a very serious dearth of courses for the freshman and sophomore years.

This difficulty is due primarily to the fact that nearly all instructors in agriculture, horticulture and home economics have their minds fixed on their subjects rather than on their students or on the best methods of teaching those students. That there is no inherent difficulty in presenting agricultural or home economics subjects to students of the earlier grades is sufficiently attested by the elaborate and successful courses now given in the high schools. One of the big and crying needs in every agricultural college is for the development of strong courses in Groups 1 and 2 for the freshman and sophomore years.

The courses hitherto given in the freshman and sophomore years have usually been selected from Groups 3, 4 and 5—perhaps

oftenest from Group 5. These have naturally proved obviously inefficient. They were bound to. The arrangement was logically and psychologically unsound.

THE COMPLETE COURSE

Let us now bring together all these materials—the science, the English, the mathematics, the agriculture—into one complete course of study for the usual four-year college period. If we assume the customary method of reckoning college credits we will require approximately 120 credits for graduation, or thirty credits in each year. Our course of study will then look something like this:

Four-Year Course

(120 Credits)

Freshman Year—30 Credits

Agriculture or home economics	6
Science	6
Mathematics	6
English	6
Military requirement	

Electives ---------- 6
Modern language
Additional science
Additional agriculture or home economics
History

Sophomore Year—30 Credits
Agriculture or home economics ------ 6
Science ---------- 8
English ---------- 4
Economics, sociology and government 6
Military requirement
Electives ---------- 6
Modern language
Additional science
Additional agriculture or home economics

Junior Year—30 Credits
Agriculture or home economics------12
English ---------- 4
Economics, sociology and government 6
Electives ---------- 8
Additional agriculture
Additional home economics
Science
Modern language

English literature
History
Economics
Sociology

Senior Year—30 Credits

Agriculture or home economics 12
Economics, sociology and government 6
Electives 12
Additional agriculture
Additional home economics
Science
English
Modern language
History
Additional economics and sociology

CHAPTER VIII

METHODS OF TEACHING

AGRICULTURE, horticulture and domestic science are to be taught, of course, by the same methods used in the teaching of other subjects. Some special adaptations are possibly necessary, but these are of relatively small importance. However, agricultural teachers are lamentably weak on these general methods of teaching. Not one in a hundred has ever had the slightest training in pedagogic methods or has been told the first principles of the teaching art. If the new professor of agronomy or market gardening makes out to be a good teacher it is by force of a strong native personality, plus considerable powers of adaptation.

It lies outside the plan of this book to discuss general principles of pedagogics; but the methods of teaching agriculture and domestic science so obviously need improve-

ment that it is impossible to avoid some consideration of these questions. It seems best, therefore, to present the subject in brief review from the standpoint of the agricultural teacher. Three principal methods are followed in modern college and high-school teaching. These are:

1. The use of a textbook with recitations.
2. The lecture, with occasional oral quizzes and written tests.
3. Laboratory work of various kinds.

Very few courses, even in the lower grades, are given wholly by either one of these methods. Exclusively text-book courses are sometimes used in high school, and exclusively lecture courses unfortunately persist in college circles; but generally the live teacher uses several different methods in each course. In large part this represents the teacher's effort to realize the advantages and minimize the disadvantages of each method.

THE TEXTBOOK

The textbook presents perhaps the oldest and simplest method. It is better suited to

elementary work, and for this reason should be used more frequently in the earlier years of the college course than in the later years, and much more frequently in the high school than in the college.

The first difficulty arises in the lack of acceptable textbooks. It is infinitely more difficult to make a good college text for dairy husbandry than for geometry or Latin. But with the thousands of earnest attempts made in the last few years a few pretty good textbooks have appeared, accompanied, to be sure, by a multitude of inferior books. A clear majority of these books are marred by the endeavor of the authors to ride two horses—to make at once a book for class use and a readable, popular, practical work for farmers. The classroom textbook ought to be entirely different from the popular exposition, especially when it is to be used in the lower grades, where the textbook is most needed.

A primary problem in the preparation of the textbook comes in the presentation of accurate, concise, definite statements. Exceptions and qualifications may be necessary for

critical and comprehensive treatment; but a textbook need not be critical or comprehensive; instead, it must present essential truths, and it should be graphic and suggestive. The ideal textbook, instead of giving a complete and carefully balanced discussion of some agricultural field, should offer a series of selected topics, each essential and significant, and forming a proper basis for an effective class exercise.

Each textbook, moreover, ought to be adapted to some particular grade of teaching. A book on pomology for the high school should be wholly unfit for use in college. It is one of the absurdities of present practice to find Bailey's "Principles of Fruit Growing" used in all the grades, from the kindergarten to the graduate school. The book is better for fruit growers than for students anyway.

Just at the present time laboratory manuals are needed more than textbooks, but there will long be a big field for new agricultural and domestic science textbooks of the right sort.

THE LECTURE

The lecture course is beyond all comparison the laziest and least effective method of teaching ever invented. Beside the modern lecture course those old sociable dialogs between Socrates and the Greek boys under the shade of the spreading plane trees of Athens were the paragon of pedagogic efficiency.

There are, however, certain reasons why the lecture method is persistently and extensively used. It is easy. Indeed, nothing could be easier. A young instructor becomes interested in some subject, say the production of certified milk or the growing of broom corn. There is, of course, no textbook on the subject. But the young man is full of the matter—just bubbling over. Sixteen students signify a wish for the course. Sixteen students can be found anywhere to take anything. It requires only thirty lectures, possibly only twenty-five, with field trips and written tests, to make a "two-credit" course. The young certified milk or broom corn enthusiast can talk an hour twice a week on his hobby and not half try—

so here we go! If he makes friends with his students they will accept enthusiasm for information (it may really be better), and entertainment for discipline. It is wonderful how easily a likable young instructor can get away with that game.

To be sure, some of the worst lecture courses are given by the oldest professors. Which reminds me of the Frau Professor of the German university, who told her cronies how shamefully the modern students neglected her worthy husband. "Ah," said she, "the students are not what they used to be. Forty years ago, when the Herr Professor was only Privat Dozent, he used to have a hundred students in his courses. But now he has only six or eight, while the students all follow after the popular foolishness. It certainly is not the Herr Professor's fault, for he reads the same lectures now that he did then, when he had his students by hundreds."

After all, the main reason why the lecture course persists is that, especially in many rapidly advancing technical subjects, it is the only method which will keep the subject

matter up to the times. It must be added, however, that the importance of keeping the subject matter up to the minute has been greatly exaggerated in the minds of many teachers. For teaching purposes old time-tried facts are usually much more serviceable than the latest discoveries.

Every college ought to make constant effort to substitute better methods for the classroom lecture; but much thought should be given, also, to the improvement of indispensable lecture courses. Much can be done to brighten up and vitalize dull lectures. Well-prepared syllabi distributed to the pupils with each lecture are usually an assistance. The main objection to the lecture course can be minimized by the introduction of quantities of drill work, such as daily written 5-minute tests, or a regular routine of outside work. In my own teaching I give one lecture course, and it meets only twice a week—a very bad arrangement, of course. But I assign each week a problem requiring outside study and involving principles discussed in the lectures. Every Tuesday morning each pupil is required to file a

written report on the week's problem, and nothing but a doctor's or coroner's certificate is accepted in lieu of this report. Every lecture course should be accompanied by some similar drill.

Lecture courses should be practically excluded from high schools, and should be reduced to the minimum in college, being most frequently used in the later college years, and with highly technical subjects. In the graduate school, where criticism in detail takes the place of drill upon essentials, the lecture method may be freely used.

THE LABORATORY METHOD

Science teaching brought in the laboratory method, supplanting the recitation-room method of the classics. The improvement was immeasurable, though it must be allowed that the recitation-room method still has its uses. The laboratory method has been widely abused for the teaching of all manner of subjects, such as psychology, law, history, civics, sociology and matrimony. Yet in some fashion the idea can really be

adapted to almost all kinds of teaching. The laboratory method, in fact, is so diversely used that it is the hardest of all methods upon which to generalize.

Roughly, it may be said that the teachers of agriculture, horticulture and domestic science have generally imitated too closely the laboratory equipment and methods of the natural sciences. They have been dazzled by all those beautiful laboratories fitted with microtomes and compound microscopes, and have forgotten that the great agricultural laboratory is on the farm and the domestic arts laboratory in the kitchen; and have overlooked also the more significant fact that the aim of professional teaching is wholly different from the aim of science teaching.

It is easily observed that the most successful laboratory courses today in the technical departments are formed on a very different model. They are courses in stock judging, in systematic pomology, in incubator management, in the operation of farm machinery, etc. Some ingenuity is required to develop effective courses in these fields

where precedents are so few, but it can be done. It is perhaps safe to assume that a subject which cannot be effectively arranged in this form had better be abandoned or given from the textbook.

The ideal laboratory exercise is the one in which the pupil does the most work and the teacher does the least. A demonstration by the instructor is not a laboratory exercise at all, and should rarely be given. Each exercise ought to occupy each individual student and should occupy him fully for the entire period. The results should be of such a nature as to indicate clearly the value of the student's efforts.

In the better agricultural high schools a new type of laboratory work has recently been developed which is worthy of wider application, not only in high schools but in college work. It is curiously like the type of work long recognized as the ideal in the graduate schools. This has been called the project method. It consists in placing the individual pupil in charge of a going problem which will require his regular attention during a whole term or an entire year. In

market gardening, for example, the pupil is assigned to the exclusive care of a specified garden, which he prepares, plants, cultivates and harvests, and upon which he keeps a full set of notes and records. In poultry husbandry the pupil begins with an incubator and a batch of eggs; he sees the hatch through the incubator, nurses the chicks through the brooder stage, and perhaps fattens them for squab broilers.

This project method seems to be especially adapted to high-school work. In the colleges it has been used mostly in the graduate work and in the senior grades with small classes, but pedagogically it would seem to be better suited to the freshman and sophomore years. Considerable readjustment of present practices will be necessary before this method can be widely adopted in the lower college years, but the idea is sound and the readjustment ought to be made.

PROFESSIONAL CAMPS

The great future of the agricultural colleges lies in the more strictly professional

work, more intensively organized, more liberally conceived, actuated by higher ideals. The best types of this work now in existence are to be found in the camps operated by the forestry schools, though the summer engineering camps of the engineering schools and the field camps of the mining schools are worth careful study. A few teachers of animal husbandry and of farm management have now organized in a small way somewhat similar methods of teaching. A group of students is taken into the field for a period of two, three or four weeks, there to live and work with the materials under study. Nearly always the time is too short, and as the other college work is at present arranged, considerable friction is developed in handling these excursions. They ought to be looked on as an essential feature of the college work and decently provided for in the year's plan. Indeed, it is to be expected that such field camps will presently become a common feature of agricultural instruction. Especially when the agricultural colleges abandon the present ridiculous custom of a long summer vacation the opportunity

will be given for this type of intensive professional work. The market gardeners may proceed to the best trucking section of the state for work in their line. The forestry pupils will take to the woods; the women students of sanitation and invalid cookery will go to the city hospital, where they can follow the best modern methods.

Aside from the opportunity for intensive study in technical lines these field camps offer other opportunities of great pedagogic value. The routine of life in camp—problems of sanitation, cooking meals, maintaining order, the development of simple social virtues—requires a kind of personal discipline of the highest order. Good teachers will not be slow to seize upon these opportunities and to make of the technical camp a great deal more than an area of contact with some professional subject.

THE HUMAN ELEMENT

All the methods here described and all the others ever invented have to be used sep-

arately or in combination as circumstances require. The good teacher must be resourceful and full of invention and must always adapt his methods to the case in hand. If it is true that most of our agricultural teachers know too little about methods it is true also that some of the normal school graduates know too much. That is, they rely on wooden methods, which they endeavor to apply without due thought for the peculiarities of each case. At least it must be said for the agricultural teachers that they are a resourceful lot, well supplied with initiative and unhampered with pedagogic formulas.

Finally, it is to be emphasized that the teacher is always more than methods. Any method is merely an expedient for putting the pupil in contact with the instructor. The best method is the one which supplies the most points of contact. This is something which the teachers themselves ought to take more seriously. It is all very well for the professor of dietetics or stock breeding to have a ready command of his subject matter. He must "have the goods," as his

students say. It is even better for him to have a trained facility in the methods of presenting his subject matter. But most of all, he must remember that the best he can do for his pupils is to offer them the inspiration of a live, clean personality. He must be enthusiastic for his subject, but it is of much greater moment that he be humanly sympathetic with his students.

SUMMARY

Agriculture is taught by the same pedagogic methods used in other subjects, but some special adaptations are desirable.

1. The three principal methods in college use are (a) the textbook with recitations, (b) the lecture, and (c) laboratory work of various kinds.

2. The textbook is better in the lower grades, but should not be used alone. Much depends in finding a good text. Most agricultural books are not written primarily for classroom use.

3. The lecture method is the poorest one, and should be used as little as possible.

Every lecture course should be accompanied by some thorough and regular drill work.

4. The laboratory method, too, is sometimes abused. A common fault is to follow too slavishly the model set in the science laboratories. Field work in agriculture should be very different from laboratory work with a microscope.

5. Professional field camps offer one of the best methods in sight for technical instruction in agricultural and horticultural subjects.

6. After all, more depends on the teacher than on the pedagogic methods adopted. The teacher must know his subject; it is yet more important that he should know how to teach; but most important of all is it that he have a strong, winning personality.

CHAPTER IX

EXTENSION TEACHING

UNIVERSITY extension has been in active operation in several places for a good many years; and though the system has not yet reached universal adoption, and though it has nowhere settled into any final form, it has evidently come to stay.

Upon the pattern of the older university extension teaching was modeled the newer extension idea of the agricultural colleges. Or perhaps it would be a more accurate genealogy to say that the modern extension service of the agricultural colleges had for its mother the university extension idea and for its father the farmers' institute. Certain it is that, from the very first, the agricultural colleges have actively conducted sundry forms of extension work, particularly institute lectures, publication of bulletins and extensive correspondence and visitation.

All these activities blossomed into sep-

arately organized branches of the college enterprise about the year 1910, and were established into permanent institutions with national co-ordination by the passage of the Smith-Lever act in 1914. From this time forth, and for many years to come, the extension service is certain to be a highly important branch of the college work in every state agricultural college.

Radical adjustments of older extension plans were necessitated, however, when there came into existence, along with the extension work in the colleges, the system of county agencies for agricultural advice. It is not my plan at this time to discuss the organization and work of these county agencies, but to speak of the extension service as a branch of college teaching, having clearly in view, however, the adaptations made necessary by the system of county advisors.

It should be recognized that the extension work is primarily a teaching enterprise. The essential difference between the original classroom work of the college and the newer extension work is that the former deals with pupils in residence, while the latter deals

with pupils outside the college walls. In one branch the pupils come to the college; in the other the college goes to the pupils.

Good extension work will therefore be founded on the universal principles of good teaching, and will tend more and more to take on the aspects of regular college instruction. Pupils will be classified. They may not be called freshmen, sophomores, juniors or seniors; they may not be called engineers, "ags," "classics," "short-horns," or any of the other group names traditional to the campus. But they will be progressively assorted into groups in such a manner that the beginner in poultry husbandry will not be getting the same helps as the advanced orchardist who specializes in peaches. Already in the boys' and girls' clubs rather careful grading appears, and this pedagogic principle must be carried to a more general and stringent application.

Extension teaching is beginning, too, to make tests of its pupils to determine their rate of progress. We may hope that the examination system will never become the incubus that it has in many colleges, and yet

we may see the tendency toward efficiency of instruction in this direction. It is important for the extension service to know who is profiting by the instruction and who is not, and to take any measures consequently necessary.

TEACHING IS DONE BY TEACHERS

Starting from this safe principle that extension work is teaching and should be governed more and more by the principles of pedagogics, we may now point out that the supreme factor in teaching has always been the teacher. A prime problem of the extension service, therefore, must be to develop the teacher—to make his personality and his humanity effective with the extension pupils. Up to the present writing this simple idea has been widely overlooked. In the old days of the farmers' institute there were popular and unpopular speakers. Some men made national reputations as institute workers, all of which meant simply that they had the personal touch of the teacher. In later times our extension organization has

stepped between these popular lecturers and their admiring audiences. The whole tendency is toward institutional instruction instead of personal human contacts. This is a great defect and ought to be remedied.

In other words, it is one of the most serious problems of the extension organization to preserve and extend these human contacts—to bring the extension teacher just as near to the extension pupil as ever he can be brought—to minimize institutionalism and to magnify humanity.

It has already been discovered by everyone who has had any contact with extension work that the selection of extension teachers is a matter of the greatest difficulty. Something like surprise attached to the first discovery that men and women for this service must have a training even broader and more thorough than the teachers in the college classroom. They must have greater resources, for they are called upon for more varied and unexpected tasks. Furthermore, they must be men and women of the highest character, who may always be relied upon, away from the college campus and its re-

straints, to uphold the best ideals of industry, agriculture and service. Still further, it is required that they be persons of winning personality. A misanthrope, a dope fiend or a confirmed grouch will sometimes be tolerated for a generation in the college classroom, but no crank, freak or tippler can be kept for a day on the extension faculty.

It is clear that we must and soon will have normal courses for the special training of extension instructors. Practical farm experience also may be regarded as essential preparation for extension teachers.

MATERIALS AND METHODS

Turning now to the materials and methods used in extension teaching we may observe that experience is already showing the futility of certain lines of work and the superiority of others. The transient, detached lecture is seen to be ineffective, and in general the old theorem that "talk is cheap" seems to apply with special force in this field. All forms of talk, therefore, may be regarded as the cheapest and least useful means of imparting extension instruction.

A certain amount of lecturing there must always be; but it should all be critically directed to specific points in much larger campaigns, where it will be supplemented by other methods of teaching.

Much of the personal correspondence and visitation which at the outset cut such a large figure in extension plans, has been taken over now by the county bureaus. This work should be left wholly to them. This transfer of the personal contact work to the county agencies is a distinct privation to the college extension organization, inasmuch as it weakens the college service at a vital point. The college will be obliged to study the situation carefully in order to remedy this infraction of the direct lines of contact between the college staff and the men on the farms. The situation, however, is both sound and inevitable, and simply must be met by more carefully planned contacts elsewhere.

DEMONSTRATION PROJECTS

College extension places great emphasis on demonstration work. It is sufficiently

plain that showing people was a great advance over telling them. Demonstration projects have grown up rapidly in some cases and reached gigantic proportions. These included projects in the use of fertilizers, in methods of seed selection, demonstration orchards, etc., etc. As a rule this demonstration teaching was a great improvement upon the plain talk which had preceded it, though we may fairly suspect that some reshaping of demonstration work would have been necessary had not the appearance on the scene of the county farm bureaus made a general revision immediately inevitable.

It would now appear that a considerable portion of the strictly demonstration projects can easily be turned over to the county organizations. The state college, which acts as a central office for these county agencies, can properly co-ordinate the county activities, can offer valuable help in organizing and directing county demonstrations, and can collate, criticize and disseminate results. While this transfer of demonstration projects from state to county agencies cannot be made all at once, progress seems to lie in

this direction. Readjustment should follow along these lines as speedily as events open the way.

BOYS' AND GIRLS' CLUBS

Just at the moment of this writing it would seem that the boys' and girls' club work is by all odds the most vital and useful form of extension endeavor in the field. The most popular groupings are in corn clubs, garden clubs, tomato clubs, canning clubs, pig clubs and poultry clubs, but many other problems are used to interest and instruct the young folks. One of the most important units in every extension organization should be the leader of this club work.

It would appear further that, under present conditions, this club work should be carried forward jointly by the county bureaus and the state college extension agents. Local organization and supervision should be given by local agencies, while state organization should be in the hands of the state officers. This state work will consist in supplying uniform methods of organization,

uniform plans of work, uniform tests of achievement, state reviews, state prizes, state reunions, etc.

It is desirable that this club work should achieve some permanent organization—that it should be continuous and progressive, like the regular school work. Thus when a boy or a girl has finished one project he or she may be promoted to a more difficult one. These problems of a permanent curriculum can obviously be handled to best advantage by the state authorities. Much remains to be learned, of course, before these problems can be finally solved.

ITINERANT SCHOOLS

The typical old-time farmers' institute used to last for two or three days. The program was one of varied entertainment, inspiration and instruction. In the hands of well-organized extension men this scheme has been widely replaced by the better organized itinerant school.

Such a school is conducted by a group of three to six college workers, who go to a

particular locality and remain at the work for a period of at least a week, sometimes ten days, better a fortnight. Preliminary organization and publicity are usually intrusted to a local committee, which committee also makes the needful arrangements for hall and other equipment.

The work of such a school is often confined to a single narrow subject, as fruit grading and packing, beekeeping, wheat growing, corn growing, poultry management, or some local agricultural specialty. At other times several different topics are taken up, though more than three or four must be considered bad management. It is rather desirable, however, in most places to offer some work especially for women; and the school may be advantageously sectioned along these lines of work for men and work for women.

An essential feature of these schools is the extensive introduction of the usual school forms of organization. A formal registration is required, with or without the payment of a fee; attendance rolls are kept; quizzes and written exercises are held;

"laboratory" work is undertaken and every effort made to enlist the active participation of the "students." While some of the character of the farmer's institute still persists, and while the school work must still be rather superficial and of limited efficiency, yet this type of extension service is valuable and ought to be continued. It is especially good when directed to some particular farm specialty, such as asparagus growing in an asparagus district or strawberry growing in a neighborhood where this crop leads all others.

CORRESPONDENCE COURSES

Whatever jokes may be spent upon the correspondence courses they have come to stay. Instruction by mail may not be the best that can be had, but it is certainly the best available to many hungry-minded people. When well conducted it is reasonably effective.

There is every good reason why the state colleges should offer extended correspondence courses in agriculture and home-mak-

ing subjects. These should be seriously undertaken, using the best talent and the best methods available. The present attitude in many colleges of merely tolerating the correspondence courses and of getting out of them with the least possible expenditure, is unworthy of the institutions and of the work itself.

In a few colleges the correspondence teaching has been made eminently successful. Pupils are numbered by the thousands, and enthusiasm is warm. The way is wide open for all other college extension organizations to secure similar results.

PUBLICATIONS

From their inception the agricultural colleges have used the printed page for the distribution of information. The college bulletin preceded the organization of the experiment stations; but when the Hatch act made four bulletins a year obligatory the floodgates were opened. Since that time there has been a deluge of bulletins, while the real problem has come to turn upon the editing,

condensation, restriction and suppression of such publications. A more or less definite censorship has already been established in most states; but a committee for the prevention of bulletins would still be one of the most useful items to be added in more than one organization.

Nevertheless, the college extension service is now projected into the field of bulletin publication. The legitimacy of this work is recognized by the granting of the federal franking privilege to extension publications. A considerable output of bulletins must be expected of every active extension organization; and if this branch of the service is carefully organized and wisely directed it will not be the least effective agency for good.

The distinction between extension service bulletins and experiment station bulletins ought to be perfectly clear. It should follow the line of fundamental distinction between these two branches of the college enterprise. The station bulletins should be confined strictly to the report of experiments actually conducted by the institution, with

only such foot-note references to other publications as are necessary to a scientific presentation. The extension bulletins, on the other hand, should deal wholly with practical and timely information. They will be largely statements of experience, sometimes compilations from many sources, always calculated to give the last word in some practical field.

It is fair to hint that up to the present time the extension service has not taken this literary branch of its work with sufficient seriousness. In many instances the extension "leaflets" are no better than passing essays in the commonest agricultural papers. Instead of being cheap scraps picked up about the campus—the leftovers from the desks of busy professors—they should be the best thought of critical specialists. They should be written with the skill of the expert magazine contributor and edited as carefully as the matter which goes into the Saturday Evening Post. Or if this high journalistic standard cannot be quite reached it should be aimed at.

In the future the development of the agri-

cultural college work would seem to require a curtailment of experiment station bulletins, limiting the output to such as can report upon really important discoveries; while on the other hand the popular publications will come from the extension organization, this line of service being much improved as the result of careful study and better editing.

VARIETY TESTING

The extension service should properly take over from the experiment station many other lines of work besides the publication of popular bulletins. It has long been notorious that the experiment stations were extensively engaged in various lines of propaganda and extension work, all popular and desirable enough, but utterly foreign to the research field and all interfering seriously with the legitimate experimental undertakings. It will be hard, of course, to pry these projects loose from the stations, no matter how clearly everyone may recognize the need. For the present we are only pointing

out the correct policy, a policy which, in its general terms, no informed person will question.

As an example of the reclassification here proposed we may cite that line of "experiment" known as variety testing. When the stations were first established this sort of work was very common. About the first thing done by every experiment station in the country was to make comparative tests of all the different varieties of corn, potatoes, tomatoes and peas in the market. This variety testing quickly ran its little day and came to be regarded as the lowest form of experiment. To a very large extent it has been abandoned—to a larger extent, in fact, than necessary. For variety testing has its uses. In Massachusetts, for example, we are deeply interested in the extension of commercial apple growing, and we would sincerely like to know what is the practical value of such sorts as Winter Banana, Delicious and Opalescent. The experiment station will not and should not squander its funds trying out every new fruit, grain and vegetable; but the extension service, in its

demonstration orchards, located in various portions of the state, could easily secure a variety test of promising apples which would be worth much more to orchard planters than any single experiment station test anywhere.

Such variety testing, therefore, should be passed over, with all its baggage, from the experimental to the extension branch of the college. And with it should go a long series of "experiments" which were never experiments at all, but only plausible demonstrations. Most of the fertilizer experiments are of this character; many of the feeding experiments, a good deal of the plant breeding; also dozens of other matters which will readily occur to those who know what goes on inside any college. The obvious thing to be done is for each institution to form a compact commission of intelligent men, preferably chosen from outside the college walls, and leave to this body the separation and realignment of the experimental and extension work. Inside the college group accomplished arrangements and personal prejudices are so strong as to make a logical

reclassification practically impossible; but aside from these personal prejudices the task presents no serious difficulties.

SURVEYS AND STATISTICAL STUDIES

Perhaps a special word should be given to the field of agricultural surveys, this being a line of work never yet quite clearly defined or assigned. While various experiment stations have conducted surveys, some of them of great significance, there has been a plain reluctance to commit the stations to an extended program of this kind. Yet field and statistical surveys, when properly conducted and the data really digested, have a high value.

It would be unwise to lay down any arbitrary rule remanding all survey and statistical work to the experiment stations, or yet assigning it all to the extension services, yet it would seem clear that the latter organizations should undertake a considerable part in this field. No fundamental principle appears to apply clearly in this matter. For the present it would be better to leave all

agencies free to undertake whatever surveys may be most plainly in line with the other problems which they have in hand.

STATE-WIDE CAMPAIGNS

Reference has already been made to the careful correlation between the county agencies and the college extension service demanded by recent developments. The general principle of division is plainly that the county agencies should handle particular persons and local problems while the activities of the college should center upon state problems. This principle may be sufficiently illustrated in the development of state-wide "campaigns."

Let us say that in Nebraska the great undertaking at a given time is the improvement of the beef cattle. The introduction of better breeding stock and the teaching of better methods of handling will be taken up by all agencies of every sort—state board of agriculture, boards of trade, granges, schools, neighborhood clubs, county agencies and agricultural college; but upon the

extension service of the college may properly fall the organization and direction of the general campaign, including the correlation of all co-operating members.

There are dozens of movements in rural betterment which can be easily set forward through such campaigns. Suggestive examples are spraying campaigns, poultry campaigns, seed corn improvement, horse-breeding campaigns, better school grounds, better farmyards, better kitchens.

In this list I would specifically include selling campaigns. One extension organization within my knowledge has done valiant service in assisting farmers to dispose of their apple crop; and there have no doubt been other undertakings along similar lines. Inasmuch as the selling end of the farming business is the one most needing help this is clearly the place to take hold. The real business of the college is to help the farmer, and as this purpose is expressed more directly through the extension service than through any other branch, no one should hesitate on the propriety of breaking in at this point.

REVIEW

This chapter does not discuss the administrative organization of extension work nor its general relations to other branches of the college enterprise, but does endeavor to outline the extension service as a form of teaching. As a specialized form of teaching, it is governed by the common principles of pedagogy; but the applications of these principles are at some points rather novel.

1. Important readjustments have been necessitated within the college to fit the newly organized extension service into its effective place. Other large readjustments have been made necessary by the organization of the county farm bureaus. These correlations have not yet been completed.

2. As in all other forms of teaching, extension instruction depends largely on the teacher. Character and personality count above all else, but sound training is highly desirable. Some specialized school should soon appear for the training of extension workers.

3. The futility of mere talk is widely

demonstrated. It is sound extension policy to minimize the giving of lectures in favor of other teaching methods.

4. Demonstrations have largely supplanted lectures in the extension field, but demonstrations, as heretofore conducted, hardly constitute a final form of teaching. Moreover, many lines of demonstration begun by the colleges should now be turned over to the county bureaus.

5. Boys' and girls' clubs are especially effective. A large part of this work can be advantageously turned over to the county agencies, but the state extension service can be of material assistance in co-operation with the local organizations.

6. Movable schools, lasting a week or two weeks in each locality, are known to be worth while. Though this kind of teaching should be practiced with discretion and not too greatly expanded in any state, it may be looked upon as one of the permanent forms of extension teaching.

7. Correspondence courses are distinctly successful. They should be extended and widely improved.

8. Publications of various sorts are effective in carrying instruction to thousands of persons. Extension publications generally need much more careful study and editing, and in general the whole college policy needs a careful restudy to determine what materials should be published and what forms the publication can best assume.

9. Many lines of work formerly politely known as experimental and conducted by the experiment stations should be transferred to the extension service. Variety testing offers a good example.

10. Agricultural surveys and statistical studies of many sorts are to be made by various agencies. While the extension service has no claim to a monopoly of this field, it should, for the present, undertake a considerable part.

11. State-wide campaigns of various sorts offer another line of highly useful endeavor to the state extension services.

CHAPTER X

THE EXPERIMENT STATION

EXPERIMENTATION loomed large in all the early projects for the agricultural colleges. Experiments of one kind and another were made from the very beginning. With the passage of the Hatch Act in 1887 the experiment stations became an integral and important feature in every agricultural college.

The experiment stations have been popular institutions, sometimes quite overshadowing in their public appeal the colleges to which they are attached. It is not too much to say that up to the present time they have done more than any other one feature of the college work to commend these colleges to the general public.

With the recent general establishment of an extension service in each agricultural college there seems to be some danger that the experiment stations shall be forgotten or

neglected. Up to the present time the experiment stations have unquestionably done a considerable amount of extension work. They have sent out many publications of a purely popular character. From the nature of the case the extension service comes nearer to the public; and if this service takes over all the popular features of the experiment station work it would seem possible that the experiment station may suffer a popular neglect, especially by those who pass laws and grant appropriations. Such a result would be unfortuate and in the end disastrous. The progress of agriculture depends primarily upon the discovery of new facts and principles, and unless the research agencies continue to make such discoveries progress must cease. In this proper sense the experiment station is the most fundamental agency connected with the whole agricultural enterprise.

For several reasons the experiment station problems, including organization, finance and general policy, have been better studied than similar problems in connection with the general work of the agricultural col-

leges. This fact makes it unnecessary at this time to go into a detailed discussion of all such matters. Certain outstanding features of the experiment station problem, however, should be considered in reference to the general problems of the whole agricultural college undertaking.

FUNDS AND THEIR USE

Nearly all the agricultural experiment stations derive their chief support from federal and state funds. The federal appropriations are received under the provisions of the Hatch Act of 1887 and the Adams Act of 1906. Each one of these bills provides $15,000 annually for each state experiment station. Besides this nearly all stations receive more or less liberal grants from their own state legislatures. Some other sources of revenue, usually of a minor nature, are open to certain stations.

In the past very considerable efforts have been necessary in certain states to prevent the misapplication of experiment station funds to other purposes. The most general

difficulties lay in the insidious and widespread diversion of these funds to the support of purely college enterprises. It was no uncommon discovery to find a man drawing two-thirds of his salary from experiment station funds while giving three-quarters of his time to college teaching. There were sometimes still more glaring instances of malfeasance. For the most part these difficulties have disappeared or are being rapidly mitigated. However, the problem in one form or another seems likely always to persist. It will be necessary always to take special care that the funds appropriated for research and experimental work shall be used for these purposes strictly and for no other.

MEN FOR STATION WORK

The difficulties just referred to have had their most manifest exemplification in the personnel of the experiment station staff. Most men in agricultural college departments were chosen primarily for their supposed ability as teachers, little consideration

being given to their aptitude for research work. Such men, with the constant pressure of teaching duties ever upon them, and with a natural preference for teaching, have given very little and very poor attention to the secondary work of research. It had long been clear that to get first-class results in the research field it is necessary to have men of special aptitude, especially trained for this undertaking.

As a practical proposition this has meant that thoroughly satisfactory results in the research field could be secured only by men devoted exclusively to that work. In other words, it is necessary to make a somewhat complete separation between the experiment station staff and the college teaching staff. This point has been pressed strongly by the experiment station directors and organizers for some years past, but the opportunity for making such a separation has been notably widened by the appearance of the extension service as a separate organization. The presence now in all these colleges of three separate kinds of work, viz., college teaching, experiment station work, and ex-

tension work, makes it much easier to divide up the duties of each particular man in a manner best suited to his personal ability.

Doubtless the practice should prevail quite generally of reserving experiment station men, especially those devoted to fundamental research, to experiment station duties exclusively. On the other hand, an occasional lecture trip into the field will help to vitalize the research man's knowledge and to give him a wider outlook. Furthermore, it is not incompatible with the principle here laid down, for the research man to conduct the work of a select group of graduate students. Indeed, a research man, surrounded by a few enthusiastic graduate assistants, makes one of the best units for research work and at the same time one of the best organizations for the prosecution of real graduate study which can be imagined. But, for a research man to undertake any general teaching of freshman or sophomore classes is certainly a bad form of organization.

We have said that for the research work we require a man whose training and aptitudes are different from those of the teacher.

While the teacher requires personal magnetism and all warm human qualities, these are an almost negligible factor in the research man. On the other hand, the experimentalist should have the most thorough fundamental training. Such training should be both broad and deep. The difficulty of getting men sufficiently well trained for the exacting work of research is widely recognized throughout the country. As a general principle, subject to only minor exceptions, the training of the research man falls mainly in the field of science. Not only should science be emphasized in his training, but pure science should predominate. Pure physics is more important than agricultural physics, pure chemistry much more important than the chemistry of fertilizers. It follows that practical training in agriculture, animal husbandry and horticulture are still less important.

It is pointed out elsewhere in this book that the field of college teaching, and especially of extension work, should be turned over to the technical man; that is, to pomologists, market gardeners, dairymen and live

stock specialists. On the other hand, the field of research belongs primarily to the scientist. Even when the problems in hand have the most direct bearing upon crop production or animal husbandry the purely scientific approach is most likely to yield results in the way of new discoveries. Real discovery is most likely to come from a thorough consideration of fundamental principles; that is, from a study of the underlying science.

PROBLEMS AND POLICIES

There is a general feeling that the work of the experiment stations may be divided broadly into two somewhat different areas, which may be denominated research and experiment. Perhaps we may call research a more thoroughgoing and fundamental form of experiment. Research work, properly speaking, is almost exclusively scientific. It belongs in the realm of physics, chemistry and biology.

On the other hand, experiment is understood to be of a more practical character and

to lie nearer to the field of general agriculture and horticulture. It deals with the more direct applications of scientific principles in these practical fields. It follows almost necessarily that, while research belongs to the field of science, practical experimentation belongs more naturally to the technical departments of poultry husbandry, dairy husbandry, animal husbandry, pomology, floriculture, etc.

Good experiment station men have been placing considerable emphasis upon the principle that research work should be more fundamental than it has been in this country. It would seem desirable to get down more nearly to bedrock principles. There should be more work in the basic lines of pure science. Unquestionably this idea ought to be distinctly emphasized in experiment station policy. Moreover, this idea properly enforced makes it possible to draw a distinction badly overlooked up to the present time. In almost every institution there has been more or less disturbance over the duplication of work in several different departments. One department overlaps

upon another. The most serious difficulties have arisen because the science departments have constantly endeavored to enter the field of practical applications on the one hand, while on the other hand the technical departments have constantly undertaken purely scientific investigations. It is plain that the proper separation of the work could be secured by confining the science investigations to fundamental principles, and by confining the experimental work of the technical department to the technical applications. This would place the research work practically exclusively in the hands of the science departments and the technical experimentation with equal exclusiveness in the hands of the technical departments. Everything is to be gained by making such a change. It makes the work more effective in both directions, and, at the same time, offers a principle of division, fair to all, and capable of clearing the deck of all difficulties.

This distinction between the scientific and the technical lines of work is easy enough, as far as it goes. We ought to make room,

however, for another kind of research work which as yet has hardly appeared above the horizon. Problems in agricultural economics and even in rural sociology are beginning to come into view, and it is plain that some of them are of great significance for the future of agriculture. While these problems for the most part have not yet been sufficiently defined nor the means of approach to them sufficiently tested to make the installation of experimental work practicable, it is nevertheless perfectly certain that far-reaching investigations in these fields must presently be made. Perhaps we may guess that the investigations in economics will have a definitely scientific character and will follow the methods developed by the research scientists; while, on the other hand, the studies in rural sociology will be more practical in their nature and more closely allied in purposes and results with the practical experiments of the present technical departments.

It is a matter of general observation that most experiment stations have endeavored to cover too much territory. They have

tried to conduct experiments in every possible field of agriculture and science. In some instances this has been due to outside pressure; in other instances it has been due to the competition of departments within the institution. Whatever the cause, the effect is weakening, sometimes disastrous.

Everyone who thinks about these problems now understands that the best results are to be secured only when the experiment station confines its efforts to a limited number of important problems. These problems should be chosen with great care, of course, but they should be adhered to strictly through a long series of years and with the utmost devotion. When any experiment station is prepared in this way to cut down its program from the widest range of possibilities to the narrowest range of efficiency the first consideration must naturally be the needs of its own particular field. The agricultural industries of the state must be served first of all. The problems to be emphasized must be those which are of prime importance to the state.

For some time, however, there has been

a feeling that neighboring states with similar agricultural problems should practice some definite form of co-operation in this division of the agricultural field. Any fundamental discoveries made in Nebraska and applicable to the growing of corn or wheat are equally available in the state of Iowa. Any experiments in poultry culture which give valuable results for Iowa will be equally useful in Nebraska. It is entirely unnecessary, therefore, for both Nebraska and Iowa to maintain duplicate departments in both these fields. While this principle of co-operation is widely recognized and has been talked about a good deal, very little has actually been accomplished in this direction.

After all other considerations have had their hearing it must be remembered that the type of work to be done in any particular experiment station is dependent to a large degree upon the men available. If a certain organization has a certain man capable of doing a certain kind of work, this is one of the strongest possible reasons for entering that field. On the other hand, if it is impos-

sible to secure a man who will enter with ability and enthusiasm upon a proposed line of work, this is the best possible reason in the world for letting that problem alone. As in all forms of organization the personal, human element must be more carefully regarded.

ORGANIZATION

The departmental type of organization which has developed so extensively in our agricultural colleges has generally run through the experiment station also. While this form of organization is highly artificial and subject to a number of shortcomings everywhere, it is particularly useless in its experiment station application. It is a fair question whether an experiment station ever ought to be organized into departments in the commonly accepted form. When an organization feels it necessary to conduct experiments in chemistry, entomology, horticulture, dairying, etc., it certainly is on the wrong track. The more appropriate procedure is to determine what problems are to be solved and then to bring to bear upon

these problems every agency which can best reach the desired results. If chemistry can contribute something, then a chemist should work upon the problem. If physics can contribute something, then the physicist should be called in. But the line of approach should be from the problem to the department and never from the department to the problem, as is now the almost universal custom. To carry out these principles logically we should organize our experimental work upon a few definite problems. We should then bring to bear upon these problems all the separate agencies at our command. Approaching our work in this direction we should secure a much better co-operation between different investigators than we now secure between different departments. Indeed, the lack of co-operation between departments is one of the best known internal diseases of our present organization.

PUBLICATIONS

When the original Hatch Act provided for the publication of at least four bulletins

each year by each experiment station it turned loose upon the country a flood of literature which can probably never be stopped, perhaps not even checked. On the whole those publications have been very valuable in the progress of agriculture. Nevertheless, everyone realizes that many of them have been useless, many more of them have been poor, and only a few of them have been of really high merit. Everyone feels that this indiscriminate publication should be in some way regulated. This regulation should accomplish at least two things; first, to reduce the quantity, and second, to improve the quality. Some experiment stations and some colleges have established definite editorships for the supervision of their publications, but on the whole this method has not yet accomplished such conspicuous improvement as to commend it for general adoption. No doubt some form of editorship will be necessary to accomplish this desirable result, but obviously it must be organized in a stronger form than has usually been given to it and must be based upon some body of principles more

carefully ascertained and more definitely stated.

Attention has already been called to the fact that the extension service has taken over from the experiment station a certain number of its functions. One of the most conspicuous of these is the publication of popular bulletins. There has always been a question in the past just how far the experiment station ought to go in this direction. Various specious arguments have been brought forward to justify the stations in the publication of popular bulletins which have little or no connection with the research work being carried on. It is quite clear that all these popular publications should now be transferred to the extension service, and that the bulletins of the experiment station should be confined strictly to the publication of results actually secured in experiments carried on by the station itself. If the work of the station is confined, as it should be, more and more to purely scientific research, then its publications will tend to take on more and more of a purely scientific character. If it should occur that

the publications of a certain station should be very rarely read by the practical farmers, such a condition would be evidence that this particular station was giving its territory the best possible service. The prime business of the experiment station is research, not publication—certainly not popular publication. Looking at the output of the experiment station in this way as a body of scientific discovery, it would mean that much of the results could be published in the scientific journals and other channels, rather than in the conventional bulletin of the experiment station.

SUMMARY

This chapter does not purport to cover exhaustively all phases of experiment station work, organization and policy, but certain questions which are of direct interest to the agricultural college and to the general public are taken up as follows:

1. The position of the experiment station has changed materially with the development of an independent extension service.

There is danger in some states that the station will be neglected.

2. The experiment station has certain funds appropriated for certain specific purposes. Experience shows that these funds have to be guarded with unremitting jealousy. Certain abuses, once common, are being extirpated, but the necessity for vigilant administration of station funds will not soon disappear.

3. Men for station work should be broadly educated, yet deeply experienced in some specialty. They must be patient, reliable investigators, rather than popular, attractive expositors.

4. Men of scientific bent and training are to be preferred for research work, and research work should be emphasized. On the other hand, purely practical experiments, involving the direct application of scientific data to field conditions, should be conducted by men of technical, nonscientific training and connections.

5. There should thus be established a practical line of separation between research in science and experiments in the practical

applications of science. These two lines ought to diverge radically. Research ought to be increasingly more scientific and abstract, while practical experimentation ought not to compete with the sciences in the search for basic principles.

6. Research in the field of agricultural economics should be organized. Rural sociology also offers a field for study, though it is difficult as yet to determine the scope and character of these investigations.

7. Concentration upon fewer problems is the best policy in most station work.

8. Problems to be emphasized are those of the local agricultural industry. There should be agreement between neighboring states to prevent duplication of work. Beyond this the decision as to what lines a particular station will or will not follow should properly depend considerably upon the men available for the work.

9. The usual departmental type of organization is of doubtful utility in the experiment station. In general it would seem better to organize the research work around certain definite problems.

10. Careful study ought to be made of station publications with a view to reducing their quantity and improving their quality. The issue of purely popular bulletins ought to be transferred without delay to the extension branch of the college service.

CHAPTER XI

SPECIAL PROBLEMS AND METHODS

AGRICULTURAL college work develops certain problems not found in the general colleges. As a rule these special problems have been too little considered. The agricultural colleges have been too ready to accept the traditions and practices of their classical forerunners, even when those practices have been quite unsuited to the work in hand. Conservatism has held alliance with other powerful forces to keep the agricultural schools to the beaten path. Some of the outstanding problems of this special nature are now to be discussed.

FARM EXPERIENCE

In quite recent times the number of city-bred boys coming to the agricultural colleges has notably increased. Several col-

leges report over one-half their students from the cities. It is plain enough that these boys have a very different standing in the agricultural courses from those other boys who from their early years have hunted hen's nests, harnessed the horses, fed the pigs, picked apples, hoed the potatoes and milked the cows. The advantages of this early farm training are incalculable for all purposes of education, but as a preparation for college courses in animal husbandry, dairying or crop production they are well-nigh indispensable.

The problem of how to teach these subjects to boys who do not know guinea hens from geese with the feathers on is plainly a serious one. The practical difficulty is greater when classes are made up of half farm boys and half city boys.

With the present tendency toward much more technical work in the college courses, the necessity for practical farm experience becomes more acute. It seems ridiculous to send out a graduate of a professional agricultural course who cannot harness and hitch up a horse or run a mowing machine.

Many agricultural educators, by no means radical in their ideas, have come to think that such men should be denied their college degrees in agriculture, at least until their deficiencies are to some extent repaired.

If this position is taken the question immediately arises, how are these city boys to get their farm experience? Shall the college attempt to supply the deficiency? Shall the college farm be opened to courses of a purely practical and experiential character? Or shall the college require its students to get the experience elsewhere?

In theory the simplest and best way is to require a minimum of farm experience for college entrance. Students who come to the college from the cities may reasonably be entered with liberal arrangements for making up any conditions of this kind.

A special committee of the Association of American Agricultural Colleges and Experiment Stations has recently considered this matter carefully and made the following specific recommendations:

"Every student enrolling in the four-year agricultural course should be given some

sort of examination to determine the extent of his knowledge of farm operations.

"If it is unwise or impracticable to exclude such students as fail in this examination until they shall have gained farm experience, the colleges must eventually assume the responsibility by providing means for giving them such experience, either on farms owned by the colleges or on private farms.

"Farm practice of a general nature should be acquired early in the college course, in order to prepare the students for practice in special branches of agriculture in the later years.

"It will doubtless be impracticable for the agricultural colleges to provide any considerable number of students with training in the manual arts of the farm by employing them on the college or station farms.

"Colleges having a number of demonstration farms may be able to train a few students in farm practice on these and the college farms.

"But neither college farms nor demonstration farms are operated under normal

conditions. It will be better, therefore, for the colleges to send inexperienced students out to selected private farms for practical experience.

"Great care should be exercised in the selection of these farms. As near as possible they should meet the following conditions:

"(1) They should be relatively small general farms, in order that the students may get a variety of work and experience.

"(2) They should be well equipped and well managed.

"(3) They should be in charge of men who are friendly to students, capable and willing to teach them, and possessed of good judgment as to the wages earned by the students.

"The college should neither encourage nor permit inexperienced students whom they place on farms to hire at high wages. Disappointment and dissatisfaction are almost sure to result from such arrangement. It would be better for each student to hire out for board, work clothes, and whatever

else the farmer thinks his services are worth.

"Each student should be required to bring from his employer a certificate of merit as a farm laborer before being credited with passing his farm practice condition. He should also make a report on his own observations and experiences and on the business management of the farm on which he has worked. Forms for the certificate of merit and for the student reports should be furnished by the college.

"For farm-reared students and advanced students specializing in some branch of agriculture, lists should be made of dairy farmers, stock farmers, fruit farmers, truck farmers, poultry farmers, and the like, who are willing to employ advanced students and capable of instructing them, and students working on these farms should likewise be required to bring back certificates of merit. and personal reports.

"The practice now followed in many institutions of arranging for groups of students to supplement their practical experience by visiting successfully managed farms is to be highly commended. Farm

observation trips can be made of great value, not only to students who have begun to specialize, but also to those in the more general courses in agriculture.

"All farms to which students are sent for training or observation should be open at all times to visitation and inspection by members of the agricultural faculty, and in return the owners or managers of them should receive from the colleges special consideration in the way of advice and assistance.

"In brief, farm practice should be dignified as an essential factor in the education of young men for agricultural pursuits, and the agencies employed by the colleges for providing such practice should be as free from unfavorable criticism as it is possible to make them."

However, this does not represent all that the college can do or should do. For one thing, most colleges can undertake organized efforts to find suitable summer work on farms for boys needing the experience. Engagements of longer duration, much more valuable, can be arranged for a certain num-

ber, and this number should be increased to the maximum. Wherever these inexperienced students cannot be effectively farmed out in this manner the college ought itself to undertake their training. Much can be done in field camps, either on college farms or on private farms made available for such uses through special arrangement. The college cannot afford to spare any effort to give its students a good grounding in practical farm affairs.

Question has been raised whether such farm experience should count for college credit. This is a local question, to be decided in the light of customs and conditions in each institution. It is really not of radical importance.

FIELD CAMPS

The use of field camps for instruction in professional lines is not by any means a new idea. It has been used with notable success for years by the engineering schools, by the mining schools and by the forestry schools. To a very limited extent it has been tried in agricultural teaching, apparently always

with much satisfaction. The idea is so peculiarly suited to the requirements of agricultural teaching that it is a great wonder it has not long ago become the universal practice.

Doubtless the simplest way to introduce this method begins with senior students majoring in some technical subject, as pomology, or animal industry. For them the camp can be established in some notable fruit district or on some first-class stock farm. In such a camp the instructors and students can live together with their work, creating an atmosphere congenial to their subject and in every way stimulating to the men.

So little has yet been done in this line, however, that detailed directions for the management of this type of instruction cannot be given. They remain to be worked out by the ambitious and fortunate teachers to whom this opportunity may come.

FIELD EXCURSIONS

Trips afield, varying in length from an hour to a week, have long been a feature of

agricultural college teaching. Their popularity proves that they have value. Yet anyone who knows this work from the inside must realize that much of it is highly inefficient. Every student is bound to see something instructive, no matter how poor the itinerary nor how wild the junket. But if the teacher makes proper plans in advance and applies proper drills afterward these trips can be made highly effective.

In practically every case a trip should be outlined on paper and a copy of the outline given to each student at the start. This program specifies the places to be visited and the items to be seen. If possible there should be outlined particular problems for investigation, the answers to which can be secured only by the personal initiative and sustained effort of the individual student. The instructor can point out this or that important matter, but the student who looks up something for himself is much better off.

The following outline, prepared by Prof. A. H. Nehrling for a two days' trip of senior students visiting commercial ranges of greenhouses producing chiefly cut flowers,

is a good example of what this form of instruction ought to be.

OBSERVATION TRIP TO CROMWELL, CONN.

Make a survey of the range and boiler plant of A. N. Pierson, Cromwell, Conn.

Note the following points:

1. Layout.
   a. Location of the lower plant as regards soil conditions and points of compass.
   b. Location of the upper plant as regards same characters.
2. Storage.
   a. Method of cooling.
   b. Flowers in storage.
3. Shipping department.
   a. Packing, materials used.
   b. Markets.
4. Houses.
   a. Notice difference in construction of modern houses and those of older type.
   b. Sizes of some of newer houses.
5. Crops.
   a. What crops are grown?

b. Varieties of the more important crops.
c. General methods used.

6. Manure system.
   a. Source of manure.
   b. Method of preparing.
   c. Method of distributing.
7. Boiler plant.
   a. Number of boilers, size and kind.
   b. Amount of coal consumed.
8. Construction and repair department.
   a. Comment upon the feasibility of having this department.
   b. Note the character of work done.

A written report of this trip will be required on a specified date.

Very soon after the return from a field trip some thorough test ought to be given. This should usually be preceded by a verbal discussion. The test may come in the form of a written report or of a written classroom examination based on questions from the instructor. But the subsequent examination, like the precedent outline, is essential in order to fix in the student's mind the knowledge developed by the trip.

FIELD LABORATORY WORK

All sorts of experiments have been made in providing laboratory work in agricultural subjects. As a rule teachers have been too much influenced by the really fine laboratory courses which they have known in botany, chemistry or zoology. The laboratory idea has been for them essentially sedentary. Also it has depended on elaborate equipments of microscopes, test tubes and reagents.

If we look over any strong agricultural college, however, for the really successful laboratory courses in technical lines we shall discover them to be of a very different character. The object of a laboratory exercise is to bring the student into stimulating contact with certain materials and processes. But the materials and processes of floriculture, for instance, are very different from those of chemistry. The ingenuity of the instructor should be directed to finding the most immediate contacts with flowers, and plants and with processes of growth and methods of handling, not to the discovery of

some machinery which may be interposed between the student and these materials.

As in the management of field trips the field laboratory exercise may be made much more effective by the use of carefully prepared written syllabi. As far as possible these outlines should set definite questions, the answers to which can be found by the work of an intelligent student. An excellent example of this sort of outline used by Prof. F. C. Sears in his work with juniors in practical pomology is given here. This exercise is designed for field use in the study of orchard cover crops.

SECTION I. CROPS

Note under each different cover crop.

a. Roots.
   1. Depth to which they go.
   2. Amount of growth—are roots few and scattering, or fibrous and plentiful.
   3. Nodules—number and size.

b. Tops—amount of growth; height of stalks, number of branches and leaves.

1. Cowpeas.
   a. Roots.
   b. Tops.
2. Soy beans.
   a. Roots.
   b. Tops.
3. Summer vetch.
   a. Roots.
   b. Tops.
4. Winter vetch
   a. Roots.
   b. Tops.
   c. Compare especially with summer vetch.
5. Buckwheat.
   a. Roots.
   b. Tops.
6. Dwarf rape.
   a. Roots.
   b. Tops.
7. Cow-horn turnips.
   a. Roots.
   b. Tops.
8. Purple-top turnips.
   a. Roots.
   b. Tops.

9. Common red clover.
   a. Roots.
   b. Tops.
10. Mammoth red clover.
   a. Roots.
   b. Tops.
11. Crimson clover.
   a. Roots.
   b. Tops.

SECTION II. GENERAL OBSERVATIONS

1. Note effect on physical condition of soil.
2. Note value as a "soil binder."
3. Note value for holding snow.

The instruction in the various specialized branches of modern agriculture is so very new that no system of laboratory exercises has been worked out to a finality anywhere. It is a field in which each instructor must use his own ingenuity, and must use it strenuously. Only the hardest kind of study on the part of a clever teacher will produce a thoroughly good course of laboratory exercises.

JUDGING WORK

During the last ten years the practice of grain, fruit and stock judging has assumed a very large place in all agricultural colleges, agricultural high schools and boys' clubs. The work is obviously effective and will doubtless long remain a feature of agricultural instruction. Yet probably it ought to be reorganized on a better pedagogic basis. The fact that the same judging exercises are given to college seniors, to high school pupils and to club boys in the eighth grade at least suggests that a careful adjustment has not yet been reached.

Judging work is particularly effective for several perfectly plain reasons. It rests upon observation; it intensifies and directs observation. It also promotes and directs analysis. Best of all, it requires the exercise of judgment. For what is stock judging except the exercise of judgment, of critical, personal judgment? And a keen, quick, accurate judgment lies at the very basis of success in all practical affairs, pre-eminently in agriculture. In mathematical science one

reasons and comes to exact conclusions based on infallible premises; but in handling fruits or grains or live stock one judges and reaches conclusions more or less reliable from premises often dubious and uncertain. Thoughtless persons sometimes sneer at this sort of mental exercise, and call it a guessing school; yet most affairs of life, and especially the great affairs, are directed, not by exact knowledge, but by sound judgment acting on conflicting data.

The universality of this judging faculty and the necessity of its constant training justify in a measure the anomalous practice of teaching by this method throughout the boy's school career, from eighth grade in the grammar school to senior year in college. It may be suggested, however, that in the later years much more critical work may be required. But the work ought to change not merely in quality—new elements ought to be added. The advanced student should not be content to compare two samples and say which is better; he ought to begin to form distinct concepts of type. He ought to know the leading types, breeds or varieties and

know them effectively, so that these general concepts become the standards by which single samples are promptly valued.

When types, breeds and varieties begin to be recognized there come in problems of pedigree or of nomenclature and of classification. Here opens the door of taxanomic science, one of the noblest fields of all science, and one of the fields on which general natural science meets freely with technical agricultural science. In this field there is unlimited room for study up to the measure of the best seniors in college. There is indeed material here in plenty for the students in the graduate schools.

THE SUMMER VACATION

Men in other lines of business have never been able to understand why teachers and students in college should have three months' vacation every summer. The common practice really does require some labored explanation. It is a fact that the teacher can often use this period most profitably for himself and in the interest of

his work. It is not so clear that the vacation is an advantage to the average student. A few men do earn money (usually a bare trifle) by peddling books, waiting on table in a summer hotel or playing on a ball team. A still smaller number find employment where the experience is of material professional advantage to them. The majority would be much better off in school, and all the more so if their summer's application should serve to shorten the days to graduation. Three months of time after graduation would have three times or ten times the practical value to the young man of three months detached time in a summer vacation.

In an agricultural college, however, the objections to the waste of the summer vacation time grow to enormous proportions and take on a totally different character. For the technical work in agriculture and horticulture the summer season is indispensable. The customary three-months break not only wastes the best weeks of the year, but largely nullifies the field work of the spring and fall. The utter absurdity of this old custom is now being widely recognized, and we

may hope that no progressive agricultural college will much longer waste the precious summer months.

SUMMARY

A few of the special problems peculiar to the agricultural colleges are discussed in this chapter.

1. Farm experience is very desirable for agricultural college students. If possible, it should be secured before entering college, and the colleges are justified in making such experience a requirement for matriculation. However, unless all students lacking such practical experience are strictly excluded, the college should make serious effort to supply the deficiency before graduation.

2. Field camps should be established and freely used in teaching various branches of agriculture and horticulture, even of domestic science.

3. Field excursions have always been popular. They need to be better organized to make them reasonably effective in teaching.

4. Regular laboratory instruction in the field also requires a stricter discipline and a more careful preparation than has usually been offered. This kind of work can be made very effective, but it is often a pure waste of time.

5. Judging work, such as corn judging, stock judging, etc., has come to occupy a peculiar position in modern agricultural teaching. It ought to be given by preference in the high school and in the earlier years of the college course, but in special cases and with special adaptations may be offered at any time.

6. The summer vacation is an anomaly and an absurdity in an agricultural college, and should be immediately, eternally and universally abandoned.

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