Trends in patterns of agricultural curricula in north central land-grant institutions

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TRENDS IN PATTERNS OF AGRICULTURAL CURRICULA
IN NORTH CENTRAL LAND-GRA NT INSTITUTIONS

by

Tillman Marion Moore

A Thesis Submitted to the Graduate Faculty
for the Degree of

DOCTOR OF PHILOSOPHY

Major Subject: Vocational Education

Approved:

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Iowa State College

1944
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INTRODUCTION

The Problem

Establishment of the separate land-grant colleges and the land-grant universities was provided for by the first Morrill Act of 1862. Among the provisions of this statute were those which dealt with federal endowment, state relationships, and the type of institutions contemplated in the legislation.

The provisions of the law bearing upon these matters were stated as follows:

... each State may take and claim the benefit of this act, to the endowment, support and maintenance of at least one college where the leading object shall be, without excluding other scientific and classical studies, and including military tactics, to teach such branches of learning as are related to agriculture and the mechanic arts, in such manner as the legislatures of the States may respectively prescribe, in order to promote the liberal and practical education of the industrial classes in the several pursuits and professions of life.  

Under terms of this provision the distinctive features of the institutions to be organized were:

1. The institutions were to be of collegiate rank.

2. Their major objective was to provide and emphasize that type of training which would prepare for and function directly in the several pursuits and professions of the industrial classes.

3. Two minor objectives were set up. These were to offer a type of education to the industrial classes which, in addition to the strictly vocational, would more broadly prepare them for their several pursuits and professions, and to provide military training.

4. Direction and control of these institutions were vested in the legislatures of their respective states.

Thus conceived, endowed, and organized, each institution began a program of instruction designed to meet the needs of its clientele. Individual courses were planned and then combined at the different levels of instruction in such a manner as to develop a curriculum, or course of study, as it was then commonly called. At this period the curriculum in agriculture, which usually included one or more courses in mechanics, was the only one offered by a large majority of the institutions included in this study.

Determination of the proportion of emphasis given in the curriculum to each of these two main areas, and to the other required but subordinate areas, was left entirely to the states. Thus the pattern of the curriculum in agriculture, virtually without precedent of any kind, became a composite comprised of as many patterns as there were states.

From such a beginning, the present-day collegiate curriculum in agriculture is the culmination of a period of
development which has covered approximately four-fifths of a century.

The whole problem presented by the development of the collegiate curriculum in agriculture in the various land-grant institutions was so comprehensive that it became necessary to limit it as follows:

1. Institutions located only in the twelve states comprising the North Central Region of the United States were selected for this study.¹

2. The number of curricula in agriculture was restricted to four, namely, general agriculture, agronomy, animal husbandry, horticulture; and to their respective subdivisions, with exceptions noted elsewhere.²

3. Only full four-year undergraduate curricula were used. Excluded were short courses and curricula of less than four years' duration.

4. This study is concerned with only the academic year, and no attempt was made to include the period covered by the summer schools.

5. Samplings from a single academic year were spaced at five-year intervals. This unit of time was used instead of a longer interval

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² See page 6.
because it was felt that the development of
trends could be more accurately traced.

Sources of Data

Data and information for this study were gathered from
several sources of documentary nature.

Institutional catalogs constituted the major source of
data and information essential to this study. Another impor­tant source of material was the Proceedings of the Association
of Land-Grant Colleges and Universities.

Eleven of the twelve institutions had one or more his­
tories each, and these were utilized at various stages during
the progress of this research.

In addition to these sources listed many miscellaneous
records and reports were consulted, and some information on
recent trends was secured through correspondence.

General Procedure

Collection of data

After the preliminary phases of this study had been com­
pleted, a survey of institutional libraries was made to
determine (1) whether all the necessary catalogs were on file,
and (2) if so, whether they would be available for use under
provisions of inter-library loan. To both of the above
inquiries affirmative replies were received from libraries. Through this inter-library loan arrangement a total of 174 catalogs was secured and used in this research. These institutional catalogs supplied printed outlines of the four-year curricula together with appropriate explanatory matter and descriptions of courses. In addition, they also supplied considerable other valuable information, such as the aims and agricultural activities in the institutions.

Classification of data

Every effort was made to devise a plan in which each of the main areas of curriculum content and each of the subdivisions of these main areas would stand out distinctly from every other one of coordinate rank. Something of the nature of the problem was evident when attempts were made to distinguish between courses in technical agriculture and those in some of the sciences most closely related to agriculture.

The plan as developed and used in this study contained the four main areas required by the first Morrill Act, and electives. With the exception of the latter, each of these main areas - technical agriculture, the sciences, the humanities, and other required content - was then subdivided into its own subject-matter fields.

Definitions formed the basis used for establishing the limits of these main areas, and also for determining the correct procedure in the actual classification of courses.
The definitions follow.

**Technical agriculture.** For purposes of this study, technical agriculture embraced curricula in four fields of agricultural instruction—general agriculture, agronomy, animal husbandry, horticulture, and their respective subdivisions. However, under horticulture, curricula in floriculture, landscape gardening, forestry, and similar curricula were excluded.

Agricultural courses were defined as courses, which, except in most unusual circumstances, would now be taught in one of the four fields defined above as technical agriculture.

In addition, those courses appearing in the curricula of these four fields which were not classified under sciences applied to agriculture but yet dealt with problems of agriculture were classified as agricultural courses. This classification applied to courses in veterinary medicine, dairy industry, agricultural engineering, forestry, and other similar courses dealing with problems of agriculture.

Agricultural courses were classified under agronomy, animal husbandry, horticulture, or other agriculture.

**The sciences.** In this study science courses consisted of courses in the biological, social, and physical sciences and in mathematics.

Courses in the biological sciences were classified as botany, zoology, or other biological sciences; those in the social sciences as economics or sociology; and those in the physical sciences as chemistry, physics, or other physical
sciences; whereas those in mathematics were classified as algebra, geometry, or other mathematics.

The humanities. The humanities were defined as those fields such as art, English, foreign languages, history, music, philosophy, speech, political science, and other subjects kindred in nature.

In addition, courses ordinarily defined as social sciences were classified as humanities when they appeared in such small numbers in the curriculum as to give evidence that they had been taught for the purpose of general culture. On the other hand, if these courses appeared in the curriculum in sufficient number to indicate that they had been taught as sciences, they were classified as social sciences.

Courses in the humanities were classified as English, foreign language, history, or other humanities.

Other required content. Courses in military science and tactics and those in physical education were classified under this heading. Included also were those courses which occasionally appeared in the curriculum but which could not logically be classified elsewhere.

Electives. Free electives only were listed under this title as the result of trial classifications made early in this study. Defined, free electives comprised only that part of the elective work which remained after the prescribed electives had been fulfilled.

Group electives numbering not more than eight were
considered as options, and were likewise prorated. In cases where group electives were needed to fulfill prescribed electives, and these were suggested in the catalog instead of named, such were treated in the same manner as group electives.

The procedure followed in the actual classification of courses consisted of several steps. In a given curriculum, credit hours for all courses were tabulated in their proper spaces on a work sheet.¹

A separate work sheet was used for each of the four years of college work. Particular attention was paid to all catalog explanations, and the catalog description of any individual course was consulted in case its proper classification was not immediately apparent.

Credit hours were then secured for each subject, for each main area, and for each of the four years of college work. To insure accuracy the latter totals always were checked with those listed in the catalog. In this manner a total of 444 separate curricula were analyzed.²

There were five periods through which classification had to proceed, and considerable overlapping was observed.

The first period was one in which the time allotted to courses either was stated in a synchronistic, or time, table or, less frequently, was listed in the catalog description of the individual courses and therefore had to be searched out.

¹ Appendix, page 161.
² Appendix, pages 163 and 164.
This period was followed by one in which the credits for laboratory work in the sciences gradually became standardized.

The next in sequence was a period in which group electives gradually merged into free electives.

The fourth period was one which began with a tendency for credits to be evaluated on a clock-hour basis but later shifted over either to standardized term or to semester credit hours.

The fifth period was marked by an extension of the free elective system and by expansion in the number of curricula.

**Summarization of data.** All data in this study have been summarized on a percentage basis. This technique was selected because it provided a means of making comparable all forms of college credit including both the early-period clock hours and standard credit hours, quarter and semester basis alike.

The actual summarization of data was facilitated by the type of summary sheet used. The arrangement and size of this form permitted all data from any catalog used in the series to be summarized with ease. Summaries of credit hours for courses within subject-matter fields, for an entire subject-matter field, for each main area, and for all areas were made, converted into percentages, and recorded on the summary form.

These summary forms, taken in series according to years covered by the catalogs, provided the raw data for a given

1. Appendix, page 162.
institution. By combining these institutional data, group data for the land-grant colleges, the land-grant universities, and for all land-grant institutions were secured. Graphs were prepared and are shown in the appendix.\(^1\)

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1. Appendix, pages 165-168.
AIMS OF AGRICULTURAL EDUCATION

The first Morrill Act stated the broad objectives of the land-grant institutions in such a manner that under state direction and control these objectives could be interpreted and accomplished as each state deemed best.¹

These objectives supplied the basis necessary for unifying these institutions into a national system of higher education and yet permitted the individual patterns in the various states.

The responsibility for interpreting and carrying out these objectives, left legally to the various state legislatures, devolved upon the administrators of these institutions immediately after they were founded.

The catalogs of these institutions supplied much information related to the development of the curriculum in agriculture. In some form or other the catalogs contained statements of the aims of agricultural instruction. These aims were recorded verbatim from the college catalogs.²

The catalogs, which ranged in form from quarterly and biennial reports to annual almanacs issued by such Boards as

1. True, A. C. Agricultural education in United States, pp. 107-08. 1929.
2. See page 1 of this study.
those of Agriculture, Curators, Trustees, and Regents, usually devoted a considerable proportion of their space to descriptions, explanations, and purposes of agricultural instruction.

An attempt was made on succeeding pages to present these aims in such sequence and fullness that their courses of development can be conveniently and accurately traced.

The plan followed consisted of two procedures. The aims in all institutions operating for each of the years sampled were presented for the period from 1867 to 1897, inclusive. The second procedure combined two sample years and presented the aims of a limited number of institutions for each of these decades. Institutions were selected because their aims for that particular period appeared to be typical of the group.

The periods covered by the four decades treated under this plan were 1902-07, 1912-17, 1922-27, and 1932-37. For the year 1942 the stated aims of all institutions were given.

No attempt was made to distinguish between general and specific aims.

A minimum amount of discussion only is deemed necessary in order to trace the development of these aims.

In the catalog of Michigan Agricultural College for 1867 the statement was made:

The State Agricultural College proposes to impart a knowledge of Science, and its
application to the arts of life. Especially are those Sciences which relate to Agriculture and kindred arts, such as Chemistry, Botany, Zoology, and Animal Physiology, prosecuted to a much greater extent than in institutions where a study of their practical applications is not pursued. . . . Particular attention is called to the course of study as laid down above. It is believed to be sufficient to impart thorough mental discipline and such information as is required by the general student.

Second, To afford to its students the privilege of daily manual labor.

Third, To prosecute experiments for the promotion of agriculture.

Fourth, the organic law of the College, as well as the act of Congress donating lands to Agricultural Colleges, contemplates courses of instruction in the military art, in the applications of Science to the various arts of life.

Fifth, To afford the means of general education to the farming class. This the Agricultural College endeavors to supply.1

In the University of Illinois catalog for 1867 under "Department of Agriculture" this object was set forth:

The aim of these courses will be to fit students to manage successfully for themselves or for others, agricultural enterprises and estates.2

The catalog of Kansas State Agricultural College, a denominational institution until it became Kansas State Agricultural College in 1863, stated under "Remarks" for the year 1867:

The Classical Course, as now arranged, is believed to be as extensive and thorough in all respects as that of the best Colleges in any part of the country. The Scientific Course is equally so, and the plan laid down for the Agricultural Course gives evidence that it will not fall behind.  

It was clearly indicated by the stated aims of the institutions in operation in 1867 that the purpose of agricultural instruction was primarily of the trade or industrial type which was to train students for farming.

The catalog in 1872 for the University of Missouri published under "Design of the Industrial College" stated that:

> It is the design of this school to give an education that will fit the pupil for intellectual and manual labor - to make him a man in body and mind. . . . The Department of Agriculture is concerned with diffusing agricultural knowledge and cultivating rural tastes.

In the fifth Biennial Report of Iowa State College under "Agriculture" purposes were presented:

> The aim of this department is to add skill to the various actual operations of the farm, to a complete understanding of those operations and a thorough knowledge of the principles which underlie them.

From the Illinois Industrial University catalog for 1872 these statements which follow were taken, from "Object of the School of Agriculture" and "Object of School of Horticulture," respectively:

2. University of Missouri catalog, page 84. 1867.
The Aim of this school is to educate scientific agriculturists.

The Aim of this school of Horticulture is to afford a scientific and practical education especially adapted to the various wants of those who cultivate garden and orchard plants.¹

The catalog of the University of Wisconsin for that same year contained this assertion:

It is the design of the University to give in this Department (Agriculture) to graduates of colleges, and to others of proper ages and requirements, a thorough course of instruction directly pertaining to Agriculture, which will enable them to conduct the operations of their farm both intelligently and profitably.²

In 1873 the University of Nebraska, under the heading "Agricultural College," explained that:

The course of instruction in Agriculture is intended to be both theoretical and practical. The theoretical part includes a careful study of those sciences upon which all correct agriculture must be based. The practical will be imparted by showing how the principles of science may be applied to the art of farming. The design is to train up a class of thoughtful, intelligent, observing farmers.³

By 1872 no significant changes had been made in the aims of either Michigan Agricultural College or Kansas State Agricultural College.

A study of the aims of these seven institutions in

operation in 1872 showed that the trade or industrial aim had been accepted by all of them. Though their statements of aims differed somewhat in form it was plain that agricultural courses were designed at this time to train practical farmers. Further evidence which supported the viewpoint just expressed was revealed in the programs of the three new institutions which had begun to operate since 1867 - the University of Missouri, the University of Nebraska, and the Iowa State College.

In the first institution named agricultural instruction was in the "Industrial College"; in the second, "Practical Agriculture" was stressed; and in the last one a system of "Manual Labor" had been inaugurated.

In 1877 Purdue University published in its catalog under "Special Schools of Science and Technology" the following statement:

This course is similar to the Scientific Course in several other American universities and colleges, but it devotes more time to the Natural and Physical Sciences. 1

Since the "School of Agriculture and Horticulture" was included as one of the special schools, it is evident that the aim was similar to or identical with the one which prevailed in other institutions at the time.

In 1877 Ohio State University set forth this aim in its catalog under the title "Agriculture":

1. Purdue University catalog, page 10. 1877.
The department of Agriculture, which also includes the diseases of animals and their medical and surgical treatment, is provided for in a distinct professorship, the aim of which is to acquaint the student with the theory and practice of a truly rational system in this most important field. The course extends through two years, and is rendered practical by being constantly connected with the work that is carried on upon the farm. Numerous opportunities are afforded to the students in veterinary medicine of observing the treatment of diseased animals. 1

In the catalog for 1877 Kansas State Agricultural College set forth under "Objects" its revised aims 2 as follows:

The College now proposes to carry out the objects of its endowment in several ways.

First, it teaches the sciences applied to the various industries of farm, shops, and home.

Second, it gives a substantial education to men and women, among farmers and artisans, and in business life.

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2. Kansas State Agricultural College catalog, pp. 48-49. 1917.

The President and Faculty of the Bluemont Central College became the first board of instruction of the Kansas State Agricultural College, when the former institution was transferred to the state and assumed its present name. The Bluemont Central College was a small institution of the older American classical type, the curriculum resting upon Greek, Latin, and Mathematics as chief of the fundamentals. Its transfer to the State, and its conversion into the State Agricultural College, involved at the time merely a change in name. The President and Faculty, and curriculum remained unchanged. The second catalog, that of 1864-65, mentions an "agricultural" course, comprising one preparatory and two collegiate years; but, although this course was strengthened from time to time, the classical studies nevertheless remained until the year 1873, when the character of the instruction involved the abolition of the classical course, and the introduction of a practical scheme of industrial education. Thus the institution became in fact what it had hitherto been only in name—an agricultural college.
Third, it trains in the elements of the arts themselves and imparts such skill as makes the hands ready instruments of thoughtful brains. Fourth, it strives to increase our experimental knowledge of Agriculture and Horticulture. Fifth, it seeks to disseminate the test of scientific inquiry.

In the catalog for 1877, the University of Wisconsin explained under "Technical Courses" that:

The design of this four-year course in agriculture is to give a thorough and extensive course of scientific instruction, in which the leading studies shall be those that relate to agriculture.

In the Seventh Biennial Report of the Iowa State College for 1877 under the heading "The Course in Sciences Related to Agriculture - Purpose," the aims were stated in these words:

The purpose of the course in the Sciences Related to Agriculture, is to make scientists in the branches which underlie agriculture. It aims, moreover, to prepare students who desire it, for scientific farming. Incidentally, it furnishes to all the means of attaining an education which is thoroughly practical.

In the catalog of 1877 the University of Nebraska under "Industrial College - Agricultural Department" stated its aims:

The design of this department is to make good, practical scholars, and enterprising successful farmers.

4. University of Nebraska catalog, page 22. 1877.
No especial significant changes had taken place in the agricultural aims of Michigan Agricultural College or Illinois Industrial University between 1872 and 1877.

Under the title, "Professional Schools - Agriculture," in the catalog of the University of Missouri for the year 1877 this statement was given:

The primary aim of the Academic Schools of Science and Language is culture; that of the Professional Schools is practice. Self is the end of culture, but self is the instrument of practice.¹

The aims or object of the University of Minnesota were set forth in the catalog for 1877 as follows:

The studies and exercises of this course are designed to give to students already well instructed in liberal studies, and in general science, special training in the sciences related to Agriculture, including their practical application.²

By 1877 the training of agricultural scientists had been introduced in addition to the training of the practical farmer, and a curriculum in "Sciences Related to Agriculture" had been instituted at Iowa State College, by President A. S. Welch.³

Some evidence was observed in the course of this investigation which indicated that training of agricultural scientists, notably agricultural chemists, was being given,

¹ University of Missouri catalog, page 53. 1877.
² University of Minnesota catalog, page 92. 1877.
although such aims were not specifically stated in the institutional catalog.¹

By 1877 then, among these ten institutions in operation at that time, there were two well-defined aims of agricultural instruction, (1) trade or industrial, and (2) scientific or professional.

The statement of aims of the newly named Ohio State University (changed from Ohio Agricultural College to Ohio State University in 1878)² was made in the catalog for 1882 by Professor Townshend as follows:

The University recognizes its obligations, imposed in terms of the grant on which it is founded, to the great industrial interest in agriculture. This obligation it aims to meet in various ways. It fixes its standards of admission so that students may enter its classes from the common schools. It provides for thorough instruction in the branches of science upon which Agriculture depends. It has established a professorship of theoretical and practical Agriculture. It has established a professorship of Horticulture and Botany. It has laid down a special course leading to the degree of Bachelor of Agriculture and in theoretical Agriculture to which the farmers of the state are invited without charge.³

In the catalog of Purdue University for 1882 under the heading, "The Agricultural Course," was found this statement:

3. Ohio State University catalog, page 35. 1882.
The Agricultural Course aims to give a good scientific education, and also to impart a thorough and practical knowledge of agriculture and horticulture. It adds to the instruction of the first three years of the scientific course (Latin and German excepted) a systematic course of instruction and practice in agriculture and horticulture. Special attention is given to scientific experiments.¹

In the University of Missouri catalog for 1882 under the heading "Agricultural and Mechanical College - The Object of the School," a statement was given as follows:

The Agricultural and Mechanical College has organized a strictly industrial course of studies. Its central purpose is to educate the farmer, rather than the citizen, to give a special rather than a general education, standing in the same relation to the art of farming that the Medical College does to the medical profession; that the Law School does to the legal profession; or that the School of Engineering does to the practice or art it seeks to give proficiency in . . . .²

In 1882 the catalog of the University of Wisconsin expressed this aim under the heading, "Department of Agriculture":

The design of this department is to give a thorough course of scientific instruction, in which the leading studies shall be those that relate to Agriculture.³

Aims of the College of Agriculture in the University of Illinois, as stated under "Object of this College," in the catalog for 1882 were as follows:

1. Purdue University catalog, page 21. 1882.
The aim of this college is to educate scientific agriculturalists and horticulturalists.

Stated in the catalog of the University of Nebraska for 1882 was this passage relating to aims:

The Industrial College now offers to the sons of farmers, or to any who desire to prepare for the higher fields of industrial pursuits, an opportunity to obtain a first-class scientific and practical education at such a moderate cost as to bring it within the reach of every young man who has good health and is not afraid or ashamed to work.

The aims of Iowa State College were set forth in the catalog for 1882 as follows:

School of Agriculture - Course in Agriculture. The design of the course in Agriculture is to furnish a broad and thoroughly practical education, giving it such direction as will be especially applicable to the life and duties of the farmer. The course has been planned to combine the knowledge and skill which will best prepare the pupil for the highest demands of Agricultural industry, and to meet the requirements of an educated citizenship.

The aims of agricultural instruction at the University of Minnesota were expressed in the catalog for 1882 as follows:

The studies and exercises of this course are designed to give to students already well instructed in liberal studies, and in general science, special training in the sciences related to Agriculture, including their practical application.

Until 1882 both Michigan Agricultural College and the Kansas State Agricultural College continued their aims relating to agricultural education substantially as they were stated in their catalogs for 1877.

An analysis of the statements of the ten institutions in operation in 1882 revealed that in nearly every instance the aims of agricultural instruction were either solely scientific, or were scientific and practical combined. In the case of the University of Missouri there was some evidence that consideration had been given to the professional aspects of agriculture, though other catalog data not quoted in the aims definitely emphasized the scientific and practical combined.

Therefore, it may be concluded that the catalog evidence of the ten institutions in operation in 1882 indicated that the combined practical and scientific aims of agricultural instruction had enlarged over those of 1877 to a considerable extent.

In 1887 the catalog of the University of Minnesota contained the aims of the College of Agriculture as follows:

The College of Agriculture is designed to give to young men, who desire it, the advantages of a thorough, liberal, and practical education, not only to prepare them for the successful prosecution of Agriculture, in all its branches, but to secure to the student the mental discipline and training necessary to qualify him for any other calling or profession;
and to fit him to discharge intelligently the duties of an American citizen.¹

In 1887 the catalog of Purdue University under the heading "School of Agriculture" contained this statement of aims:

The course of study in this school is designed to prepare young men for agricultural pursuits. The purpose is not to make farmers and fruit growers merely, but intelligent citizens as well. Hence, a wide range of instruction is afforded in both general and special subjects.²

The aims of instruction in "Scientific Agriculture" in Michigan Agricultural College in 1887 were given in its catalog as follows:

In harmony with the purpose of its founders, the college endeavors to impart a knowledge of the natural sciences and their application to the arts of life. Those sciences especially which relate to agriculture and kindred arts, such as chemistry, botany, horticulture, zoology, veterinary and physiology, are studied with constant reference to their practical applications in industrial life.³

In the catalog of the University of Illinois for 1887 the "Object of the College" was explained:

The aim of this College is to educate scientific agriculturalists and horticulturalists.⁴

The aims of Iowa State College in 1887 were listed in its catalog under the heading, "The Course in Agriculture," as follows:

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2. Purdue University catalog, page 36. 1887.
The course in Agriculture is designed to meet the wants and needs of such pupils as desire an extended course in the sciences which underlie agriculture, with special reference to their practical application in the diversified industries of the farm. The course has been framed to combine that knowledge and skill which will best prepare the pupil for the highest demands of the agricultural industry.¹

The University of Wisconsin published a statement of its aims for 1887 in the catalog for that year under "Agriculture" as follows:

The Long Course offers higher, more liberal and more scientific training, and opens an avenue to a professional mastery of agriculture, agricultural chemistry, and other special phases of the subject. Besides the strictly professional branches, it embraces chemistry, physics, and similar sciences which have agricultural bearings. These constitute the foundation for special work in agricultural science.²

South Dakota Agricultural College in its first catalog in 1887 under the heading "Design of the College," explained its purposes:

The design of the institution is to afford practical instruction in agriculture and the natural sciences which bear directly upon all industrial arts and pursuits.³

The Universities of Nebraska, Ohio State, and Missouri, together with Kansas State Agricultural College, continued their aims in agriculture as stated in 1882 substantially unchanged until 1887.

¹. Iowa State College catalog, page 62. 1887.
². University of Wisconsin catalog, page 128. 1887.
Science was identified, with one exception, in the aims of all eleven colleges in operation in 1887. Especially significant was the fact that the term applied science was mentioned in about one-fourth of these aims.

Citizenship was specifically pointed out in the aims of two institutions, and the term professional mastery was used in one of the stated aims. Mental discipline and the liberal and practical aims were not entirely neglected, for this combination was cited in the aims of one institution. However, by 1887 it had become apparent that the major aims of agricultural instruction were centered largely on science and its applications to agriculture.

In 1892 the aims of Ohio State University were stated in its catalog under the title "School of Agriculture":

The aim of this school is to give young men a general education, and to fit them especially, first, for the pursuit of agriculture and horticulture in a rational manner; second, to fill positions as agriculturists, horticulturists, botanists, and agricultural chemists.¹

Under the title "Scope of Instruction," the catalog of the University of Minnesota for 1892 contained:

The object of this college is to teach practical and scientific agriculture, combined with such other branches of learning as are necessary for mental discipline and training, and such as constitute a liberal education.²

¹ Ohio State University catalog, page 56. 1892.
² University of Minnesota catalog, page 114. 1892.
In 1892 Purdue University in its catalog expressed its aims under the heading "School of Agriculture":

The course of study in this school is designed to give students a thorough training in the approved principles and practices of agriculture.¹

The catalog of the University of Missouri for 1892 outlined under the heading "Courses of Study" its aims as follows:

The courses of study in the College of Agriculture and Mechanic Arts have been selected to fully meet the requirements of the Acts of Congress providing for its organization, and while they are especially adapted to prepare students for the industrial pursuits of life, they are also sufficiently comprehensive, and of such a character as to secure the mental discipline and the practical experience necessary for other callings and professions, and to qualify pupils for the duties and responsibilities of American citizenship.²

The University of Illinois under the heading "Object" explained in its catalog for 1892 that:

The College of Agriculture aims to give a liberal and practical education, based largely on the natural and physical sciences, but supplementing those with a list of technical or professional studies in which the application of science to the best modern practice of agriculture is carefully considered. The purpose is to prepare its students to be intelligent and successful farmers or horticulturists; teachers of agriculture in schools or colleges, or through the agricultural press, or to be investigators in the agricultural experiment stations of the country. It also gives a good foundation in Veterinary Science.³

1. Purdue University catalog, page 66. 1892.
2. University of Missouri catalog, page 42. 1892.
A general statement of aims was given in the University of Nebraska catalog for 1892 as follows:

In the Industrial College are found the agricultural group, in which agriculture, horticulture, botany, chemistry, entomology and geology are emphasized, especially in relation of each to the everyday problems of agriculture.¹

In 1892 in the catalog Professor James Wilson stated the aims of agricultural instruction at Iowa State College:

The agricultural course is designed to teach the sciences that underlie practical agriculture, and sufficient English, literature, mathematics, history, and other supplementary studies to sustain both scientific and practical agriculture and develop the agricultural student to the intellectual level of the educated in any profession.²

The aims as given in the catalog of the University of Wisconsin for 1892 were stated thus:

The Long Course offers a liberal and scientific training along agricultural lines; it opens an avenue to a professional mastery of agricultural chemistry, agricultural physics, animal husbandry, dairying and other special phases of the subject.³

In its first catalog in 1892, the North Dakota Agricultural College explained its object:

The North Dakota Agricultural College shall be . . . distinctively agricultural in character. The object of the institution is not first the making of farmers, but rather the making of men, and then to so equip these

¹. University of Nebraska catalog, page 23. 1892.
². Iowa State College catalog, page 34. 1892.
³. University of Wisconsin, page 114. 1892.
men that, if their inclinations draw them toward the farm, their efforts there may be reasonably expected to be attended by success.¹

The Agricultural Colleges of Kansas, Michigan, and South Dakota showed no appreciable changes in aims between the years 1887 and 1892.

When aims for 1887 and for 1892 were compared, several points of difference stood out. In the first place, the twelve institutions in their aims as stated in 1892 showed more diversity and less agreement than was apparent in 1887. The emphasis placed upon the scientific aim had shown some decline when all twelve institutions were taken as a group for the year of 1892, and further analysis showed that the separate land-grant colleges had actually increased their emphasis upon the scientific aim while the land-grant universities had decreased such emphasis. General or liberal education, citizenship, and mental discipline as stated aims had received, particularly in the land-grant universities, an appreciable amount of increased emphasis in 1892. It should be kept in mind that the three aims of general or liberal education, citizenship training, and mental discipline were, according to evidence presented in the catalogs, intended to further the aim of providing a broad and cultural education.

Of particular significance is the fact that in neither 1887 nor 1892 did any institution give the aim of training

¹ North Dakota Agricultural College catalog, page 13. 1892.
farmers as its sole aim. By 1892, then, the early trade or industrial aim of training practical farmers had been replaced in all twelve institutions by one which was to a considerable extent scientific in its nature.

Under the title, "Purpose and Scope," in the catalog of the University of Minnesota for 1897 this statement was given:

The College course in agriculture is a thoroughly scientific course emphasizing the sciences of botany, chemistry, physics, and geology.¹

At Purdue University in 1897 the aims presented in the catalog under the title, "The Regular Four Years' Course," were:

This course of instruction is intended to give students a thorough training in the approved principles and practices of agriculture.²

The Michigan Agricultural College published in its catalog for 1897 the following significant statement about its revised aims:

While the general trend of all the instruction is along agricultural lines the course itself is so broad that the training and mental discipline to be obtained from it is fully equal to what could be secured at a purely scientific or classical college . . . . As will be seen from the following pages, the Agricultural Course has been greatly strengthened along the technical side . . . .³

¹. University of Minnesota catalog, page 153. 1897.  
². Purdue University catalog, page 85. 1897.  
Typical of the readjustment taking place in this year, the University of Missouri published this statement in its catalog for 1897 under the heading, "A Four Years' Course":

This course, a continuation of the Two Years' course, is more scientific but less practical. It has been recast in order to adapt it as far as possible to present requirements in both science and practice. Its object is to give young men a thorough education at the same time they are carefully instructed in the relations that the sciences bear to the various branches of agriculture; to give mental training that is indispensable to success and to the highest duties of citizenship, as well as the scientific and technical training and knowledge requisite for becoming efficient workers in agricultural affairs, whether as practical farmers, teachers, or investigators. It aims to impart a thorough and scientific knowledge of the principles underlying the business of farming according to modern methods. ¹

In 1897 the University of Illinois stated its aims in the catalog for that year as follows:

The College of Agriculture offers a course especially strong in chemistry, botany, zoology, physiology, and bacteriology, in which agriculture and horticulture are taught from a scientific basis, always with regard to scientific practice. The aim is to discuss and teach the principles that underlie these great arts. Besides affording special preparation for a technical pursuit, it is hoped the course will commend itself to all lovers of rural life and its affairs in offering them the means of keeping pace with the increasing desire for higher learning. ²

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¹ University of Missouri catalog, page 109. 1897.
² University of Illinois catalog, page 110. 1897.
Under the caption, "Purpose," in its catalog the South Dakota Agricultural College in 1897 published:

The college is devoted to advancing the interest of practical education and its purpose is to give men and women such training as will best fit them for the actual duties of life. . . . The aim of all work offered is to fit young people to be able to occupy more acceptably, any position they may be called upon to fill, than they could without such training; and to make better and more intelligent citizens.¹

From the catalog of the University of Wisconsin for 1897 came this statement:

The Long Course offers a liberal and scientific training along agricultural lines; it opens an avenue to a professional mastery of agricultural chemistry, agricultural physics, horticulture, animal husbandry, dairying, and other special phases of the subject.²

The North Dakota Agricultural College plainly set forth its purpose in the catalog for 1897, as:

To fit the citizen for his place in the body politic is the aim of the Agricultural College. The industrial state constitutes a large aspect of our national life, and agriculture is the principal factor in our industrial system. . . . The curriculum embraces, in addition to technical subjects pertaining to Agriculture and Mechanics, every line of culture study essential to a liberal education.³

Ohio State University, Kansas State College, the University of Nebraska, and Iowa State College, in their respective catalogs for 1897 continued their agricultural aims

practically unchanged from those given in the catalogs for 1892.

The combined agricultural aims of these institutions in 1897 showed few differences from those of 1892. The principal change noted was that increased emphasis was given to technical training, especially in agriculture.

A second difference was the expansion of the cultural aims alongside the technical aims. It was obvious from statements of the institutions themselves that mental discipline, citizenship training, and liberal education were being continued as cultural aims of agricultural education. To these cultural aims the land-grant universities continued to give more emphasis, which was an indication that in these institutions there had been a particularly strong reaction against the increased technical emphasis tending then to replace considerable humanistic content in the curriculum.

In summary, aims of both technical and cultural education were increased in 1897. Judged by their aims, institutions were divided into two types: those primarily technical and those which carried both aims in varying proportions.

The catalog of the Kansas State Agricultural College for 1902 stated its aims in these words:

This institution is preeminently industrial in its aims, methods, and tendencies. . . . The leading feature of the four-year agricultural course is the training offered in methods of farm production.¹

The University of Minnesota in the catalog for 1902 stated its aims of agricultural instruction as follows:

"This course (four-year agriculture) is designed to give a broad preparation for farm life or for the work of the specialist in the sciences and arts relating to rural industries and rural life."¹

In 1902, under "Course of Study," the following was presented in the catalog of Iowa State College:

"The courses in these several departments unite in making a foundation for the student upon which he can build a successful career as a farmer, or develop into a specialist in the many possible lines that are branches of the farming industry."²

Under "Agricultural Course" in the catalog of the University of Missouri for 1907 was this statement:

"The Agricultural Course is designed to train young men for the business of farming. In addition to this, it serves to meet the constantly increasing demand for men trained in agriculture to fill the positions of farm managers, experiment station workers, and teachers of agriculture - a demand which thus far the agricultural colleges of the country have not been able to supply."³

Michigan Agricultural College put into its catalog for 1907 this combined description and statement of aims for its agricultural courses:

"The agricultural course, the oldest and for many years the only course, is centered around instruction and practice in

¹ University of Minnesota catalog, page 9. 1892.
² Iowa State College catalog, pages 54 and 55. 1902.
³ University of Missouri catalog, page 46. 1907.
agriculture and horticulture, and the sciences bearing directly upon successful farming. . . . After the end of the first term, junior year, all agricultural students specialize in their technical work, electing either agriculture or horticulture. 1

It is apparent from a study of the combined aims of 1902 and 1907 that these institutions centered upon two major aims. These, as will be seen from an analysis of foregoing aims presented, were (1) to train successful farmers, and (2) to train specialists.

Although there was no particular agreement among the twelve institutions as to which of the two aims was most important, all institutions in the group had definitely committed themselves to these major aims.

Besides these two aims there were minor ones included, the most important of which were concerned with cultural studies, citizenship training, and broad or liberal education. These aims had particular significance in this study, for the strengthening of emphasis on aims related to specialization in agriculture resulted in a weakening of emphasis on the aims of cultural education and vice versa.

In 1912 the University of Nebraska under "Purposes of the College of Agriculture" published these two agricultural aims in its catalog:

The purpose of this college is (1) to provide thorough instruction in the technical agricultural sciences, (2) to aid in the promotion of agriculture through its secondary Schools of Agriculture, its Experiment Stations, and its Agricultural Extension Work, and (3) to promote household arts through its department of Home Economics.

Under "Agriculture" in the Purdue University catalog for 1912 was the statement:

The four-year plan of study is intended to fit students for the business of farming and offers a broad education by providing well-balanced instruction in the Science and Art of Agriculture. . . . By choice of electives the student may fit himself for general or special farming or for teaching and work in the Experiment Stations or other lines of highly specialized Agricultural work in the fields of Animal Husbandry, Agronomy, Dairying, and Horticulture.

The Kansas State Agricultural College in its catalog for 1912 declared:

The four-year course is designed to meet the needs primarily of the students who expect to return to the farm. However, the student who completes any of the courses offered will have sufficient training to enable him to enter some one of the many lines of agricultural industry as a specialist.

Under "College of Agriculture" there was taken from the University of Illinois catalog for 1917:

This college offers curriculums to both men and women. The curriculums offered are designed for four distinct purposes:

1. University of Nebraska catalog, page 293. 1912.
2. Purdue University catalog, page 70. 1912.
First, and mainly, to train for the profession of farming.
Second, to train for the teaching of agriculture in the public schools.
Third, to train for landscape gardening.
Fourth, to train for the profession of floriculture. 1

Under "College of Agriculture" in the catalog of the University of Missouri for 1917 the purpose of agricultural instruction was listed as:

The object of instruction is to train men and women for success in the vocation of agriculture. The college aims to educate farmers, farm managers, foresters, fruit growers, grain growers, dairymen, and stockmen. It prepares men for responsible positions as teachers in agricultural colleges, as investigators in experiment stations, for extension work in agriculture and home economics and for service in the United States Department of Agriculture. 2

The aims of agricultural instruction during the period represented by the years 1912 and 1917 were significant in one respect. In either one or both of the sample years included in this period all twelve institutions in the group gave prominence in their aims to the scientific training of agricultural workers in and for specialized fields. Although there was apparent general agreement on the inclusion of this aim, catalog evidence was insufficient to indicate whether or not all institutions agreed on the proportion of emphasis which should be given it.

In summary, by the close of the academic year of 1917-18 these institutions were found to be substantially agreed that two of their major aims of agricultural instruction were those of training for the business of farming and training for the technical and professional fields in agriculture.

Under "College of Agriculture" in the North Dakota Agricultural College catalog for 1922 was published:

The curricula in agriculture are designed to give to the student a fundamental knowledge of the sciences most closely related to agriculture and to show their applications to intelligent agricultural practice.\(^1\)

The University of Nebraska in its catalog for 1922 explained its purpose of instruction in agriculture as follows:

The General Agriculture Group (four-year curricula only) meets the needs of those students who wish to prepare themselves for general farming; it also meets the needs of those who wish to prepare for the pursuit of scientific investigation along some line of agriculture, such as agricultural chemistry, agricultural engineering, agronomy, animal husbandry, animal pathology, dairy husbandry, entomology, horticulture, rural economics, agricultural education and other technically related subjects. This group should also appeal to those who desire to prepare themselves for teaching in colleges, high schools, or other schools.\(^2\)

In 1927 the University of Illinois catalog listed under "College of Agriculture - Instruction" the following:

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1. North Dakota Agricultural College catalog, page 68. 1922.
2. University of Nebraska catalog, page 75. 1922.
The college of Agriculture offers to both men and women four curricula leading to a B. S. in Agriculture. These courses are designed for four purposes: First, and mainly, to fit the student for life work in the profession of farming, for technical positions in industries closely allied to agriculture, or for public service in lines of investigational work or extension service relating to agriculture, and also to train for the teaching of agriculture. Second, to train for the teaching of agriculture in the public schools. Third, to train for landscape gardening. Fourth, to train for the profession of floriculture.

Iowa State College set out its aims in the catalog for 1927 in this way:

The Division of Agriculture is made up of all the departments of the College devoted to the various phases of technical and practical agricultural work. The work of these departments is closely related, and the purpose of all of them is to train men for better service in agriculture.

Under "Agriculture" in the Purdue University catalog for 1927 was published:

The four-year plan of study offers opportunity for a broad, scientific education and for a certain amount of specialization in some chosen field of agriculture. . . . While the agricultural courses are designed to train students for the farm and in the country, they offer also an opportunity for a very broad, well-balanced, satisfying education and at the same time may serve to fit men for a variety of very excellent positions in educational, scientific, and commercial work in connection with institutions and industries closely allied or connected with agriculture.

2. Iowa State College catalog, page 51. 1927.
3. Purdue University catalog, page 106. 1927.
When various aims for 1927 were classified into three categories—agricultural service, farming, and agricultural or applied science—slightly more than half of all of the chief phases of aims were classified under agricultural service, and approximately one-fourth were grouped under each of the other two classes—farming and agricultural science. When the data for 1922 and 1927 were taken collectively and studied, it was apparent that a change in aims had taken place during this period. It was evident that among the contributing factors which had influenced this change were (1) the continued desire to supply trained specialists in the now broadened field of agriculture, (2) the enactment of two federal statutes,¹ (3) the general and common objectives of service to agriculture largely along economic and social lines, and (4) finally, the important factor of a national economy modified and shaped, to a considerable extent, by the effects of the first world war. The changes in major aims and the definite trend toward agricultural service as an aim characterized the period represented by combining data for 1922 and 1927.

Under "Division of Agriculture" South Dakota Agricultural College in its catalog for 1932 stated:

The aim of the resident instruction is to prepare men for successful work and leadership in the field of active farming, in agricultural education, in research work, in administrative and regulatory work, and

in the many lines of business closely related to agriculture.¹

In the University of Wisconsin catalog for 1932 under "College of Agriculture - Plan of the College" there were listed these aims:

The work of the College of Agriculture is conducted on a three-fold basis. Each department aims; First, to give instruction to students at the University. Second, to develop science through investigation and experiment. Third, to disseminate among the farmers and farm women of the state by means of publications, farmers' courses, institutes, and the agricultural extension service.²

Under "College of Agriculture" the Ohio State University catalog for 1937 contained this statement:

The four-year curricula of the College of Agriculture consist of regular collegiate courses in the University and lead to the degree of Bachelor of Science. These courses offer opportunity for specialization in Agriculture, Animal Science, Applied Entomology, Dairy Production, Dairy Technology, Horticulture (Pomology, Vegetable Gardening, Floriculture), Plant Science, Rural Economics and Rural Sociology, and Home Economics.³

North Dakota Agricultural College in its catalog for 1937 stated under "College Curricula in Agriculture" that:

A choice between two basic curricula, general agriculture and agricultural science, is offered to students pursuing collegiate work in agriculture who expect to receive the bachelor of science degree. The curriculum in general agriculture is intended primarily for those students who desire a broad training in agriculture rather than in some specialized field.

3. Ohio State University catalog, page 240. 1937.
The curriculum in agricultural science is intended for students who wish to select a major in an agricultural science field, that is, in one of the fields which has a strong basis for pure science. The curriculum is more elastic as regards choice of courses outside of the major field.¹

Under the "Four-Year Curriculum in Agriculture" the catalog of the University of Missouri for 1937 explained:

This course of study requires four years for completion and leads to the B. S. in Agriculture. It offers training for those students who are planning to enter the business of farming in any of its varied forms. Those who are planning to enter any of the various forms of business more or less directly connected with Agriculture will find this course of study adapted to their needs. It also provides the basic training necessary for county agricultural work and extension work and for agricultural experimental work and college teaching. Ample opportunity is given for specialization to meet the needs of individual students.²

An analysis of the aims of all institutions for the period formed by the combined grouping of aims for the two sample years of 1932 and 1937 showed that the three phases—agricultural service, business of farming, and agricultural or applied science—had continued practically on the same basis as in the previous period. However, agricultural science had shown a gain over that of the previous period. Significantly, the term "broad education" appeared in the aims of three institutions during this period. This analysis

¹ North Dakota Agricultural College catalog, page 51. 1937.
² University of Missouri catalog, page 148. 1937.
and other available evidence indicated that some considera-
tion had been given in these aims to that of broadening the
base of training in specialized agricultural fields.

The aims of agricultural instruction in these institu-
tions during 1942 appeared to possess especial interest and
value, and for that reason those of all twelve institutions
are presented.

In 1942 the catalog of the University of Illinois under
"College of Agriculture" contained the following:

To prepare men and women for successful
careers in agriculture and home economics,
the College of Agriculture offers many
courses in these two fields, which have
in common an interest in the production,
processing, sale, and use of food and
clothing materials.1

Under "Agriculture" Purdue University in its catalog for
1942 published its aims:

The eight-term plan of study offers oppor-
tunity for a broad scientific education
and for a certain amount of specialization
in some chosen field of agriculture. . . .
By proper choice of electives students may
fit themselves for practical work as farm
operators or managers, or for scientific
work in the above-mentioned fields. While
the agricultural courses are designed to
train students for the farm and life in
the country, they aim at the same time to
fit men for a variety of very excellent
positions in educational, scientific, and
commercial work in connection with insti-
tutions and industries closely allied
with agriculture.2

2. Purdue University catalog, page 176. 1942.
The catalog of Iowa State College for 1942 stated the aims of curricula in agriculture as follows:

The curricula in this division are designed to teach the sciences that underlie practical agriculture, mathematics, history, and other supplementary subjects to sustain both scientific and practical agriculture and to develop the agricultural student to the level of the educated in other professions. ¹

The division of Agriculture is made up of all the departments in the College devoted to the various phases of technical and practical agricultural work. The work of these departments is closely related and the purpose of all of them is to train men for better service in agriculture. ²

In the catalog for 1942 Kansas State College of Agriculture and Applied Science stated that:

The scientific farmer must have scientific and economic knowledge and training. They are quite as essential as practical knowledge of agriculture in the development of an agricultural state such as Kansas. Soil is most effectively utilized by those who have knowledge of how soils have been formed, how fertility has been stored in them, and how the resources of the soil can be maintained.

The successful farmer knows what kind of plants to grow and how to improve them. He understands the principles of selection, breeding, and feeding of livestock. He knows how to maintain orchards, gardens, and attractive surroundings. He has an appreciation for good and adequate farm buildings and a farm home equipped with modern conveniences. He is familiar with the best methods of marketing the products of the farm.

¹,² Iowa State College catalog, page 136. 1942.
Kansas State College gives systematic training in agriculture which fits young men for the farm. The College also prepares students for the scientific investigation of agricultural problems in state and national institutions, for agricultural extension work, for the teaching of agriculture, for service in industries closely related to agriculture and for a variety of other public and private services of an agricultural nature.¹

Michigan State College of Agriculture and Applied Science in 1942 in its catalog explained:

Modern training in agriculture is based upon an understanding of the sciences and knowledge of effective farm practices and marketing. The courses in Agriculture are planned to give fundamental training in basic sciences and arts during the first two years, maintaining, however, a direct contact with the field of technical agriculture by requiring one or more agricultural courses during each quarter. A sufficient number of courses in the various technical lines are given in the first two years to acquaint the student with all the phases of agriculture and to furnish a foundation for the final decision in regard to the course in which he wishes to specialize.²

The University of Minnesota in its catalog for 1942 explained:

Technical Agriculture - This curriculum is arranged for students who plan to follow one or more of the technical or applied fields of agriculture immediately upon graduation.

Science Specialization - This curriculum provides for more intense specialization, particularly in the sciences basic to many

¹. Kansas State College of Agriculture catalog, page 96. 1942.
fields of agriculture. Only that amount of technical training in practical agriculture is required which deals with the special science or field selected.¹

In 1942 the catalog of the University of Missouri contained under "College of Agriculture" the following:

The character of the instruction to be given in this college is to some extent specified in the legal enactments providing for its establishment. The object of this instruction is to train men and women for success in the vocation of agriculture. The College offers training for farmers, farm managers, fruit growers, grain growers, dairymen, poultrymen, and stockmen. It prepares men for responsible positions as teachers in agricultural colleges, investigators in experiment stations, for extension work in agriculture, for service in the United States Department of Agriculture, and for business related to commerce in agricultural commodities.²

In the University of Nebraska catalog for 1941-42 there was given this statement under "College of Agriculture":

The purpose of this college is (1) to provide thorough instruction in the technical agricultural sciences and home economics, and (2) to aid in the promotion of agriculture and home economics through its secondary schools of agriculture, its experiment stations, and its agricultural extension work.

The college believes in thorough training along broad fundamental lines and in a culture which develops the powers of the individual to the higher degree. Through its courses of study and social and athletic student organizations, it fosters individual growth and encourages that kind of development which tends to make the

graduate desirable to society and industry and confident of his own powers in business. The Agricultural College student has an opportunity for study along many lines. He goes into a number of fields of research of scientific, technical, and economic information. His training is related to agriculture on the one hand and business on the other.¹

The Agricultural College curricula are designed to prepare men for activity in one of the five general fields: general agriculture, technical scientific work, conservation activities, agricultural education, and business related to agriculture.²

The objectives of the "School of Agriculture" presented in the North Dakota Agricultural College catalog for 1942 were:

The School of Agriculture prepares men to understand and grapple with the social, civic, political, economic, and religious problems relating to country life.

Curricula in agricultural science are designed for especially well-qualified students who wish to pursue scientific studies in preparation for a scientific career.³

The following was given in the catalog of the Ohio State University for 1941-42 under "College of Agriculture":

The College of Agriculture offers instruction in the fundamental sciences as well as special and technical training in the various branches of Agriculture and Home Economics. The courses offer a broad foundation for specialized training. The four-year curricula of this College consist of regular collegiate courses of the University and lead to the degree of B. S. These courses offer opportunity for specialization in Agriculture, Agricultural Engineering,

¹ University of Nebraska catalog, page 93. 1941-42.
² University of Nebraska catalog, page 96. 1941-42.
³ North Dakota Agricultural College catalog, pages 44 and 46. 1942.
Animal Science, Applied Entomology, Dairy Production, Dairy Technology, Horticulture (Pomology, Vegetable Gardening, Floriculture), Plant Science, Rural Economics and Rural Sociology, and Home Economics.1

The aims of the Division of Agriculture were presented in the South Dakota State College catalog for 1942 as follows:

The aim of resident instruction is to prepare men for successful work and leadership in the field of active farming, in agricultural education, in research work, in administrative and regulatory work, and in many lines of business closely related to agriculture.2

In the University of Wisconsin catalog for 1942 under the heading "The Long Course - Objectives" was this statement:

The Long Course in Agriculture is the regular four-year collegiate course leading to the degree of B. S. in Agriculture, serving a two-fold purpose, namely, to give a broad, general training and a specific of shorter duration. Majors in Agricultural Science - Many of the Wisconsin College of Agriculture students in the past have entered some phases of agricultural science and it seems probable that this field will continue to provide many opportunities. In this field high scholarship is a necessity; only those students whose work in the first two years is of high quality should plan to enter this field. The three general fields of particular importance are Animal Science, Plant Science, and Social Science.3

By 1942 in the stated aims of the institutions greater emphasis had been placed upon both agricultural service and agricultural science than in the years previously sampled.

1. Ohio State University catalog, page 11. 1941-42.
The aims relating to the training of practical farmers and to broad education had continued with little or no change in emphasis since 1937.

It was evident that the aims of these institutions had been shaped largely by two factors, federal legislation, and the Association of Land-Grant Colleges and Universities.1

Federal legislation had consisted in the main of the first Morrill Act, the Hatch Act, the second Morrill Act, the Smith-Lever Act, the Smith-Hughes Act, the Purnell Act, the George-Reed Act, and other later laws similar in their general purpose. Among these statutes three stood out prominently in relation to the major aims of agricultural instruction as stated by the land-grant institutions. These major aims were formulated by the first Morrill Act; they were supplemented and redirected by the Hatch and the second Morrill Acts, passed in 1887 and 1890, respectively; they were enlarged by the addition of the agricultural service aims which secured a strong impetus from the Smith-Lever and Smith-Hughes laws passed in 1914 and 1917, respectively. It is interesting to note that the first pair of laws came at the end of the first quarter century of land-grant existence, and the second pair shortly after the end of the second quarter century.

1. The relationship between the land-grant system and the United States Department of Agriculture, both established by separate enactments in 1862, was indicated by the name, Association of American Agricultural Colleges and Experiment Stations, adopted in 1887.
It should be mentioned further in connection with the Hatch and second Morrill Acts that, together, they immediately began to clarify institutional objectives and to establish more firmly in these institutions the newer scientific aim. This fact was of great importance for at this opportune time the scientific aim was more quickly and firmly established because of the formation of the permanent association of land-grant institutions in 1887.

The Smith-Lever and the Smith-Hughes Acts in effect reduced the emphasis placed upon the trade and industrial type of aim, that of training practical farmers, in the land-grant institutions, since by these acts such training was in large measure transferred from the collegiate level either to the secondary level or to training on the job through extension methods. At the same time both these acts gave a strong impetus to the new social service aim and prepared the way for progressively increased emphasis upon it, as was demanded by rapidly changed and changing national and international economic and social conditions.

Though no attempt has been made to correlate any changes in the aims of these institutions with the influence of these two federal acts previously mentioned or with that of the Purnell Act or others whose general purpose was that of the promotion of social service to agriculture, there seems little doubt that a very close relationship did exist. Furthermore, since in the long run legislation usually reflects changes in
a given field, it seemed only reasonable to assume that these acts were also correlated with changes out in the field of agriculture itself.

The second of the two factors which shaped the aims of agricultural instruction in these land-grant institutions was the American Association of Land-Grant Colleges and Universities. Formed into a permanent body in 1887 by the land-grant institutions, after several previous attempts to unite, this official body has exerted a great and varied influence upon the direction and development of these institutions.

Three authoritative statements have been selected, each of which represents a different period since this permanent organization was formed, which show something of the nature and importance of this association in the work of the land-grant institutions.

The first, an excerpt from an address, "The Teaching of Agriculture," delivered in November, 1894, at the Annual Meeting of the Association of Agricultural Colleges and Experiment Stations by the United States Commissioner of Education, W. T. Harris, was as follows:

The annual conference of agricultural college presidents is itself sufficient evidence that what each discovers in the course of the year is brought to the attention of all his fellows. There is a constant process of reinforcing each agricultural college by the experience of all similar institutions.¹

¹ Proceedings of the Association of American Agricultural Colleges and Experiment Stations, page 44. 1894.
At the time this statement was made there had been only seven annual meetings, and it therefore was apparent that the work of the group had accomplished enough in the way of tangible results to engage the attention of the United States Commissioner of Education and prompt from him this evaluation of the work of the official body.

An even stronger statement was that delivered in November, 1911, before the Association of Agricultural Colleges and Experiment Stations by the President, W. H. Jordan, in the annual address of that officer:

This association has been an active and most influential agency in augmenting the resources of the institutions from which you come, and in developing and unifying their administrative and pedagogical methods. You must also recognize very clearly that your annual discussions have been helpful, even essential, to the wise solution of administrative and educational problems. Probably no other influence has been more potent in hastening and shaping the far-reaching readjustment that has been effected during the past few decades in the aims and methods of education, even in our secondary schools, than has been the example and propaganda of institutions arising from the first Morrill Act, an influence, to which your deliberations have served to give form and purpose.

As this statement came near the end of the first quarter century after the permanent formation of the official body, it was considered to be a reviewed and an accurate appraisal of the influence of this factor during that period.

The third authority, Dean F. B. Mumford, after more than half a century, evaluated the influence of the Association of Land-Grant Colleges and Universities in this manner:

The rapid progress of the colleges of agriculture and mechanic arts has been importantly influenced from the beginning by the Association of Land-Grant Colleges and Universities. ... The association has come to have a very important place in the educational movements of the United States and, in particular, the land-grant college movement.¹

General Survey

In summary, these twelve institutions under study had uniformly and consistently recognized the fundamental nature and importance of aims as related to agricultural instruction.

Three major aims had come into existence approximately a quarter of a century apart, and had become established as major aims of these institutions. The first was to train students to become practical farmers, called in this study the trade or industrial type of aim; the second aim was to train scientists, at first mainly research workers but later professional scientists, known then as specialists; the third aim was to train social workers, in a broad sense of the term, for the whole of agriculture.

Generally speaking, heavy emphasis was given to the aim of training practical or dirt farmers during the first

¹ Mumford, F. B. The land-grant college movement. pp. 78-79. 1940.
quarter century of land-grant existence. Partly as a result of the influence of several factors and partly as a result of only limited success in the actual accomplishment of this first aim, emphasis placed upon this aim declined considerably by 1887. This period was characterized by contrasts in viewpoints and by experiments with various means and methods of training practical farmers, and by the gradual rise in emphasis given to the scientific aim.

In the early part of the second quarter century of existence the scientific aim shared emphasis with the trade and industrial type of aim and also with the aim of a broadened base for agricultural education, in varying proportions, and more especially in the land-grant university group. Aided materially in its progressive development by the formation of an official body composed of representatives from the various land-grant institutions, the scientific aim rapidly gained acceptance and emphasis in all institutions. The second quarter century was a period marked by compromises in aims and by a closer and closer harmony, particularly after the turn of the century, among the institutions as to their major aims.

Entering approximately at the beginning of the third quarter century of existence was the aim of social service to the whole field of agriculture. Although the emphasis placed by the twelve colleges and universities upon agricultural science as a major aim was appreciably increased during this period, it was obvious that since a part of the
emphasis placed formerly upon the training of practical farmers had been transferred to other than the collegiate level, the emphasis upon this aim had been decreased considerably. During the third quarter of a century which closed in 1942 there was, with very few exceptions, a substantial uniformity of agreement among the twelve institutions in regard to their major aims. These findings were not unexpected, and are in line with those reported by authorities in the field of land-grant education.¹

Some evidence was available to suggest that as a general rule changes in aims which occurred during the early or formative period resulted from changes in administration, whereas in later periods there was little or no evidence to indicate that important changes in aims accompanied changes in administration at any level above that of Dean of Agriculture.

A major aim had arisen at approximately every quarter century. This fact was of particular significance in this study because these changes in major aims were intimately related to the changes which occurred in the content of the curriculum during the same twenty-five year periods.

¹ Mumford, F. B. The land-grant college movement. p. 31. 1940.
MAIN AREAS OF CONTENT

Aims and content of instruction are closely interrelated. When the aims of collegiate instruction in agriculture were once determined, the development of content for that purpose followed. As has been previously pointed out, the nature of the major aims of agricultural education as set up in the provisions of the Morrill Act required instruction in four areas. As the whole body of human knowledge expanded and as the development of this content progressed, many changes of both quantitative and qualitative nature occurred in content, and certain trends became evident.

Two general trends were revealed when the content of the collegiate curriculum in agriculture in its present form was considered in terms of its development and in terms of its main areas.

Trends in Required Content

The first of these two general trends was concerned with the amount of required content in the curriculum in agriculture, and it was therefore possible to trace the trend in electives. Although the two general trends were quite marked in character, it was apparent that there were associated with each of them other interrelated trends which were quite as
definite and as marked. After a survey of all trends—the two general and the minor ones associated with them—it was decided to center the discussion upon the general trends and at appropriate places to bring out the chief characteristics of the various minor ones.

Data in Table 1 indicated that in the twelve institutions during the entire period under study two distinct phases had developed in the trend dealing with required content. As defined in this study, all content in the curriculum during the first phase, 1862-1882, was required. New content had gradually accumulated during the two decades ending in 1882, some of which had been introduced into the single curriculum in agriculture then in existence by the employment of four practices.

The earliest evidence of any attempt to make adjustments to provide for additional content to be introduced into the curriculum was observed when the number of credits required for graduation was expanded from about thirty, the usual number, to thirty-six, or sometimes more.

Another device commonly employed to serve the same purpose was that of assigning fewer periods per week for certain content. All the content of the curriculum was then fitted into what was often called a synchronistic table, or time table.

1. Data given in the tables of this study are shown graphically in the appendix, pages 165 and 167.
Table 1
Percentages of Subject-Matter Content in the Curriculum in Agriculture.
All Land-Grant Institutions.

<table>
<thead>
<tr>
<th>Year</th>
<th>Agriculture</th>
<th>Science</th>
<th>Humanities</th>
<th>O.R.C. Content</th>
<th>Electives</th>
<th>Total</th>
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<td>.00</td>
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<td>18.45</td>
<td>4.20</td>
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</table>
The third practice, widely followed during this early period, consisted of allowing the student to exercise options between one or more pairs of subjects offered at the same time.

The final method of this period, the group elective system, in reality a multiple option, provided for considerable elasticity and readjustment of content and was commonly used by a large majority of the institutions included in this study.

According to definition used in this study, the second phase of the trend in required content, which had begun in 1887 with the introduction of the free elective system and had continued through 1942, was marked by a progressive decrease in total required content in each sample year, as was shown by data in Table 1.

In 1887 there had been retained in the curriculum much of its original traditional and classical content. Due to the expansion of the early scientific courses and to the introduction of new ones, the body of verified knowledge which accumulated and which awaited introduction into the curriculum was too great to be accommodated by means of the group elective system alone. The new demand for trained technicians following passage of the Hatch Act redirected the institutional aims of agricultural instruction toward technical training, and therefore made it more necessary for the scientific and technical content to be introduced into the
curriculum in order to accomplish the new aim. Therefore, it was expected that findings in this study should show that the free elective system should have begun in 1887 at the same time as technical training began; and further, it was expected that the findings in this study should show that an increase in the amount of free electives had corresponded to the increase in technical agriculture.

The elective system was a kind of revolutionary movement principally against the traditional and classical content of the curriculum, that was brought into prominence by President Eliot at Harvard University, and in the land-grant institutions it was essentially a continuation of the fight against the classics. This was especially true after the land-grant institutions began their technical training. The elective system, particularly that of the free elective, early gained the momentum necessary to function effectively in replacing the traditional content in the curriculum with sufficient technical content to enable these technical institutions to accomplish their declared aims.

The function of the elective system was set forth in an address on the topic, "Some Recent Changes in the Theory of Higher Education," by President E. A. Bryan of Washington State College at the meeting of the Association of Agricultural Colleges and Experiment Stations in 1898:
The introduction of the elective system was the first breach in the apparently impregnable wall of mediaeval scholasticism.¹

Along this same line, at the annual meeting of the Association of Land-Grant Colleges and Universities in 1923 Dr. A. Ross Hill, former President of the University of Missouri, explained:

The gradual encroachment of the sciences and other modern subjects in the colleges in the latter half of the nineteenth century led to the elective system and the abandonment, to a large extent, of the disciplinary basis of education.²

Although the amount of free electives had shown a large increase since 1887, this increase had shown variation from time to time. During the period 1887-1907, the percentage of free electives had increased rapidly and nearly uniformly for each succeeding sample year, whereas during the remainder of the period which ended in 1922, only a moderate increase had taken place in each of the five-year intervals.

The period from 1927 to 1942 deserved especial attention, for the data in Table 1 disclosed that the gains in free electives were heavier and were inclined to show more uniformity from sample year to sample year.

The amounts of free electives as found in this study

corresponded closely to the results found in separate studies by Woodward\(^1\) and Jarvis\(^2\).

Although during the formative period some elective content other than the free was allowed in the first two years of college work, as a policy the free electives were confined to the senior college level in all institutions. Evidence was found to indicate that even in the early existence of these institutions this common practice among them was consciously followed for the purpose of permitting some degree of specialization in certain main areas of content.\(^3\)

This practice of confining free electives to the senior college level, followed during the formative period, has been modified from time to time. Although these variations have occurred, it should be emphasized that the data gathered in this study indicated clearly that these land-grant institutions have followed this policy consistently throughout their existence.

After 1887 the relationship between free electives and certain phases of specialization became increasingly intensified. When the free elective system, operating in conjunction with group electives previously described, could not provide for all the content in an already overcrowded single curriculum, an expansion in the number of curricula appeared

3. Reference was made chiefly to the sciences and to technical agriculture.
to offer the best solution to the problem.

What occurred in this connection was typically illustrated by one institution in the group. Twice, twenty-five years apart, Iowa State College was the first of the institutions under study to expand the number of its curricula in agriculture. Although the expansion from one to three definite four-year curricula which took place at this institution in 1872 appeared to be somewhat premature, the expansion which occurred in 1897 set a pattern which was typical of that followed later by other institutions. This plan consisted of the same required work in each of the four curricula during the first three years, and this arrangement not only permitted but required election by the student of the curriculum in which he was to major. This broad use of the elective system, when further concentration of study was allowed by the choice of subject matter within the curriculum selected, greatly facilitated and promoted specialization in the area of technical agriculture and within its leading fields as well.

This study showed that the three institutions to make the earliest use of free electives were the University of Nebraska, the University of Wisconsin, and the University of Missouri. It was also noted that these same institutions were more liberal in their allowance of free electives prior to 1900

1. Iowa State College catalog, pages 26-29. 1897.
than were others in the group. Michigan State Agricultural College since 1900 has been among those offering the largest proportion of free elective content.

Two very different policies were followed in this development of the free elective system, and as might be expected, there were all stages in between the two extremes of these policies. On the one hand, the number of curricula was greatly expanded, and adjustments in the amounts of free electives were made accordingly. On the other hand, the amount of free electives was expanded and the number of curricula reduced.

The functional nature of the free elective system in these institutions became much clearer after its operation had been traced through the half century of its existence, and after its relationship to specialization in agriculture had been examined.

To what exact degree these readjustments between main areas had been made cannot be ascertained from data collected in this research. Although the nature of free electives makes impossible an accurate determination of the proportions of content distributed among the main areas, the assumption was made that in an institution primarily technical in its nature the technical areas would most likely receive more than their normal share of electives. This viewpoint was strengthened when the choices of the students and the
operation of the faculty-adviser plan were considered as factors which had influenced the distribution of free electives.

In tracing the course of development of this first major trend and in analyzing its distinguishing features no evidence was found that would tend to indicate just how far this trend in free electives is likely to be expanded, or to what extent, if any, it is likely to be reduced in rate or changed in direction.

In the preceding portion of this study the first major trend in the main areas of all twelve land-grant institutions was traced. The twelve institutions covered in this study were equally divided between the separate land-grant colleges and land-grant universities, and it was therefore possible to make comparisons between these two groups.¹

A study of data in Tables 2 and 3 showed that at different stages in the development of the land-grant system some essential differences existed between these two types of institutions in regard to the amount of free electives allowed. The first difference in major trends shown in the data in Tables 2 and 3 was concerned with the amount of required content. In the case of the colleges, the tendency had consistently been toward maintaining a greater body of required content. Two differences stood out prominently in connection with this general trend. The first difference

¹. In the remainder of this study these two groups of institutions will be referred to in the abbreviated form as colleges and universities.
Table 2
Percentages of Subject-Matter Content in the Curriculum in Agriculture.
Separate Land-Grant Colleges.

<table>
<thead>
<tr>
<th>Year</th>
<th>Agriculture</th>
<th>Science</th>
<th>Humanities</th>
<th>O.R.C. Content</th>
<th>Electives</th>
<th>Total</th>
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Table 3
Percentages of Subject-Matter Content in the Curriculum in Agriculture.
Land-Grant Universities.

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<th>Humanities</th>
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was one of time; the second difference was one of amount.

The first difference was that free electives in the universities appeared one decade in advance of those in the colleges. For example, in the universities free electives appeared in this time series in 1887, whereas in the colleges the free electives did not appear until 1897.

In regard to the second difference, data in Tables 2 and 3 showed that the universities had given much more emphasis to free electives than had the colleges. The difference in amount was especially great during the period 1887-1902, when the universities emphasized free electives much more than did the colleges.

Taken together, the two sample years of 1907 and 1912 were a time when the amount of free electives allowed by the colleges increased rapidly, in fact, so fast that by 1912 a comparatively small difference existed between the two groups of institutions. However, by 1917 an increase in the amount of free electives allowed by the universities, when added to a corresponding decrease in that of the colleges, widened the difference between the two groups in this respect considerably.

It should be noted that the amount of increase in free electives for the two groups after 1917 was approximately equal and that by 1942 the difference between the amounts of electives allowed by the two groups of institutions was not particularly great.
As a result of the survey of data and information collected in this study, attention was focused upon factors which may have caused such differences, and since the free elective system, as defined in this research, first appeared in 1887, an inquiry was made into conditions which existed in that year. It was apparent from a study of all possible factors that two had stood out conspicuously.

The first one was that a very much greater scope of instruction had been offered by the university group. These offerings had been given in such divisions of the university as medicine, law, liberal arts and sciences, and in the normal school divisions for the training of teachers which later, in some institutions, became colleges of education. All evidence pointed to the fact that these professional schools had become well established in the universities earlier than had the schools of agriculture, and had successfully used the free elective system in training programs for their specialists. It was therefore quite natural that after 1887 when the demands for agricultural specialists had suddenly expanded, the colleges of agriculture located in the universities would have adopted this system already in operation.

The second factor of importance revealed by catalog data and information was that of the size and training of the faculty. For example, in 1887 on the university staffs the number who held degrees was almost two and one-half times the
number of those on the staffs of the colleges who had degrees. When the degrees these staff members had received were divided into two classifications, scientific and literary, some interesting differences were revealed. 1

In the college group fifty-five per cent of the staffs held degrees primarily scientific in their nature, whereas in the university group, approximately twenty per cent of the staffs held such degrees. At the same time twenty-four per cent of the college staffs held literary degrees and thirty-six per cent of the staffs of the universities held literary degrees.

These data and other catalog information left little reason to doubt that these differences between the colleges and the universities in 1887 and immediately thereafter were influenced to no small degree by these two factors.

These conditions, which existed in 1887, when considered together with data bearing on the entire period under study, helped to explain the greater specialization in technical agriculture found in the colleges.

Trends in Main Areas of Required Content

A second general trend was disclosed when the data in Table 1 were examined. It was apparent that in the twelve

1. Five colleges were in operation in 1887.
institutions there had been a general movement within the required content toward replacement of some main areas by other main areas. Further examination revealed that this movement had two well-defined phases, and that the end of the first was clearly evident in 1917 and the beginning of the second in 1922.

With the exception of one decade this period from 1862 through 1917 was marked by a continuous increase in the amount of content replaced in other main areas by technical agriculture.

During the decade ending in 1872 the gains made by technical agriculture and the humanities had been made at the expense of the sciences, whereas technical agriculture and the sciences both had gained at the expense of the humanities during the next decade which ended in 1882.

That there had taken place, throughout the first quarter century of the land-grant institutions and more especially in this first decade, a struggle between the humanities and other main areas was verified by the data in Table 1. This situation was described in his history of the land-grant movement in its formative stages by Dr. Earle D. Ross of Iowa State College, in this manner:

In the separate colleges, designed primarily for technical training by new and appropriate methods, the traditional, both in subject matter and instruction, lingered. Such "liberal" studies as English composition and literature, the modern languages, Latin, usually as an option, philosophy,
political economy, and constitutional history with mathematics and the general sciences constituted a large part of the early curricula in "agriculture" and the various branches of "engineering." The technical and vocational subjects were often interspersed more in accordance with the convenience of the instructor than the progressive sequence of the curriculum.¹

By 1892 both technical agriculture and the sciences had sustained some losses, whereas in the humanities and in the area of "other required content" the amount of content had again increased. The gain in the last-named area had been made at the expense of technical agriculture, and this condition apparently reflected to some degree the instability in the content of technical agriculture in the curriculum at this time.

It was noted that by 1897 technical agriculture had regained its content lost in 1892, and had again begun to replace content in both the sciences and the humanities. By 1902 technical agriculture had become so firmly established in a sufficient number of institutions that content in this field progressively replaced content in other areas in each succeeding sample year through 1917.

During the more than half century, 1887-1942, covered by this phase of the trend, content in the main area of technical agriculture had increased fast in some institutions. In the

first quarter century of land-grant existence which ended in 1887, Kansas State Agricultural College had placed rather heavy emphasis upon technical agriculture. This, according to catalog evidence, had been due in large measure to the features of the industrial program in progress there for a large part of this early period. Also worthy of mention was the fact that during the first twenty-five years there was considerable fluctuation among these various institutions with respect to the emphasis which had been placed upon technical agriculture. Not only did this emphasis vary widely from institution to institution but frequently within the same institution as well. There was ample evidence to indicate that the emphasis given to each of the main areas during this period was determined to a considerable extent by the attitude of the chief administrator.\(^1\)

In the second quarter century which ended in 1917 many changes were made. Institutions which had placed comparatively great emphasis upon the content in the main area of technical agriculture were Iowa State College, the University of Illinois, Purdue University, and Kansas State Agricultural College. Of these four, Purdue University placed greatest stress on technical agriculture during this period, although it should be noted that as defined in this study Purdue University did not then allow any free electives. Of the

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\(^1\) See footnote 2, page 17 of this study.
other three institutions that allowed free electives, Iowa State College placed slightly more emphasis upon technical agriculture than did the University of Illinois. Although it did not compare closely with these two previously named institutions, the Kansas State Agricultural College gave rather heavy emphasis to technical agriculture.

The second general trend, when interpreted in terms of the results which had taken place during the period 1862-1917, revealed that the large gains in technical agriculture had been made very largely at the expense of the humanities, and only to a small extent at the expense of the sciences.

The second phase of this trend toward replacement of main areas by other main areas within the required content covered the period 1922-1942. During the period 1922-1927 in the twelve institutions content in the sciences had replaced a moderate amount of content in technical agriculture and in the humanities. According to the data in Table 1, the period 1932-1937 was one in which content in the sciences had again replaced a moderate amount of content in technical agriculture, and also had made slight gains.

Data for 1942 revealed that the amount of the content in the three main areas had declined about in the proportion expected when the decrease in all required content was considered. The increase in military science and tactics for 1942, according to data in this study, was characteristic of that observed in the previous war period in 1917-1918.
For the period which ended in 1942, the replacement of content in technical agriculture by that in the sciences varied from institution to institution. However, it was particularly noteworthy that the five institutions which showed the heaviest declines in the content of technical agriculture offered curricula in agricultural sciences under these names, or in some cases achieved the same result through electives.

The content of curricula in the agricultural sciences as a rule consisted of proportionately more courses in the sciences than were found ordinarily in the various curricula in technical agriculture. This situation accounted, in very large measure, for the increases and decreases shown in the sciences and in technical agriculture, respectively, for the period 1922-1942.

The trend toward increased training primarily in the sciences most closely related to technical agriculture was a definite one, and according to data and information gathered in this study, has followed a long and fluctuating course of development. As has been previously pointed out, as early as 1877 there was a curriculum in the agricultural sciences. As content in the sciences most closely related to agriculture expanded it ordinarily found ready acceptance in the agricultural curriculum. Until about the close of the nineteenth century in most institutions no particular distinction was made between technical agriculture and the strictly scientific fields. However, considerable evidence existed
which indicated that there developed about 1900 a tendency to emphasize and to teach the strictly agricultural subjects as agriculture.

This development was reflected in a series of discussions and deliberations which took place at several annual meetings of the Association of American Agricultural Colleges and Experiment Stations. In an address delivered before that body in 1896 by H. C. White of Georgia, an early leader in agricultural education, the viewpoint was expressed:

The professor of agriculture should teach neither physics, nor chemistry, nor biology, nor engineering, nor any part thereof under the titles of soil physics, agricultural chemistry, stock breeding, farm surveying, and the like. He should rather demonstrate the applications of the previously taught principles of pure science in the operations of the farm.¹

In 1903 Director A. C. True of the office of Experiment Stations in an address entitled "The Relation of Natural Sciences to Agriculture in the Four Year Course," made this summarizing statement after he had made certain recommendations about instruction in the sciences:

Our effort has been chiefly to so present this matter as to indicate how the science teaching may be differentiated from and at the same time related to the teaching of agriculture in a college course.²

During the next two decades it was evident that

2. Ibid., pp. 63-75. 1903.
specialization corresponding to that taking place in technical agriculture was also progressing in the sciences, and in the early twenties in some institutions there appeared curricula in the agricultural sciences on a par with those of technical agriculture. This movement spread to such an extent that by 1942 most of the institutions under study had established curricula in the agricultural sciences.

As was pointed out elsewhere in this study, certain federal legislation had tended to shift the training of farmers toward the secondary level, and somewhat away from the collegiate level. As a result, in some institutions a part of the emphasis which had formerly been given to technical agriculture was transferred to the agricultural sciences. Among the first institutions to establish curricula in the agricultural sciences after 1917 were Purdue University and the Universities of Minnesota and Nebraska.

The recent trend toward an increased amount of training in the agricultural sciences characterized the period, 1922-1942. No evidence of any kind was found in this study to indicate that this trend would not continue toward even greater amounts of training than were shown at the close of the period under study.

There was an important difference in the amounts of emphasis placed on the main area of technical agriculture by the colleges and by the universities. According to data in Tables 2 and 3 the emphasis placed upon technical agriculture
by the colleges during the entire period under study had been considerably greater than that placed by the universities. Such emphasis was particularly noticeable during the period which ended in 1877. However, during the interval 1877-1887 the universities had surpassed the colleges in the amount of emphasis given to technical agriculture. There was little reason to doubt that this increased emphasis which had been given in the first period by the colleges and in the later period by the universities was the result of industrial programs which had been introduced in the various institutions then in operation.

Throughout the period 1892-1942, the colleges had placed more emphasis upon technical agriculture. This fact was established by the data in this study, which showed conclusively that the colleges had emphasized technical agriculture following the passage of the Hatch and the second Morrill Acts.

In all twelve institutions during the period under study the content in the sciences had shown a moderate downward trend. Such content had continuously occupied a substantial portion of the required content in the curriculum, and had shown an exceptionally strong tendency to follow the course taken by the general trend in all required content. With few exceptions, there had also been shown a similar tendency toward freedom from severe fluctuations in amount.
As was shown by data in Table 1, the all-time peak in the amount of content in the sciences had been reached, after some decline in the first decade of existence, in 1877. However, by 1887 content in the sciences had been sharply reduced in amount, and it was noted that at the same time content in the humanities had gained in amount almost sufficient to offset this loss. It was apparent from this and other evidence that content in the sciences, like that of the other main areas, was undergoing severe competition from within the curriculum.

After 1892, there had taken place a gradual decline in the amount of content in the sciences. Of two increases which had taken place, the first, which occurred in 1917, was probably an outgrowth of war conditions in that year. The second one, in 1932, was a result of the introduction of (1) curricula in the agricultural sciences, and (2) additional courses in the social sciences, principally in economics.

Among the institutions which had placed heavy emphasis upon the sciences were Purdue University, Ohio State University, and the Universities of Wisconsin, Minnesota, and Missouri.

A difference of importance was disclosed when the emphasis placed upon the sciences in the colleges was compared to that in the universities. Data in Tables 2 and 3 revealed that the universities had given considerably greater emphasis to the sciences during the entire period under study than had
the colleges. These same data indicated that although the colleges had placed somewhat more emphasis in the beginning upon the sciences than was true for the universities, the latter had shown a substantial increase by 1872 and with only a few exceptions had continued to give more emphasis to the sciences than had the colleges.

The first of the two periods during which the colleges had emphasized the sciences more than had the universities was that represented by the combined data of 1902 and 1907. This situation had likely resulted more from a larger amount of free electives allowed by the universities than from any real difference in emphasis given by these groups of institutions.

In the second period, 1937-1942, the colleges had given slightly more emphasis to the sciences than had the universities. No especial significance seemed to be attached to this fact, and in all probability this slight difference was related to extra content in curricula in the agricultural sciences.

During the period under study, humanistic content in the twelve institutions had followed a general and rapid decrease in amount. Particularly had there occurred, during the first quarter century of existence, much variation. Besides a heavy replacement of content in this main area by that of technical agriculture during this period, a strong reaction to opposition resulted in a sizeable gain in 1887. Such a
situation undoubtedly reflected the type of struggle which had been waged between content in the main areas for dominant positions in the curriculum at that time.

After 1887, the amount of decline in humanistic content was marked by its regularity and size from sample year to sample year. However, during the period 1932-1942, several increases had occurred. Such increases in all probability resulted from additional emphasis which was placed upon the humanistic subjects following the economic crisis of the early thirties.

Institutions which had maintained comparatively large requirements in the humanities were the South Dakota Agricultural College, and the Universities of Nebraska, Minnesota, and Wisconsin.

No appreciable difference in emphasis had been given by the colleges and the universities to the humanities as a group when considered for the period under study. However, during the early years of land-grant existence the universities had given considerably greater emphasis to humanistic content, as was shown by data in Tables 2 and 3. A survey of courses which had been offered by the colleges and by the universities revealed that the courses offered by the universities, more than those offered by the colleges, had been characterized by a classical nature.

The first quarter century of land-grant existence was one characterized by heavy fluctuations in content of
humanistic subjects in both the colleges and the universities. All-time peaks in the amounts of content in the humanities were reached in the universities in 1867 and in the colleges in 1872, but by 1882 the humanities had suffered considerable losses in amount in both the colleges and universities.

An important point of difference was noted in 1887, when the colleges had given considerably more emphasis to the humanities than had the universities. During the period 1887-1902, the amount of content in the humanities had shown a marked decline in the colleges, whereas only a slight decline had taken place in the universities. After 1902 the amount of content in the humanities declined progressively from sample year to sample year through 1927.

Data in Tables 2 and 3 showed that for the period 1927-1942 the colleges and universities had pursued entirely different policies with regard to the humanities. The amount of humanistic content had reached an all-time low in the universities in 1927, but had not reached that position in the colleges until 1942.

It was evident from catalog data that requirements in the humanities had been increased after 1927, particularly in certain of the universities, and by 1942 one institution in the university group had set up a minimum requirement of hours in the social sciences and humanities to be met before
An inspection of data in Tables 2 and 3 revealed that, in the main, content in technical agriculture had replaced that of the humanities, and revealed further that this replacement had taken place particularly in the colleges. This fact indicated clearly that the replacement of content which had occurred was the result of the movement toward specialization in agriculture which was led by the colleges.

The content in military science and tactics and physical education had shown a mild tendency to increase in amount during the entire period under study in the twelve institutions.

An all-time peak in the amount of this content had been reached in 1892 after an irregular course of development had been followed. The inclusion of the military training feature of the first Morrill Act had been caused by the Civil War and by a desire to provide for the national safety and strength by requiring and subsidizing training in military affairs and in agriculture, respectively. A more or less natural tendency developed after the inter-sectional struggle closed to forget the feature of national preparedness, and this general attitude contributed to much variation in emphasis during the early period which ended in 1887.

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1. Reference here was to the University of Minnesota which required a minimum of 10 hours of the totals of 204 and 192 credit hours required for graduation in technical agriculture and the agricultural sciences, respectively, as listed on page 10 of the 1942 catalog.
It should be explained that this study recorded only that military and physical training which had been given on a credit basis, and therefore, a large part of such training, though it had actually been given, was not shown in the data in Table 1.

After 1892, the peak year in the amount of content in this area, "Other Required Content," the result of considerable deliberation on the subject of military training at meetings of the newly-formed Association of American Agricultural Colleges and Experiment Stations, a strong tendency toward maintaining an almost constant amount of content had been followed. There had been small increases in military and physical training during war periods.

Among the institutions which had emphasized military and physical training were Kansas State Agricultural College, North Dakota Agricultural College, and South Dakota Agricultural College.

The colleges had given considerably more emphasis to military and physical training during the period 1862-1942 than had the universities. In fact, the colleges had given, as shown by data in Tables 2 and 3, more emphasis to military and physical training in every sample year throughout the period under study, but the universities had given such emphasis since 1882.

1. The topic of military training received especial attention during the first few annual meetings of this newly-formed body, especially until 1893.
It was apparent from catalog information gathered in this study that in the colleges the military training program was taken more seriously than was the assigning of credit for instruction. In many cases in the universities instruction in physical education was more or less consistently offered on a parity with that in military training as part of the requirement in this main area, and in some cases instruction in band work was accepted as part of the requirement in military training.

General Survey

In summary, the course of development was characterized, after 1887, by a trend toward increased amounts of work given as free electives in each sample year through 1942. The second general trend was definitely toward increases in the amount of content in technical agriculture through 1917 at the expense mainly of the humanities and, to a less extent, at the expense of the sciences. Both these general trends functioned in such a way as continuously to readjust the proportion of emphasis among the four main areas of required content.

After 1917 the trend in the agricultural sciences was toward the redistribution of emphasis between the two principal remaining main areas, technical agriculture and the sciences.
THE HUMANITIES

The humanities occupied a place of considerable prominence in the curricula prevailing in institutions of higher education at the time the land-grant institutions came into operation. It is not surprising, therefore, that these new institutions at the beginning had placed similar emphasis upon the humanities.

That portion of the humanities which still remained until 1942 had been retained in spite of constant competition for prominence in the curriculum both from without and from within this area. Pressure from without the area had resulted in serious losses during the preceding eighty years in the amount of emphasis given to the whole field of the humanities, whereas pressure from within in the form of competition among the various fields had continually changed the proportion of emphasis upon the subjects classified under the humanities.

English

For the twelve institutions during the period 1862-1942, the data in Table 4 showed that in general the amount of content in English had remained fairly constant. However, at times there had been a tendency for English to vary
### Table 4

#### Percentages of Humanities by Areas.

**All Land-Grant Institutions.**

<table>
<thead>
<tr>
<th>Year</th>
<th>English</th>
<th>F. Lang.</th>
<th>History</th>
<th>Other</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1862</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1867</td>
<td>5.87</td>
<td>8.43</td>
<td>3.94</td>
<td>13.85</td>
<td>32.09</td>
</tr>
<tr>
<td>1872</td>
<td>8.56</td>
<td>10.39</td>
<td>4.53</td>
<td>10.62</td>
<td>32.30</td>
</tr>
<tr>
<td>1877</td>
<td>7.03</td>
<td>7.12</td>
<td>3.21</td>
<td>9.73</td>
<td>27.09</td>
</tr>
<tr>
<td>1882</td>
<td>6.97</td>
<td>3.44</td>
<td>2.62</td>
<td>7.66</td>
<td>20.69</td>
</tr>
<tr>
<td>1887</td>
<td>9.63</td>
<td>4.38</td>
<td>2.68</td>
<td>7.20</td>
<td>25.89</td>
</tr>
<tr>
<td>1892</td>
<td>8.88</td>
<td>5.30</td>
<td>2.55</td>
<td>4.73</td>
<td>21.56</td>
</tr>
<tr>
<td>1897</td>
<td>7.62</td>
<td>5.17</td>
<td>1.42</td>
<td>4.23</td>
<td>18.44</td>
</tr>
<tr>
<td>1902</td>
<td>6.90</td>
<td>7.50</td>
<td>1.31</td>
<td>2.40</td>
<td>18.11</td>
</tr>
<tr>
<td>1907</td>
<td>7.39</td>
<td>4.13</td>
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<td>1.23</td>
<td>14.54</td>
</tr>
<tr>
<td>1912</td>
<td>6.54</td>
<td>3.18</td>
<td>.95</td>
<td>.80</td>
<td>11.47</td>
</tr>
<tr>
<td>1917</td>
<td>6.33</td>
<td>.80</td>
<td>1.05</td>
<td>.66</td>
<td>8.84</td>
</tr>
<tr>
<td>1922</td>
<td>6.68</td>
<td>.27</td>
<td>.80</td>
<td>.74</td>
<td>8.59</td>
</tr>
<tr>
<td>1927</td>
<td>5.63</td>
<td>.22</td>
<td>1.00</td>
<td>.86</td>
<td>7.71</td>
</tr>
<tr>
<td>1932</td>
<td>5.92</td>
<td>.39</td>
<td>.55</td>
<td>.90</td>
<td>7.76</td>
</tr>
<tr>
<td>1937</td>
<td>5.78</td>
<td>.45</td>
<td>.41</td>
<td>1.41</td>
<td>8.05</td>
</tr>
<tr>
<td>1942</td>
<td>5.63</td>
<td>.55</td>
<td>.33</td>
<td>1.49</td>
<td>8.00</td>
</tr>
</tbody>
</table>
considerably in the amount of emphasis it had received. For example, the amount of English content in the curriculum had increased to a considerable extent during the first twenty years, and had reached its all-time peak in 1887.

All the available data indicated that two factors had accounted in large measure for the situation just described. These two factors were, in order of their occurrence, strong competition from the foreign languages, especially in the earliest years, and the value of intense training in English, which was then recognized and increasingly emphasized, as an essential and very important part of the qualifications for leadership in the various industrial occupations for which the students were being prepared. The second factor was especially influential during the latter part of the first quarter century for at that time agricultural training at the trade or industrial level was at its peak.

As was shown by data in Table 4, after 1887 a gradual decline had taken place in the amount of required content in English, and by 1942 an all-time low had been reached.

It should be explained that all courses, including speech, which had regularly been given as a part of the instruction in English were classified as English.

From the first, themes and essays had been required as a part of the written work in English. The composing of themes apparently had been regarded as preparation for the writing
of the more difficult essays which were reserved for the junior and senior years. By 1887 the thesis requirement on a non-credit basis in some institutions had been set up, always as a part of the work to be done during the last term of the senior year. It was evident that this requirement usually had been adopted first by the specialized sciences and, in the order named, by the departments in the mechanic arts, horticulture, and agriculture.

Later on, the thesis requirement had been placed on a credit basis. Prior to this time the requirement was little, if any, more than an essay on some topic of scientific or technical nature, but it now had become a device, like the elective system, for promoting specialization in technical fields. During the progressive development of specialization in agriculture the thesis requirement had continued for some time, though one by one the institutions had dropped it, and by 1942 it had practically disappeared except as an option in a very few departments.¹ Although no precise techniques have been employed to correlate the fall of the thesis requirement with the rise of graduate work, it is very probable that this requirement was transferred to the graduate level as graduate work developed.

In oral English, rhetorical exercises and declamations

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¹ There seemed to be some relationship, especially in a few institutions, between the decline in the thesis requirement at the undergraduate level and work offered in research topics and in seminars.
had been commonly required by the land-grant institutions during the early years. In a general way, these exercises had led to other and more advanced exercises called orations. These, like the theses, had first been non-credit requirements. Orations usually had been delivered before the student body once or twice in the junior and senior years. From among the students who had best met the thesis and oration requirements the faculties selected those who read theses and delivered addresses at commencement.

Institutions which had maintained heavy emphasis upon content in English were Michigan Agricultural College, Iowa State College, and Kansas State Agricultural College.

The data in Tables 5 and 6 revealed that the emphasis placed upon English by the colleges had been considerably greater than that given in the universities.¹

This heavier emphasis given by the colleges to English had been one of many outgrowths of the more intensified industrial training programs in agriculture which had been developed by the colleges at this time, and has been explained earlier in this section.²

Foreign Languages

In the twelve institutions the foreign languages had

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¹. For graphs, see Appendix, pages 166 and 168.
². Page 88.
Table 5
Percentages of Humanities by Areas.
Separate Land-Grant Colleges.

<table>
<thead>
<tr>
<th>Year</th>
<th>English</th>
<th>F. Lang.</th>
<th>History</th>
<th>Other</th>
<th>Total</th>
</tr>
</thead>
<tbody>
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<td>1862</td>
<td>4.73</td>
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<td></td>
<td></td>
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<tr>
<td>1867</td>
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<td>1882</td>
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<td>8.93</td>
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<td>1.84</td>
<td>8.93</td>
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</tr>
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<td>1.84</td>
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<td>11.19</td>
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<td>8.93</td>
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Table 6
Percentages of Humanities by Areas.
Land-Grant Universities.

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<tr>
<th>Year</th>
<th>English</th>
<th>F. Lang.</th>
<th>History</th>
<th>Other</th>
<th>Total</th>
</tr>
</thead>
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<td>1872</td>
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received very much less emphasis than English had received. However, for the period ending in 1877, somewhat more emphasis had been given to the foreign languages than had been given to English. This unusual situation, indicative of the nature of the humanities offered at that time, had come about as a result of additional emphasis upon Latin, French, and especially German.

The increased emphasis which had been given to content in the foreign languages during the period, 1887-1902, after a low had been reached for the early period in 1882, was very largely in French and German, and therefore it may reasonably be assumed that this increased emphasis upon the foreign languages followed, to some extent, the growth of the sciences during this period.

Foreign language content sufficient in amount to be worth noting had been continued by several institutions through 1912. According to a survey of courses classified, German— for its value in scientific investigation— had constituted a large portion of this content, although French had been offered on a par with the German. Since 1912, there had been little emphasis given to the foreign languages in the landgrant institutions except for their value in scientific investigation, and a sharp decline in emphasis, especially in German, had occurred in 1917. By 1942, all that had been retained in the curriculum was expressly for scientific purposes.
Among the twelve institutions, the University of Wisconsin, the University of Minnesota, and the University of Illinois had placed the greatest emphasis upon the foreign languages.

Considerably more emphasis had been placed upon the foreign languages in the universities than had been given in the colleges. Though this situation may be explained somewhat by the geographical location of institutions which had placed greatest emphasis on the foreign languages in the early period, it may be regarded also as an index to the nature of the curriculum in agriculture which had existed in these institutions during this period.

History

For the entire period in all twelve institutions, as was shown by data in Table 4, history had slowly declined. Such increases as had occurred in the amount of content in history by 1872 probably reflected the attempts which had been made to broaden the education of the student. The small increase in emphasis which had been given to history in 1907, though it could not be explained by these data, was most probably related to the adverse economic conditions which occurred about that time.

During the first world war a slight increase had taken place in the amount of emphasis which had been given to
history, and like similar increases in military and physical training, had probably reflected the problems of that time. After the first world war agricultural history had received some emphasis along with problems of agricultural marketing and credit, and this fact accounted in large measure for the emphasis upon history which continued after the war.¹

Greatest emphasis upon history had been given in the early period by the University of Illinois, Michigan Agricultural College, and the University of Missouri, whereas in the last twenty-five years of the period under study Purdue University, North Dakota Agricultural College, and Iowa State College had given the heaviest emphasis.

In the colleges history had received somewhat more emphasis than that given in the universities. Data did not reveal the reason, or reasons, for this difference, but the assumption was made that the factor of restricted offerings among the humanities usually found in the colleges as compared to those in the universities was one of importance.

Other Humanities

There should be noted here that such courses as political economy, free-hand drawing, art, music, philosophy, moral science, mental science, ethics, psychology, education,

¹. This explanation was given orally by Dr. Earle D. Ross of the Department of History at Iowa State College.
political science, and others similar in nature were classified under this heading. In the curriculum, these courses, as shown by data in Table 4, had occupied a considerable portion of all content in the humanities during the first quarter of a century, but after 1887 had shown heavy losses, and by 1917 had reached an all-time low. The upward trend in amount of content in this category since 1917 had been due in considerable measure to the classification of courses in government, psychology, and education.

The courses classified under this heading had been transferred very largely from the old type institutions, and at first had been uniformly placed in the senior year for their cultural value.\(^1\) Later on there had been a tendency to place a few of these courses in the junior year, and eventually they were replaced by free electives. Although there was insufficient catalog evidence to support a definite conclusion, there was enough to suggest that as the body of new knowledge had developed, this content became elective.

A large proportion of emphasis given before 1887 to courses in "other humanities" was due to the attitude of the presidents of these institutions. It was the rule during

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\(^1\) This fact was evident from comparisons of courses in the fields included in "other humanities" in the catalogs of some institutions which were in operation before the first Morrill Act but which later became land-grant institutions.
this early period for the presidents to teach one or more courses along with their administrative duties, and with very few exceptions such courses had been those classified under "other humanities." The courses most regularly taught by the early presidents and required of all juniors and seniors were political economy, mental science, moral science, philosophy, and ethics. That such a procedure had been the pattern followed was not surprising for it was in keeping with the classical training which a large majority of the presidents unquestionably had received, and furthermore, this plan afforded some measure of administrative control over the upper-classmen through the instruction in certain of these subjects. Instruction by the presidents, and the emphasis upon the content in the fields of "other humanities" as well, declined very rapidly after 1887 during the movement toward specialization in agriculture.

Among the institutions, greatest emphasis had been given to content in "other humanities" by the universities of Minnesota and Nebraska.

Data in Tables 5 and 6 indicated that at the beginning the universities had placed heavier emphasis upon content in the fields listed under the heading "other humanities," and it was not surprising, as these institutions had given considerably more emphasis during the same period to content in the whole area of the humanities.
The amount of content included in "other humanities" in both the colleges and the universities showed a general decline until about the time of the first world war, when it reached an all-time low. After 1922, in the universities the amount of content in "other humanities" showed a definite tendency to increase at a faster rate than had been found for the colleges.

General Survey

The trends which have been traced in this study correspond to those found in a survey of land-grant colleges and universities by Arthur J. Klein, who reported under the title "Trends in Agriculture Curricula":

The major changes that have taken place since 1880 have been the gradual elimination of foreign languages as a requirement the reduction of the requirement in mathematics, physics, and chemistry, and increases in economics and in electives.

A reason for the severe decline in humanistic content during the entire period under study had been, perhaps, the failure to adapt the humanities to the rapid changes in agricultural conditions.

Another point of view is that such a decline has been due to crowding the curriculum with so much of the technical and

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scientific content that little room has been left for required content in the humanities.

Recent changes in economic and social conditions in the world, and more especially out in the field of agriculture, would suggest now, and perhaps demand ultimately, that in the curriculum of the immediate future the values of content in the humanities and in the social sciences be reappraised and that readjustments be made if warranted.

In summary, it may be said that the emphasis upon the whole area of the humanities had declined markedly over the period considered and that this reduction had been distributed almost entirely between three fields--the foreign languages, history, and "other humanities."

The losses in content which had been sustained by the humanities had been offset by gains principally in technical agriculture but also, to an important extent, by gains in the sciences.

It was evident that the purpose to be served by the humanities in the curriculum in agriculture had not changed greatly during the period under study.
In the earliest years of land-grant institutions the curriculum content in technical agriculture was scant, had little recognition from any quarter, and was taught very largely as an art rather than as a science. Such content as appeared thus in the name of agriculture was, at best, usually nothing more than an aggregation of common farm practices. Later, through the application of the sciences, technical agriculture was gradually enriched, given a respectable standing, and expanded into a large body of tested and proved knowledge.

The applications of the sciences to all aspects of the agricultural industry quite naturally led to enlarged instructional content in the area of technical agriculture and more particularly in certain of its fields. In time there developed in some of these fields sufficient closely interrelated content to give them greater prominence than that given to other coordinate fields. In a similar fashion other important subject-matter fields developed from time to time.

For purposes of this study, agricultural courses were classified under four headings: agronomy, animal husbandry, horticulture, and "other agriculture." Descriptions of courses in some cases were not sufficiently definite to permit
accurate classification in one of the first three categories; such courses were tabulated as "other agriculture." It should be pointed out that among the courses in these subject-matter fields listed, the relatively large amount of content shown in "other agriculture" through 1887 frequently resulted from incomplete catalog descriptions.

Furthermore, the pattern customarily followed in the large majority of the twelve institutions until at least 1902 was that of a single agricultural curriculum into which the conglomerate-type courses in agriculture and the much better systematized courses in horticulture were interspersed in widely varying proportions. All through this period everything in content which was not included in the field of horticulture was called agriculture.

**Agronomy**

According to data in Table 7, the amount of content in agronomy had, in a general way, followed the increase and the decrease, respectively, of that in the whole area of technical agriculture. The comparatively large figure given for 1867 was the result of emphasis given to courses in agronomy by two institutions, Illinois Industrial University, later the

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1. These courses were mixed agronomy, animal husbandry, horticulture, farm management, farm improvement, surveying and drainage, and other such content all combined and offered as a single course.
2. For graphs, see Appendix, pages 166 and 168.
Table 7

Percentages of Technical Agriculture by Areas.

All Land-Grant Institutions.

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<tr>
<th>Year</th>
<th>Agron.</th>
<th>A. Husb.</th>
<th>Hort.</th>
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<td>12.20</td>
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<td>3.47</td>
<td>28.49</td>
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</table>
University of Illinois, and Kansas State Agricultural College, especially the last named one.

A study of the data in Table 7 disclosed that comparatively little specialized instruction had been given in agronomy until after 1902, although an increase in content was evident in each of the sample years after 1887. As a matter of fact, there had been considerably more work given in agronomy than was shown because this instruction was offered under course titles not sufficiently specific for separate classification as agronomy.

In order to illustrate this point two typical courses from different institutions have been selected. In 1887 there was given in the junior year at the University of Missouri a course, "Agriculture in Its Practical and Scientific Processes." In the same year, there was given at the junior level in the South Dakota Agricultural College a course called "Agriculture." The amount of emphasis which was given to agronomy was very likely large in each case, but could not be accurately determined even from the catalog description of the courses. In contrast, there was offered in the freshman year at Ohio State University in 1887 a course entitled "How Crops Grow," the content of which was quite readily classified under agronomy.

For the period 1907-1917, the amount of content in agronomy increased rapidly, and that gained by 1917 was maintained in large measure through 1927. However, by 1932 an
appreciable decline had occurred, and another lesser one by 1937, though no further increase or decrease had occurred by 1942.

A partial explanation, if not a full one, of the rapid increase in agronomy content was offered when the annual recommendations which were made at the meeting of the Association of Agricultural Colleges and Experiment Stations in 1898 were examined. In that year a complete four-year curriculum in agronomy was recommended, and an outline of lectures and laboratory exercises for practice was suggested.¹

It was suspected that this curriculum pattern, which had been recommended at the annual meeting of the college representatives and later was distributed in printed form, would have a delayed effect and that a lapse of several years would be required before its use by enough institutions would result in a gain of about the size of that shown in agronomy for the period 1907-1917.

Particularly interesting was the nature of the early courses in agronomy. Some of the earliest were joint courses in farm machinery repair and crops; others divided time between soils and crops; still others consisted of the economics of crop production and farm management; and still others consisted entirely of producing and judging cereals and other farm crops.

¹. Proceedings of the Association of American Agricultural Colleges and Experiment Stations, page 78. 1898.
These courses were replaced gradually by specialized agronomy courses, and in some of the institutions where greatest specialization had taken place these courses were grouped into separate departments of soils and farm crops. Another point noted was that agronomy courses during the two decades preceding 1942 had become extremely specialized in several of the institutions covered by this study. No doubt the rapid progress in the production and improvement of small grains and corn had stimulated such specialization.

Four institutions, the University of Illinois, Kansas State Agricultural College, Purdue University, and Iowa State College, had placed comparatively great emphasis upon content in this subject-matter field, particularly during the period 1912-42.

Comparative data in Tables 8 and 9 revealed that in the colleges somewhat more emphasis had been given to agronomy content during the period under study than had been given by the universities. During the period which ended in 1902, the universities had devoted considerably more emphasis to agronomy than had the colleges. However, this difference could possibly have been due to more clearly defined courses rather than to any real difference in emphasis. It should be pointed out that with the exception of 1907 the colleges had consistently devoted more emphasis to agronomy in each of the sample years of the period which ended in 1942 than had the universities.

1. For graphs, see Appendix, pages 166 and 168.
Table 8
Percentages of Technical Agriculture by Areas.
Separate Land-Grant Colleges.

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<th>Hort.</th>
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Table 9
Percentages of Technical Agriculture by Areas.

Land-Grant Universities.

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</table>
Animal Husbandry

In all land-grant institutions, according to data in Table 7, content in animal husbandry had been an important part of the total agricultural requirement during the last part of the period under study. Among the three specialized fields until 1902 considerably more emphasis had been given to the content in animal husbandry than to that in agronomy, but much less than had been given to horticulture. In general, however, there had been a tendency for the amount of animal husbandry content to increase at a moderate rate through 1897. This increase at that time was an index to the degree of specialization which had developed in animal husbandry up to this time.

Data in Table 7 disclosed that the amount of content in animal husbandry had fluctuated through 1887 and then had remained nearly constant for the decade ending in 1897. A survey of the courses listed during the earliest part of the period disclosed that they were generally of the strongly conglomerated type, and those which began about 1882 often were a part of the courses called "Practical Agriculture." In either case, these data showed that animal husbandry content was quite unstable during the first twenty-five-year period. These fluctuations were due in part to the general conditions which prevailed in the range and livestock industry.
In order to indicate something regarding the nature of content in animal husbandry during this early period, a sequence of course titles has been selected, with one title for 1867 and one for each of the succeeding sample years through 1897. These courses in order were: Stock Feeding and Dairy Produce; The Dairy, the Flock, and the Hive; Stock-Breeding; The Dairy; Domestic Animals; and Livestock. These titles themselves, without any catalog descriptions, obviously indicated that even the specialized content in animal husbandry in some institutions of that early period was of an intensely practical nature. It might be added that the course descriptions, often amusing but not always clear as to the real nature of their content, tended to impress the reader with their ultra-practical nature and their usefulness in farm operations.

It should be explained that the emphasis given in this early period to content in animal husbandry would have been somewhat greater had more of the veterinary science and medicine courses been classified under animal husbandry rather than under the biological sciences. These courses were rigidly classified in the last-named category unless there was convincing evidence in the catalog that their content would be accepted today as belonging in animal husbandry.

1. Courses selected in order given were from Illinois Industrial University, Kansas State Agricultural College, Purdue University, Iowa State College, Ohio State University, and Michigan Agricultural College.
A better idea of the importance of content in animal husbandry during this period ending in 1897 was gained when it was understood that, taken together, the specialized content in animal husbandry and that in agronomy were approximately equal in amount to that of horticulture.

Animal husbandry content had shown a heavy gain during the period 1902-1922. As indicated by the data in Table 7, the amount of content in animal husbandry had nearly doubled by 1922 and when compared with that of agronomy the difference was exceptionally noticeable. During this period there appeared in the catalogs descriptions of entirely new animal husbandry courses which emphasized types and breeds of livestock and offered intensified work in judging in several institutions. Much of the gain in content effected at this time was attributable to these new and specialized courses.

The large increase in content which took place during the period 1902-22 may be explained by the fact that in 1899 the Committee on Teaching Agriculture recommended a full four-year curriculum in zootechny, or animal husbandry.¹

Courses in different aspects of management were usually required, and in several institutions considerable emphasis was placed comparatively early upon certain phases of scientific management. In this connection it was noted that there had developed in these institutions during this period a

definite drift toward more courses in not only selection but breeding and improvement, feeding and care, prevention and control of diseases, and other specialized fields involved in management.

Courses in dairying and dairy husbandry appeared in increasing numbers during the early part of this twenty-year period ending in 1922, and their catalog descriptions reflected an increasing amount of specialization in these fields from sample year to sample year. It is only fair to point out that there was considerable evidence in the catalogs of these institutions to indicate that in most cases content in the field of dairy husbandry during this period was changing quantitatively and qualitatively as well, and a similar tendency was noted later in the field of poultry husbandry.

Increases in the amount of content in dairying and in dairy husbandry had taken place after 1900, and it was revealed that in that year at the annual meeting of the official body the Committee on Methods of Teaching Agriculture had recommended three separate syllabi on agrotechny or dairy industry, rural engineering, and rural economics. ¹ No doubt remained that those recommendations had accomplished results along this line similar to those made for agronomy and animal husbandry.

From evidence based upon catalog data and information it appears that this period was one of rapid expansion in content

in this subject-matter field, and one even of specialization within the field itself. This period, since animal husbandry content had occupied such a commanding position in the main area, was therefore one of especial importance to technical agriculture.

In the order named the institutions which had placed greatest emphasis on animal husbandry content during the period 1902-1922 were the University of Illinois, Iowa State College, Kansas State Agricultural College, and Purdue University.

From 1927, the content in animal husbandry showed a general decline except for an increase in 1937. Since content in each of the other fields had declined somewhat, it was assumed that this gain in animal husbandry content was made at the expense of the two other specialized fields.

Data in Table 7 showed that during the period 1927-1942 the amount of content in animal husbandry and its subdivisions had constituted a considerable proportion of that in the area of technical agriculture.

Among all institutions for the entire period, the University of Illinois, Iowa State College, Kansas State Agricultural College, and Purdue University gave greatest emphasis to animal husbandry.

In the colleges animal husbandry had received considerably more emphasis over the period than in the universities. According to data in Tables 8 and 9, there had been somewhat
more emphasis placed upon animal husbandry before 1902 in the colleges than in the universities, although very little difference had existed during the forty-year period 1902–1942. It was noted especially that in both groups of institutions the peak in animal husbandry content was reached in 1922, and from 1927 there had been a general decline. A point which deserved special mention was that from 1927 the content in animal husbandry in the two groups of institutions had decreased about the same amount by 1932; each group had regained part of this loss by 1937; and by 1942 the amount of content in each group had again decreased in about the same proportion.

Horticulture

For the period under study, the data in Table 7 from all twelve institutions taken as a group showed that of the specialized agricultural fields the emphasis given to horticulture had been moderate, and had exceeded slightly that given by all institutions to agronomy.

Of the specialized fields in technical agriculture, horticulture had exhibited the most regular growth through the period which ended in 1897 and had reached its all-time peak in that year. An attempt was made to discover some basis upon which this fact could be satisfactorily explained. It was recalled that throughout this study the boundaries of
horticulture were much better established in most institutions than were those of its competitor-associate, agriculture. Additionally, there was much in the early and inseparable relationship of botany to reinforce the content of horticulture within these established boundaries. This situation naturally tended to promote the general growth of content in horticulture, to develop some degree of early specialization in the field, and to result in a steady increase in content.

In contrast, the field known then as agriculture presented opposing evidence. The impression gained from the catalogs was that agriculture had no definite boundaries, and that besides its very close association with chemistry, it was also related closely to botany, zoology, veterinary medicine, geology, entomology, physics, mathematics, and some others. Growth in the amount of content was inevitable, but such a broad and roughly defined field necessarily required additional time for any considerable degree of specialization to develop in these various fields. A review of the development of instruction in both horticulture and agriculture led to the conclusion that instruction in horticulture had profoundly influenced that in agriculture. Most important of all, it paved the way for and acted as the forerunner of specialization in agriculture.

Furthermore, during this early period, in the catalogs of several institutions there was featured much descriptive material relating to instruction in horticulture. One was
led to conclude that horticulture, through museums, greenhouses, orchards, and the campus layout—all providing twelve months' facilities for instruction—was actually being presented in accordance with a systematized plan of instruction. With the exception of animal husbandry, instruction in agriculture had seemingly been regarded as seasonable, and this fact had been pointed out in the catalogs in connection with experiments and "means of illustration."\(^1\)

Another possible and plausible explanation was derived from references and other catalog material which had revealed certain relationships with horticultural societies that no doubt were instrumental in not only promoting the instruction in horticulture but strengthening its content in several ways.\(^2\)

For the period 1902-1942, with minor exceptions, the amount of content in horticulture showed a steady decline, and in 1937 had reached a new low. This decline was no doubt due to an increase in the amount of content in the other two specialized fields and to a decrease in content of technical agriculture. The limitations imposed in this study tended to show a somewhat lower amount of content in horticulture, since some of the horticultural curricula excluded from this study contained sizeable amounts of horticultural content.

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1. This term was somewhat commonly employed to describe the existing facilities for laboratory work.
2. Material along this line may be found in the proceedings of the various state horticultural societies.
A third explanation was suggested by the early catalog material on horticulture. Descriptions revealing the type of farming carried on, and claims of horticulturalists regarding advantages of horticulture, plainly confirmed the fact that at that time farming was on a self-sufficing basis. However, specialization in agriculture led to commercialized farms, and in turn these have resulted in progressively decreased emphasis being placed upon horticulture as the progress of commercialization advanced.

Three fluctuations had occurred in the amount of content after 1902. The first occurred in 1922, the second in 1932, and a third in 1942. It was possible that these increases in content reflected demands for increased food supplies brought on by war and by depressed economic conditions.

From the very beginning, Michigan Agricultural College pioneered in horticulture and emphasized this content in the curriculum. In the same period other institutions which gave emphasis to horticultural content were Ohio State University, the University of Illinois, and Iowa State College. The last-named institution, after 1902, showed, with three minor exceptions, a slow and steady increase in the amount of horticultural content.

The data in Tables 8 and 9 disclosed that for the entire period under study the colleges devoted somewhat more emphasis to horticulture than did the universities. This fact may be explained readily, since this same group of institutions gave
about the same additional emphasis to technical agriculture during the period.

During the early period universities increased their emphasis upon horticulture rapidly after having lagged for a period, and in 1887, as a result, had reached the early-period peak in content at the same time as had the colleges. After 1887, no particularly great difference existed until 1902, at which time a decline in horticultural content began in both types of institutions, proceeding, however, at different rates. It was noted that by 1917 a severe drop in the amount of content had occurred in the universities, while the rate of decline was slower in the colleges for the period which ended in 1942.

Other Agriculture

In the twelve institutions for the period under study the content in the category designated "other agriculture" occupied a place of importance about midway between that of agronomy and that of animal husbandry, and showed a distinct two-phase movement.

The amount of content in "other agriculture," according to data shown in Table 7, moved rapidly upward through 1877; by 1882 it had registered another and smaller gain; and it reached an all-time peak by 1887. This rapid rise in total content in this field portrayed both the character of courses
and the rate at which these courses had become conglomerated
with bits of newly accumulated content.

The second period, which began in 1892, was marked, with
the exception of 1892 itself, by a general decline. The sharp
drop in 1892 probably resulted from the initial stages of
specialization in agriculture which had set in by that year at
some of the institutions, and the drop registered in 1902 was
very probably due to the same influence. Fluctuations which
occurred in 1917 and 1932 were undoubtedly outgrowths of war
and economic conditions.

For the entire period under study, the University of
Missouri and Kansas State Agricultural College had given
greatest emphasis to content included in this classification.

Data in Tables 8 and 9 disclosed that for the entire
period the separate land-grant colleges had given slightly
more emphasis to content in "other agriculture." The colleges
showed one sharp increase in 1877, whereas the universities
showed two such increases in the early period which ended in
1877, the peak year for both the colleges and the universities.
For the period 1892-1942 there was a general decline with an
almost identical loss in content for the two groups of insti-
tutions. Conditions during the period of transition, 1887-
1897, doubtless had been responsible for the fluctuations
shown in 1897, whereas the heavy decline which occurred in
the period 1902-1942 apparently was due to increased
specialization in agricultural instruction in other fields.
General Survey

In summary, the amount of content in the main area of technical agriculture had received a progressively increasing amount of emphasis through more than two-thirds of the entire period under study, or until 1917. After 1917 some of the emphasis formerly given to technical agriculture was shifted somewhat, being transferred to the agricultural sciences and to the social sciences. Such a transfer of emphasis away from technical agriculture to other areas was intimately related to changes in aims which took place about this time.

Horticulture and agriculture provided practically all the agricultural content in the collegiate curriculum in agriculture during nearly four decades. Horticulture was much the better established of the two, and profoundly influenced the development of technical agriculture. Horticulture was the forerunner of specialization in agriculture.

Specialization in agriculture began in some of its inceptive phases after 1887, but this movement, led by the colleges, did not get into active operation until very near the turn of the century and did not reach fruition until 1917.

Full implications of the transfer of part of the training of practical farmers away from the collegiate level may not yet be recognized by all institutions concerned, and it remains to be seen what developments will result from it.
THE SCIENCES

The sciences have played a fundamental part in the development of agricultural instruction. It was the teaching of science which introduced the laboratory method and supplanted the recitation-room method of teaching the classics, fostered experimentation, developed and verified content, led ultimately to specialization, and redirected the aims of agricultural instruction as changed social and economic conditions warranted.

Both qualitatively and quantitatively have the sciences served other areas by providing the basis of their particular applications. By reason of these contributions to other areas the sciences have continued to supply and to maintain, as science content, a substantial proportion of the total subject matter in the curriculum.

The amount of content in the sciences has generally followed the downward course taken by all required content. As in other areas, this large movement has resulted in changes within the various fields included in the area.

The Biological Sciences

The biological sciences were given comparatively heavy and continued emphasis by the institutions for the period
under study. As shown by data in Table 10, from one-third to nearly one-half of all science content had come from this source. Throughout the period under study, the amount of content in the biological sciences had shown little tendency to decline. The greatest tendency during the first twenty-five years had been toward an increased amount of content; by 1912 the peak had been reached. In 1892 a reduction occurred. The period 1917-1942 was characterized by a gradual loss in content.

Particularly worth noticing was the close relationship which existed between the amount of content in the biological sciences and the rise in specialization in agriculture.

A survey of the various institutions showed that the Universities of Minnesota and Wisconsin, Ohio State University, Michigan State Agricultural College, and Kansas State Agricultural College had placed comparatively heavy emphasis upon the biological sciences. The data in Tables 11 and 12 revealed that the universities had given slightly more emphasis to the biological sciences during the entire period under study than had the colleges.¹

Although the two groups of institutions during the period ending in 1887 had given approximately the same emphasis to the biological sciences, there was one difference noted. The universities had placed considerably more emphasis upon these

¹. For graphs, see Appendix, pages 166 and 168.
Table 10

Percentages of Sciences by Areas, and in Certain Subject-Matter
All Land-Grant Institutions

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Table 11

Percentages of Sciences by Areas, and in Certain Subject-Matter Separate Land-Grant Colleges

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### Table 11

<table>
<thead>
<tr>
<th>Subject Matter Fields Within These Areas</th>
<th>Separate Land-Grant Colleges</th>
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<tr>
<td><strong>PHYSICAL</strong></td>
<td><strong>SOCIAL</strong></td>
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<tr>
<td>Em.</td>
<td>Phys.</td>
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<td>39</td>
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<td>.73</td>
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<td>1867</td>
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<tr>
<td>1937</td>
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<td>1942</td>
<td>2.62</td>
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Table 12
Percentages of Sciences by Areas, and in Certain Subject-Matter Fields
Land-Grant Universities
Table 12

Areas, and in Certain Subject-Matter Fields Within These Areas
Land-Grant Universities

<table>
<thead>
<tr>
<th>Physical</th>
<th>Social</th>
<th>Mathematics</th>
<th>Total</th>
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<tbody>
<tr>
<td>Phys.</td>
<td>Other</td>
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<td>Econ.</td>
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<td>7.11</td>
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<td>1.55</td>
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</tr>
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<td>2.29</td>
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<tr>
<td>1.42</td>
<td>.80</td>
<td>12.57</td>
<td>7.41</td>
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</tbody>
</table>
sciences during the latter part of the period, whereas the colleges had placed a similar amount of emphasis on them in the first part of the period. One explanation of this situation was that, as a whole, technical agriculture and the biological sciences did not receive nearly so much early emphasis in the universities, but after this content had become established, emphasis upon it increased rather rapidly in amount through 1887.

It should be explained that general courses in botany and zoology were classified under botany and zoology, whereas those under the heading "other biological sciences" consisted of the conglomerate-type courses in the early period and the specialized courses later. Examples of the last-named were those in plant and animal physiology, entomology, veterinary science, and those of similar nature.

**Botany**

During the entire period in the land-grant institutions botany content had been given, when compared with that of zoology, considerably more emphasis. This condition was attributed partly to the close interrelationship which had existed between horticulture and botany, and as has already been shown, horticulture was consistently emphasized in the early period.

Data in Table 10 disclosed that the amount of content in botany had sustained a heavy loss for the entire period
under study. During the period which ended in 1887, there were some variations from year to year, and a considerable decrease in emphasis. Reference to data disclosed that at least a part of this decline was due to the increased emphasis about this time in some of the institutions upon entomology and some of the other specialized sciences.

Since 1892 the emphasis given to botany diminished consistently except in 1912 and 1932. The increase in amount in 1912 was of sufficient importance to be noted, but the data did not offer any explanation. It was quite probable that such an increase in emphasis was incident to specialization in agriculture.

The institutions which had given emphasis to botany were Michigan State Agricultural College, Kansas State Agricultural College, and the University of Minnesota.

For the entire period the amount of emphasis given to botany had been slightly greater in the universities than that given in the colleges. An examination of the data in Tables 11 and 12 also disclosed that these differences in the amount of emphasis did not occur during identical periods in the two types of institutions.

In the very early years of the formative period the colleges had placed considerably more emphasis upon botany than had the universities, whereas the opposite condition had prevailed during the latter part of the period. It was observed
that this situation was typical of the trend followed by all biological content during this period, a condition which continued through 1932. However, for the decade which ended in 1942 it was apparent that the colleges had regained their former status, in that they were again giving more emphasis to botany during that period.

**Zoology**

In general the emphasis given to zoology was largely an outgrowth in its connection with animal husbandry, veterinary science, and horticulture. The development of these fields naturally led to increased emphasis upon entomology. It should be pointed out that zoology had shown evidence of some specialization comparatively early in the formative period, and apparently had contributed in an important way to the establishment, as well as to the development, of veterinary science as a separate field.

There was, in reality, more emphasis given to zoology than was indicated in Table 10, because the classification "other biological sciences" included much zoological content.

The amount of content in zoology tended to remain fairly constant for the entire period and showed little tendency to increase except in 1887 and in 1917. Both these years are known to be transition years for content in the agricultural curriculum, and the increases during those years can be best explained when that fact is understood.
Zoology was emphasized by the University of Minnesota, Ohio State University, and Kansas State Agricultural College during the entire period.

The data in Tables 11 and 12 revealed that a slightly greater emphasis upon zoology was consistently given by the universities for the period under study. Particularly in the early period and in that from 1922 to 1942 the universities placed considerably more emphasis upon zoology content than did the colleges, a situation which was partly due to the fact that the universities rather consistently required courses in general zoology.

Other biological sciences

Data in Table 10 made plain that for all institutions a large proportion of the content in the biological sciences was included under "other biological sciences." The early period which ended in 1887 had courses, like those in technical agriculture, of the conglomerate type which were most accurately classified in this category. In addition to these courses described there were classified other specialized courses, principally in veterinary science. The last-named courses were rather strongly emphasized in some of the institutions under study and therefore constituted at least a sizeable proportion of the content of this period.

For the interval which ended in 1922, the increased emphasis placed upon content in "other biological sciences"
was largely the result of further specialization within the biological sciences. Some change occurred in the amount of content, but no special importance seemed to be attached to it. During the period 1927-1942 no noteworthy changes took place.

Those institutions which gave heaviest emphasis to "other biological sciences" were the University of Wisconsin, the University of Minnesota, Ohio State University, and Iowa State College.

Data in Tables 11 and 12 showed that the colleges had given somewhat more emphasis to "other biological sciences" than had the universities.

Although there had been no noticeable difference in the amount of emphasis which had been given by the colleges and universities to "other biological sciences" during the period which ended in 1887, the data disclosed that during the period 1892-1917 the colleges placed only moderately more emphasis upon content in "other biological sciences" than did the universities.

The chief differences in the amounts of emphasis given to "other biological sciences" existed in the early period and in the last quarter century which ended in 1942.

Physical Sciences

For the entire period the amount of emphasis given to the
physical sciences by the land-grant institutions was heavy, but the amount of content in the physical sciences declined considerably during this period.

As shown by the data in Table 10, the amount of content included in the physical sciences had been especially large during the formative period which ended in 1887.

Particular attention should be called to the changes which took place in the physical science content from 1892 through 1917. Reference to data collected in this study disclosed that the physical sciences had made important contributions to the earliest phases of specialization in agriculture. The two variations in the amount of content which occurred in 1892 and in 1902 probably were outgrowths of this movement. After 1922, the amount of emphasis which was placed upon the physical sciences declined moderately.

For the entire period under study the universities had devoted considerably more emphasis to the physical sciences than had the colleges. An inspection of the data in Tables 11 and 12 showed that the amount of emphasis which these two groups had given to the physical sciences had varied considerably. For example, the universities had placed much greater emphasis upon the physical sciences in the period which ended in 1887. Although there was no appreciable difference in the amount of emphasis which was devoted to the physical sciences during the period which ended in 1917, there was considerably more emphasis given to the physical sciences in the quarter
century which ended in 1942.

Among the land-grant institutions under study those which had emphasized the physical sciences most were the University of Wisconsin, the University of Missouri, Michigan State Agricultural College, and Ohio State University.

Chemistry

The data in Table 10 showed that of the physical sciences chemistry led all other subjects in the amount of content provided for the curriculum in agriculture. These data revealed further that the content in chemistry had shown a strong inclination to remain constant throughout the entire period.

The peak in chemistry content was reached in 1877. Data collected in this study indicated that during the earliest years of the land-grant institutions chemistry was much better established than the other laboratory sciences. There was much evidence in the institutional catalogs to lead one to conclude that the standardization of laboratory work in the various sciences had been largely, if not almost wholly, the result of pioneering done in chemistry. Another reason for the prominent position of chemistry among the physical sciences and in the curriculum in agriculture was that its relationship with agricultural instruction corresponded closely to that of botany with horticultural instruction.
During the period 1882-1942, chemistry maintained an almost constant amount of content in the curriculum in agriculture. This fact was proof of the importance which was attached to the field.

More pointed evidence than that given above was expressed by Dean Eugene Davenport in this statement:

We know that the success of the agricultural colleges is founded upon what science has done and is doing for agriculture. But in the middle of the last century there was no real science aside from chemistry and that was only beginning.¹

During the period under study the universities had given considerably more emphasis to chemistry than had the colleges. Especially should it be noted in this connection that in some of the universities included in this study there were developed, through the applications of chemistry to agriculture, such techniques as feed analyses, the Babcock test, feeding standards for animals, and others.²

The institutions which placed greatest emphasis upon chemistry were the Universities of Wisconsin, Illinois, Missouri, and Minnesota, and Ohio State University.

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² In the field of chemistry the work of the University of Wisconsin has contributed very greatly to agricultural progress and has been widely recognized.
In the twelve institutions during the period under study the emphasis given to physics was very much less than that given to chemistry. It was apparent from data in Table 10 that the decline in the amount of emphasis on physics occurred during two distinct periods. In the first one of these, which ended in 1902, there had been except in a few instances a fairly strong tendency for the amount of content in physics to remain constant. In an increase similar to that which was experienced by chemistry, the peak had been reached in 1877. A sharp reduction occurred in 1882, and an early-period low was reached in 1887. In the last part of the period 1892-1902, a second high point in the amount of content in physics was reached.

There was much in the way of catalog evidence to indicate that the amount of physics content, when added to that in "other physical sciences," had been equal in the first few years to the amount of emphasis given to chemistry. It was further indicated that in the early decades much effort to apply physics content to agricultural instruction had been made. For example, courses in mechanics, the physics of agriculture, practical physics, soil physics, and others similar in nature were established.

Data collected in this study showed that specialization had occurred early in the field of physics. Such early
required courses in the curriculum as meteorology and climatology were taught in the department of physics.

The United States Department of Agriculture had been established by a federal act in the same year as the land-grant system, and one of the many intimate relationships between the two national agencies had developed through their common interest in climate and weather as influencing factors in agriculture.¹ The previously-mentioned specialized courses in physics unquestionably were introduced into the curricula in agriculture largely as a result of the cooperative attempts of the two new federal agencies to solve the little-understood problems of weather and climate, upon which farming so much depended for its success.

The second of the two periods in the development of physics content began in 1907. After that time the trend followed by content in physics turned sharply downward, and by 1942 an all-time low was reached.

A strong tendency among the institutions under study to drop physics content from the curriculum prevailed at different times, but two of the schools, Michigan Agricultural College and North Dakota Agricultural College, continuously required physics in the agricultural curricula.

The greatly reduced emphasis upon physics, as compared with that given in the early period, cannot justly be

interpreted to mean the dropping of physics from the curriculum in agriculture. As is true in the cases of some other fields of science, from this subject-matter field has come to the agricultural curriculum much content as a result of applications of the science to agriculture. For example, much in the way of mechanics, agricultural engineering, soils science, and other similar content has long been included in the curriculum and taught as applications of physical principles but under the name of technical agriculture.

The institutions which gave especial emphasis to physics were Michigan State Agricultural College, the University of Missouri, the University of Wisconsin, the University of Minnesota, and the North Dakota Agricultural College.

For the entire period the colleges gave slightly more emphasis to physics content than did the universities.

For the period which ended in 1937, the universities had emphasized physics more than had the colleges; during each of the two twenty-five-year periods which ended in 1917 and 1942 there were negligible differences.

Other physical sciences

Data in Table 10 showed that during the entire period somewhat less emphasis had been given to "other physical sciences" than to physics. A survey of the early period revealed that there were classified under this category
courses in astronomy, physical geography, climatology, mineralogy, paleontology, meteorology, general geology, economic geology, and agricultural geology. The courses listed constituted practically all those classified under "other physical sciences," and it was noted that by 1917 about all that remained from this original group was geology. Such courses, continued through 1942, were usually required in agronomy.

Especially heavy losses in the content of "other physical sciences" occurred in the twenty-five-year period which ended in 1887. In the period from 1892 to 1897 there was a mild decrease in the amount of emphasis given to content classified under this heading. However, by 1902 an increase had taken place which, it was apparent, had resulted from the rapid acceleration of specialization in agriculture.

During the period 1907-1942, there was a strong trend toward exclusion from the curriculum of content included under this heading.

Among the institutions which placed heavy and continuous emphasis upon the content of "other physical sciences" during the entire period were the University of Missouri, Ohio State University, and Michigan State Agricultural College.

The entire period considered, the universities had given considerably greater emphasis to the "other physical sciences" than had the colleges. This condition was especially noted in the early period which ended in 1887, and no differences
worthy of mention have been noted in either of the twenty-five-year periods which ended in 1917 and in 1942.

One explanation, based on catalog evidence, was that during the early period the universities had a wider range of science courses to select from and therefore incorporated more content in "other physical sciences" into the curriculum in agriculture.

The Social Sciences

From data shown in Table 10 it was apparent that comparatively little emphasis to the social science content had been given during the period under study by the twelve institutions. However, after 1892 there was a definite trend toward an increased amount of emphasis upon content in the fields included in the social sciences.

Although some content in the social sciences had been introduced into the agricultural curriculum earlier, it did not become permanently established until 1892.

The data in this study which were collected from institutional catalogs did not explain the reason for 1892 having been the particular year in which content in the social sciences entered the curriculum upon a permanent basis. The provisions of the second Morrill Act passed in 1890 probably furnished the most satisfactory answer, for instruction in the economic sciences was specifically named along with that
of other sciences and areas for which these federal funds could be expended.¹

During the period 1892-1942, a steady expansion in requirements took place. The peak was reached in 1932, and this was followed by a slight decline. It appeared that this decline in social sciences was typical of that in other subjects most closely related to national emergencies, for after the economic emergency had passed the emphasis declined. In this, as well as in other fields already treated in this study, some courses were introduced on a more or less temporary basis during the crisis and then were promptly dropped as soon as conditions had improved.

Institutions which gave comparatively great emphasis to the social sciences were Purdue University, Ohio State University, University of Minnesota, and South Dakota Agricultural College.

For the entire period the universities, as compared to the colleges, gave somewhat more emphasis to content in the social sciences. This fact was revealed by data in Tables 11 and 12.

In general, it may be said that the universities not only gave greater emphasis to the social science content but also have maintained a somewhat more steady emphasis since

¹ Further information regarding the importance of the provisions of the second Morrill Act is to be found in Dr. Earle D. Ross's book, Democracy's College, pages 179 and 180. 1942.
its introduction into the curriculum. It was noted that social science content entered the curriculum in the colleges in 1882, one decade earlier than in the universities.

The two colleges which led in this movement were Purdue University and Iowa State College.

Economics

Within the field of the social sciences for the period under study, the twelve institutions gave very heavy emphasis to content in economics with only two exceptions, and the trend after 1892 was definitely toward an increased amount of emphasis. The first decrease in emphasis which occurred in 1902 very likely resulted from the greater emphasis which was being given to productive phases of agriculture at that time. The peak of emphasis upon economics had been reached in 1932, the same year as that for economics and sociology combined, and a decline, also corresponding to that for the social sciences, had taken place by 1942.

A part of the increased emphasis given to economics was due to federal legislation, for such legislation, as had already been pointed out, in the long run usually reflects changes out in the field of agriculture.

That some of the increase in emphasis upon economics was due to recommendations of the Committee on Methods of Teaching Agriculture was unquestioned. One of the three syllabi presented in 1900 at the annual meeting of the Association of
Agricultural Colleges and Experiment Stations was that for rural economics.¹

Although several institutions had given an average amount of emphasis to the social sciences, the University of Minnesota, Purdue University, the University of Missouri, and Ohio State University were those in which economics content was most heavily stressed.

Data in Tables 11 and 12 showed that considerably greater emphasis in economics had been maintained by the universities as compared to that in the colleges. There was a tendency for the universities to require a larger number of courses in general economics, a practice which apparently resulted in a somewhat larger total requirement in economic science, since these general courses were often prerequisites for the more specialized courses.

Sociology

During the period under study the twelve institutions gave the content in sociology a place of very limited importance. Although the tendency was toward a general increase in emphasis, there were some irregularities in such emphasis from time to time.

Among the twelve institutions, Iowa State College first introduced sociology into the agricultural curriculum. Since

that date, in 1882, there has taken place considerable change in the amount of content in sociology, and it was not until 1902 that this subject gained a permanent place in the curriculum.

During the period 1902-1927, further fluctuations were noted, and after 1927 there was a definite trend toward increased requirements in sociology. The all-time peak in amount of content was reached in 1932, after which a slow decline, corresponding to that noted in economics, took place.

Some institutions in which sociology content received more than average emphasis were the University of Missouri, South Dakota Agricultural College and Purdue University. Of these three, the South Dakota Agricultural College gave more emphasis than either of the other two, and the University of Missouri maintained some emphasis continuously after 1917.

Data in Tables 11 and 12 indicated that the colleges emphasized content in sociology much more than did the universities, particularly during the period 1932-1942.

Mathematics

Data in Table 10 indicated that for the period under study mathematics had been given a moderate amount of emphasis by the twelve institutions. The amount of content in mathematics, at its all-time peak in 1867, was fairly comparable in the beginning to that in the biological and the physical
sciences. Over the entire period under survey a sharp downward trend was shown and, at times, a strong tendency for the subject to be forced entirely from the agricultural curriculum.

The catalogs furnished positive evidence that special efforts had been made during the first twenty-five years to fit mathematics, like physics, into the curriculum in such a manner as to be of real service to agricultural instruction. For example, the course in surveying had been given in each of the twelve institutions as a part of the prescribed work in mathematics during the period which ended in 1887 and direct applications to agriculture were made through the various exercises carried on in the required field practice. Among these exercises were surveying land, ditching farm ponds, laying of tile drains, designing earthen tanks, and many others.

While courses in surveying served agriculture directly, they also served a larger purpose for the new and struggling institutions, according to Dean Davenport of the University of Illinois, who wrote as follows:

Farmers were indifferent to the early attempts to teach the applications of science to agriculture. Indeed strange as it seemed at the time but simple now, the first college subject to interest farmers was the general topic of under-drainage.

That the heavy decline in emphasis upon mathematics, the humanities, and certain of the physical sciences in the curriculum had been due principally to failures to make the adjustments necessary to provide service courses for technical agriculture on a par with those provided in other competing fields was supported by considerable evidence gathered in this study.

In the period 1892-1917, there was a succession of sharp losses. Investigation disclosed that all institutions had materially decreased their emphasis on mathematics; by 1902 three had dropped it entirely, and one decade later still others had done likewise. However, in 1917 the content in mathematics showed some increase in amount. In all probability this increase was due to the additional attention given to mathematics because of war conditions. This period was one of very diverse practices as regards requirements in mathematics, and no clear pattern was followed.

After 1922, there was a strong tendency for the amount of content in mathematics to remain fairly constant, although data showed some movement toward an increase. Such changes in amounts of content in mathematics as occurred after 1917 may best be explained by the fact that in practically all institutions in which curricula in the agricultural sciences had been established there were minimum requirements in mathematics.

Mathematics, like physics and "other sciences," provided
content for various other fields, and to this extent, at least, has its place in the present pattern of the curriculum in agriculture.

Among the twelve institutions which strongly emphasized mathematics for the period under study were Michigan State Agricultural College, Kansas State Agricultural College, Purdue University, and Iowa State College.

The colleges gave very much greater emphasis to the content in mathematics than did the universities. This fact, shown by data in Tables 11 and 12, was one of the essential points of difference between the colleges and the universities. This great difference in emphasis began in the earliest years of operation and continued rather consistently throughout the entire period. No satisfactory explanation was suggested by the data collected in this study.

Algebra

For all institutions, the amount of content in algebra followed approximately the general downward course described for all mathematics.

During the period which ended in 1887, the amount of content in algebra had declined noticeably, and by 1882 had reached its lowest point of the early period. This decline was partly the result of increased emphasis given by some

1. Reference is made to college algebra only.
institutions to geometry and to "other mathematics" during those years.

For the period 1892-1917, there was a severe reduction in the amount of content in algebra. Although this content had increased a moderate amount by 1892, a large loss was registered by 1902, and by another sample year still further decrease was shown. This amount of content in algebra continued to diminish through 1917, and in that year algebra almost had been dropped from the curriculum.

By 1902 several institutions had dropped algebra entirely, and geometry also, and those institutions which maintained the requirement thereafter as a rule placed little emphasis upon mathematics. The practice of combining all specialized courses in mathematics into a single course known as agricultural mathematics began about 1907, and by 1922 all institutions which required any mathematics taught algebra as part of these courses.

After 1922, emphasis given to algebra was small, but in 1942 some increase was shown, very probably the result of demands incident to war conditions.

For the entire period Purdue University had emphasized content in algebra, as had Michigan State Agricultural College, Kansas State Agricultural College, and Iowa State College.

Geometry

The twelve institutions, during the entire period, gave
slightly more emphasis to geometry\(^1\) than to algebra. No satisfactory explanation was offered for this situation, and the difference was regarded as of no importance.

With few exceptions the amount of emphasis upon geometry in these institutions followed the same downward trend as that followed by algebra. During the period which ended in 1837 geometry was emphasized more than algebra; however, during the period 1892-1942, the amount of content in geometry did not compare favorably with that of algebra.

There was considerable catalog evidence to suggest that some of the emphasis which had been given to geometry in the early period ending in 1887 had been the result of specialized service courses in geometry for certain of the sciences. One such course in particular was astronomy, required of agricultural students in seven of the twelve institutions at some time during the twenty-five-year period which ended in 1887.

The seven institutions which required astronomy, and which gave moderate-to-heavy emphasis to geometry in the early period, were the University of Missouri, University of Minnesota, University of Wisconsin, University of Nebraska, Michigan Agricultural College, Purdue University, and Kansas State Agricultural College.

Although not one of this group had continued such

\(^1\) Includes courses in plane, solid, analytical, and descriptive geometry.
emphasis upon geometry beyond the early period, Michigan agricultural College, Purdue University, and the University of Nebraska had given it considerable emphasis for the entire period.

As was shown in Tables 11 and 12, during the period under study, the colleges had given considerably more emphasis to content in geometry than had the universities. During the period which ended in 1887, geometry had received much more emphasis from the colleges, and had reached its peak in content in 1877, five years after the peak had been reached by the universities.

For the period 1892-1917, the colleges continued to give geometry more emphasis than was given to it by the universities. In 1917, however, geometry had almost disappeared from the curriculum, and the two institutions which required any amount whatsoever of this content had dropped it by 1922.

During the period 1927-1942, there was a slight tendency for the universities to require more geometry than was required by the colleges.

Other mathematics

The content classified under "other mathematics" consisted in the early period of surveying, calculus, plane and spherical trigonometry, advanced arithmetic, and civil engineering. Of these, surveying provided by far the most content for the curriculum.
As shown by data in Table 10, the downward trend in the amount of content in "other mathematics" corresponded closely to that followed by content in all mathematics and in algebra and geometry. The low for the entire period was reached in 1912, but after that date there was a tendency toward an increased amount of content in this category. Such an increase was due in large part to the practice of combining mathematics which had formerly been taught as specialized courses into one course usually called agricultural mathematics. This trend reached its height in 1922 when all mathematics required in the twelve institutions was taught as agricultural mathematics. With some negligible variations the amount of content remained nearly constant during the period 1917-1942.

Among the land-grant institutions, Michigan State Agricultural College had for the entire period given comparatively greater emphasis to "other mathematics," and other institutions which had given more than average emphasis for the entire period were the University of Wisconsin, Ohio State University, Kansas State Agricultural College, and Purdue University.

Data in Tables 11 and 12 showed that for the entire period under study the colleges consistently gave considerably more emphasis to "other mathematics" than did the universities.
General Survey

In summary, it may be said that in the twelve institutions during the period under study the sciences had consistently provided a large portion of the agricultural curriculum content.

The universities had given considerably more emphasis to the sciences than had the colleges.

Among the sciences, the biological group and the physical group had provided a large portion of all curriculum content, and this in about equal amounts. Of the two groups which remained, mathematics had provided considerably more content for the curriculum than had the social sciences.

For the period under study, the amount of content in the biological sciences showed an exceptionally strong tendency to remain constant; the amount in the physical sciences to decline moderately; the amount in mathematics to decline greatly; and that in the social sciences to increase at a slow-to-moderate rate.
SUMMARY

The land-grant institutions which were studied had earnestly and uniformly attempted to shape their policies and procedures which related to collegiate instruction in agriculture in accordance with their stated objectives and aims.

There had been, during the eighty-year period, three basic or major aims of collegiate instruction in agriculture. The trade or industrial type of aim, which stressed the training of practical farmers, prevailed during the first quarter century. During the period 1887-1917, the scientific aim, which emphasized the training of technicians and specialists for agricultural work, gained full acceptance and first rank. After 1917 the third major aim, having for its purpose the training for agricultural leadership in the broad sense of the term, was added.

Emphasis upon the original aim of training practical farmers declined as that upon the scientific aim increased, and near the end of the second quarter century by legal enactment a large part of the program for training farmers was transferred from the collegiate to the secondary level of instruction. Whether the full implications of such a transfer have yet been recognized by all of the twelve institutions is somewhat doubtful.
Throughout the period which was studied there was a tendency toward complete agreement among the twelve institutions upon their major aims and objectives of collegiate instruction in agriculture. Although there was not complete agreement in regard to the proportion of emphasis which should be given to each of the three major aims, the institutions were in substantial agreement regarding the aims themselves.

In the twelve institutions studied, a close relationship existed between the official acceptance of new aims and the development of measures, including curricula, which were employed to accomplish the new aims.

The required content which remained in the curriculum in 1942 had been retained in spite of the most severe competition between the main areas and between subjects within the main areas.

Two general trends had taken place in curriculum content. Since 1887 there had been a definite trend toward less and less required content in the curriculum. The elective system had provided an important means for the accomplishment of specialized training, and at the same time had provided an effective means for adjusting the proportion of emphasis between the main areas of curriculum content.

In the movement toward specialization in agriculture, required content in the area of the humanities and in the
area of the sciences was replaced by that of technical agriculture. However, after 1917 there was a slight tendency for the sciences and the humanities to register small gains in content at the expense of technical agriculture.

The present pattern of the collegiate curriculum in agriculture, representing eighty years of development, was the result of the operation of factors and combinations of factors relatively more than it was the result of the application of accepted and proven scientific principles underlying curriculum construction.

One very important factor was the enabling and supporting federal acts, the provisions of which defined the purposes of the institutions and shaped their curricula. Another factor was that of the predominantly classical pattern of curriculum in vogue in the established institutions during the early years of the land-grant institutions. A third factor consisted of the limited facilities in trained staff and in physical equipment. A fourth and very vital factor was the viewpoint and influence of the presidents during the early decades. A fifth factor which influenced the agricultural curriculum was the much better constructed curriculum in mechanic arts which had been formulated in Europe, where the industrial development and instruction were far in advance of those in America. A sixth of the chief factors noted was the continued interaction between institutions in
which, before the permanent body was formed in 1887, the successful curriculum practices of the better established and better organized institutions were passed to the other institutions; after 1887, the same result was accomplished through the Association of Land-Grant Colleges and Universities. In its broader phases this interaction which had taken place between the colleges and universities appeared to have exerted a mutually beneficial influence upon each of these two groups of institutions. A final factor was the influence of a few individuals—among them Director A. C. True of the Office of Experiment Stations—who had an overview of the whole field of collegiate work in agriculture and who had, through the Committee on Methods of Teaching Agriculture, a most important work in formulating and directing the standardization of agricultural instruction.

Throughout the period there was a marked trend toward the dropping of humanistic subjects from the curriculum in agriculture. During the development of this trend content in the fields of foreign languages, history and "other humanities" sustained unusually heavy reductions in amount. The purpose served in the original curriculum by the humanities had not changed greatly. Adjustments both in the nature and in the amount of humanistic content were made from time to time as social and economic conditions had seemed to warrant.
In the curriculum, the amount of content in technical agriculture advanced from a subordinate place to one of leading importance. The process of expansion took place over approximately half a century and ended in 1917.

The real success of agricultural instruction at the collegiate level dated from the last decade of the nineteenth century, at which time a movement toward specialization in agriculture was initiated, following the passage of the Hatch and second Morrill Acts.

The productive phases of agriculture had continuously received heavy emphasis in collegiate instruction, and of the total required content in the area included in technical agriculture a substantial portion had been concerned with different phases of agricultural production in its various subject-matter fields. As a result, technical developments along productive lines had far outdistanced those along certain other scientific lines, particularly the economic and the social.

The contribution made by the sciences was of the greatest importance to the development of the curriculum in agriculture. For example, the sciences had provided a continuous supply of tested content in an amount such that it made possible the establishment of technical agriculture as a separate area of instruction and at the same time it provided essential support for its technical content.
There was a tendency after 1917 for the content of the sciences taught as sciences to occupy a larger portion than formerly of the total required content in the curriculum.

After 1917 there was a definite trend toward separate curricula in the agricultural sciences on a par with those of technical agriculture, and by 1942 a majority of the institutions under study had established one or more such curricula.

If the contribution made by the sciences to the curriculum content of agriculture is typical of technical fields in general, when a new field develops, the curriculum construction pattern that follows is to take the content of the organized pure sciences most closely related to the new field and combine it with the existing information in this new field. As sciences are applied to the new field this body of applied science is set apart and becomes a technical field with primary emphasis upon the technical content rather than upon the science content as such.

The balance in the present curriculum is very largely one between the required content in technical agriculture and that in the sciences. In view of this fact and because the solutions to many problems in agriculture now tend to lie in the economic and social fields, it appears that efforts should be made to effect a better balance within each of the fields of technical agriculture and the sciences.
Specifically, in agriculture this balance should be one between the productive and the economic and social phases; and in the sciences, one between the laboratory phases and the economic and social phases. It is possible to establish such balances without appreciably lessening the emphasis upon the productive and laboratory phases by the use of the elective system, and by increasing the emphasis upon the economic and social phases in the actual instruction.
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Land-Grant Institutions

With Numbers of Curricula Analyzed from Each in 1862-1942

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Fig. 1. Percentages of Subject-Matter Content in the Collegiate Curriculum in Agriculture in All Land-Grant Institutions

Key: Electives ☒ Other Required Curricula Content ☐ Humanities ☐ Science ☐ Agriculture ☒
Fig. 2. Percentages of Subject-Matter Content in the Collegiate Curriculum in Agriculture in the Separate Land-Grant Colleges and the Land-Grant Universities

KEY: Electives Other Required Curricula Content Humanities Science Agriculture

Left Columns - Colleges  Right Columns - Universities
Fig. 3. Percentages of Subject-Matter Content in the Collegiate Curriculum in Agriculture in All Land-Grant Institutions

KEY: Electives ☒ Other Required Curricula Content ☐ Humanities ☐ Science ☐ Agriculture ☒
Fig. 4. Percentages of Subject-Matter Content in the Collegiate Curriculum in Agriculture in the Separate Land-Grant Colleges and in the Land-Grant Universities

KEY: Electives Other Required Curricula Content Humanities Science Agriculture

Left Columns - Colleges
Right Columns - Universities