DEPARTMENTS OF INSTRUCTION

Abbreviations in the announcement of courses:
Yr.—course continues throughout the year
I—given during the first semester
II—given during the second semester
I and II—repeated each semester. If used with Yr., means course
may be begun first or second semester
cr.—credits, i.e., hours of credits. Unless otherwise stated, the
number of credits per semester is given.

AGRICULTURAL BACTERIOLOGY

EDWIN GEORGE HASTINGS, M.S., Professor of Agricultural Bacteriology,
Chairman
EDWIN BROWN FRED, Ph.D., Professor of Agricultural Bacteriology
WILLIAM DODGE FROST, Ph.D., D.P.H., Professor of Agricultural Bacteriology
IRA LAWRENCE BALDWIN, Ph.D., Associate Professor of Agricultural Bacteriology
OSCAR NELSON ALLEN, M.A., Instructor in Agricultural Bacteriology
HARRY E. SAGEN, M.S., Instructor in Agricultural Bacteriology

Students majoring in this department may take Medical Bacteriology
102 or 104 or Veterinary Science 126, and count five of these credits toward
the major requirement.

1. GENERAL SURVEY OF BACTERIOLOGY. I; 5 cr. The relation of micro-
organisms to soil fertility, to animal diseases, and to food. Prerequi-
site: Chemistry 1a. Required of all agricultural students. Lab. fee
$6.75. Mr. Baldwin, Mr. Sagen.

2. GENERAL SURVEY. II; 4 cr. The relation of micro-organisms to
chemical transformations, especially as regards their relation to wa-
ter, food, sewage disposal, and industrial processes. For chemistry
course students. Prerequisite: Chemistry 1b. Lab. fee $6.75. Mr.
Baldwin, Mr. Sagen.

4. GENERAL SURVEY. II; 5 cr. Survey of bacteriology with special em-
phasis on the relation of micro-organisms to foods and domestic sanita-
tion. One out-of-town class trip taken. Prerequisite: Chemistry
1a. Required of students in home economics. Lab. fee $6.75. Mr.
Frost.

100. THESIS. Yr; 2 cr. A definite problem in dairy, soil, or household
bacteriology or in animal diseases. Prerequisites: Agr. Bact. 1, 2,
or 4, and consent of instructor. Lab. fee $2.25 per lab. cr. Staff.

121. DAIRY BACTERIOLOGY. II; 3 cr. The bacteriology of milk production
and distribution and of dairy manufacturing. Prerequisite: Agr.
Bact. 1, 2, or 4, or Medical Bact. 102. Lab. fee $4.50. Mr. Hastings.

123. SOIL BACTERIOLOGY. II; 3 cr. The relation of micro-organisms to
soil fertility. Prerequisite: Agr. Bact. 1, 2, or 4, or Medical Bact.
102. Lab. fee $4.50. Mr. Fred.

125. Food Bacteriology. I; 3 cr. The role of bacteria as related to the preservation, preparation, and sanitation of foods. Prerequisite: Agr. Bact. 1, 2, or 4, or Medical Bact. 102. Lab. fee $4.50. Mr. Frost.

126. Physiology of Bacteria. I; 3 cr. The chemistry and physics of bacterial processes. Prerequisite: Agr. Bact. 1, 2, or 4, or Medical Bact. 102. Lab. fee $4.50. Mr. Baldwin, Mr. Allen.

130. Determinative Bacteriology. Yr; 2–5 cr. Training in the common methods of the bacteriological laboratory. Prerequisite: Agr. Bact. 1, 2, or 4, or Medical Bact. 102. Lab. fee $2.25 per lab. cr. Mr. Frost.

200. Research. Yr; 2–5 cr. A detailed study of a definite problem in the field of agricultural bacteriology. Prerequisites: Agr. Bact. 121, and 123, 124, 125, or 130. Lab. fee $2.25 per lab. cr. Staff.

231. Seminary. Yr; 1 cr. Discussion of the research work of the department and of current problems in the fields covered by the department. Staff.

AGRICULTURAL CHEMISTRY

Edwin Bret Hart, B.S., Professor of Agricultural Chemistry, Chairman
William Harold Peterson, Ph.D., Professor of Agricultural Chemistry
Harry Steenbock, Ph.D., Professor of Agricultural Chemistry
William Edward Tottingham, Ph.D., Associate Professor of Agricultural Chemistry
Karl Paul Link, Ph.D., Associate Professor of Agricultural Chemistry
James Waddell, Ph.D., Research Associate in Agricultural Chemistry
Conrad Arnold Elvehjem, Ph.D., Instructor in Agricultural Chemistry
Seymour William Frederick Kletzien, Ph.D., Instructor in Agricultural Chemistry
Blanche Marve Rising, B.S., Instructor in Agricultural Chemistry
Henry Thomas Scott, Ph.D., Instructor in Agricultural Chemistry

The courses offered in this department are intended to give a broad view of farm chemistry useful to the general agricultural student, and to develop men fitted for instructional or experimental work in the various fields of chemical activity applied to agriculture. Courses 120 and 122 are for students desiring a more detailed knowledge of the special subjects treated and are preliminary to greater specialization. These courses should be preceded or accompanied by work in biology and organic chemistry. Physiology and bacteriology are desired prerequisites. All other advanced courses in this department are open to undergraduates and graduates who have had the necessary preliminary training.

1. Agricultural Chemistry. II; 3 cr. A general discussion of chemistry applied to the farm, including the chemistry of plants and animals and the processes involved in their growth. Prerequisite: Chemistry 1b or concurrent registration. Mr. Elvehjem.
2. **AGRICULTURAL ANALYSIS.** II; 2 cr. Analytical chemistry applied to agricultural materials; quantitative analysis of soils, fertilizers, manures, feeding stuffs, and insecticides. Prerequisites: Chemistry 1b and 12. Lab. fee $4.50. Mr. Elvehjem.

3. **HOUSEHOLD CHEMISTRY.** I; 5 cr. The composition, physical properties, and nutritive value of foods; chemistry of the home, cleaning materials, dyes, etc. Required of all home economics students. Prerequisite: Chemistry 1b. Lab. fee $6.75. Mr. Peterson.

100. **THESIS.** Yr; 2 cr. May be taken in plant, animal, fermentation, or dairy chemistry. Lab. fee $2.25 per lab. cr. Mr. Hart, Mr. Peterson, Mr. Steenbock, Mr. Tottenham.

120. **PLANT CHEMISTRY.** II; 2 or 5 cr. The mechanism and course of chemical processes in the growth of plants, including the effect of environmental factors. Selected methods for the determination of plant constituents. Prerequisites: Chemistry 1b and 120. Lab. fee $2.25 per lab. cr. Mr. Tottenham.

121. **DAIRY CHEMISTRY.** I; 2 or 5 cr. The chemistry of milk and its products, including the chemistry of fermentation and detection of adulterants. Prerequisites: Chemistry 1, 12, and 120. Lab. fee $2.25 per lab. cr. Mr. Hart.

122. **ANIMAL CHEMISTRY.** I; 2 or 5 cr. The chemistry of feeds, processes of digestion, use of nutrients, and metabolic changes involved in the nutrition of animals. Prerequisites: Chemistry 1, 12, and 120. Lab. fee $2.25 per lab. cr. Mr. Steenbock.

124. **ADVANCED BIO-CHEMISTRY.** I, II; 1–3 cr. A survey of important analytical processes used in the study of bio-chemical problems. Prerequisites: Chemistry 1, 12, 120, and Agr. Chem. 122. Lab. fee $2.25 per lab. cr. Mr. Waddell.

125. **THE VITAMINS.** II; 1–3 cr. Lectures and laboratory work on the vitamins, including the animal technique used in their identification. Prerequisite: Agr. Chem. 122. Lab. fee $2.25 per lab. cr. Mr. Steenbock.

126. **MODERN VIEWS OF ANIMAL NUTRITION AND THEIR APPLICATION.** II; 2 cr. A course of lectures and conferences on the newer knowledge of nutrition applied to man, poultry, dairy cattle, swine, etc. Prerequisite: Agr. Chem. 122. Mr. Hart.

127. **FERMENTATION BIO-CHEMISTRY.** II; *cr. Lectures and laboratory work on the chemistry and bacteriology of fermentation. Lab. fee $2.25 per lab. cr. Mr. Peterson, Mr. Fred.

128. **CARBOHYDRATE CHEMISTRY.** I; *cr. Laboratory work with conferences on the chemistry of the carbohydrates. Includes a study of the properties and methods of separation and identification of the more important sugars. Lab. fee $2.25 per lab. cr. Mr. Link.

230. **PLANT NUTRITION.** Yr; *cr. The influence of fertilizers upon the development and composition of plants in field and pot experiments, including the effects of environmental factors. Prerequisite: Agr. Chem. 120. Lab. fee $2.25 per lab. cr. Mr. Tottenham.
231. **ANIMAL NUTRITION.** Yr; *cr. Composition and digestibility of foods and their influence upon growth, production of milk, etc. Prerequisite: Agr. Chem. 122. Lab. fee $2.25 per lab. cr. Mr. Hart.

232. **ADVANCED DAIRY CHEMISTRY.** Yr; *cr. The proximate analysis of milk and its products, and a study of the changes which occur in the manufacture of dairy products. Prerequisites: Agr. Chem. 121. Lab. fee $2.25 per lab. cr. Mr. Hart.

233. **SEMINARY.** Yr; 1 cr. Original articles of importance are studied in detail, to broaden and deepen the understanding and to act as a stimulus to further research. Mr. Hart and staff.

**AGRICULTURAL ECONOMICS**

**Benjamin Horace Hibbard,** Ph.D., *Professor of Agricultural Economics, Chairman*

**John Harrison Kolb,** Ph.D., *Professor of Rural Sociology*

**Preston Essex McNall,** M.S., *Professor of Agricultural Economics*

**George Simon Wehrwein,** Ph.D., *Professor of Agricultural Economics*

**Ellis Lore Kirkpatrick,** Ph.D., *Associate Professor of Rural Sociology*

**Henry Harrison Bakken,** M.A., *Assistant Professor of Agricultural Economics*

**Isaac Fults Hall,** Ph.D., *Assistant Professor of Agricultural Economics*

**Arthur F. Wileden,** M.S., *Assistant Professor of Rural Sociology*

**John Sweet Donald,** B.S., D.D.S., *Lecturer in Agricultural Economics*

**Miles Charles Riley,** LL.B., *Lecturer in Agricultural Economics*

**Marvin Arnold Schaars,** M.S., *Instructor in Agricultural Economics*

**Rudolph Knugaard Froker,** M.A., *Instructor in Agricultural Economics*

The courses in agricultural economics are intended to give the students a knowledge of the economic principles which relate to the production and marketing of farm products, and to the economic and social conditions of the agricultural classes. As such it is a field of general interest to all concerned with farmers and their welfare.

There are two methods of taking agricultural economics. First, it may be taken as a joint major along with work in one or more other departments, economics being recognized as a phase of farming coordinate with many other lines of inquiry; second, agricultural economics may be taken as a full major by those who decide to make it a main line of study preparatory to teaching, research, or work of an economic character. The major consists of 15 credits, including the thesis.

1. **PRINCIPLES OF AGRICULTURAL ECONOMICS.** I; 3 cr. Application of economics to agriculture. Required of all agricultural students. Prerequisite: Economics 1a. Mr. Hibbard.

2. **FARM RECORDS AND ACCOUNTS.** II; 2 cr. Inventories, bookkeeping, and accounting principles as applied to farm operations. Mr. Mitchell.

3. **FARM ORGANIZATION AND MANAGEMENT.** II; 3 cr. Farm methods and practices as applied to business management on the farm. Mr. McNall.
14. **Farm Business and Legal Practice.** II; 3 cr. Mr. Riley.

25. **Rural Life.** I; 3 cr. The rural life movement with special attention given to the group organization of rural society; rural social institutions, such as the family, the school, the church, social and welfare agencies; principles and policies of rural community organizations. Prerequisite: Sophomore standing. Mr. Kolb.

100. **Thesis.** Yr; 2 cr. Staff.

107. **Farm Cost Accounting.** II; 2 cr. Systems of cost accounting in their application to the problems of farm organization and operation. Prerequisite: Agr. Econ. 8. Mr. McNall.

117. **Outlines of Land Economics.** I; 3 cr. This course undertakes to cover the theoretical principles underlying landed property including the theories of rents, taxation, and conservation, together with the leading facts of land utilization. Prerequisite: Econ. 1a. Mr. Hibbard.

**Seminary Group in Agricultural Economics**
Problems of co-operation, marketing, farm management, farm credit and land tenure are of greatest importance to the nation.

126. **Rural Standards of Living.** II; 2 cr. Origin, development, and contact of rural standards of living; prevailing rural standards respecting food, clothing, housing, operating, health, and advancement; factors conditioning rural standards; and relation of community arrangements and institutions. Prerequisite: Junior standing. Mr. Kirkpatrick.

127. **Cooperative Marketing.** II; 2 cr. The structure, business essentials, policies, scope, and merchandising of cooperative corporations. Examination of the principal cooperative marketing companies, their consumer brands, reasons for success, and influence upon their respective industries. Prerequisite: Agr. Econ. 128. Mr. Schaars.

128. **Marketing of Farm Products.** II; 3 cr. Essential marketing services, methods employed and agencies operating the marketing system. Consideration of price making forces, weaknesses in marketing agencies, avenues of improvement, governmental relations and marketing status of leading farm products. Prerequisite: Econ. 1a, or middle course sophomore standing. Mr. Schaars.

150. **Economic Thought and the Farm Press.** II; 2 cr. Mr. Hibbard.
152. **Farmer Movements.** I; 2 cr. A discussion of the great farmer movements such as the Grange, the Alliance, and the American Farm Bureau Federation. Prerequisite: Agr. Econ. 1. Mr. Hibbard.

180. **Topical Work.** Yr; *cr. Staff.

200. **Research.** Yr; *cr. Cooperation and marketing, Mr. Bakken, Mr. Schaars; Farm surveys and financial accounts in their relation to farm management, Mr. McNall; Cost accounting and its relation to farm management, Mr. McNall; History of agricultural production, Mr. Hibbard; Rural life, Mr. Kolb; Farmer movements, taxation and farm credit, Mr. Hibbard; Land economics and land problems, Mr. Wehrwein.

221. **Land Income.** II; 2 cr. The economic characteristics of land; the economics of land utilization with reference to costs and income; theories of rent; valuation and taxation of land. Mr. Wehrwein.

225. **Seminary in Rural Social Organization.** I; 2 cr. The theory and practice of rural social organization related to rural population groups, to villages and small town groups, and to towns and county organization policies. Emphasis is given to research methods of study. Prerequisite: Agr. Econ. 25. Mr. Kolb.

226. **Land Problems.** Yr; 2 cr. The economic status of the agricultural classes with special reference to the relations of landlord and tenant. Prerequisite: Agr. Econ. 117 or 229 or concurrent registration. Mr. Hibbard, Mr. Wehrwein.

229. **Advanced Agricultural Economics.** Yr; 2 cr. The fundamentals of economics in their application to agricultural problems. Recent works in English, German, and French will be used. Prerequisite: Agr. Econ. 1 or Econ. 1a. Mr. Hibbard.

### Agricultural Education

**John Ambrose James, B.S., Professor of Agricultural Education, Chairman**  
**Kirk Lester Hatch, B.S., Professor of Agricultural Education**  
**Thomas Lyman Bewick, M.S., Professor of Agriculture**  
**Vincent Earl Kivlin, M.S., Assistant Professor of Agricultural Education**  
**Ivan Glen Fay, B.S., Assistant Professor of Agriculture**  
**Warren William Clark, B.S., Associate Professor of Agricultural Extension**

Students in the College of Agriculture who wish to prepare for the teaching of agriculture in secondary schools must complete, in addition to a major, the general requirements of the Long Course in Agriculture and the fifteen credits in education required for the University Teachers' Certificate as outlined below. The major consists of a minimum of fifteen elective credits in any department of the College of Agriculture but preferably in Agricultural Education.

Students who receive the degree of Bachelor of Science (Agriculture) and who have satisfied the following requirements are entitled to receive the University Teachers' Certificate and a license to teach issued by the State Superintendent: (a) registration in the School of Education at the beginning of the junior year, (b) the recommendation of the College of Agriculture, (c) the completion of the following courses:
Students beginning work for a certificate may arrange their courses most satisfactorily by starting to meet the requirements during the second semester of the sophomore year or the first semester of the junior year. Education 31 and 75 should definitely be completed before the beginning of the senior year. During the senior year the three courses in agricultural education are prescribed. This provides the best sequence and one which interferes least with technical subjects. Students should secure a list of the desirable technical agricultural elective courses from the chairman of the Department of Agricultural Education, and discuss with him the requirements for the certificate.

Graduates of the professional courses of the state teachers' colleges who are majoring in agriculture and who wish to qualify for the University Teachers' Certificate, should elect 8 credits as follows:

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Education (advanced)</td>
<td>3-4</td>
</tr>
<tr>
<td>Agricultural Education (advanced; or 302)</td>
<td>3</td>
</tr>
<tr>
<td>Agricultural Education 301</td>
<td>2</td>
</tr>
</tbody>
</table>

Candidates may be excused from the departmental teachers' course with the approval of the Chairman of the Department of Agricultural Education.

**Major.** Not more than 5 credits in education taken in Letters and Science may count on the major in agricultural education. These 5 credits shall in no way be counted as a portion of the 50 credits required in the strictly agricultural subjects.
There is a demand for men trained as principals and superintendents for rural communities and small cities. Teachers' college graduates and others with teaching experience are urged to consider this opportunity. The opportunity for electives outside this college makes it possible to take many courses in the Department of Education and thus to prepare for this field.


5. **Junior Extension.** I; 2 cr. Place of boys' and girls' clubs in rural education. Educational values, methods of organization, leadership, meetings, demonstrations, follow-up materials, exhibits and reports. For prospective extension workers and teachers. Lectures and demonstrations. Mr. Bewick.

25. **Rural Life (Ag. Econ. 25).** I; 3 cr. Counts as part of education major. Mr. Kolb.

100. **Thesis.** Yr; 2 cr. Original work on problems of agricultural extension or teaching. Staff.

103. **Seminary.** I, II; *cr. Special problems in rural education and educational problems of county agent, demonstrator, extension workers, teachers, and rural leaders. Mr. James.

110. **Training Course for County Agents.** II; 2 cr. Development and administration of the county agent system. The agent's responsibilities to the federal and state governments and the community. Projects, plans for work, and county organization; relation of college specialists and local organization. Open only to seniors and graduate students. Mr. Clark.

200. **Research.** Yr; *cr. Topical work relative to problems of elementary, vocational, or college agricultural education; extension, county agent, or demonstration work. Mr. James, Mr. Clark.

301. **Program Building in Vocational Agriculture.** II; 2 cr. Factors determining the program of work, directed practice, part-time and evening schools, etc., adapted to teaching agriculture in secondary schools. Prerequisites: Agr. Educ. 1 and senior standing. Mr. Kivlin.

302. **Teaching of Agriculture.** I, II; 3 cr. Directed teaching based upon participation in agricultural activities of the Wisconsin High School, problems of subject matter and methods of teaching. Open only to seniors registered for a teachers' certificate. Mr. Kivlin.
AGRICULTURAL ENGINEERING

EDWARD RICHARD JONES, M.S., Professor of Agricultural Engineering,
Chairman
FLOYD WALDO DUFFEE, B.S., Professor of Agricultural Engineering
FREDERICK GROVER WILSON, B.S.F., Assistant Professor of Forestry
OTTO REINHART ZEASMAN, B.S., Associate Professor of Soils and Agricultu-
ral Engineering

MARVIN FREDERICK SCHWEERS, B.S., Instructor in Agricultural Engineering

Aggressive, alert men with an agricultural background supplemented
by thorough training in technical engineering are in keen demand by rural
power, construction, and reclamation companies and the manufacturers of
farm machinery and equipment.

Students inclined toward engineering and desiring to return to their
farms or to take positions as agricultural agents or farm managers or to
enter the farm equipment business, are advised to major in non-technical
agricultural engineering, which has no special requirement in mathematics.
They are advised to take, in addition to their major studies, liberal electives
in soils, agronomy, agricultural economics, and business methods. A non-
technical major in agriculture may be combined with a University Teach-
ers’ Certificate giving the legal qualifications to teach in the high schools.

Those desiring to enter the more technical field, or mechanical, elec-
trical, civil, or structural engineering as applied to agriculture, are
recognized as majors in technical agricultural engineering, and are re-
quested to consult the department chairman before or during the first
semester of the freshman year so that the proper sequence of studies in
mathematics, drawing, and mechanics may be followed, substituting Mathe-
mat i c s 51 for Mathematics 71 and then shaping Curriculum B so as to
include in addition to the required courses in the College of Agriculture,
Mathematics 52, 54, and 55, Drawing 1, 2, and 3, Mechanics 1 and 2, and
Physics 51 and 52 in the College of Engineering. In addition to graduating
from agriculture at the end of four years, it is possible for these men to
finish a course in civil, mechanical, or electrical engineering at the end of
the fifth year.

Throughout the year the majors in both technical and non-technical
agricultural engineering function as a student branch of the American
Society of Agricultural Engineers, and during the first semester of both
junior and senior years they take Agricultural Engineering 121, if possible.

About one-third of the work included in each of the courses listed
below is made technical for students who have sufficient prerequisites in
mathematics and mechanics; and more general for students without such
prerequisites, but with more farm experience.

1. LAND SURVEYING AND DRAINAGE. I; 3 cr. Surveying and engineer-
ing as applied to land drainage. Subdivision of land, chaining,
levelling, mapping, computing, and designing for drainage systems.
Lectures accompanied by field work, drafting, and laboratory tests.
Laying tile on university marsh. Optional subject for all agricul-
tural students. Lab. fee $4.50. Mr. Jones.

2. FARM STRUCTURES. I; 3 cr. The arrangement, construction eco-
nomics, and design of the farm house, barns, and other farm build-
ings. Strength and selection of materials in the economical design
of farm structures. Preparation of bills of material and estimates
of cost from plans and specifications. Lectures, laboratory, drafting
room, and field practice. Lab. fee $2.25. Mr. Jones.
3. **GAS ENGINES. I; 3 cr.** Construction and operation of gasoline engines; electrical generators; application of power to farm work. It is desirable to have this course preceded by course 14. Lab. fee $4.50. Mr. Duffee.


![Image of group of people]

**GOING TO THE MARSH**
Practical work in drainage is done by students in the course, Agricultural Engineering 1.

5. **FARM FIELD MACHINERY. II; 3 cr.** Lectures and laboratory studies on the construction and operation of tools and machinery for preparing the seed bed, sowing and planting, tilling and harvesting farm crops. Optional subject for all agricultural students. Lab. fee $2.25. Mr. Duffee.

8. **DOMESTIC ENGINEERING AND PRACTICE. I; 2 cr.** Water supply, sanitation, heating, and lighting of farm houses and operation of household equipment. Rope work, belt-lacing, soldering, and babbitting. Lab. fee $2.25. Mr. Schweers.

100. **THESIS. Yr; 2 cr.** Lab. fee $2.25 per lab. cr. Staff.

101. **ADVANCED GAS ENGINES AND FARM TRACTORS. II; 3 cr.** Laboratory tests of gas engines and field practice with farm tractors. Prerequisite: Agr. Engr. 3. Lab. fee $4.50. Mr. Duffee.

102. **DRAINAGE DESIGN. II; 2 cr.** Preliminary and final surveys and designs for farm and community drainage systems near Madison and other convenient places. Optional work is provided for those specializing in irrigation. Field work and conferences by appointment. Prerequisite: Agr. Engr. 1 or Top. Engr. 1 and 2. Mr. Jones.

105. **BELT AND TRACTOR MACHINERY. II; 2 cr.** Threshers, silo fillers, and other belt-driven farm machines, large and small; tractor plow; ma-
chinery calibration tests. Lectures, laboratory studies, and field demonstrations. Prerequisites: Agr. Engr. 5 and 101 or concurrent registration. Offered 1929–30 and in alternate years. Lab. fee $2.25. Mr. Duffee.

121. **SEMINARY.** I; 1 cr. Review of current literature and studies of agricultural engineering problems. For juniors, seniors, and graduate students. Mr. Jones and staff.

122. **EXPLOSIVES.** II; 1 cr. Principles and practices in the use of explosives in agriculture and industry, including demolition of old structures and excavation for new ones. Lectures, laboratory, and field work during the spring recess. Lab. fee $2.25. Mr. Rowlands.

200. **RESEARCH.** I, II; *cr. Special problems in farm buildings, farm machinery, farm power, forestry, land clearing, or land drainage are assigned to advanced students who have had the necessary previous training. Lab. fee $2.25 per lab. cr. Mr. Jones and staff.

**ELECTIVES IN THE COLLEGE OF ENGINEERING**

**SHOP 2.** **BENCH WORK, FORGE, AND WELDING.** I, II; 1 cr. Forge and bench work in iron and steel. The processes involved in forging, welding, and brazing of iron and steel. The use of the chisel, file, and drill in finishing and fitting. Lab. fee $3.00. Mr. Holland.

**SHOP 15.** **GENERAL FARM CARPENTRY.** I, II; 1 or 2 cr. The use and care of tools and principles involved in the construction of such structures as concrete forms and farm buildings; framing of doors and windows, and interior finishing. Lab. fee $3.00. Mr. Cluley.
ELECTIVES GIVEN BY FOREST PRODUCTS STAFF

1. Forestry and Utilization of Wood. I; 2 cr. General introductory course. Includes identification of native trees, forest conditions and forest policy in the United States and utilization of wood. Mr. Tiemann.

102. Wood Technology. II; 2 cr. Includes a study of the formation, structure, and properties of wood, laboratory identification of United States species of wood. Forms a logical sequence to Course 1 but can be taken independently. Especially suited for students who expect to go into some wood-using business, or for students intending to specialize in forestry elsewhere. Mr. Tiemann.

AGRICULTURAL JOURNALISM

Andrew Winkle Hopkins, B.L., Professor of Agricultural Journalism, Chairman

William Allison Sumner, B.S., Associate Professor of Agricultural Journalism

Grace Langdon, M.A., Instructor in Agricultural Journalism

Rupert Henry Rasmussen, M.S., Instructor in Agricultural Journalism

The ability to write simple, understandable English is invaluable to the teacher, extension worker, county and home demonstration worker, and farmer. To render the greatest service the technically trained worker must use the printed page. Selling and advertising are important in the neglected half of farming—the business side. More and more farmers are coming to appreciate the need of salesmanship, sales letter writing, effective classified and display advertisement, and systematic sales campaigns.

For students returning to the farm, Agricultural Journalism 1 and 3 are suggested. For prospective teachers and extension workers, courses 1, 3 and 103 are recommended. For research workers and future college staff workers Agricultural Journalism 1, 103, and 105 are advised.

 Majors in the department will be expected to take Agricultural Journalism 1, 2, 3, 100, 103, 111, 150, and 200. Courses in the Department of Journalism in the College of Letters and Science may be taken and not to exceed 5 credits from the following courses may count on the major: Journalism 2, Newspaper reporting and correspondence; Journalism 3, Copy reading; Journalism 7, Community newspaper; Journalism 104, Editorial writing.

1. Writing Farm News. I, II; 3 cr. An elementary course to help students who expect to write news articles about farming for publication in the weekly or daily papers or the various agricultural journals. Mr. Sumner.

2. Practice in Editing. I, II; 1 cr. The editorial, business, and circulation problems of the Wisconsin Country Magazine are analyzed and actual practice given on the magazine. Mr. Sumner.

3. Agricultural Advertising. II; 3 cr. How to write "want ads", advertisements to sell livestock, dairy products, fruit, berries, truck, food products; how to write the business letters of the farmer; the preparation of booklets, posters, sales bills, and other mediums. Lectures and assignments for practice. Mr. Sumner.
8. Writing Home Economics News. I; 3 cr. A course in the fundamentals of writing home economics material. Designed to aid teachers and extension workers in publicity and to give training to students who plan to make a profession of journalism. Mr. Sumner.

100. Thesis. Yr; 2 cr. Original studies of a journalistic or advertising nature. Practical problems are investigated. Mr. Hopkins, Mr. Sumner.

EVERY AG NEEDS THE “MAG”
The editors of the Country Magazine learn the business of writing articles by actual experience.

103. Agricultural Publicity Methods. II; 2 cr. Outlining and finding effective methods of publicity. This course takes up the publicity campaign, the different mediums as to their advantage and uses, publicity copy, exhibits, and charts. Prerequisite: Agr. Journ. 1 or 8. Mr. Hopkins.

104. The History of Farm Papers. II; 2 cr. A survey of the farm paper field, past and present. Mr. Sumner.

105. Writing and Editing Farm Bulletins. I; 2 cr. A course for those who have to use or write station or extension bulletins and circulars. Mr. Sumner.

106. Advertising Survey for Home Economics. II; 2 cr. A general course to present to the home economics student who expects to enter the business world, a background of sales and advertising methods and practices. Mr. Sumner.

111. Writing Farm and Home Features. II; 2 cr. A course to follow the elementary courses in writing farm and home stories. The technique of writing the longer feature stories for the farm papers and women’s magazines is given primary consideration. Prerequisite: Agr. Journ. 1 or 8. Mr. Sumner.

150. Seminary. I, II; 2 cr. Mr. Sumner.

200. Research. I, II; *cr. A practice problem such as confronts the county agent, scientist, publicity man, extension worker, or editor is analyzed and an effort made for a constructive solution. Advertising problems and policies such as confront the breeder or pure-bred seed grower may be studied. Prerequisite: Agr. Journ. 1, 3, or 8. Mr. Hopkins, Mr. Sumner.
AGRONOMY

Ransom Asa Moore, Professor of Agronomy, Chairman
Edmond Joseph Delwiche, M.S., Professor of Agronomy
Laurence Frederick Graber, M.S., Professor of Agronomy
George Byron Mortimer, B.S., Professor of Agronomy
Benjamin Donald Leith, B.S., Professor of Agronomy
George McSpadden Briggs, B.S., Associate Professor of Agronomy
Andrew Hamilton Wright, M.S., Associate Professor of Agronomy
Alden Lescombe Stone, Assistant Professor of Agronomy
Eugene Davenport Holden, M.S., Assistant Professor of Agronomy

GENERAL MAJOR. Students majoring in agronomy and wishing to prepare for the business of farming, farm managers, county agricultural agents, crop reporting positions, commercial positions in seed trade, or teachers of secondary school agriculture, should pursue Curriculum B, electing 10 credits from the following: Physics 61, 5 cr.; Zoology 3, 3 cr.; Geology 1, 5 cr.; Geography 4, 5 cr.; Geography 104, 2 cr.; Botany 2, 5 cr.; Chemistry 11, 3-5 cr.; Mathematics 2, 4 cr.; Mathematics 3, 3 cr. In addition the regular course requirement must be taken as prescribed.

It is suggested that the courses selected in agronomy be taken in the following order: For the sophomore year, 120, 3 cr.; 102, 2 cr.; for the junior year, 106, 3 cr.; for the senior year, 107, 2 cr.; 121, 3 cr.; 130, 3 cr.; 131, 2 cr.

General majors desiring to teach secondary school agriculture should note the regular teacher training requirements given under Agricultural Education.

SPECIAL MAJOR. Students desiring to prepare as professional agronomists such as plant breeders, either institutional or commercial research and extension specialists, teachers, or seed analysts should take a more specialized major emphasizing scientific subjects. In the sophomore year Chemistry 11, 3 cr., and Zoology 3, 3 cr., should be taken, together with an additional 4 cr. in either science or mathematics. Soils 1, 5 cr., and Agricultural Chemistry 1 and 2, 5 cr., are suggested. In the junior year, Chemistry 20, 4 cr., Botany 109, 3 cr., and Genetics 101, 3 cr. In the senior year, Chemistry 130, 5 cr., Soils 127, 2 cr., and Plant Pathology 101, 3 cr.

Departmental requirement should be followed as suggested under the general major with the addition of Agronomy 205, 2 cr., in the senior year. If graduate work is intended a foreign language should be added beginning with the junior year. A thesis may be taken in either major with the consent of the adviser. Not to exceed five credits from the following courses may be counted as a portion of the major requirement in Agronomy: Soils 120, Soil management; Soils 127, Soil science and plant nutrition; Plant Pathology 101, Diseases of plants; Plant Pathology 116, Diseases of field crops; Botany 109, Structure of economic plants; and Botany 129, Classification of cultivated plants.

1. GENERAL FARM CROPS. I, II; 3 cr. Includes a study of varieties and types, botanical relations, adaptations, cultural practices, judging, and studies of individual crops. Required of all agricultural students. Lab. fee $4.50. Mr. Mortimer.

100. THESIS. Yr; 2 cr. Lab. fee $2.25 per lab. cr. Staff.

101. SPECIAL CROP PROBLEMS. Yr; *cr. Offered at Madison and the branch experiment stations. Lab. fee $2.25 per lab. cr. Staff.
102 PASTURES AND PASTURE PROBLEMS. I; 2 cr. Pasture studies based on kinds; best methods of establishing, maintaining and improving them; and the crops best suited to this use. Prerequisite: Agronomy 1. Mr. Mortimer.

106. FORAGE CROPS. II; 3 cr. Growing and handling forage crops, with emphasis on recent developments in relation to livestock farming. Prerequisite: Agronomy 1. Mr. Moore, Mr. Graber.

107. FORAGE PROBLEMS. II; 2 cr. Physiological, anatomical, and morphological aspects of forage plants in relation to field practices, with emphasis on food reserves, winter injury, and other agronomic problems. For seniors and graduate students. Lab. fee $4.50. Mr. Graber.

120. SEED AND WEED CONTROL. I; 3 cr. A study of the economic relations of farm seeds and weeds to profitable agriculture. Prerequisite: Agronomy 1. Lab. fee $4.50. Mr. Stone.

121. GRAIN PRODUCTION AND CROP JUDGING. II; 3 cr. Varieties, uses, distribution, and approved practices in growing, together with judging competitive farm crop displays. Prerequisite: Agronomy 1. Lab. fee $4.50. Mr. Mortimer.

130. PLANT BREEDING. II; 3 cr. Methods and principles involved in the improvement of crops. Prerequisites: Agronomy 1 and Botany 1. Mr. Leith.

131. SEMINARY. Yr; 1 cr. A review of current literature and studies of agronomic problems. For seniors and graduate students. Prerequisites: Agronomy 1 and Botany 1. Staff.

200. RESEARCH. Yr; *cr. Agronomic problems for students qualifying for advanced degrees. Given in connection with thesis or graduate study. Lab. fee $2.25 per lab. cr. Staff.

205. CROP ENVIRONMENT. II; 2 cr. Reports and discussions on the findings in fields related to crop plants, and their interrelations. Offered 1930–31 and in alternate years. Mr. Wright.
ANIMAL HUSBANDRY

GEORGE COLVIN HUMPHREY, B.S., Professor of Animal Husbandry, Chairman
GUSTAV BOHSTEDT, Ph.D., Professor of Animal Husbandry
JAMES GARFIELD FULLER, M.S., Professor of Animal Husbandry
ARLIE MAX MUCKS, B.S., Associate Professor of Animal Husbandry
JOHN MERRILL FARGO, M.S., Assistant Professor of Animal Husbandry
ISAAC WALKER RUPEL, M.S., Assistant Professor of Animal Husbandry
ARTHUR OWEN COLLENTINE, Instructor in Animal Husbandry
ALBERT JULIUS CRAMER, B.S., Instructor in Animal Husbandry
ROY THEODORE HARRIS, Instructor in Animal Husbandry
JAMES JEROME LACEY, Instructor in Animal Husbandry
BENJAMIN HAMILTON ROCHE, M.S., Instructor in Animal Husbandry

Two majors are offered students in animal husbandry. The practical major is intended primarily for students who intend to return to the farm either at home or as farm managers or herdsmen. Students taking this major should follow Curriculum B, electing Chemistry 12, Quantitative analysis, 3 cr., and Agr. Chem. 1 and 2, 5 cr., in their sophomore year. In the junior year they should elect Physiology 3, Animal physiology, 4 cr., in addition to animal husbandry courses in feeding, breeding, and production. In the senior year Agr. Journalism 3, Advertising, 3 cr., Dairy Husbandry 5, City milk supply, 3 cr., and Agr. Bact. 121, Dairy bacteriology, 3 cr., are suggested in addition to animal husbandry production courses.

The scientific major is planned for men desiring to go into college or experiment station work and is suggested for those intending to do extension work. For training in this field Curriculum A should be followed, electing Veterinary Science 1, 3 cr., and Dairy Husbandry 1, 3 cr., in the sophomore year. Organic chemistry should be taken in the junior year in addition to courses suggested in the practical major. In the senior year desirable electives, in addition to some production courses, are Agr. Chem. 121; Dairy chemistry, 2 or 5 cr.; Agr. Chem. 122, Animal chemistry, 2 or 5 cr.; and Genetics 101 and 102, 5 cr. Not to exceed five credits from the following courses may be counted as a portion of the major requirement in animal husbandry: Agr. Chem. 121 and 122, Genetics 101 and 102, Veterinary Science 2 and 3.

1. LIVESTOCK PRODUCTION. I, II; 3 cr. Livestock survey, breed history, judging, market classification; practical problems, lectures, and laboratory exercises. Required of all agricultural students. Lab. fee $4.50. Mr. Fuller.

100. THESIS. Yr; 2 cr. Lab. fee $2.25 per lab. cr. Mr. Humphrey and staff.

124. ANIMAL BREEDING. II; 2 cr. The principles and approved methods relating to the breeding of livestock. Prerequisite: An. Husb. 1. Mr. Fargo.

126. LIVESTOCK FEEDING. I; 4 cr. A study of the principles of feeding and the composition of feeds; practice in formulating rations for the various classes of livestock; evaluation of feeds and feeding practices from a study of experiments and customs. Prerequisite: An. Husb. 1. Mr. Bohstedt, Mr. Rupel.

129. SHEEP PRODUCTION. II; 2 cr. A study of breed history and judging; farm flock management for production of market and pure-bred sheep.

130. SWINE PRODUCTION. I; 3 cr. Judging of breeding and market hogs; history of the hog industry in America; systems and costs of production and marketing; the hog carcass and consumption of pork products; and the breeding, feeding, and management of breeding and market hogs. Prerequisites: An. Husb. 1 and 126. Lab. fee $4.50. Mr. Fargo.

131. HORSE PRODUCTION. I; 2 or 3 cr. Pedigree work, conformation study, judging, production problems, and fundamentals in breaking and hitching. Prerequisite: An. Husb. 1. Lab. fee $2.25. Mr. Fuller.

132. BEEF CATTLE PRODUCTION. II; 2 cr. Pedigree work, judging, feeding, and marketing beef cattle; production problems. Prerequisite: An. Husb. 1. Lab. fee $2.25. Mr. Fuller.

133. DAIRY CATTLE AND MILK PRODUCTION. II; 3 cr. Selection of animals for milk production and for breeding purposes. Present day types and breed characteristics. Herd management, advanced registry testing, calf raising, selling of surplus breeding stock. Control measures relating to quality in commercial and special grades of milk. A two-day tour to visit leading pure-bred herds, dairy equipment plants, and farms producing certified milk is required; the cost is from $10.00 to $15.00. Prerequisite: An. Husb. 1. Lab. fee $4.50. Mr. Rupel.

134. SPECIAL PROBLEMS. Yr; *cr. Special problems on feeding, management, breeding, or judging of livestock, including laboratory, library, or field work with conferences and reports. These problems will be assigned by respective members of the staff. Consent of instructor required. Lab. fee $2.25 per lab. cr. Mr. Fuller and staff.

135. ANIMAL HUSBANDRY SEMINARY. Yr; 1 cr. Studies and discussions of research work in animal husbandry and related fields; reports on articles of interest. For advanced and graduate students. Mr. Bohstedt.

200. RESEARCH. Yr; *cr. A detailed study of a definite research problem in animal husbandry. Conference on experimental methods. Lab. fee $2.25 per lab. cr. Mr. Bohstedt and staff.

DAIRY HUSBANDRY

HOWARD CAMPBELL JACKSON, Ph.D., Professor of Dairy Husbandry, Chairman
WALTER VAN PRICE, Ph.D., Professor of Dairy Husbandry
HUGO HENRY SOMMER, Ph.D., Professor of Dairy Husbandry
JOHN LANGLEY SAMMIS, Ph.D., Associate Professor of Dairy Husbandry
LOUIS CHARLES THOMSEN, B.S., Assistant Professor of Dairy Husbandry
HANS TJELLENSEN SONDERGAARD, Instructor in Dairy Husbandry

The department offers instruction in the science and art of manufacturing dairy products, suited to the needs of (a) farm dairymen, (b) investigators or teachers, (c) managers, operators, or inspectors of creameries, cheese factories, city milk, ice cream plants, and condenseries.
Students majoring in dairy manufacturing should follow Curriculum B, electing Chemistry 12, 3 cr., Physics 61, 5 cr., Chemistry 20 or 120, 5 cr., Agricultural Chemistry 1 and 2, 5 cr., and Dairy Husbandry 1, 3 cr., in the sophomore year. Agr. Chem. 121, Dairy chemistry, 5 cr., and Agr. Bact. 121, Dairy bacteriology, 3 cr., should be taken in the junior year; and Dairy Husbandry 3, 4, and 5, 3 cr. each, and Dairy Husbandry 123, 2 cr., should be taken in the senior year as a minimum.

Dairy Husbandry is intimately connected with the Departments of Animal Husbandry, Agricultural Bacteriology, and Agricultural Chemistry, and with marketing given in the Department of Agricultural Economics. Students preparing for dairy manufacturing should consider courses in these departments when selecting electives related to the major.

1. **Introduction to Dairying.** II; 3 cr. A general survey course designed to give the student an understanding of the relationship of dairy manufacturing to general farm problems. Emphasis is given to methods of quality control, judging, and elementary analysis of dairy products. Lab. fee $4.50. Mr. Jackson, Mr. Thomsen.

2. **Creamery Operation and Management.** I; 1–3 cr. The theory and practice of cream separation, the pasteurization and handling of dairy products under commercial conditions, composition and flavor control of butter, and the management and operation of creameries. Lab. fee $2.25 per lab. cr. Mr. Jackson, Mr. Thomsen.

3. **Cheese-Making.** I; 4 cr. A combined lecture and laboratory course to study the manufacture of cheese. Several types of cheese will be made by the students in the laboratory to acquaint them with commercial practices and to illustrate the importance of certain physical, chemical, and biological factors which influence curd-making and cheese-ripening. Lab. fee $4.50. Mr. Price.

4. **City Milk Supply and Ice Cream Making.** I; 3 cr. The commercial handling of market milk and preparations. Milk ordinances and board of health regulation of milk supplies. Theory and practice of ice cream making. Lab. fee $4.50. Mr. Sommer.

5. **Dairy Mechanics.** II; 3 cr. Dairy plant construction, heating, ventilation, sewage disposal, refrigeration, installation and operation of dairy machinery. Lab. fee $2.25. Mr. Thomsen.

100. **Thesis.** Yr; 2 cr. Lab. fee $2.25 per lab. cr. Staff.

102. **Dairy Practice.** Yr; 1–4 cr. One credit for each 48 hours of work. Lab. fee $2.25 per lab. cr. Mr. Jackson.

121. **Advanced Dairy Manufacturing Problems.** Yr; 1–3 cr. Problems relating to dairy manufacturing. Lab. fee $2.25 per lab. cr. Staff.

123. **Seminary.** Yr; 1 cr. For advanced and graduate students. Mr. Sommer and staff.

124. **Physical Chemistry of Dairy Products.** II; 3 cr. Physical chemistry of dairy products, laboratory exercises on hydrogen ion concentration, oxidation-reduction potentials, surface tension, absorption, viscosity and plasticity, isoelectric point of proteins, colloidal properties of milk constituents. Offered 1929–30 and in alternate years. Lab. fee $4.50. Mr. Sommer.

200. **Research.** Yr; *cr. Experimental study of problems in dairy manufacturing. Lab. fee $2.25 per lab. cr. Staff.
ECONOMIC ENTOMOLOGY

HARLEY FROST WILSON, M.S., Professor of Economic Entomology, Chairman
CHARLES LEWIS FLUKE, Jr., Ph.D., Associate Professor of Economic Ento-

mology

ALEXANDER ANASTACIEVITCH GRANOVSKY, M.S., Assistant Professor of Eco-

nomic Entomology

GEORGE EUGENE MARVIN, M.S., Instructor in Economic Entomology

CLEMENT HALL GRIFFITH, B.S., Instructor in Economic Entomology

Students majoring in economic entomology and desiring to be trained in entomological or beekeeping research for the positions offered by the state agricultural experiment stations and the government service, should follow Curriculum B. Those preparing for entomological chemical work, especially with insecticides, should elect more work in chemistry and physics. Students pursuing specialized lines, such as biological control of insects, insect physiology, and insects in relation to plant diseases, should elect more work in plant pathology, botany, and physiology.

Those interested in the opportunities in the field of entomology and beekeeping should write to the Department of Economic Entomology for a special circular of information.

1. FARM INSECTS. II; 3 cr. A study of the insect groups, especially those in relation to the farm and home. Each student makes a collection of at least one hundred specimens, which he classifies. Optional subject for all agricultural students. Lab. fee $4.50. Mr. Fluke.

2. ELEMENTARY ECONOMIC ENTOMOLOGY. I; 3 cr. The fundamental principles of entomology are stressed, giving the student a foundation in the subject which prepares him for advanced studies of insects. Lab. fee $4.50. Mr. Fluke.

10. ELEMENTARY BEEKEEPING. I; 2 cr. Elementary principles of beekeeping with lectures and practical laboratory work. A general survey of the subject is taken up, with the fall and winter care in the apiary being stressed. Lab. fee $2.25. Mr. Marvin.

100. THESIS. Yr; 2 cr. Lab. fee $2.25 per lab. cr. Mr. Wilson and staff.

103. ORCHARD INSECTS. II; 2 cr. A laboratory study of the life histories and controls of the principal insect pests of the orchard and bush fruits. Prerequisite: Economic Entomology 1 or 2, or Zoology 3. Offered 1930–31 and in alternate years. Lab. fee $2.25. Mr. Fluke.

105. FIELD CROP AND GARDEN INSECTS. II; 2 cr. A laboratory study of the principal insect pests of field, garden, and truck crops; their life histories and controls. Prerequisite: Economic Entomology 1 or 2, Zoology 3. Offered 1929–30 and in alternate years. Lab. fee $2.25. Mr. Granovsky.

110. COMMERCIAL HONEY PRODUCTION. II; 2 cr. Lectures and laboratory periods dealing with the yearly management of the apiary for intensified honey production, building up in the spring, swarm control, supering for the honey flow, and care of bees in the fall and winter. Lab. fee $4.50. Mr. Marvin.

120. TAXONOMY AND TOPICAL WORK. I, II; *cr. a. Biological relations of insects; physiology of insects. b. Methods in entomology and insect photography. c. Taxonomy of insects. Prerequisite: Economic
Entomology 1 or 2. Lab. fee $2.25 per lab. cr. Mr. Wilson, Mr. Fluke, Mr. Granovsky.

125. **Insects in Relation to Plant Diseases.** I; 2 cr. A study of the principal insect carriers and their habits; types of insect injuries affecting health of plants; modes of insect transmission and dissemination of plant diseases; and the methods of rearing and handling the carriers. Arranged to meet the needs of students in entomology, plant pathology, horticulture, and agronomy. Prerequisite: A course in entomology and plant pathology or consent of instructor. Lab. fee $2.25. Mr. Granovsky.

130. **Seminary.** I, II; 1 cr. For advanced and graduate students. Mr. Wilson.

200. **Research.** Yr; *cr. Lab. fee $2.25 per lab. cr. Mr. Wilson and staff.

**GENETICS**

LEON JACOB COLE, Ph.D., Professor of Genetics, Chairman
ROYAL ALEXANDER BRINK, D.Sc., Associate Professor of Genetics

The following courses are designed for those who desire a general knowledge of the subjects of heredity and breeding, or who contemplate following these lines, either from the theoretical or practical point of view. Special opportunity is offered those doing advanced work to get practical experience in the methods of experimental breeding.

100. **Thesis.** Yr; 2 cr. Lab. fee $2.25 per lab. cr. Mr. Cole, Mr. Brink.

101. **Principles of Breeding.** I; 3 cr. Elementary principles of heredity in their application to plant and animal breeding. Additional prescribed reading and written reports for graduate credit. Prerequisite: A course in biology. Mr. Cole.

102. **Elementary Laboratory.** I; 1–2 cr. Breeding experiments illustrating the principles of heredity. Prerequisite: Genetics 101 or concurrent registration. Lab. fee $2.25 per lab. cr. Mr. Brink and staff.

104. **Plant Genetics.** I; 3 cr. Variation and inheritance in plants, including genetics of sterility and disease resistance, and principles of plant improvement. Prerequisite: Genetics 101 or equivalent in zoology or botany. Mr. Brink.

105. **Animal Genetics.** II; 2 cr. Inheritance of economic characters in domesticated animals; study of animal breeding methods; evaluation and analysis of pedigrees; application of genetics to the problems of livestock production. Prerequisite: Same as for Genetics 104. Mr. Cole.

106. **Biometric Methods.** II; 2 cr. Lectures and laboratory work in calculation of statistical measures of variability and correlation and their practical application. Determination and usage of probable errors of such measures and for Mendelian data. Prerequisite: Same as for Genetics 104. Lab. fee $4.50. Mr. Brink.

120. **Seminary.** Yr; 1 cr. Consent of instructor required before election. Mr. Cole.
121. TOPICAL WORK. Yr; *cr. Either (a) assigned topics in laboratory or field work with reading, conference, and report, or (b) practice work, including practical experience in the various lines of research carried on in the department; problems, technique, and methods of record keeping. For those not prepared to elect Course 200. May be taken in connection with, or subsequent to, Genetics 101; consent of instructor required. Lab. fee $2.25 per lab. cr. Mr. Cole, Mr. Brink.

200. RESEARCH. Yr; *cr. For students qualified by preliminary training. Work may be based on the analysis of available data, or upon new data acquired by experiment. The summer season offers exceptional opportunity for breeding work with both animals and plants. Opportunity is offered to a limited number of properly qualified students for research under direction during the summer. Such work may extend through the whole season and is applicable toward advanced degrees. Lab. fee $2.25 per lab. cr. Mr. Cole, Mr. Brink.

HORTICULTURE

JAMES GARFIELD MOORE, M.S., Professor of Horticulture, Chairman
JAMES JOHNSON, Ph.D., Professor of Horticulture
JAMES GARFIELD MILWARD, M.S., Professor of Horticulture
RAY HARLAND ROBERTS, Ph.D., Professor of Horticulture
FRANZ AUGUST AUST, M.S., M.L.D., Associate Professor of Horticulture
JOHN WILLIAM BRANN, M.S., Assistant Professor of Horticulture and Plant Pathology
CONRAD LOUIS KUEHNER, B.S., Assistant Professor of Horticulture
EARL FREDERICK BURK, M.S., Instructor in Horticulture
GEORGE WILLIAM LONGENECKER, B.S., Instructor in Horticulture
WILLIAM BUTLER OGDEN, B.S., Instructor in Horticulture

The courses offered in horticulture permit of the student specializing in fruit growing, landscape design, or vegetable production. The choice of electives taken in other departments to supplement horticultural courses will be determined by the specialization and the particular phase of the work the student expects to enter. Courses 1, 2, 5, 6, and 7 should be of particular interest to students specializing in other departments who are fitting themselves to be county agents, teachers in vocational or high schools, or farm managers or operators.

Majors in general horticulture may count a maximum of five credits towards the major requirement by electing Economic Entomology 1 and Plant Pathology 5. Students specializing in landscape gardening may count toward the major five credits in the above mentioned courses or in the following: Agricultural Economics 25, Applied Arts 52, 62, and Topographic Engineering 108. Such students are also referred to courses in city planning, offered by the College of Engineering; see page 280.

1. PRINCIPLES OF FRUIT GROWING. I; 3 cr. The principles of fruit growing and their application to our common tree fruits. Optional subject for all agricultural students. Lab. fee $2.25. Mr. Moore.

2. ADVANCED FRUIT GROWING. Yr; 2 cr. Lecture and laboratory work dealing with orchard practice, pruning, spraying, cultivation, harvesting, storing, and marketing fruits. Prerequisite: Hort. 1 or consent of instructor. Lab. fee $2.25. Mr. Roberts.
3. **Vegetable Gardening.** II; 3 cr. Principles and practices involved in the growing of vegetables. Practical work in the gardens; hotbed construction and manipulation. Lectures and laboratory. Optional subject for all agricultural students. Lab. fee $4.50. Mr. Moore.

4. **Vegetable Forcing.** I; 3 cr. Principles involved in growing vegetables under glass with practical work in the forcing house. Forcing house construction and heating. Offered 1928-29 and in alternate years. Lab. fee $4.50. Mr. Moore.

5. **Small Fruit Culture.** I; 2 cr. Principles and practices of the successful culture of cane, bush, and other small fruits. Mr. Moore.

6. **Landscape Gardening.** I; 3 cr. Discussion of the principles of landscape art. Field and laboratory work in the study of decorative plants and making of planting plans. A trip to some nursery will be taken for the purpose of studying plant materials and nursery practice. Lab. fee $4.50. Mr. Aust, Mr. Longenecker.


11. **Potatoes and Truck Crops.** I; 2 cr. Lectures and laboratory work on the methods of growing and improving potatoes, including variety, identification, and disease control. Also a general consideration of the more important truck crops, as cabbage, onions, celery. Lab. fee $2.25. Mr. Milward, Mr. Brann, Mr. Burk.

100. **Thesis.** Yr; 2 or more cr. Research work on horticultural subjects. Fees depend upon character of thesis work. Lab. fee $2.25 per lab. cr. Mr. Aust, Mr. Johnson, Mr. Moore, Mr. Roberts.

110. **Seminary.** Yr; 1 cr. For advanced and graduate students. Mr. Roberts, Mr. Aust.

**LANDSCAPE ART**

An interesting field of work is found in landscape gardening.
121. HORTICULTURAL PROBLEMS. Yr; 1–5 cr. The student is assigned a special problem in the phase of horticulture in which he is particularly interested: (a) fruit-growing, Mr. Roberts, Mr. Moore; (b) gardening and floriculture, Mr. Moore; (c) landscape design, Mr. Aust; (d) plant materials, Mr. Aust; (e) landscape construction, Mr. Aust. Prerequisite: Consent of the instructor. Lab. fee $2.25 per lab. cr.

122. SYSTEMATIC POMOLOGY. I; 3 cr. Classification, identification, judging and distribution of our common fruits. Prerequisite: Consent of instructor. Offered 1929–30 and in alternate years. Lab. fee $4.50. Mr. Moore.

125. ADVANCED LANDSCAPE GARDENING. II; 2 to 5 cr. Continuation of Horticulture 6. Advanced work in landscape design and drafting. A trip is taken to Lake Geneva for the purpose of studying different landscape treatments. Prerequisite: Hort. 6. Lab. fee $4.50. Mr. Aust, Mr. Longenecker.

126. RURAL IMPROVEMENT. I; 2–3 cr. A discussion of farmstead, community center, and regional planning and their relation to rural conditions. Lectures, assigned readings, reports. Prerequisite: Economics 1a. Mr. Aust.

LIBRARY

CLARENCE SCOTT HEAN, B.A., Librarian

1. LIBRARY PRACTICE. I; 1 cr. The classification and arrangement of books, filing of bulletins, use of card catalogs, periodical indexes, abstract journals, public documents, standard reference works, including handbooks in the various fields of knowledge, and the compiling of bibliographies. Mr. Hean.

PLANT PATHOLOGY

GEORGE WANNAMAKER KEITT, Ph.D., Professor of Plant Pathology, Chairman

JAMES GEERE DICKSON, Ph.D., Professor of Plant Pathology

BENJAMIN MINGE DUGGAR, Ph.D., Professor of Botany and Plant Pathology

EDWARD MARTINIUS GILBERT, Ph.D., Professor of Botany and Plant Pathology

LEWIS RALPH JONES, Ph.D., Sc.D., Professor of Plant Pathology

RICHARD ENGLISH VAUGHAN, M.S., Professor of Plant Pathology

JOHN CHARLES WALKER, Ph.D., Professor of Plant Pathology

ALBERT JOYCE RIKER, Ph.D., Associate Professor of Plant Pathology

JOHN WILLIAM BRANN, M.S., Assistant Professor of Horticulture and Plant Pathology

JOHN JEFFERSON DAVIS, B.S., M.D., Curator of the Herbarium

CLARICE AUDREY RICHARDS, Ph.D., Lecturer in Forest Products

Courses 104, 149, 220, 221, and 252 are offered in the Department of Botany, College of Letters and Science.

5. CROP DISEASES AND THEIR CONTROL. I; 2 cr. Lectures and demonstrations dealing with the occurrence, symptoms, and control of the
more important diseases of the commonly cultivated crops. Lab. fee $2.25. Mr. Vaughan and staff.

100. **Thesis.** Yr; 2 cr. Investigation of some problem in plant pathology. Subject should be chosen early, preferably the preceding spring, in order to take advantage of the summer session to secure material. Lab. fee $2.25 per lab. cr. Mr. Jones and staff.

101. **Diseases of Plants.** I; 3 cr. The nature, causes, and remedies of the diseases of economic plants, including field and laboratory studies of a typical series of examples. Prerequisite: Botany 1 and Agr. Bact. 1. Lab. fee $4.50. Mr. Walker, Mr. Gilbert.

102. **Methods in Plant Pathology.** I; 3 cr. Isolation of parasites, technique of cultural methods, spore germination, and infection. Prerequisite: Plant Path. 101. Lab. fee $4.50. Mr. Keitt and staff.

104. **Morphology of Fungi.** I; 3 cr. Prerequisite: Botany 1. Lab. fee $3.50. Mr. Gilbert.

**Studying Plant Diseases**

Farmers lose thousands of dollars each year through plant disease. Most plant diseases can be controlled or prevented.

116. **Diseases of Field Crops.** II; 2 cr. Arranged to meet the needs of students in plant pathology and agronomy. Prerequisite: Plant Path. 101. Offered 1929–30 and in alternate years. Lab. fee $2.25. Mr. Dickson.

117. **Diseases of Orchard Fruits.** II; 2 cr. A study of the more important diseases of deciduous orchard fruits. Prerequisite: Plant Path. 101. Offered 1929–30 and in alternate years. Lab. fee $2.25. Mr. Keitt.

120. **Diseases of Vegetable Crops. II; 2 cr.** A study of the more important field and storage diseases of vegetable crops. Prerequisite: Plant Path. 101. Offered 1930–31 and in alternate years. Lab. fee $2.25. Mr. Walker.

122. **Fungicides in Relation to Host and Parasite. II; 1 cr.** Advanced course, primarily intended for students specializing in plant pathology and horticulture. Prerequisite: Plant Path. 101. Offered 1930–31 and in alternate years. Mr. Keitt.

149. **Special Physiology of Pathogenic Fungi. II; 2 cr.** Prerequisite: Botany 146. Mr. Duggar.

200. **Research. Yr; *cr.** Lab. fee $2.25 per lab. cr. Staff.

220. **Advanced Mycology. Yr; 2 cr.** Prerequisite: Botany 104. Lab. fee $2.00 per semester. Mr. Gilbert.

221. **Classification of Parasitic Fungi. Yr; 1 cr.** Prerequisite: Botany 104 or Plant Path. 101. Mr. Davis.

223. **Seminarty in Plant Pathology. Yr; 1 cr.** For advanced and graduate students. Mr. Jones and staff.

252. **Cytology of Fungi. II; *cr.** Prerequisite: At least one semester of general cytology. Lab. fee $2.00 per cr. Mr. Gilbert.

### Poultry Husbandry

**James Garfield Halpin, B.S., Professor of Poultry Husbandry, Chairman**

**John Barry Hayes, B.S., Associate Professor of Poultry Husbandry**

**Clayton Ernest Holmes, B.S., Instructor in Poultry Husbandry**

**Gerald Everett Annin, B.S., Instructor in Poultry Husbandry**

Students majoring in poultry husbandry may prepare for commercial poultry farming, for one of the various lines of commercial work with which poultry husbandry is related, or for educational work in extension, instruction, or research. Poultry majors should supplement their training by electing such courses as Animal Husbandry 126, Agr. Chem. 1 and 2, Agr. Econ. 127 and 128, and Genetics 101. Students preparing for educational work along the more scientific lines should elect Chemistry 20 or 120, Agr. Chem. 122, Zoology 103 and 105. Opportunities are provided for students majoring in poultry husbandry to become familiar with methods of poultry management by working at the university poultry plant, local hatcheries, etc. Not to exceed five credits from the following courses may be counted as a portion of the major requirement in poultry husbandry: Veterinary Science 125, Diseases of Poultry; Animal Husbandry 126, Livestock feeding; Agr. Chem. 122, Animal chemistry; Agr. Econ. 127, Cooperative Marketing; Agr. Econ. 128, Marketing farm products; and Genetics 105, Animal genetics.

1. **Poultry Raising. I; 3 cr.** A general survey course designed to give the student an understanding of the various problems concerned in poultry raising. Emphasis is given to the study of the various breeds and varieties, breeding and selection for egg production, and the housing of laying hens for egg production. Optional subject for all agricultural students. Lab. fee $2.25. Mr. Halpin, Mr. Holmes.
2. **POULTRY FEEDING.** II; 2 cr. A study of the feeding, breeding, and management of poultry. Mr. Holmes.

5. **ARTIFICIAL INCUBATION AND BROODING.** II; 1–3 cr. Designed to give poultry majors and other students interested in poultry a thorough understanding of the factors influencing the hatchability of eggs; a practical study of chick embryology; practical problems in the operation of incubators and brooders. Prerequisite: Poultry Husbandry 2 or concurrent registration. Lab. fee $2.25 per lab. cr. Mr. Holmes.

8. **MARKETING POULTRY PRODUCTS.** I; 2 cr. A consideration of those factors tending to produce quality in market poultry. Laboratory practice in fattening, dressing, grading, and packing various classes of market poultry; a consideration of those factors tending to produce quality in market eggs. Laboratory practice in candling, grading and packing market eggs; methods of marketing poultry products. Prerequisite: Poultry Husbandry 1. Lab. fee $2.25. Mr. Holmes.

100. **THESIS.** Yr; 2 cr. Mr. Halpin, Mr. Holmes.

106. **POULTRY JUDGING.** I; 3 cr. Origin, history, and points of excellence of the various breeds and varieties of poultry as described in the American Standard of Perfection. A study of the inheritance of common characters in poultry. Prerequisite: Poultry Husbandry 1 or Genetics 101. Lab. fee $2.25. Mr. Halpin.

107. **ADVANCED POULTRY MANAGEMENT.** II; 3 cr. Influence of recent investigations in poultry husbandry as they affect modern methods of feeding, housing, breeding, care and management of poultry. Special emphasis on rations and practices where poultry is kept on a large scale. Prerequisites: Poultry Husbandry 1 and 2 or Animal Husbandry 126. Mr. Halpin.

200. **RESEARCH PROBLEMS.** Yr; *cr. Lab. fee $2.25 per lab. cr. Mr. Halpin, Mr. Holmes.

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**STUDENT JUDGES AT THE INTERNATIONAL**

Each year a group of our students take part in the collegiate judging contest at Chicago.
SOILS

Andrew Robinson Whitson, B.S., Professor of Soils, Chairman
Fred Ludwig Mussbach, B.S., Professor of Soils
Emil Truog, M.S., Professor of Soils
Clinton Joseph Chapman, B.S., Associate Professor of Soils
Edward John Graul, M.S., Associate Professor of Soils
Otto Reinhardt Zeasman, B.S., Associate Professor of Soils and Agricultural Engineering
Arthur Robert Albert, B.S., Assistant Professor of Soils
Harold Haight Hull, M.S., Instructor in Soils

Soils 1 is prerequisite to all other courses in soils. Soils 122 may be elected by middle course sophomores. Soils 1 and 120 are general in character and are adapted to the needs of all students of agriculture. Advanced students specializing in this subject are advised to elect courses in chemistry, soils bacteriology, plant physiology, agronomy, or geology, according to their special needs, during their senior and graduate years. The summer period is particularly suited to advanced work in soil fertility; for courses offered see summer session bulletin.

General Major. Students majoring in soils and preparing for practical farming, positions as farm manager, teacher of agriculture, or county agricultural agent, should follow Curriculum B, taking Physics 61, 5 cr., Botany 146, 4 cr., and science or mathematics, 5 cr.; and select the courses in soils in the following order: For the sophomore year, 1, 5 cr.; 122, 3 cr.; for the junior year, 120, 2 cr.; for the senior year, 127, 2 cr.; 128, 2 cr.; and thesis, 4 cr., or 121, 4 cr. In addition to these suggestions, students are urged to elect courses in the Departments of Agronomy, Botany, Agricultural Economics, Agricultural Engineering, Animal Husbandry, Bacteriology, and Geology to supplement the required work in soils. General majors desiring to teach should consult the chairman of the Department of Agricultural Education concerning requirements not later than the beginning of the junior year.

Technical Major. Students desiring to prepare for the work of soil surveying, land classification, or field experimentation should follow the general suggestions given above for the general major, but choose supplementary electives from the following group: Agr. Engr. 5, 102; Agronomy 102, 106, 120; Botany 109; Chemistry 11 or 12; Geology 1, 11; Soils 121.

Students preparing to become soil chemists should take Curriculum B with Soils 1, 5 cr., and Soils 122, 3 cr., in the sophomore year Soils 127, 2 cr., and Soils 121, 4 cr., in the junior year; and Soils 120, 2 cr., Soils 125, 3 cr., Soils 100, 4 cr., and Soils 128, 2 cr. in the senior year. In addition, Chemistry 12, 3 cr., Zoology 3, 3 cr., Geology 2, 3 cr., Agronomy 106, 3 cr., should be elected in the sophomore year; Chemistry 120, 3 or 5 cr., and a language in the junior year; and Agr. Bact. 123, 4 cr., Chemistry 130, 5 cr., Agronomy 102, 2 cr., in the senior year.

Students are urged to consult a member of the department not later than the second semester of their sophomore year so that a logical sequence of courses may be arranged. Agr. Bact. 123, Soils bacteriology, will be considered as a part of the major.

1. Principles of Soil Fertility. I; 5 cr. Discussions and laboratory work on the formation, composition, tillth, and fertility of soils in relation to the growth of plants. Prerequisite: Chemistry 1b or concurrent registration. Lab. fee $4.50. Mr. Graul and staff.
100. **THESIS.** Yr; 2 cr. Lab. fee $2.25 per lab. cr. Mr. Whitson and staff.

120. **SOIL MANAGEMENT.** I; 2 cr. Lectures and field work, maintenance of fertility, including principles of fertilizer practice, and adaptation of system of agriculture to type of soil and climate. Prerequisite: Soils 1. Mr. Whitson.

121. **SOIL ANALYSIS.** II; 4 cr. Lectures and laboratory. Soil acidity methods, limestone analysis, determination of essential elements, availability methods, complete soil analysis. The use of chemical analysis in soil diagnosis. Prerequisites: Soils 1, Chemistry 12. Lab. fee $4.50. Mr. Truog.

122. **SOIL PHYSICS AND TILLAGE.** II; 2-3 cr. Lectures and laboratory. The physical properties of the soil constituents, tillth, soil moisture, heat, in relation to the growth of plants, with practical applications to farm practice. Prerequisite: Soils 1. Lab. fee $2.25 per lab. cr. Mr. Graul.

125. **AGRICULTURAL CLIMATOLOGY; SOIL AND LAND CLASSIFICATION.** II; 3 cr. Lectures and field work in soil mapping. The principles of climatology and soil and land classification in relation to agriculture, including a study of the soils and climate of the United States and of the chief foreign countries. Prerequisite: Soils 1 or graduate standing. Mr. Whitson.

127. **SOIL SCIENCE AND PLANT NUTRITION.** I; 2 cr. Lectures and discussions. The constitution of the soil, especially as a medium for plant growth. The newer applications of scientific principles to such problems as soil acidity, use of fertilizers, soil amendments, and toxic agents. Prerequisite: Soils 1 or graduate standing. Mr. Truog.

128. **SEMINARY IN SOILS.** I, II; 1 cr. Mr. Whitson, Mr. Truog.

180. **TOPICAL WORK.** Yr; *cr. Mr. Whitson, Mr. Truog, Mr. Graul.

200. **RESEARCH.** I, II; *cr. Lab. fee $2.25 per lab. cr. Mr. Whitson, Mr. Truog, Mr. Graul.

228. **FIELD COURSE.** Yr; 2-4 cr. Soil and crop rotation problems, soil acidity and legumes, farm soil survey, factors determining fertility balance sheet, planning and use of experimental and demonstrational fertilizer plots. Prerequisite: Soils 1. Mr. Whitson, Mr. Musbach, Mr. Albert.

**VETERINARY SCIENCE**

**FREDERICK BROWN HADLEY, D.V.M., Professor of Veterinary Science, Chairman**

**ALEXANDER SEPTIMUS ALEXANDER, F.H.A.S., M.D.C., Professor of Veterinary Science**

**BURR ABRAHAM BEACH, D.V.M., Associate Professor of Veterinary Science**

**CHARLES ROY STRANGE, D.V.M., Instructor in Veterinary Science**

The courses described below have been planned to give the students an appreciation of the various branches of veterinary science. They are taught largely by the laboratory method. Besides giving information needed for
the intelligent care and management of sick animals, they aid advanced students to secure a knowledge of animal breeding, animal pathology, and veterinary bacteriology.

1. THE ANIMAL BODY. I; 3 cr. The structure, functions, and derived products of the animal body. The student learns about the form, capacity and productivity of farm animals as well as the fundamentals relative to their feeding and breeding. Optional subject for all agricultural students. Lab. fee $4.50. Mr. Hadley.

2. DISEASES OF HORSES AND SWINE. II; 2 cr. Their causes, symptoms, prevention and treatment, including conformation and soundness. Mr. Hadley.

3. DISEASES OF CATTLE AND SHEEP. I; 2 cr. Their causes, symptoms, prevention, and treatment. Mr. Hadley, Mr. Alexander.

100. THESIS. Yr; 2 cr. Mr. Hadley, Mr. Beach.

124. TOPICAL WORK. Yr; *cr. Assigned work for advanced students. Mr. Hadley and staff.

LABORATORY WORK IN VETERINARY SCIENCE
These students are learning how the animal body is constructed and works.

125. DISEASES OF POULTRY. II; 2 cr. A study of the more common diseases of poultry. Prerequisite: Vet. Science 1 or Poultry Husb. 1. Offered 1929–30 and in alternate years. Mr. Beach.

126. INFECTION AND IMMUNITY. II; 3 cr. An experimental study of the principles of infection and immunity. Prerequisite: A course in bacteriology. Offered 1930–31 and in alternate years. Lab. fee $4.50. Mr. Hadley and staff.

200. RESEARCH. Yr; 2 cr. Lab. fee $2.25 per lab. cr. Mr. Hadley, Mr. Beach.