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COLLEGE OF AGRICULTURE

ANNOUNCEMENT OF THE
DEPARTMENT OF FORESTRY
1912-13

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CALENDAR

First Term, 1912-13

Sept. 13,	Friday,	University entrance examinations begin.
Sept. 23,	Monday,	Academic year begins. Registration of new students.
		All special students in the College of Agriculture must first present themselves at the Office of the Secretary, Main Building 122, unless permission to register has previously been sent to them by the Registrar.
Sept. 24,	Tuesday,	Registration of new students.
Sept. 25,	Wednesday,	Registration of old students.
Sept. 26,	Thursday,	Instruction begins. President's annual address to new students, 12 m.
Sept. 28,	Saturday,	Registration, Graduate School.
Oct. 15,	Tuesday,	Last day for payment of tuition.
Nov. 19,	Tuesday,	Registration for the Winter Courses, beginning at 8 a. m. at the Office of the Secretary.
Nov. 20,	Wednesday,	Instruction begins in the Winter Courses.
Nov.	Thursday-Friday,	Thanksgiving Recess.
Dec. 21,	Saturday,	Instruction ends in regular and special work. Christmas Recess.
Jan. 6,	Monday,	Instruction resumed.
Jan. 11,	Saturday,	Founder's Day. Holiday.
Jan. 27,	Monday,	Term examinations begin.

Second Term, 1912-13

Feb. 8,	Saturday,	Registration, undergraduates.
Feb. 10,	Monday,	Registration, Graduate School.
Feb. 10,	Monday,	Instruction begins.
Feb. 12,	(week of),	Farmers' Week.
Feb. 14,	Friday,	Instruction ends in the Winter Courses.
Feb. 28,	Friday,	Last day for payment of tuition.
April 3,	Thursday,	Instruction ends. Spring Recess.
April 10,	Thursday,	Instruction resumed.
May 24,	Saturday,	Navy Day.
June 4,	Wednesday,	Term examinations begin.
June 18,	Wednesday,	Forty-fifth Annual Commencement.

First Term, 1913-14

Sept. 12,	Friday,	Entrance examinations begin.
Sept. 22-23,	Monday-Tuesday,	Registration of new students.
Sept. 24,	Wednesday,	Registration of old students.
Sept. 25,	Thursday,	Instruction begins.

THE DEPARTMENT OF FORESTRY

FACULTY

Jacob Gould Schurman, A.M., D.Sc., LL.D., President of the University.
[Absent on leave.]

Thomas Frederick Crane, A.B., A.M., Ph.D., Litt.D., Acting President of the University, Professor of the Romance Languages and Literatures, Emeritus.

Ernest George Merritt, M.E., Dean of the Graduate School.

Liberty Hyde Bailey, M.S., LL.D., Director of the College of Agriculture and Dean of the Faculty.

David Fletcher Hoy, M.S., Registrar of the University.

Albert Russell Mann, B.S.A., Secretary to the College of Agriculture.

Walter Mulford, B.S.A., F.E., Professor of Forestry.

Samuel Newton Spring, B.A., M.F., Professor of Forestry.

Arthur B. Recknagel, B.A., M.F., Professor of Forestry.

John Bentley, jr., B.S., M.F., Assistant Professor of Forestry.

Students in the Department of Forestry receive instruction also from a corps of professors and instructors in the Colleges of Agriculture, Arts and Sciences, and Civil Engineering.

WORK OF THE DEPARTMENT

The Department of Forestry is a department of the New York State College of Agriculture, a college of Cornell University.

The Department of Forestry has three principal aims: to give instruction at the University; to conduct research; and to give direct help to the owners of forest lands in New York State.

The instruction in forestry at the University is designed to meet the needs of several classes of students: (1) students of general agriculture who wish elementary instruction in the care of woodlands and in forest planting and forest nursery work; (2) prospective teachers, business men, lawyers, and others who desire an understanding of the place of forestry in the housekeeping of a nation; (3) technical students in other lines who wish one or more technical forestry courses, for example, wood technology; (4) professional forestry students.

Research work is conducted under the general supervision of the Department of Forestry.

An important part of the Department's work is its effort to be of direct help to the owners of forest lands in New York State. This is accomplished by correspondence, publications, lectures, and personal inspection of woodland or of land to be planted.

GENERAL INSTRUCTION IN FORESTRY

For students who wish general instruction in forestry, but do not wish to take the professional course in forestry, courses 1, 2, 3, and 6 (see page 12) are recommended. The other courses in the Department are also open to such students, if they have the necessary prerequisites.

PROFESSIONAL COURSE IN FORESTRY

Aims

The professional forestry course is designed to prepare students for a professional career in general forestry, and also to provide opportunity for advanced study and research in silviculture, forest management, forest mensuration, forest entomology, forest pathology, and other lines in which specialists will be useful. The professional forestry course is also suitable as a means of general education.

Degrees and Length of Course

The full course requires five years and leads to the degree of Bachelor of Science at the end of the fourth year, and to the degree of Master in Forestry at the end of the fifth year. Students who enter as graduates without having had undergraduate instruction in forestry should be able to complete the work for the Master's degree in two years, if they have had substantially the equivalent of most of the courses, other than forestry, listed in the sequence of courses on pages 9-10. If they lack much of the fundamental science work there listed, it will require a correspondingly longer time to get the Master's degree. Work for the degree of Doctor of Philosophy may also be done in the Department of Forestry.

Admission and Classification

The following four classes of students are admitted to the work of the Department of Forestry of the New York State College of Agriculture:

1. Persons that desire to begin, as freshmen, the regular undergraduate course leading to the degree of Bachelor of Science.
2. Persons that have already attended some college or university and desire to enter with advanced standing.
3. Graduate students that are candidates for the degree of Master in Forestry.
4. Graduate students that are not candidates for a degree.

1. **Admission to Freshman Class.** An undergraduate student registers in the College of Agriculture and is a candidate for the degree of Bachelor of Science. An applicant for admission as a freshman to the Department of Forestry of the New York State College of Agriculture, must offer fifteen units arranged as follows: English (3), history (1), elementary algebra (1), plane geometry (1), solid geometry ($\frac{1}{2}$), plane trigonometry ($\frac{1}{2}$), a foreign language (3), elective (5).

The required and elective subjects that may be offered for admission are named in the following list; the figure in parenthesis following each subject indicates its value in units and shows the maximum and minimum amount of credit allowed in the subject. A unit represents five prepared recitations a week for one year in a study.

1a. English A	(2)	8a. Ancient History	($\frac{1}{2}$ -1)
1b. English B	(1)	8b. Modern History	($\frac{1}{2}$ -1)
2a. First Year Greek	(1)	8c. Am. History and Civics ...	($\frac{1}{2}$ -1)
2b. Second Year Greek	(1)	8d. English History	($\frac{1}{2}$ -1)

2c. Third Year Greek	(I)	9a. Elementary Algebra.....	(I)
3a. First Year Latin	(I)	9b. Intermediate Algebra	(½)
3b. Second Year Latin	(I)	9c. Advanced Algebra	(½)
3c. Third Year Latin	(I)	9d. Plane Geometry	(I)
3d. Fourth Year Latin	(I)	9e. Solid Geometry.....	(½)
4a. First Year German	(I)	9f. Plane Trigonometry.....	(½)
4b. Second Year German.....	(I)	9g. Spher. Trigonometry	(½)
4c. Third Year German	(I)	10. Physics	(I)
5a. First Year French	(I)	11. Chemistry	(I)
5b. Second Year French	(I)	12. Physical Geography.....	(I)
5c. Third Year French.....	(I)	13. Biology*	(I)
6a. First Year Spanish.....	(I)	14. Botany*	(½-I)
6b. Second Year Spanish	(I)	15. Zoology*	(½-I)
6c. Third Year Spanish	(I)	16. Agriculture	(½-I)
7a. First Year Italian.....	(I)	17. Drawing	(½-I)
7b. Second Year Italian	(I)	18. Manual Training	(I)
7c. Third Year Italian.....	(I)		

Applicants must present certificates of good moral character. Students are admitted on examination, or on presenting credentials of the Department of Education of the State of New York, or on acceptable school certificates.

Candidates for admission must file their credentials and obtain permits for examination at the University Registrar's Office, Morrill 10. Results of examinations may be ascertained from the Registrar.

For other details as to subjects and methods of admission, see the General Circular of Information, which may be had on application to the Secretary, Cornell University, Ithaca, New York.

2. Admission to Advanced Standing. A student who, having already attended some college or university, desires advanced undergraduate standing, should file with the Registrar of Cornell University, on an official blank to be obtained from him, a formal application for admission to advanced standing in the College of Agriculture along with an official certificate from the college or university already attended, of his honorable dismissal, his entrance examinations in detail, his terms of attendance and the amount of work that he has completed, and a detailed statement of the courses pursued for which he desires credit at Cornell. He should send also a catalogue of the institution, writing on it his name and marking the entrance requirements that he has satisfied and each subject that he has completed.

A student admitted to the College of Agriculture from another college in Cornell University, or from any other institution of collegiate rank, will be regarded as having completed the number of terms and hours to which his records entitle him, and will receive all the privileges of students who have completed the same number of terms and hours by residence in the College. In order, however, to secure the degree of Bachelor of Science, he must have completed the subjects listed in black faced type in the recommended sequence of studies on pages 9-10, and two-thirds of his elective work must have been taken in courses allowed as

*If an applicant has counted Biology (I) he may not also offer Botany (½) or Zoology (½).

agricultural electives. He must also have been in residence in the College of Agriculture at least two consecutive terms and have completed not less than fifteen hours a term, of which two-thirds, at least, must be subjects taught by the staff of the College of Agriculture. He will not be required to take all the subjects not in black faced type on pages 9-10, the Department of Forestry arranging his course of study to suit his needs.

3. Admission as a Graduate Student, Candidate for the Degree of Master in Forestry. A graduate student registers in the Graduate School as a candidate for the degree of Master in Forestry, if the following entrance requirements have been fulfilled:

(1) The candidate's training must be accepted as substantially equivalent to the first four years of the professional forestry course given at Cornell University (see pages 9-10).

(2) The candidate must have had at least three months experience in forestry work or in a logging camp, proof of which is to be by a signed statement or an examination in woodmanship, or by both.

A student entering the Graduate School as a candidate for the degree of Master in Forestry, should not enter at the beginning of the second term. It will be impossible to arrange his work unless he enters at the beginning of the first term.

4. Admission as a Graduate Student, not a Candidate for a Degree. A student who is a graduate of an institution in which the amount of work required is substantially equivalent to that required for the first degree in one of the four-year courses at Cornell University, but who cannot meet the technical requirements listed under 3, may register in the Graduate School, but not as a candidate for a degree. Or, such a student may register in the College of Agriculture as a candidate for the degree of Bachelor of Science. In either case, as soon as the requirements listed under 3 are fulfilled, the student registers in the Graduate School as a candidate for the degree of Master in Forestry.

REQUIREMENTS FOR DEGREES

Undergraduate Work Leading to the Degree of Bachelor of Science

The requirements for the degree of Bachelor of Science shall be residence for eight terms, and, in addition to the prescribed work in the Departments of Physical Culture and of Military Science and Tactics, the completion of one hundred and twenty hours of required and elective work. The required and elective work must include all the courses listed in black faced type in the sequence of studies given below and such other courses as the Department of Forestry believes to be best adapted to meet the needs of the individual student, subject to the regulations of the College of Agriculture. The sequence of studies given below is recommended and will prove desirable for most students. It is to be understood, however, that this is not a curriculum required of all students. Deviations from it will be made for students entering the course with advanced standing, and for other students whenever advisable. In selecting the subjects to be elected, each forestry student must obtain the advice and approval of a professor or an assistant professor in the Department of Forestry, who shall be

chosen by the student at the beginning of the sophomore year. Admission to candidacy for the degree of Master in Forestry may be conditioned on compliance with this regulation. Freshmen who are planning to take the professional forestry course are urged to call at the office of the Department of Forestry at the beginning of the college year.

Graduate Work Leading to the Degree of Master in Forestry

In the fifth year the student selects one major and one minor subject and pursues either advanced study or research along those lines. Graduate students do not devote this year to undergraduate class work, although in special cases a part of the student's time may be spent in such work. The work of each candidate for an advanced degree is in charge of a committee consisting of two or more professors under whom his major and minor subjects are pursued, the professor of his major subject being the chairman. A candidate for the Master's degree must spend at least one year in residence at this University. He must present a satisfactory thesis or essay, and must pass an examination.

The course of study for students who enter as graduates but are not yet candidates for the Master's degree, will be arranged to suit the needs of each student.

Attention is called to the fact that the Departments of Entomology and Plant Pathology offer facilities for advanced study of forest insects and tree diseases. Details regarding advanced work along these and other allied lines are to be found in the Announcement of the Graduate School.

Graduate Work Leading to the Degree of Doctor of Philosophy

Candidates for the degree of Doctor of Philosophy may elect either major or minor subjects in the Department of Forestry. Details regarding work for the doctorate may be obtained on application to the Dean of the Graduate School.

RECOMMENDED SEQUENCE OF STUDIES FOR PROFESSIONAL FORESTRY STUDENTS

The subjects in black faced type are required of all students in the College of Agriculture.

Freshman year			
	Hours 1st term		Hours 2d term
English 1	4	English 1	4
Chemistry 1	6	Chemistry 85	4
Biology 1	3	Biology 1	3
The Farm 1	2	Drawing I	2
		Meteorology 1	3
Sophomore year			
Botany	5	Plant Physiology 7	4
Geology 1	3	Geology 11	3
Physics 1	4	Advanced Surveying	4
Elementary Surveying	3	Entomology 31	1
Entomology 3	3	Soil Technology 1	3
		Farm Mechanics 3	3

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Summer following sophomore year

Summer camp for six weeks, beginning in June. Topographic surveying, six hours credit.

		Junior year	
		Hours 1st term	Hours 2d term
Political Science 51	3	Political Science 51	3
Forestry 6	2	Forestry 8	2
Plant Pathology 1	3	Plant Pathology 8	2
Zoology 5	3	Zoology 5	3
Botany 10	3	Rural Economy 7	3
Forge Work S. 4	1	Entomology 30	2
Geology 15*	1	Landscape Art 2	1
Senior year			
Forestry 9	4	Forestry 10	2
Forestry 13	3	Forestry 11	5
Forestry 14	3	Forestry 15	3
Forestry 18	2	Forestry 16	3
Forestry 19	2		

The remaining work of the undergraduate years should be chosen with reference to the tastes and needs of the individual student.

Fifth Year

Forest management (Forestry 20); seminary (Forestry 22); and either advanced work (Forestry 23) or research (Forestry 24). During the six or eight weeks preceding Commencement, students taking course 23, except those who are specializing in lines not requiring the work, will be engaged in the preparation of a forest working-plan of a large forest tract in New York or Pennsylvania.

EQUIPMENT

The Department has a laboratory, classroom, and offices in the Home Economics Building. The State has appropriated \$100,000 for a forestry building, which it is expected will be ready for occupancy in the year 1913-14. The Department has charge of eight woodlots on the University farms, including stands of white pine, hardwoods, and hemlock; it has also a farm of thirty-eight acres, part of which is open land used for experimental plantations, the remainder being wooded. All these lands are within two miles of the University Campus. The Department has established experimental and demonstration plantations and a forest nursery. There is a good forestry library, including extensive files of forestry periodicals, and an ample collection of forestry instruments and lantern slides.

EXPENSES

Tuition for Undergraduate Students. Tuition is free to undergraduate students, who for a year or more immediately preceding admission, have been residents of New York State. Tuition for undergraduate students from outside New York State is as follows: for regular undergraduate students, \$100 payable in instalments of \$55 at the beginning of the first term and \$45 at the beginning of the second term.

Tuition for Graduate Students. Tuition is free to graduate students for work in the New York State College of Agriculture. For Graduate School

*New course in general lithology not given until 1913-14.

minor subjects taken outside the College of Agriculture, pro rata tuition (one-sixth for each minor) of the college in which the minors are taken, will be charged. For Graduate School minors taken in the College of Agriculture by students whose major subject is in another college, pro rata tuition (one-sixth for each minor) will be deducted. For Graduate School students not candidates for a degree, tuition will be pro rata as of the college or colleges in which the work is taken.

A graduate student taking the regular professional forestry course, will have no minors outside the College of Agriculture.

Other fees and expenses. Other fees are as follows: matriculation fee, paid when entering the University, \$5; fee for baccalaureate degree, \$10; fee for advanced degree, \$20; Infirmary fee, \$3 a term. Laboratory fees are required in various courses. The expense for textbooks, instruments, and the like, varies from \$10 to \$75 a year. The cost of living in Ithaca, including board, room, heat, and light, varies from \$5.50 to \$10 a week.

CORRESPONDENCE

Correspondence regarding entrance as a freshman and admission to advanced undergraduate standing should be addressed to The Registrar, Cornell University; requests for the General Circular of Information (containing details regarding entrance requirements and other information for prospective students) should be addressed to The Secretary, Cornell University.

Correspondence regarding admission as a graduate student, and requests for copies of the Announcement of the Graduate School, should be sent to the Dean of the Graduate School, Cornell University.

Copies of the general announcement of the College of Agriculture and of the forestry announcement may be obtained from The Secretary, College of Agriculture.

Information regarding opportunities for self-support may be obtained from the Cornell University Christian Association, and from the Secretary of the University.

Prospective forestry students who plan to enter as graduates, or as undergraduates with advanced standing, are urged to write to the Department of Forestry for general information regarding the course of study which they would need to pursue.

COURSES OF INSTRUCTION OFFERED BY THE DEPARTMENT OF FORESTRY

Courses intended primarily for students who do not expect to make forestry their major work

1. **Farm Forestry.** Either term. Two hours. Lecture, M, 9. Home Economics Building 115. Practice, M or T, 2-4.30. Home Economics Building 360. Professor MULFORD.

The management of the farm woodlot, and the starting of new woodlots by planting or sowing. A course dealing with the woodlot as deserving and repaying proper care, such as is given the other crops on the farm. Laboratory fee, \$.50.

Students expecting to take courses 2 and 3 should not elect course 1, as the ground covered in course 1 is gone over in courses 2 and 3.

2. **Elements of Forestry: Mensuration, Utilization, and Management.** First term. Three hours. Lectures, T Th, 9. Home Economics Building 115. Practice, W or Th, 2-4.30. Home Economics Building 360. Assistant Professor BENTLEY.

An elementary course including estimating and measuring the amount of standing timber and its value; measurement of logs and of other forest products; the rate of growth of timber in diameter, height, volume, and value; the best uses to which various forest products can be put; methods of logging, milling, and sale of timber; identification of common woods; age at which timber should be harvested; methods of regulating the amount of timber cut so as to insure a permanent income. (See course 3.) Laboratory fee, \$1.

3. **Elements of Forestry: Silviculture.** Second term. Three hours. Lectures, T Th, 9. Home Economics Building 115. Practice, W or Th, 2-4.30. Home Economics Building 360. Professor SPRING.

An elementary course including the life history of the forest; the influence of soil and climate on forests; the influence of forests on stream flow, climate, and soil; forest planting, sowing, and nursery work; reproducing the forest without planting or sowing; care of the crop during its growth, including thinning; protection from fire and other enemies; identification of a few of the principal timber trees of this region. Laboratory fee, \$1.

Courses 2 and 3 may be taken independently. If both courses are taken, they should meet the needs of students who wish a more detailed knowledge of timberland management than is given in course 1, but do not wish the professional courses.

Courses intended for both professional forestry students and students in other lines

6. **The Field of Forestry.** First term. Two hours. Lectures, W F, 9. Home Economics Building 115. Professor SPRING.

The place of forestry in the housekeeping of a nation; its aims and importance; national, state, communal, and private forestry enterprises; the day's work of a forester.

8. **Wood Technology.** Second term. Two hours. Lecture, M, 10. Home Economics Building 115. Practice, T, 2-4.30. Home Economics Building 360. Professor RECKNAGEL.

The structure, identification, and technical qualities of the leading kinds of timber; seasoning, preservation, and distillation of wood; paper pulp. Laboratory fee, \$1.

Courses intended primarily for professional forestry students, but open to others who wish detailed technical courses

Professional forestry students should not elect courses 1, 2, and 3, as the following required professional courses will cover the same ground in greater detail.

9. Forest Utilization. First term. Four hours. Lectures, M T W Th, 10. Home Economics Building 115. Field trip, one week (spring vacation), study of a lumbering operation in the Adirondacks or in northern Pennsylvania. Professor RECKNAGEL.

The principal uses of leading timbers; production and consumption of lumber; markets; methods of lumbering and milling; utilization of other forest products, such as naval stores, maple sugar, nuts, game, etc.

[10. Forest Engineering. Second term. Two hours. Hours to be arranged.] Not given in 1912-13.

The construction of trails, roads, telephone lines, etc.

11. Forest Mensuration. Second term. Five hours. Lectures, M W, 8. Home Economics Building 115. Practice, F, 8-1 and 2-4.30. Home Economics Building 360. Assistant Professor BENTLEY.

Measurement of logs and of standing timber; timber cruising; study of the rate of growth of timber; volume and yield tables. Laboratory fee, \$1.50.

13. Timber Trees and Forest Regions. First term. Three hours. Lectures, M W, 12. Home Economics Building 115. Practice, F, 2-4.30. Home Economics Building 360. Assistant Professor BENTLEY.

Brief account of the forest regions of the world; detailed description of the forest regions of the United States and Canada; the distribution, importance, and silvical characteristics of a large number of the leading timber trees of the United States and Canada, and the identification of such of these as do not grow near Ithaca. (The identification of trees growing near Ithaca is included in Botany 10.) Laboratory fee, \$1.

14. Silviculture: Forest Ecology. First term. Three hours. Prerequisite Botany 1 and 2 or the equivalent. Lectures, W F, 8. Home Economics Building 115. Practice, W, 2-4.30, Home Economics Building 360. Professor MULFORD.

The influence of site on the forest, and of the forest on site; the behavior of trees as members of a forest community. Laboratory fee, \$.50.

15. Silviculture: Natural Reproduction and Care of the Forest. Second term. Three hours. Prerequisite courses 13 and 14. Lectures, T Th, 8. Home Economics Building 115. Practice, Th, 2-4.30. Home Economics Building 360. Professor MULFORD.

A technical discussion of the silvicultural systems as practiced in Europe, and the possibility of using them in each of the forest regions of the United States and Canada; improvement cuttings, thinning, and underplanting; marking timber for cutting on the National Forests and elsewhere. Laboratory fee, \$.50.

16. Silviculture: Forest Planting and the Forest Nursery. Second term. Three hours. Lecture, W, 9. Home Economics Building 115. Practice, S, 8-1. Home Economics Building 360. Professor SPRING.

Collection, care, and testing of tree seeds; identification of tree seeds and seedlings; raising trees in a forest nursery; starting forests by planting trees and by direct seeding; fixation of sand dunes; forestation on the prairies and under the semiarid conditions of the Far West; great forestation enterprises of the world. Laboratory fee, \$1.50.

18. Forest Protection. First term. Two hours. Lectures, T Th, 11. Home Economics Building 115. Professor SPRING.

Protection of forests from fire, wind, and other enemies.

19. Forest Policy, Forest Law, and History of Forestry. First term. Two hours. Lectures, M W, 11. Home Economics Building 115. Professor SPRING.

The historical development and present status of the relations of state and individual to forestry; the elements of forest law.

20. Forest Management.* First term. Five hours. Open only to graduate students. Four lectures and seminary discussions, one practice period. Hours to be arranged. Home Economics Building 115. Professor RECKNAGEL.

The regulation, valuation, and administration of forest properties; forest working plans.

22. Seminary.* Throughout the year. Two hours a term. Open only to graduate students. Hours to be arranged. Home Economics Building 115. Professors MULFORD, SPRING, and RECKNAGEL, and Assistant Professor BENTLEY.

23. Advanced Work. Throughout the year. Two or more hours a term. Open to undergraduate and graduate students who have had the necessary training. Hours by appointment.

Individual advanced study of designated topics.

24. Research. Throughout the year. Three or more hours a term. Open only to graduate students who have had the necessary training.

COURSES OF INSTRUCTION GIVEN BY OTHER DEPARTMENTS AND LISTED IN THE RECOMMENDED SEQUENCE OF STUDIES

Biology and Entomology

1. General Biology. Throughout the year. Three hours a term. Lectures M W, 9. Auditorium. Practice, M, T, Th, or F, 2-4.30; T, Th, F, or S, 8-10.30; or W, 10.30-1. Main Building 302. Professor NEEDHAM, Dr. JOHANNSEN, and assistants.

This is an elementary course designed to acquaint the general student with the main ideas of biology through selected practical studies of the phenomena on which biological principles are based. Both lectures and laboratory work will deal with such topics as: the interdependence of organisms, the simpler organisms, organization and phylogeny, oogenesis and ontogeny, heredity and variation, natural selection and adaptation, segregation and mutation, the life cycle, metamorphosis and regeneration, and the responsive life of organisms. Laboratory fee, \$2.50 a term.

3. General Entomology. Throughout the year. Three hours a term. Prerequisite Biology 1 or Zoology 1. Lectures, W F, 9. Main Building 392. First term, Professor COMSTOCK; second term, Professor HERRICK. Practical exercises, Th or F, 2-4.30. First term, Professor COMSTOCK and Miss STRYKE; second term, Professor HERRICK.

First term, lectures on the characteristics of orders, suborders, and the more important families, and on the habits of representative species. The practical exercises include a study of the structure of insects and practice in their classification. The lectures only (credit two hours) are taken by those who have had courses 4 and 5.

Second term, lectures on the more important insect pests and on methods of controlling them. The practical exercises will include a study of the different stages of as many of the forms as time will permit, together with observations in the field on the habits of the pests. Laboratory fee, \$3 a term.

30. Aquiculture. Second term. Two hours. Lectures at hours to be arranged. Insectary, Biological Field Station, and Experimental Hatching Station. Assistant Professor EMBODY.

A course on the utilization of the resources of our inland waters. Laboratory fee, \$2.

*Courses 20 and 22 will not be given until 1913-14, unless more than three students apply for them in 1912-13.

31. Forest Insects. Second term. One hour. Prerequisite first term of course 3. Lecture, Th, 9. Main Building 392. Professor HERRICK.

A course of lectures dealing with insects injurious to forest and shade trees, together with a consideration of the best methods of controlling their ravages.

Botany

The course in botany required of regular students will not be offered in 1912-13.

10. Forest Botany. First term. Three hours. Prerequisite Botany I and 2 or their equivalent; designed especially for juniors in forestry. Conference, T, 12. Practice, M, 2-4.30, Th, 8.30-11. Home Economics Building 360. Mr. RANKIN and Mr. FRANCIS.

A course in the identification of trees, shrubs, etc.

Chemistry

1. Introductory Inorganic Chemistry. Lectures, recitations, and laboratory. Repeated in second term, credit six hours.

1a. Lectures. First term, T Th S, 11. Professor DENNIS and Mr. DAVIS; M W F, 11. Professor BROWNE and Mr. DAVIS. Second term, M W F, 11. Morse 1.

1b. Recitations (one hour a week to be arranged), and laboratory, M F, 2-4.30; T Th, 2-4.30; W, 2-4.30, and S, 8-10.30. Professors DENNIS and BROWNE, Mr. WELSH, and Messrs. FINK, O'BRIEN, OVERMAN, GILBERT, GULICK, and ———.

85. Agricultural Chemistry. Second term. Four hours. Prerequisite Chemistry 1. Lectures, T Th S, 11. Morse 1. One recitation, M, W or F, 8 or 9. Professor CAVANAUGH, Assistant Professor CROSS, and Messrs. HEDGES and RICE.

A general course treating of the relations of chemistry to agriculture and dealing with the composition and chemical properties of plants, soils, fertilizers, feeding stuffs, insecticides, and fungicides.

Drawing

1. Mechanical Drawing. Either term. Two hours. Practice, M W, 2-4.30, or T Th, 2-4.30. Dairy Building 371. Assistant Professor BAKER and Mr. REYNA.

An elementary course to enable the student to make and read simple working drawings, plans, elevations, etc.

English

1. Introductory Course. Throughout the year, credit four hours a term. Students who have not taken the course in the first term may enter in the second term in sections provided for them. Open only to underclassmen who have satisfied the entrance requirement in English. Assistant Professors ADAMS and MONROE, Drs. BAILEY, BROUGHTON, and GILBERT, and Messrs. KIRK, PRALL, STELTER, and BALDWIN. Twenty-one sections, at the following hours: T W Th F, 8, 9, 10, 11, 12. Special sections for agricultural students, T W Th F, 8, 10, 12. Rooms to be announced.

A study of representative works in English literature, including three plays of Shakespeare, five modern novels, and selected lyrics and essays. Practice in composition in connection with the reading, with incidental study of the principles of writing. The course is in charge of Professor STRUNK.

Students who elect English 1 must apply at Goldwin Smith 159 on Tuesday, Wednesday, or Thursday of registration week for assignment to sections.

The Farm

1. The Farm. First term. Two hours. Lecture, M, 8. Auditorium. Practice, M, T, W, Th, or F, 2-4.30, at appointed places on the farm. Professor NEEDHAM, Mrs. COMSTOCK, Assistant Professor EMBODY, and assistants.

This is a course in the study of our agricultural environment. The Cornell University farm will be explored. Its history, its topography, its population, and its chief crops, wild and cultivated, will be studied. Its fields, hills, woods, and streams will be explored, and records will be made of the things observed.

The course deals with the sources of agriculture. It considers crops from the naturalist's viewpoint—Nature's cereals and fruits and roots and fowls that were all present before agriculture developed. Wild products will be compared with cultivated varieties, and the related forms that have not been brought into cultivation will not be overlooked. Finally, these things will be viewed collectively, as conditioning the human affairs of the country community. They will be considered as elements that may be contributory to the beauty, the healthfulness, and the intellectual interest and enjoyment of the farm home. Fee, \$2.

Farm Mechanics

3. Farm Mechanics. Either term. Three hours. Students are urged to take Drawing 1 in preparation for this course. First term, lectures, T Th, 8. Animal Husbandry Building 112. Practice, M, T, or W, 2-4.30. Farm Mechanics Building. Second term, lectures, T Th, 12. Dairy Building 222. Practice, M, T, or W, 2-4.30. Farm Mechanics Building. Professor W. H. RILEY and Messrs. ROBB, KEPHART, WESTERVELT, and ———.

A study of the principles of operation, the details of construction, and the practical operation and care of: A—Machinery, including gasoline engines, water wheels, devices for transmitting power, hydraulic rams, pumps, spray nozzles, spraying outfits, water-supply outfits. B—Implements, including plows and binder attachments, with a discussion of the special mechanical features of some of these implements now on the market. Laboratory fee, \$2.

S. 4. Forge Work. Either term. One or more hours. Practice, daily 8-11 or 11-2, or daily except S, 2-5, as assigned by Assistant Professor WELLS. East Sibley. Mr. HEAD.

A course given in Sibley College especially for agricultural students, covering the construction of the forge, selection of coal, care of the fire, practice in forging to shape and size, welding iron and steel, and tempering steel. By paying for material used, the student will have opportunity as far as time permits to make for himself a set of tongs, punches, chisels, and other tools. A laboratory fee will be charged.

Geology

1. Dynamic Geology. First term. Credit three hours. Assistant Professor VON ENGELN and Messrs. STORRER, VERWIEBE, ELSTON, MORDOFF, HAUSMAN, and CLAYTON. Lectures, T Th, 11. McGraw, Geological Lecture Room. Recitations at morning hours to be arranged; one laboratory period a week, sections, afternoons daily except Saturday; one all-day Saturday excursion by train or boat.

Planned to give beginners a knowledge of the fundamental principles and facts of dynamic geology by means of lectures, maps, lantern slides, specimens, and field and textbook study.

11. Elementary Mineralogy. Second term. Credit three hours; if taken after course 12, credit two hours. Professor GILL and Mr. WILBER. Lectures, M W, 8, McGraw, Geological Lecture Room. Laboratory sections to be arranged.

For beginners who desire a general knowledge of the commoner minerals and their uses, the properties by which they are recognized, and their significance as constituents of the earth's crust, or as sources of useful substances.

15. [General Lithology. First term. Credit one hour. Prerequisite course 11 or equivalent. Professor GILL and Mr. ———. One laboratory period, 8.30-11.] Not given in 1912-13.

An elementary course designed to teach recognition of the various kinds of rocks, their mineral composition, mode of origin, etc.

Landscape Art

2. Lectures Introductory to Work in Landscape Art. Second term. One hour. Lecture, T, 12. Assistant Professor DAVIS, and occasional lectures by Professor FLEMING.

A preliminary course introductory to Landscape Art 4, and suggested as of cultural value to the general student. Regular students in the Department should elect this course in their freshman year.

Meteorology

1. **Meteorology and Climatology.** Second term. Three hours. Lectures, M W F, 10. Dairy Building 222. Professor WILFORD M. WILSON.

Lectures and weather observations. Designed to acquaint the student with the general circulation of the atmosphere; development, movement, and conditions that attend cyclones, tornadoes, and special storms; practical weather forecasting from weather maps and local observations; the use of meteorological instruments; general and special climatology and its relation to agriculture.

Physics

1. **Introductory Experimental Physics.** Repeated in second term. Credit four hours. Professors NICHOLS and SHEARER and Assistant Professor GIBBS. M T W Th, first term 9 or 12, second term 12. Rockefeller A.

Entrance physics is not accepted as an equivalent of this course.

Plant Pathology

1. **Plant Pathology.** First term. Three hours. Prerequisite Botany 1 and 2 or their equivalent. Lecture, F, 12. Main Building 392. Practice, W F, 2-4.30, or Th, 2-4.30 and S, 10.30-1. Agronomy Building 302. Professor WHETZEL and Messrs. GREGORY and CHUPP.

A fundamental course treating of the common diseases of cultivated plants, their nature, cause, and control. A prerequisite for all other courses in plant pathology. The practice sections must be taken in the couplets announced above. Laboratory fee, \$4.50.

8. **Dendropathology.** Second term. Two or three hours. Prerequisite course 1. Conference, F, 12. Agronomy Building 302. Practice by appointment, Th F, 8-1. Mr. RANKIN.

Designed especially for students in forestry and rural art. Laboratory fee, \$4.50.

Plant Physiology

7. **General Plant Physiology.** Second term. Four hours. Prerequisite all freshman work or its equivalent; this course may be taken to satisfy the requirement in plant physiology. Lectures, T Th, 10. Animal Husbandry Building 112. Laboratory, sect. 1, M, 2-5, Th, 11-1; sect. 2, T, 2-5, S, 11-1; sect. 3, T, 11-1, Th, 2-5; sect. 4, M, 10-1, W, 11-1. Agronomy Building 21. Assistant Professor KNUDSON, Mr. PRUCHA, and Messrs. WILSON, ROBBINS, and NANZ.

Lectures and laboratory work, supplemented by field studies where possible. The topics include absorption, nutrition, relations to environment, growth, introduction, and propagative processes. Laboratory fee, \$5.

Political Science

51. **Elementary Economics.** Throughout the year. Credit three hours a term. One lecture and two recitations each week. Lecture, M, 11; repeated M, 12. Assistant Professor BAUER. Recitations, T Th, 8, 10, 11, 12; W F, 8, 10, 11, 12. Assistant Professor BLAKEY, Drs. USHER, SPEDDEN, and H. E. SMITH and Messrs. G. C. SMITH, WOODBURY, and GILMAN.

A general introduction to economics. This course is a prerequisite for most of the other courses in the field of political science. For section assignments and other information apply at Goldwin Smith 260.

Rural Economy

[7. **Conservation.** Second term. Three hours. Open to juniors and seniors in all colleges. Lectures, M W F, 11. Agronomy Building 152. Professor LAUMAN.] Not given in 1912-13.

Soil Technology

1. **Principles of Soil Management.** Either term. Three hours. Prerequisite Chemistry 1 and Geology 1. Lectures, M W, 9. First term, Poultry Building 375; second term, Dairy Building 222. Laboratory, M, W, or F, 2-4.30. Agronomy 42. Assistant Professor BUCKMAN.

A comprehensive course dealing with the origin, composition, and properties of soils, with particular reference to their management in crop production. The laboratories will consist in practices designed to demonstrate fundamental physical relations, and will be supplemented by laboratory lectures. Laboratory deposit, \$3.

Surveying

11. **Elementary Surveying.** First term. Credit three hours. Use of steel tape, level, and transit. Fundamental surveying methods. Measurement of lines, angles, and differences of elevation. Land surveying; areas and plotting. U. S. Public Lands. Recitations, field work, computations, and mapping. Textbook: Tracy's Surveying. Three periods a week. Assistant Professors LELAND and BOOTHROYD and Instructors LAWRENCE, McCURDY, CONWELL, and TEETER. Eight sections.

12. **Advanced Surveying.** Second term. Credit four hours. Preparation: course 11. Topographic and geodetic surveying and field astronomy. Precise measurements. Transit and stadia; plane table; sextant. Triangulation; base lines; precise leveling. Field determinations of azimuth, time, and latitude. Recitations and field work. Textbooks: Breed and Hosmer's Surveying and Campbell's Astronomy. Four periods a week. Assistant Professors LELAND and BOOTHROYD and Instructors LAWRENCE, McCURDY, and CONWELL. Eight sections.

13. **Summer Survey; Topographic and Geodetic Survey; Camp.** Six weeks during summer. Credit six hours. Date of commencing to be announced during the second term. Preparation: course 12. Practical experience in surveying under field conditions. An extensive topographic survey with the transit and stadia and the plane table is executed, and field maps are made. Each student takes part in all branches of the work. Field and office work six days and evenings a week. Assistant Professors LELAND and BOOTHROYD, Instructors UNDERWOOD, LAWRENCE, McCURDY, TEETER, and CONWELL, and four assistants.

Zoology

5. **Systematic Vertebrate Zoology and Ecology.** Throughout the year. Credit three hours a term. Assistant Professor REED, Dr. WRIGHT, and Dr. ALLEN. Lecture M, 8. Laboratory: sect. 1, T Th, 2-4.30; sect. 2, W F, 2-4.30, McGraw 7.

Lectures on the principles of classification and nomenclature; characters and relationships of groups; the habits, life histories, principles of coloration, and economic value of the common species. Laboratory study of representative forms with special reference to the parts employed in classification, and with a view to practical identification. Field work is given during the fall and spring.

OFFICIAL PUBLICATIONS OF CORNELL UNIVERSITY

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Directory of Faculty and Students, First Term, 1912-13, price 10 cents, and the following informational publications, any one of which will be sent gratis and post-free on request. The date of the last edition of each publication is given after the title.

General Circular of Information for prospective students, October 1, 1912.

Announcement of the College of Arts and Sciences, June 15, 1912.

Announcement of Sibley College of Mechanical Engineering and the Mechanic Arts, Feb. 15, 1912.

Announcement of the College of Civil Engineering, March 1, 1912.

Announcement of the College of Law, May 15, 1912.

Announcement of the College of Architecture, March 15, 1912.

Announcement of the New York State College of Agriculture, Aug. 1, 1912.

Announcement of the Winter Courses in the College of Agriculture, November 1, 1912.

Announcement of the Summer School in Agriculture, July 1, 1912.

Announcement of the New York State Veterinary College, April 15, 1912.

Announcement of the Graduate School, January 15, 1912.

Announcement of the University Summer Session, April 1, 1912.

Announcement of the Department of Forestry, November 1, 1912.

Annual Report of the President, December 1, 1912.

Annual Report of the Treasurer, November 1, 1912.

Pamphlets on prizes, samples of entrance and scholarship examination papers, special departmental announcements, etc.

Correspondence concerning the publications of the University should be addressed to

The Secretary of Cornell University,
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