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THE GRADUATE SCHOOL

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1931-32

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CALENDAR OF THE GRADUATE SCHOOL FOR 1931-32

1931

FIRST TERM

- | | |
|----------|--|
| Sept. 28 | Registration of new students. |
| Sept. 29 | Registration of old students. |
| Sept. 29 | |
| Sept. 30 | Registration of old students. |
| Oct. 1 | |
| Oct. 1 | Instruction begins. |
| Dec. 15 | Last day for announcing titles of theses by candidates for advanced degrees in June. |

1932

- | | |
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| Feb. 10 | Last day for completing requirements for advanced degrees to be conferred in February. |
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SECOND TERM

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| Feb. 12 | Registration. |
| Feb. 13 | |
| Feb. 15 | Instruction begins. |
| March 15 | Last day for filing applications for fellowships and graduate scholarships. |
| June 15 | Last day for completing requirements for advanced degrees to be conferred at Commencement. |
| June 20 | Commencement. |

THE GRADUATE SCHOOL

HISTORY AND ORGANIZATION

THE initiation of graduate studies at Cornell University was coincident with the establishment of the University; the first advanced degree was conferred at the second annual Commencement. Until 1896 there was no formal organization of graduate studies, which were intrusted to the direction of the University Faculty, although beginning with 1890 a standing Committee on Graduate Work of the University Faculty had general charge of graduate study. In 1896 graduate work was definitely organized as a Graduate Department under the immediate charge of the University Faculty. In 1909, on the recommendation of the Faculty, the Board of Trustees established the Graduate School, to have exclusive jurisdiction over all graduate work and advanced degrees.

The Faculty of the Graduate School shall consist of the President, who shall be *ex-officio* the presiding officer, the Deans of the several Faculties of the University, the Director of the New York State Experiment Stations, and of those Professors, Assistant Professors, and Instructors who are engaged in actively supervising the work of graduate students as members of the special committees in charge of major and minor subjects. Members of the University Faculty who during five consecutive years shall have been in charge of graduate work shall be members of the Graduate Faculty. This Faculty shall have exclusive jurisdiction over all graduate work and advanced degrees. The Dean of the Graduate School is the executive officer of the Faculty.

Professors, assistant professors, instructors who hold the Doctor's degree, and such other members of the teaching staff of the University as the Faculty may authorize, are eligible for membership on the Special Committees in charge of the work of graduate students.

For the convenient discussion of questions which chiefly concern those engaged in related fields of work, the members of the faculty of the Graduate School are divided into nine groups, as follows:

- A. Languages and Literatures.
- B. History, Political Science, Philosophy, Agricultural Economics, Farm Management, Rural Sociology.
- C. Mathematics, Astronomy, Physics, Chemistry, Geology, Physical Geography, Geodesy.
- D. Biological Sciences.
- E. Engineering, Architecture, Applied Physical Sciences, Rural Engineering, Landscape Design.
- F. Science Departments of the Cornell University Medical College in New York City.
- G. Agricultural Sciences.
- H. Law.
- I. Education.

The General Committee of the Graduate School consists of four members at large, elected by the Faculty; nine members elected, one by each group; the Secretary of the Faculty; and the Dean, who is ex officio chairman of the General Committee.

THE PURPOSE OF GRADUATE STUDIES

The purpose of the Graduate School is two-fold: it aims to provide the student with a comprehensive view of a field of knowledge and to train him for individual investigation in that field. The student who comes as a candidate for the master's degree will normally devote the larger part of his time to the first of these aspects; he will need to supplement and to correlate his understanding of his field, to study its background and its relationship to kindred fields, to gain a wider vision of its significance. The student who comes as a candidate for the doctor's degree will first secure this broader understanding and then push on to cast new light on some phase of it, to enlarge in some measure the knowledge of the field. But to all who come the Graduate School strives to furnish the technique of analyzing a body of information or observation and the power to express an independent and unprejudiced judgment.

In furnishing this opportunity for independent study and investigation, the Graduate School seeks to make the conditions such as will enable the student to devote himself wholly to his chosen field. Unhampered by restrictions that necessarily obtain in undergraduate work, he will come into freedom of association with older scholars, who will seek to make his work profitable to him by giving him such aid and directions as he may need. Inasmuch as subjects differ greatly, the requirements for all subjects cannot be stated in terms at once specific and uniform. In some departments of knowledge original research may begin with the student's entrance into the School; in other subjects much preliminary work may be necessary to fit the student for profitable research.

In carrying on studies in the Graduate School, the student is expected to assume the initiative and the responsibility. All courses of study offered in the University, and all the facilities for study and investigation afforded by its libraries, museums, and laboratories are open to graduate students in so far as they are qualified to make use of such facilities. It is important, however, to recognize from the beginning that graduate work does not consist in the fulfilment of routine requirements, and that the various opportunities for study, as well as the advice and assistance of teachers, are to be regarded simply as aids to the student in acquiring for himself the discipline and method of independent scholarship.

ADMISSION

In order to undertake work leading to an advanced degree, the student must be admitted (1) to the Graduate School and (2) to candidacy for the desired degree.

Graduates of the following colleges of Cornell University, namely, the College of Arts and Sciences, the College of Architecture, the College of Engineering, the Medical College, the New York State College of Agriculture, the New York State Veterinary College, the New York State College of Home Economics, and the Law School, and also graduates of other institutions in which the requirements for the first degree are substantially equivalent, are eligible for admission to the Graduate School. In other cases studies pursued after graduation, and experience gained by professional work or otherwise, are taken into consideration in deciding whether the candidate's preparation as a whole is such as to justify his admission to the Graduate School.

In order to be admitted to the Graduate School, a student must furnish evidence that he has already received a first degree, by presenting either a diploma or a statement from some official source. The simplest procedure will ordinarily be to submit an official statement from the registrar or dean that the degree has been conferred. In the case of graduates of Cornell University this is not necessary, since the records are conveniently accessible. Graduates of colleges which are not on the Approved List of the Association of American Universities should in every case submit with their applications for admission a transcript of their undergraduate studies.

College graduates whose training is regarded as less than one year short of that required for the corresponding first degree at Cornell, may be admitted to the Graduate School, but not to candidacy for an advanced degree until the shortage shall have been removed. College graduates whose training is regarded as a year or more short of that required for the corresponding first degree at Cornell may not be admitted to the Graduate School until such shortage shall have been reduced to less than one year.

Seniors in the colleges of Cornell University who have completed all requirements for the Bachelor's degree except that of residence, may, with the approval of the deans of their respective colleges, be admitted to the Graduate School.

To avoid delays at the beginning of the academic year, those who desire to enter the Graduate School are advised to make application for admission, either in person or by letter, in the preceding spring or early summer. Correspondence should be addressed to the Office of the Graduate School, Morrill Hall, Cornell University, Ithaca, New York.

In order that a prospective student may be assured that his preparation is adequate for satisfactory graduate work in a particular field of study, he should, as soon as he has satisfied himself of his eligibility for admission to the Graduate School, confer by letter or otherwise with one or more professors in that field. A further reason for such early conference is that in some fields the available facilities and personnel set a limit to the number of students that can be accepted.

ADMISSION TO CANDIDACY FOR ADVANCED DEGREES

In order to become a candidate for an advanced degree, the student must first choose a field of study. Within that field, the branch of knowledge to which he intends to devote the larger part of his time is termed his Major Subject; the other subject or subjects which will necessarily be more restricted in their scope and which should be selected with reference to their direct bearing upon the Major Subject, are termed the Minor Subjects.

The Graduate School does not prescribe the fields in which a student may pursue his work; any group of subjects recognized as of graduate standing, which has a basic unity is considered a proper field for study. As a general principle, however, when the Major Subject is selected from the applied sciences, it is desirable that the theoretical science or sciences most directly involved should be chosen as Minor Subjects.

The student must next satisfy one or more professors in each subject which he has chosen for Major or for Minor study that he has the necessary preparation to undertake graduate work in that subject and he must obtain their consent to serve as his Special Committee.

The subsequent work of the student is in charge of this Special Committee, a representative of his Major Subject being chairman. The student is expected to confer freely with the members of his Special Committee, both in regard to the general plan of his work and in connection with individual courses of study. A candidate for an advanced degree must present to the Dean, not later than two weeks after registration in the Graduate School, a statement of his Major and Minor Subjects approved by the members of his Special Committee.

Changes in the personnel of his Special Committee may be made by a graduate student with the approval of the continuing members. Any vacancy on a Special Committee, due to the absence of a member on leave from the University, is filled by the Dean on recommendation by the member on leave and with the consent of the student and the added member. Any graduate student who desires an examination in the summer must arrange for any necessary examining substitute on his Special Committee and file with the Dean before the first of June preceding the examination notice of such arrangement together with written approval both of the substitute and of all the members of the Special Committee.

Candidates for one of the advanced technical degrees, M.C.E., M.M.E., M.E.E., M. Chem., M.S. in Agr., M.F., M.Arch., M.L.A., and M.F.A. must have had training equivalent to that required for the corresponding first degree at Cornell University.

No student may be admitted to candidacy for an advanced degree whose training has not included work in a foreign language equivalent to that required for entrance to the undergraduate colleges of Cornell University.

The work of each graduate student who is not a candidate for a degree is in charge of an Adviser selected by the student from the members of the Faculty representing his field of work. A student who is not a candidate for a degree must present to the Dean, not later than two weeks after registration, a detailed statement of the studies selected, approved by his Adviser.

ADMISSION FOR GRADUATE STUDY IN LAW

One who has met the requirements for admission to the Cornell Law School, and who has received the degree of Bachelor of Laws or an equivalent degree from a law school qualified for membership in the Association of American Law Schools, may petition for admission to the Graduate School as a candidate for the degree Master of Laws (LL.M.), or the degree Doctor of the Science of Law (J.S.D.). The petition should state the purpose for which graduate work is desired. Foreign students may be admitted to the Graduate School as candidates for these degrees, by the vote of the Law Faculty, if, in the opinion of the Law Faculty, they have had a training substantially equivalent to the requirements set forth in this paragraph.

REGISTRATION

Students who have been admitted to the Graduate School are required to register both in the office of the Graduate School and in the office of the Registrar of the University on the regular registration days of each term, unless special permission for later registration has been granted by the Dean.

Graduate students who have completed requirements of residence for the degrees for which they are candidates, and who remain in residence working on their theses or toward or in contemplation of a degree must register each term in which they are thus engaged. Any student whose residence requirement has been met and who completes his thesis elsewhere must register for the term in which he presents himself for his degree.

A CERTIFICATE OF VACCINATION REQUIRED BEFORE MATRICULATION

Every student matriculating in the University for graduate study, whether in the Summer Session or during the regular terms, is required to present to the Registrar a satisfactory certificate of vaccination against smallpox. This certificate is considered satisfactory only if it certifies to a successful vaccination within the last five years or certifies that at least three unsuccessful attempts at vaccination have been made within that period.

RESIDENCE

Residence credit toward an advanced degree is granted to regularly enrolled students only upon the satisfactory completion of a term or other period of work, attested by the members of the student's Special Committee.

CREDIT FOR WORK DONE IN CORNELL UNIVERSITY

Residence credit for work *in the University* may be acquired in four ways:

(1) By the satisfactory completion of a term or portion of a term of work during the regular sessions of the University.

(2) By the satisfactory completion of work done in the Summer Session of Cornell University, in the Summer School in Agriculture, or in the Summer School of Biology.

Residence credit for such summer work may be counted toward the degrees of Master of Arts, Master of Science, and Master of Science in Agriculture, and, on recommendation of the student's Special Committee, in partial fulfillment of the requirements for the degree of Doctor of Philosophy for which a maximum residence credit of one year may be acquired in summer sessions; one term of residence may be acquired by two summer sessions, and one year (or two terms) of residence by four summer sessions. All students pursuing graduate studies during one of the Summer Sessions are required to enroll both in the office of the Registrar of the University and in that of the Dean of the Graduate School before beginning work. Candidates for these degrees who are in residence during Summer Sessions only are required also to continue their studies during the year under the direction of the Chairman of the Special Committee in charge of their work. It should be noted that in some departments no graduate work is offered in the Summer Session. A statement of the graduate work offered will be found in the Announcements of the various Summer Sessions, which will be sent upon application to the Secretary of the University.

(3) By the satisfactory completion of a period of work during the summer under the personal direction of a member of the Faculty of the Graduate School.

The general library and many of the laboratories and special libraries of the University are open during this period, and certain members of the instructing staff who remain in residence during the summer are willing to assume responsibility for the supervision of the work of students who are qualified to carry on investigations. It is impossible to make any announcement in advance as to what opportunities for graduate work may be found at any definite time in a particular subject; but such information may be obtained by correspondence. Residence credit towards an advanced degree for work carried on under personal direction during the summer will be granted only if the following conditions are complied with: (a) The student must have already completed at least a full year of graduate work as a candidate for an advanced degree, either in this University or in some institution whose graduate work is acceptable. In all cases graduate students are required to register both in the office of the Registrar of the University and in that of the Dean of the Graduate School. No candidate for the Doctor's degree may receive credit for more than two terms of residence during any twelve consecutive months. (b) The student must present to the Dean of the Graduate School a statement from the member of the Faculty under whose direction the student is to work, signifying his readiness to undertake such direction and also stating the number of weeks during which he will be prepared to supervise this work.

(4) By the satisfactory completion of work done in the Summer Session in Law, or of work done during the summer under the personal direction of a member of the Law Faculty.

Residence credit for this work may be counted toward the degree of LL.M. or of J.S.D. A summer session in law or such summer work under the personal direction of a member of the Faculty is equivalent to one-third of a year, and with the approval of the faculty in charge residence credit may be obtained in the summer. It is not possible to make any announcement in advance as to what opportunities for graduate work may be found at any definite time in a particular subject, but such information may be obtained by correspondence. All students pursuing graduate studies in law during the summer are required to enroll both in the office of the Registrar of the University and in that of the Dean of the Graduate School before beginning work.

Graduate students who hold appointments as instructors or as teaching or research assistants in Cornell University may not receive more than three-fourths residence credit for graduate work carried on during the period of their appointment. Such students may, on recommendation of their Special Committee, obtain full graduate residence for the year by carrying on their studies during the summer provided they devote their whole time during this period to graduate study and do not hold a teaching appointment. An instructor or assistant who has completed at least one term of satisfactory graduate work at another university may, however, upon the recommendation of his Special Committee, satisfy the residence requirement for the master's degree by one year at Cornell.

No student may obtain more than two terms of residence in a calendar year.

CREDIT FOR WORK DONE ELSEWHERE

For the Master's degree no credit may be obtained for work done elsewhere. For the Doctor's degree, however, residence credit for work done elsewhere may be granted in the following cases:

(1) Residence as a graduate student in another university may, on recommendation of the student's Special Committee, be accepted as the equivalent of residence at Cornell University. No general statement can be made regarding the conditions under which this permission will be granted; each case will be decided on its merits. The last year of required residence must be in regular sessions at Cornell University.

(2) There are certain cases in which, in order to give the work of the Graduate School the greatest possible breadth, it is desirable, from the point of view both of the student and of the University, to take advantage of opportunities for study and research not found in university centers.

The conditions under which a candidate for the degree of Doctor of Philosophy may be allowed residence toward this degree for time spent in study away from the University have been stated in the following form by the legislation of the Faculty: (a) Applicants for this privilege must be regularly registered in the Graduate School as candidates for the Doctorate, and while not in residence shall receive no compensation except from the University. (b) They shall have spent at least two terms in Cornell University in study towards the Doctor's degree. (c) Permission to count such time as residence may be given by the Dean

of the Graduate School for a period not to exceed one term, when the application is unanimously approved by the members of the student's Special Committee. When a longer period of outside study is required, applications for an extension of time should be made to the General Committee, which may, at its discretion, extend the period to two terms. In no event, however, shall a student acquire a total of more than two terms' residence under these provisions. (d) A student who avails himself of this privilege shall continue to work under the general direction of his Special Committee. Whenever possible, however, the work should be carried on under the immediate supervision of a competent director, acting for the Special Committee and to be designated by that Committee. (e) Reports regarding the progress of the work shall be made as directed by the Special Committee at intervals not in excess of one month.

(3) Under conditions to be ascertained from the Dean, instructors in Cornell University who are also registered in the Graduate School may receive credit for work done without compensation during the summer months away from the University.

Students, who because of work outside of their graduate studies obtain only partial credit for each term of residence, may, on recommendation of their special committees, obtain additional residence credit by carrying on their studies for a period of not less than eight weeks during the summer, provided they devote their whole time during this period to graduate study. Such students may obtain a maximum of one-half term's residence credit for such summer work.

RESIDENCE CREDIT CONVERTIBLE

Residence, whether at Cornell University or elsewhere, in pursuance of work for a Master's degree, may be credited toward the residence required for the degree of Doctor of Philosophy provided the Special Committee in charge of the work for the latter degree approves, certifying the work done as forming an integral part of the work required for the Doctor's degree.

DEGREES

The requirements for advanced degrees, with the exception of the professional degrees in Law and in Education, are based, not upon courses or credits, but upon the completion of a definite period of residence, the presentation of a satisfactory thesis or essay, and the passing of an examination.

THE MASTER'S DEGREES

Cornell University confers the degrees of Master of Arts, Master of Science, Master of Architecture, Master of Civil Engineering, Master of Mechanical Engineering, Master of Electrical Engineering, Master in Forestry, Master in Landscape Architecture, Master of Chemistry, Master of Science in Agriculture, Master of Laws, Master of Fine Arts, Master of Arts in Education, and Master of Science in Education.

The Master's degree is conferred upon a candidate who, after completing at least one year of residence devoted to the study of a field

comprising a Major Subject and one Minor Subject, presents a satisfactory thesis, or essay, as the chairman of the candidate's Special Committee may decide, and passes an examination on his special field.

The degree of Master of Laws is conferred upon a candidate who has completed at least one year of residence and has obtained at least twenty credit hours or their equivalent with high merit in courses of special work chosen with the approval of Group H of the Faculty of the Graduate School. A comprehensive examination on the work of the year may be required.

THE THESIS

The thesis, or essay, must not only demonstrate the candidate's ability to do independent work, but must be acceptable in literary style and composition.

A statement of the general subject of the thesis, or essay, with the written approval of the chairman of the Special Committee in charge of the candidate's work, must be filed in the office of the Dean at least six months before the candidate expects to present himself for examination.

The completed thesis, or essay, approved by the Special Committee, must be presented at the office of the Dean at least five days before the examination for the degree, and must remain on file until the day preceding the examination. When the Major Subject for the degree of Master of Architecture or the degree of Master in Landscape Architecture is in Design, the candidate is required to deposit in place of the thesis, either the original drawings or a photographic reproduction of them.

Each candidate for a Master's degree is required to furnish two bound typewritten copies of this thesis, or essay, for the use of the University Library, and these copies are to be delivered to the office of the Dean not less than five days before the degree is to be conferred. One of these copies may be a carbon copy.

The paper on which the thesis is typewritten must be a durable rag bond; the size of the page of the typewritten thesis should be 8 by 10½ inches; the margin on the left should be at least an inch and a quarter. The title page of the thesis should be set up according to the following form:

[TITLE OF THESIS]

A Thesis

Presented to the Faculty of the Graduate School of Cornell
University for the degree of

[—————]

By

[Author's Name in Full]

[Date on which degree is to be conferred.]

Immediately following the title-page there shall be a biographical sketch of the author, the length of which shall not exceed 150 words. These two copies of the thesis become the permanent property of the Library.

EXAMINATIONS

After the thesis, or essay, has been accepted by the Special Committee, and duly filed in the office of the Graduate School, the candidate is required to present himself for examination on his Major and Minor Subjects and on the subject matter of his thesis.

Examinations for a Master's degree may be written or oral, or both, at the option of the examining committee, and are open to all members of the Faculty. The examination for the degree of Master of Architecture may be waived by the General Committee of the Graduate School in any case where, in the opinion of the student's Special Committee, the Major and Minor Subjects are of such a nature as to make an examination impossible or inexpedient.

THE DEGREE OF DOCTOR OF PHILOSOPHY

The degree of Doctor of Philosophy is conferred upon a candidate who, after completing not less than three years of resident graduate work devoted to the study of a field of work comprising a Major Subject and two Minor Subjects, presents a satisfactory thesis, and passes an examination on his chosen field and on the subject matter of his thesis.

The Doctor's degree is intended to represent, not a specified amount of work covering a specified time, but the attainment, through long study, of independent and comprehensive scholarship in a special field.

A candidate for the Doctor's degree will ordinarily be expected to have a working knowledge of French and German before beginning graduate work. In all cases he must, before beginning his second year of residence, show to the satisfaction of his Special Committee that he possesses a reading knowledge of these languages.

QUALIFYING EXAMINATIONS

Candidates for the degree of Doctor of Philosophy are required to pass a Qualifying Examination, to be held normally not later than the close of the second year of residence. The legislation of the Faculty on this subject is given in the following paragraphs:

(1) The qualifying examination or examinations required of a candidate for the degree of Doctor of Philosophy shall be held at such time as his Special Committee may determine, normally not later than the close of the second year of residence. No candidate may proceed to his final examination until two terms have been completed after he has passed the qualifying examination.

(2) The Special Committee shall pass upon the results of this examination as a whole, and shall report to the Dean whether the candidate has made satisfactory progress and is qualified to proceed in due order to complete the requirements for the degree.

(3) The Special Committee, in the case of any candidate, may waive the qualifying examination in whole or in part; but the Committee shall nevertheless

report to the Dean whether the candidate has made satisfactory progress and is qualified to proceed in due order to complete the requirements for the degree.

(4) If a candidate fails to pass the qualifying examination, no re-examination shall be allowed except on the recommendation of the Special Committee.

THESIS

The thesis for the Doctor's degree must not only give evidence of the candidate's power to carry on independent investigation but must be satisfactory in style and composition. A statement of the general subject of the thesis, with the written approval of the chairman of the Special Committee in charge of the candidate's work, must be filed in the office of the Dean at least six months before the candidate expects to present himself for examination. The thesis of a candidate intending to take his degree at the June commencement should normally be completed by May 1, in order that ample time may be afforded for the inspection of the thesis by all members of the Special Committee. Two bound typewritten copies (one of which may be a carbon copy) of the completed thesis, approved by the Special Committee, are to be presented at the office of the Graduate School at least five days before the examination for the degree, and must remain on file until the day preceding the examination, after which they become the property of the University Library.

The paper on which the thesis is typewritten must be a durable rag bond; the size of the page of the typewritten thesis should be 8 x 10½ inches; the margin on the left should be at least an inch and a quarter. The title-page of the thesis should be set up according to the following form.

[TITLE OF THESIS]

A Thesis

Presented to the Faculty of the Graduate School
of Cornell University for the degree of

[—————]

By

[Author's Name in Full]

[Date on which degree is to be conferred.]

Immediately following the title page there shall be a biographical sketch of the author, the length of which shall not exceed 150 words.

Each candidate for the Doctor's degree must, before the degree is conferred, meet one of the following requirements:

(1) He must deposit in the office of the Dean of the Graduate School one hundred printed copies of his thesis for the purposes of the University Library:

(2) He must present with the two bound typewritten copies mentioned above, 100 printed copies of an abstract or description of his thesis, which abstract must be approved by his Special Committee: or

(3) He must present with the two bound typewritten copies mentioned above a typewritten copy of the abstract, not exceeding 1500 words in length, and the sum of \$25 to defray the expenses of printing the abstract.

It is recommended that each student publish his thesis in full.

PUBLICATION OF THE THESIS

The candidate should consult with the Dean regarding the form of publication of the thesis. The thesis shall have both a cover and a title-page. The title-page shall include the printed statement that the thesis is presented to the Faculty of the Graduate School of Cornell University for the degree of Doctor of Philosophy. If the thesis is a reprint, the place and date of the original publication must be given.

FINAL EXAMINATIONS

The final examinations for the doctor's degree may be either oral or written, or both, at the option of the examining committee, and are open to all members of the Faculty. The Faculty has, however, expressed the opinion that a written examination should be required for the doctorate at some time during the student's candidacy. In the event of failure in final examination, no re-examination may be held until a period of three months has elapsed.

It is not the policy of the Graduate School to divide the final examination for advanced degrees into parts, or to accept piece-meal fulfilment of the requirements for these degrees. In ordinary cases, examinations for advanced degrees are not held until after the candidate has completed the minimum period of residence and has presented a thesis duly approved by the members of his Special Committee. But on recommendation of the Special Committee the examination on the Major and the Minor Subjects may be held not earlier than two weeks before the end of the fourth term of residence. If this examination be passed, it must be followed by an examination on the subject matter of the thesis when the completed thesis is presented.

THE DEGREE OF DOCTOR OF THE SCIENCE OF LAW

To receive the degree of Doctor of the Science of Law, the candidate shall be in residence at least one year; shall pursue with distinction such graduate or advanced courses as shall be prescribed by the Law group; shall engage in such independent investigation in some field of law under the direction of a member or members of the Law group as shall be determined by that body, the results of such investigation to be embodied in one or more essays which shall be creditable contributions to legal scholarship and two copies of which shall be deposited in the Law Library; and shall pass a com-

prehensive oral examination on the work of the year. It is desirable that candidates for this degree shall have had some practical or teaching experience after obtaining a first degree in law.

DATES FOR CONFERRING DEGREES

Advanced degrees are conferred in February, June, and September.

In February, degrees will be conferred on students who have made application for the degree on or before the first day of instruction after the Christmas recess, and who have completed the requirements not later than the last day of the final term examinations.

In June, degrees will be conferred on students who have made application for the degree not later than May 15, and who have completed the requirements not later than the last day of the final term examinations.

In September, degrees will be conferred on students who have made application for the degree not later than September 1, and who have completed the requirements not later than the day preceding the first day of instruction of the first term.

TUITION AND OTHER FEES

A Tuition Fee of \$75 for the academic year is to be paid by all students registered in the Graduate School. It is payable in installments of \$37.50 at the beginning of each term.

Certain classes of students are exempt from the payment of the tuition fee. They are:

(1) Graduate students holding certain appointments as University Fellows or Graduate Scholars, and holders of certain temporary fellowships and scholarships.

(2) Resident Doctors, i.e., students in the Graduate School who have the Doctor's degree and are not candidates for a degree.

(3) Graduate students holding appointments as assistants and instructors and having their major studies in the college or line of work in which they are instructing, are exempt from the payment of tuition fees and laboratory and shop fees in the department in which they are employed to give instruction during the regular first and second terms only; members of the instructing staff who take work for which they must pay tuition are required to pay in proportion to the amount of work for which they are registered.

No student may receive the Master's degree who has not paid the tuition fee for at least one year, and no one may receive the Doctor's degree who has not paid the tuition fee for at least three years, unless one or more of the years spent in study for the Doctor's degree have been spent in graduate study at another university, or unless payment of tuition has been waived under one of the foregoing heads.

Any student of the Graduate School who has completed the requirement of residence for the degree for which he is a candidate, whose studies have been satisfactory to the Faculty, and who during that time has satisfied the requirements as to tuition fees, is, on paying the annual administration fee, exempt from the further payment of tuition fees for a period not to exceed one year.

An Administration Fee of \$25 is to be paid by all students registered in the Graduate School except Honorary Fellows and Resident Doctors. It is payable in installments of \$12.50 at the beginning of each term.

A Matriculation Fee of \$10 is required of every student upon entrance into the University. It must be paid at the time of registration.

An Infirmary Fee of \$5 a term is required of all students (except Honorary Fellows and Resident Doctors and students registered in the Medical College in New York City) at the beginning of each term. For a statement of the privileges given in return for this fee, see the General Information Number.

A Graduation Fee of \$20 is required, at least ten days before the degree is to be conferred, of every candidate for an advanced degree. The fee will be returned if the degree is not conferred.

Laboratory Fees. Every person taking laboratory work in courses in which a fee is charged must pay to the Treasurer of the University the required fee or the required deposit for the materials *et cetera* that are to be used in the work.

A Willard Straight Hall Membership Fee of \$5 a term is required of all graduate students except those who are members of the instructing staff, for whom membership is optional. The use of the hall is restricted to those who have paid this fee.

Fees for the Summer Session. Students taking work in any of the summer courses must register both in the Graduate School and in such summer course or courses, and must pay a tuition fee equal to that of the University Summer Session.

No student shall receive the master's degree who has not paid tuition equivalent at least to one academic year, during the academic year, or summer courses, or both; and no one shall receive the doctor's degree who has not paid tuition for the equivalent of at least three academic years, unless one or more of the years spent in study for the doctor's degree shall have been spent in approved graduate study at another university—but in any event at least the equivalent of one academic year's tuition must be paid while in graduate study at the University.

Any student of the Graduate School who has completed the requirements of residence for the degree for which he is a candidate, whose studies have been satisfactory to the Faculty as evidenced by a certificate to that effect signed by the Dean of the Graduate School, and who during that time has satisfied the requirements as to tuition fees, is, on paying the regular administration fees of each subsequent term or summer course exempt from the further payment of tuition fees for a period not to exceed one academic year, or the equivalent four summer courses.

Those entitled to exemption from summer course tuition fees, must pay an administration fee of \$6.25 for each summer's work.

Personal Direction. Students carrying on studies during the summer as candidates for advanced degrees under Personal Direction are required to register with the Registrar as well as in the Graduate School and to pay an administration fee of \$10. No administration fee is required of persons who have been regularly appointed members of the instructing staff during the preceding academic year and who have during that year paid the full administration fee.

If registered under Personal Direction, a student in the Graduate School who is not exempt from summer course tuition fees, may be permitted, upon joint approval of the Professor directing his work and the Chairman or Director of any of the summer courses, to take one or more subjects in any of such courses upon the payment of such part of the regular tuition fees (pro rata or otherwise) as may be determined by the administrative board of the particular summer course.

On registering for the first time as a candidate, a student who has not previously matriculated in Cornell University, must pay a matriculation fee of \$10.00 in addition to any other fees. This fee is not refundable.

Tuition and other fees become due when the student registers. The University allows twenty days of grace each term, five days in the Summer Session. The last day of grace is generally printed on the registration coupon which the student is required to present at the Treasurer's office. Any student who fails to pay his tuition charges, other fees, and other indebtedness to the University, or who, if entitled to free tuition, fails to claim it at the Treasurer's office and to pay his fees and other indebtedness, within the prescribed period of grace, is thereby dropped from the University unless the Treasurer has granted him an extension of time to complete payment. The Treasurer is permitted to grant such an extension when, in his judgment, the circumstances of a particular case warrant his doing so. For any such extension the student is assessed a fee of \$5 for the first week and \$2 additional for each subsequent week in which the whole or any part of the debt remains unpaid, but the assessment in any case is not more than \$15. The assessment may be waived in any instance for reasons satisfactory to the Comptroller and the Registrar, when such reasons are set forth in a written statement.

Students registering at any time during the last ten weeks of either the first or the second term are required to pay tuition at the rate of ten per cent of the regular tuition of the term for each week or fraction of a week between the day of registration and the last examination day of the term. Students registering at any time during the last four weeks in the short summer courses are required to pay tuition at the rate of twenty-five per cent of the term's tuition for each week or fraction of a week between the day of registration and the last examination day of the term.

A tuition fee or other fee may be changed by the Trustees at any time without previous notice.

LIVING EXPENSES IN ITHACA

The minimum cost of living in Ithaca during the school year from September till June is \$700, exclusive of tuition or other fees due the University. Board and room for that period cost about \$550, and \$150 is not more than a safe allowance for other personal expenses. If the student is to live in Ithaca throughout the calendar year he had better estimate his living expenses at the rate of twenty dollars a week.

Prospective graduate students who must depend on employment partially to meet living expenses are advised that opportunities for such employment are relatively limited in Ithaca.

FELLOWSHIPS, SCHOLARSHIPS, PRIZES

HONORARY FELLOWSHIPS

Holders of the Doctor's degree or other persons of recognized standing as scholars who wish to continue work in a field in which they have already achieved distinction may, in the discretion of the Faculty, be appointed to honorary fellowships. These fellowships cover all fees except laboratory charges. Actual residence at the University and regular registration in the Graduate School are required of incumbents.

RESIDENT DOCTORS

Holders of the Doctor's degree may register in the Graduate School as Resident Doctors and, on recommendation of the Dean, are exempt from the payment of all fees except laboratory charges.

FELLOWSHIPS

The following twenty-seven fellowships are annually offered in the Graduate School:

1. The Cornell Fellowship in English.
2. The McGraw Fellowship in Civil Engineering.
3. The Sage Fellowship in Chemistry.
4. The Schuyler Fellowship in Animal Biology.
5. The Sibley Fellowship in Mechanical and Electrical Engineering.
6. The Goldwin Smith Fellowship in Botany, Geology, or Physical Geography.
7. The President White Fellowship in Physics.
8. The Erastus Brooks Fellowship in Mathematics.
9. The University Fellowship in Architecture or Landscape Architecture.
10. The University Fellowship in Romance Languages.
11. The University Fellowship in German.
12. The University Fellowship in Agriculture.
13. The Charles Bull Earle Memorial Fellowship in Mechanical and Electrical Engineering.
14. The President White Fellowship in Modern History.
15. The President White Fellowship in Political and Social Science.
- 16, 17. The Susan Linn Sage Fellowships in Philosophy.
18. The Susan Linn Sage Fellowship in Psychology.
- 19, 20. The Fellowships in Political Economy.

- 21, 22. The Fellowships in Greek and Latin.
23. The Fellowship in American History.
24. The Edgar J. Meyer Memorial Fellowship in Engineering Research.
25. The George C. Boldt Fellowship in History.
26. The Anna Cora Smith Fellowship in Home Economics.
27. The Clinton DeWitt Smith Fellowship in Agriculture.

The President White Fellowships in Modern History and in Political and Social Science, the Anna Cora Smith Fellowship in Home Economics, and the Clinton DeWitt Smith Fellowship in Agriculture have an annual value of \$500 each; the George C. Boldt Fellowship in History has an annual value of \$1,000; the others have an annual value of \$400 each. Some of the Fellows are also exempt from tuition. It is possible that, during the year 1931-32, some modifications may be made in the lists of fellowships and graduate scholarships and in certain cases the stipends attaching to them may be considerably increased. In cases where any such change is made applicants will be informed by correspondence.

The President White Fellowships in Modern History and in Political and Social Science may at the discretion of the Faculty of the Graduate School, be made traveling fellowships. The holders of these fellowships are by the terms of the gift called upon to be in attendance for a certain period each day in the President White Library, where they will ordinarily do a large part of their study. In the case of a student of very exceptional ability and promise in the fields of either of these fellowships, the two fellowships may, in the discretion of the Faculty, be combined for a single year into one.

SPECIAL TEMPORARY FELLOWSHIPS

In addition to the fellowships enumerated above, the income of the Susanna Phelps Gage Fund for research in physics may, by the decision of the professors in the Department of Physics, be devoted to the support of fellowships in Physics.

At the present time the following special fellowships are also awarded by the Faculty of the Graduate School: The American Creosoting Company Fellowship in Chemistry; the American Rose Society Fellowship in Plant Pathology; the Bausch and Lomb Fellowship in Optical Chemistry; The Bean Disease Investigation Fellowship in Plant Pathology; the Calumet Baking Powder Fellowship in Chemistry; the Eli Lilly Research Fellowship in Chemistry; the Genesee-Orleans Vegetable Growers Association Fellowship in Plant Pathology; the Holstein Friesian Association Fellowship in Animal Husbandry; the Harry Latz Service Fellowship in Hotel Management; the Morgenthau Fellowship in Home Economics; the Nassau Farm Bureau Fellowship in Plant Pathology; the Niagara Sprayer and Chemical Company Fellowship in Plant Pathology; the N. V. Potash My. Export Fellowship in Agronomy; the Charles Lathrop Pack Fellowships in Nature Education and Forestry; the du Pont Fellowship in Chemistry; the Smith Incubator Fellowship in Poultry Husbandry; the Williamson Coöperative Vegetable Association Fellowship in Plant Pathology. It is impossible at the present time to announce these fellowships as annually awarded to applicants. Information in regard to them may at any time be obtained by correspondence with the respective departments.

GRADUATE SCHOLARSHIPS

The following eighteen graduate scholarships are offered annually in the graduate school:

- 1-5. The Susan Linn Sage Graduate Scholarships in Philosophy.
6. The Susan Linn Sage Graduate Scholarship in Psychology.
7. The Graduate Scholarship in Mathematics.
8. The Graduate Scholarship in Chemistry.
9. The Graduate Scholarship in Physics.
10. The Graduate Scholarship in Civil Engineering.
11. The Graduate Scholarship in Latin and Greek.
12. The Graduate Scholarship in Archaeology and Comparative Philology.
13. The Graduate Scholarship in Animal Biology.
14. The Graduate Scholarship in Botany, Geology, or Physical Geography.
15. The Graduate Scholarship in English.
16. The Graduate Scholarship in History.
17. The Graduate Scholarship in Architecture.
18. The Graduate Scholarship in Veterinary Medicine.

The graduate scholarships, with the exception of the Scholarship in Architecture, have an annual value of \$200 each. Some of the holders of graduate scholarships are also exempt from tuition. The Graduate Scholarship in Architecture grants only free tuition.

The Faculty of the Graduate School has the authority to award fellowships and scholarships in the following ways:

- (1) to fill all fellowships and scholarships at the stipends now established;
- (2) to combine the stipends of two or more scholarships or fellowships in order to increase the stipend of a single scholarship or fellowship;
- (3) to leave the scholarships and fellowships, or any of them, unfilled during one or more years in order to reserve such unused funds for increasing the stipends of such scholarships and fellowships as may be filled during a subsequent year.

AWARD AND TENURE

Appointments to fellowships and scholarships for the ensuing year are made by the Faculty, upon recommendation of the professors concerned, on April 1 of each year.

Official forms for making application for fellowships and graduate scholarships may be obtained from the Office of the Graduate School. All applications shall be filed in the office of the Dean on or before March 15 of the academic year preceding the one for which application is made. Before this application is filed, the applicant should have convinced himself by correspondence that he is eligible for admission to the Graduate School of this University as a candidate for an advanced degree in his chosen field, since appointments are given only to those who are eligible for admission to candidacy for an advanced degree.

Prospective graduate students who wish also to apply for positions as teaching or research assistants should address applications for such positions directly to the Department or College concerned, and not to the Office of the Graduate School.

All other information, papers, and testimonials should be submitted on or before March 15 to the department in which the appli-

cant desires to carry on the principal part of his work. Applicants are advised to submit any published or unpublished papers or reports showing the result of their study or research which might serve to indicate the extent of their knowledge of the subject, their command of the methods and tools of research, and their capacity generally for clear written expression. Candidates who are graduates of other colleges or universities should submit recommendations from the instructors best acquainted with their ability and attainments. It should be borne in mind that information cannot be too exact or detailed in the case of students not personally known to the appointing body.

The term of each fellowship and graduate scholarship is one year, but the term may under exceptional circumstances be extended to two years.

Students holding fellowships or graduate scholarships are not free to accept other appointments, but will be expected to devote their time uninterruptedly to the prosecution of their studies.

The moneys due on fellowships and graduate scholarships are paid at the office of the Treasurer of the University in six equal payments on October 15, December 1, January 15, February 15, April 1, and June 1.

THE GRADUATE PRIZE IN PHILOSOPHY

The Graduate Prize in Philosophy has an annual value of about twenty-five dollars, and is open for competition to all students registered in the Graduate School of Cornell University.

The prize will be awarded to the graduate student who submits the best paper embodying the results of research in the field of philosophy. To be acceptable, the paper must show independent scholarship and research in dealing with philosophical ideas. The subject of the paper may be either historical or critical and constructive in character. It may be concerned either with problems of pure philosophy or with the philosophical bearing of the concepts and methods employed in mathematics or in any of the natural or humanistic sciences.

Papers submitted in competition must be deposited in the office of the Dean of the Graduate School on or before the first of May. Each paper is to be type-written, and must bear a fictitious signature and be accompanied by the name of the writer in a sealed envelope.

The prize will be awarded by a committee appointed by the President of the University. A copy of the successful paper is to be deposited in the University Library by the Dean of the Graduate School.

THE UNIVERSITY LIBRARIES

OTTO KINKELDEY, *Librarian*; E. R. B. WILLIS, *Associate Librarian*; G. L. BURR, *Librarian Emeritus of the President White Library*; HALDÓR HERMANSSON, *Curator of the Icelandic Collection*; G. L. HAMILTON, *Curator of the Dante and Petrarch Collections*; E. E. WILLEVER, *Librarian of the Law Library*; W. W. ELLIS, *Librarian of the Agricultural College Library*.

The University Libraries comprise the General Library of the University, the Seminary Libraries in the General Library Building,

the Architectural Library, the Chemical Library, the Sibley Engineering Library, the Civil Engineering Library, the Law Library, the Flower Veterinary Library, the Barnes Hall Library, the Goldwin Smith Hall Library, the Van Cleef Memorial Medical Library, the Library of the New York State College of Agriculture, and the Library of the New York State Agricultural Experiment Station at Geneva. The total number of bound volumes in them is now about eight hundred and forty thousand. The number of periodicals, transactions, and other serials currently received, is over two thousand, and of most of these complete sets are on the shelves.

In addition to the general store of books which a University Library of this size may be expected to contain, there are many special collections, assembled by scholars or with scholarly intent, of which a list in some detail may be found in the Register of the University. Among the more noteworthy are:

THE PRESIDENT WHITE LIBRARY, received in 1891 as a gift from the first President of the University and largely increased by subsequent gifts and purchases. It includes special collections on the History of Superstition, the Age of the Reformation, and the French Revolution.

THE DANTE, PETRARCH, AND ICELANDIC COLLECTIONS, for which separate catalogues have been printed, were gathered by the first Librarian, Willard Fiske, who gave them to the University and bequeathed funds for their upkeep.

THE MAY COLLECTION relating to the history of slavery had as its nucleus the Library of the late Rev. Samuel J. May, long secretary of the American Anti-slavery Society.

THE WASON COLLECTION of books dealing with China and the Chinese was bequeathed to the Library by Charles William Wason, '76, with provision for its increase.

For the study of English, of the classical languages, of the Germanic and Romance languages, of philosophy, of politics and economics, of American and of European history, there have been provided in the library building seven seminary rooms, each equipped with a carefully chosen body of reference books, to which advanced students in these fields have access. In connection with the scientific and technical laboratories similar collections have been formed and well supplied with reference books, standard works, and sets of periodicals, conveniently arranged for study and research.

Cards of admission to the shelves in the stackrooms and to the White Historical Library will be issued to graduate students for the purpose of consultation and research. The privilege of taking books for home use is granted to all students who comply with the library regulations.

LECTURES IN BIBLIOGRAPHY. As a part of the work of the General Library, Mr. Willis, associate librarian, offers a series of informal talks to graduate students in the second term on the resources and facilities of the Library and on the employment as aids to research of the general bibliographical helps.

FIELDS OF INSTRUCTION

In the following pages are outlined the opportunities for graduate study in the various subjects taught in the University. The subjects are grouped in broad fields. An asterisk (*) preceding the title of a special field of study indicates that this is a field which may be chosen as a Major or Minor Subject. Under each subject there is usually given a statement of (1) the special facilities and encouragements for work in that subject, (2) the general prerequisites for advanced work in the subject, (3) courses of instruction for graduates and undergraduates or primarily for graduates, and opportunities offered for the direction of individual investigation in the subject.

More detailed information concerning any one of these various courses (time and place of meeting, and in the case of a few courses given in alternate years whether or not offered in 1931-32, etc.) will be found in the separate announcement of the college in which the particular course is given. The latest edition of any of these special announcements of the several colleges may be obtained by application to the Secretary of the University.

THE FINE ARTS

THE HISTORY AND PRACTICE OF THE FINE ARTS

Professors O. M. BRAUNER, CHRISTIAN MIDJO, H. P. CAMDEN, D. L. FINLAYSON, A. C. PHELPS.

Committee: O. M. BRAUNER, OTTO KINKELDEY, and GEORGE YOUNG, jr.

Graduate work is offered in historical, theoretical, or creative work in the field of the fine arts.

Candidates for the degree of Master of Fine Arts must be holders of a baccalaureate degree and must spend at least one year in residence following the granting of such degree.

The History and Theory of the Fine Arts, Drawing, Painting or Sculpture may be selected as major subjects. Minor subjects may be selected as approved.

DRAWING AND PAINTING. Professors BRAUNER and MIDJO.

SCULPTURE. Professor CAMDEN.

HISTORY OF ART. Professor FINLAYSON.

HISTORY OF ARCHITECTURE. Professor PHELPS.

Other members of the staff will cooperate as necessary.

ARCHITECTURE

Professors F. H. BOSWORTH, C. A. MARTIN, A. C. PHELPS, GEORGE YOUNG, jr., L. P. BURNHAM, H. E. BAXTER, and A. D. SEYMOUR, jr.

Graduate work is offered in architectural design, in the history of architecture, and in advanced construction.

Candidates for the degree of Master of Architecture must have had preliminary training in the subjects elected for graduate work equivalent to that required in like subjects in this University for the degree of Bachelor of Architecture. Architectural Design, History of Architecture, and Architectural Construction are offered as major subjects for the Master's degree; Landscape Design; Drawing, Painting, Modeling, and approved courses in other departments of the University may be elected as minor subjects.

The facilities for graduate work in architecture are excellent. Large, well lighted drafting-rooms and studios are provided and a special architectural library, comprising several thousand books, photographs, lantern slides, and numerous original drawings, is situated in White Hall where it is easily accessible to the student.

Instruction is given by means of lectures, seminary discussions, and especially by direct personal criticism and advice.

*ARCHITECTURAL DESIGN. Professors BURNHAM and SEYMOUR.

*HISTORY OF ARCHITECTURE. Professor PHELPS.

*ARCHITECTURAL CONSTRUCTION. Professors MARTIN, YOUNG, and BAXTER.

LANDSCAPE ARCHITECTURE

Professors E. D. MONTILLON, EDWARD LAWSON and R. W. CURTIS, and the Faculty of Architecture.

Graduate work in Landscape Architecture is offered in design, history, and planting design.

Candidates for the degree of Master of Landscape Architecture must have had preliminary training in the subjects elected for graduate work equivalent to that required in like subjects in this University for the degree of Bachelor of Landscape Architecture. Any one of these subjects may be selected as the major study for the degree of Bachelor of Landscape Architecture. The minor subject may be one of the other two, Architectural Design, Drawing, Modeling or approved work in any department of the University.

*LANDSCAPE DESIGN. Professors MONTILLON and LAWSON.

*HISTORY OF LANDSCAPE ARCHITECTURE. Professors MONTILLON and LAWSON.

*PLANTING DESIGN. Professors LAWSON and CURTIS.

*MUSIC

Professors P. J. WEAVER, OTTO KINKELDEY, H. D. SMITH, A. C. HAIGH, and ———.

Primarily for Undergraduates

THE ART OF MUSIC. Professor WEAVER. (Music 5, M W F 11).

HISTORY OF MUSIC. Professor WEAVER. (Music 10, T Th 10).

HISTORY OF PIANOFORTE LITERATURE. Assistant Professor HAIGH. (Music 12, M W F 10).

HISTORY OF ORCHESTRAL LITERATURE. Assistant Professor ———. (Music 13, M W F 8).

DOUBLE COUNTERPOINT, CANON AND FUGUE. Assistant Professor SMITH. (Music 25, M W F 8).

INSTRUMENTATION. Assistant Professor ———. (Music 30, M W F 2).

ADVANCED COMPOSITION. Assistant Professor HAIGH. (Music 41, T Th S 9).

Primarily for Graduates

SEMINARY IN MUSICOLOGY. Professor KINKELDEY. (Music 100). Primarily for graduates (and, by permission, to seniors) who have the requisite reading knowledge of one or more of the important foreign languages, a fair knowledge of musical theory, and some skill in practical music. The work is intended to make the student acquainted with the accomplishments of the past and with modern methods and aims in all fields, scientific, aesthetic, and historical, of musical research and investigation. Special topics or fields of study will be selected for each term after consultation with the class.

LANGUAGES AND LITERATURES

*SEMITIC LANGUAGES AND LITERATURES

Professor NATHANIEL SCHMIDT.

Special facilities for advanced work in these subjects are: (1) a collection of several hundred squeezes of inscriptions found in Syria and Arabia Petraea, chiefly in Arabic, Hebrew, Syriac, Assyrian, Nabataean, and Greek; (2) squeezes of Old Egyptian, Coptic, and Hittite inscriptions; (3) a collection of

several thousand photographs taken in Syria and Arabia Petraea and slides taken from these photographs; (4) reproductions of inscriptions and objects of art in the Museum of Casts; (5) a valuable collection of Arabic, Hebrew, Samaritan, Ethiopic, and Coptic manuscripts secured in Syria; (6) the Eisenlohr Library, especially rich in Egyptology; (7) the Fiske collection of Arabic books; (8) a growing collection of Egyptian antiquities.

To the candidate for an advanced degree, opportunities are offered of studying every Semitic language and dialect, and also Sumerian, Old Egyptian, and Coptic. The student may, if he so chooses, specialize in Semitic literature or in Oriental history. A candidate for the Master's degree or the Doctor's degree, with Semitic languages as a major subject, must have had a year of elementary Hebrew or Arabic; and a candidate for either of these degrees, with Oriental history as a major subject, must have had one year of ancient history and one year either of the history of Asia or the history of Africa before entering upon the graduate course.

Courses will be given in the following subjects, as demanded, by special arrangement with the professor.

ADVANCED HEBREW. NEO-HEBRAIC. ETHIOPIC. ASSYRIAN. SUMERIAN. ARAMAIC (Mandaic, Babylonian Talmudic, Syriac, Nabataean, Palmyrene, Galilean, Samaritan, and Judean). ARABIC (Sabaean and Minaean, Classical, Modern). EGYPTIAN. COPTIC. COMPARATIVE SEMITIC PHILOLOGY. SEMITIC EPIGRAPHY (in Semitic Seminary). HEBREW LITERATURE (in Semitic Seminary).

See also ORIENTAL HISTORY.

THE CLASSICS

Professors C. L. DURHAM, E. P. ANDREWS, H. L. JONES, HARRY CAPLAN, and JAMES HUTTON; H. F. CHERNISS and Dr. J. E. FONTENROSE.

Admission to graduate study is a subject included in the group of the Classics, except in archaeology, assumes a knowledge of the field selected equivalent in general to that expected of a student who has pursued the subject concerned throughout four years of undergraduate study in a college of recognized standing.

Graduate work in the Classics is conducted in the main by the seminary system, the object of which is training in the methods, the principles, and the performance of independent research and criticism, and the work is therefore as far as possible put into the hands of the students themselves. Subjects other than those investigated in one of the seminaries of the year are ordinarily presented by courses of lectures.

Two seminary rooms in the Library Building are reserved for the exclusive use of graduate students in the Classics. In addition to the various complete sets of philological and of archaeological journals and standard works of reference in these rooms, the general University Library is at the disposal of the graduate students; stack permits are available when required, and special collections of books can be transferred from the general library to the seminary rooms when needed.

Two fellowships in Greek and Latin; a scholarship in Greek and Latin; and a scholarship in Archaeology and Comparative Philology are awarded annually.

The Charles Edwin Bennett Fund for Research in the Classical Languages yields an annual income of three hundred dollars which may be used each year in the way best suited to promote the object for which the fund was established.

*GREEK

20. LYRIC POETRY; AESCHYLUS, PROMETHEUS VINCTUS; THEOCRITUS; DEMOSTHENES, DE CORONA; THUCYDIDES. Throughout the year. First term, Assistant Professor HUTTON. T Th S 11. Goldwin Smith 120; second term, Professor JONES. T Th S 9. Goldwin Smith 120.

[25. ADVANCED GREEK COMPOSITION. Dr. CHERNISS. Not given in 1931-32.]

31. LECTURES ON GREEK LITERATURE: LYRIC AND EPIC POETRY. First term. Professor JONES. T Th 12. Goldwin Smith 120.

[33. CLASSICAL AND MEDIAEVAL RHETORIC AND ORATORY. Professor CAPLAN. Not given in 1931-32.]

[41. SEMINARY. Professor JONES. Aeschylus; or Lysias; or the geography of Homer in the Odyssey, a study based on Strabo's Geography and Bérard's *Les Phéniciens et L'Odyssée*; also special problems connected with the text of Strabo. Not given in 1931-32.]

[43. SEMINARY. Professor CAPLAN. The works of Homer. Not given in 1931-32.]

[44. SEMINARY. Greek Elegiac Poetry. Assistant Professor HUTTON. Not given in 1931-32.]

45. SEMINARY. Herodotus. Textual, linguistic, literary, and historical studies. Professor JONES. Throughout the year. Th 2:30. Library, Classical Seminary Room.

See also PLATO'S REPUBLIC (under *PHILOSOPHY*), Indo-European Philology (under *LATIN*), and METHODS OF LITERARY AND LINGUISTIC STUDY, and PRINCIPLES OF LITERARY CRITICISM (under *COMPARATIVE STUDY OF LITERATURE*).

*LATIN

17. LITERATURE AND HISTORY OF THE EARLY EMPIRE. Throughout the year. Tacitus, Annals; Juvenal; Pliny's Letters; Suetonius. Assistant Professor HUTTON. M W F 9. Goldwin Smith 128.

30. HISTORY OF ROMAN LITERATURE. Lectures and readings. Second term. Professor CAPLAN. M W F 11. Goldwin Smith 134.

[33. MEDIAEVAL RHETORIC. Professor CAPLAN. Not given in 1931-32.]

[39. SEMINARY. Professor DURHAM. The MS tradition of Cicero's oratorical works; Plautus; Cicero's Orator and the Doctrine of Prose Rhythm; problems in Latin pronunciation and versification; or Catullus and Alexandrianism. Not given in 1931-32.]

[40. SEMINARY. Professor CAPLAN. The works of Horace: their literary and historical significance with the textual and metrical problems presented. Not given in 1931-32.]

41. SEMINARY. Studies in the History of Latin Literature. Professor CAPLAN. T 2:30. Library, Classical Seminary Room.

[47. HISTORICAL LATIN SYNTAX. With special reference to the moods and tenses of the Latin verb. Not given in 1931-32.]

[48. VULGAR LATIN. Professor DURHAM. The sounds, flexions, and syntax of informal Latin; the extension and the characteristics of the spoken language under the Empire. Primarily for students of Latin who are interested also in the history of the Romance Languages. Not given in 1931-32.]

49. INDO-EUROPEAN PHILOLOGY. Phonetics; the principles, methods, and results of the comparative philology of the Indo-European family of languages.

SOUNDS AND FLEXIONS OF LATIN; THE ITALIC DIALECTS. The sounds and flexions of Latin from the earliest period down to the time of Augustus; the Oscan and Umbrian dialects.

Throughout the year. Professor DURHAM. M W 11. Goldwin Smith 128.

50. LATIN EPIGRAPHY. Professor DURHAM. The earlier republican and the later imperial inscriptions (including Christian inscriptions) will be studied primarily for their linguistic value; the late republican inscriptions and those of the early Empire will be considered more particularly with reference to their historical content. Second term. M W 12. Goldwin Smith 128.

*GREEK ART AND ANTIQUITIES

Professor E. P. ANDREWS.

The Museum of Casts furnishes abundant material for the study of Greek sculpture and for most branches of Greek archaeology. Several hundred squeezes bring the most important Greek inscriptions within reach for independent work in Greek epigraphy.

GREEK EPIGRAPHY, in Seminary. The Greek alphabets and illustrative inscriptions, working chiefly from squeezes.

GREEK ARCHAEOLOGY, in Seminary. The pre-hellenic civilization; Greek vases, coins, terracottas, gems, metal-work, painting, architecture.

HISTORY OF GREEK SCULPTURE, in Seminary.

MODERN GREEK, WRITTEN AND COLLOQUIAL.

PAUSANIAS AND THE TOPOGRAPHY OF GREECE, with especial reference to Athens.

*ENGLISH LANGUAGE AND LITERATURE

Professors WILLIAM STRUNK, jr., F. C. PRESCOTT, C. S. NORTHUP, J. Q. ADAMS, B. S. MONROE, L. N. BROUGHTON, F. M. SMITH, J. W. HEBEL, and W. H. FRENCH, and Doctors MILTON MARX, J. J. ELSON, and D. R. MITCHELL.

Among the books available to the student are complete sets of the publications of the Early English Text, Chaucer, Scottish Text, Percy, English Dialect, Shakespeare, New Shakespeare, Spenser, Philological, Malone, and other societies; of the Arber, Bullen, Grosart, and Farmer reprints; and of all the important periodicals dealing with the English language and literature. Most of the American and foreign dissertations on English subjects, standard and other editions of individual authors, English and American, and several special collections are also in the Library, which is exceptionally rich in the field of Old and Middle English, and in the Elizabethan and Victorian periods. The Hart Memorial Library, founded by the late Professor James Morgan Hart, contains about four thousand five hundred volumes and includes valuable collections in the bibliography of English philology. This library, in Goldwin Smith Hall, is for the use of graduate students and members of the Faculty. The Department has also a seminary room in the University Library. A fellowship and a scholarship are annually awarded. The *Cornell Studies in English*, a series of monographs issued by the Department, affords some opportunity for the publication of work accomplished by graduates as well as by members of the staff. Seventeen numbers have appeared.

Candidates for an advanced degree may take their major subject in literature or in language. In general, thirty-six hours (i. e., three full years) of college English are required before a student may enter upon candidacy for an advanced degree. Work in philosophy, history, and languages, ancient and modern, may, at the discretion of the candidate's special committee, be counted against a shortage in undergraduate English. Training in the Greek and Latin literatures is especially desirable as preparation for graduate work in English. All candidates must have a reasonable familiarity with Old and Middle English; must have a general knowledge of English literature and English history; and must accomplish satisfactory work in research. Candidates for the Master's degree must have sufficient knowledge of French or German to make use of scholarly work in one of those languages, and candidates for the Doctor's degree must have a similar knowledge of both French and German, and a reading knowledge of Latin.

For Upperclassmen and Graduates

32. OLD ENGLISH. Throughout the year. Professor MONROE. M W F 9. Goldwin Smith 162.

Old English grammar. Reading of selections from the *Old English Chronicle*, King Alfred, Aelfric, and other representative prose texts, and of the simpler

poetry. A part of the second term is devoted to early Middle English, with supplementary reading on the growth of the language.

Designed primarily for prospective teachers and for graduates who have made no previous study of the early language.

38. MIDDLE ENGLISH METRICAL ROMANCES. Second term. Hours to be arranged. Assistant Professor FRENCH.

40. CHAUCER. First term. T Th 9. Assistant Professor FRENCH. Goldwin Smith 162.

[42. THE ENGLISH DRAMA TO 1642. Throughout the year. Professor ADAMS. M W F 11. Goldwin Smith 142.

First term: the origin of the drama; mysteries, saint-plays, moralities, folk-plays, interludes; the rise of professional actors; the development of stage-craft. Second term: the neo-classical revival; the academic drama; the erection of theatres; the contemporaries and successors of Shakespeare; the suppression of acting.

Not to be given in 1931-32. This course alternates with course 44.]

44. SHAKESPEARE. First term. Professor ADAMS. M W F 11. Goldwin Smith 142.

A study of Shakespeare's greater plays, with emphasis upon their literary values. Collateral reading is required in Shakespeare's life, and in various aspects of the Elizabethan Age.

46. SHAKESPEARE. Throughout the year. Professor STRUNK. M W F 10. Goldwin Smith 156. First term: the chief comedies; second term: the chief tragedies.

[48. SPENSER. First term. Professor HEBEL. Not given in 1931-32.]

50. SEVENTEENTH CENTURY LITERATURE. First term. Professor HEBEL. T Th S 11. Goldwin Smith 234.

A study of English literature, history, and philosophy of the seventeenth century; Bacon, Donne, Herbert, Vaughan, Traherne, Jonson, Herrick, Carew, Suckling, Burton, Browne, Walton, Pepys.

52. MILTON. Second term. Professor HEBEL. T Th S 11. Goldwin Smith 234.

A study of Milton's poetry and selections from his prose.

56. EIGHTEENTH CENTURY PROSE. Throughout the year. Professor BROUGHTON. M W F 9. Goldwin Smith 156.

A study of the leading prose writers of the century: Defoe, Swift, Addison, Steele, Goldsmith, Johnson, Burke, and others.

[60. EIGHTEENTH CENTURY NOVEL. First term. Professor BROUGHTON. T Th 9. Goldwin Smith 134.

The origin of the modern English novel and its development to the end of the eighteenth century. Lectures, recitations, and extensive reading in Defoe, Richardson, Fielding, Smollett, Sterne, and others. Not given in 1931-32.]

[66. NINETEENTH CENTURY PROSE. Throughout the year. Professor BROUGHTON. W 4-6. Goldwin Smith 160.

Extensive reading in nineteenth century prose, with some attention to the literary criticism and theories of style of the period; frequent reports and a term essay. Not given in 1931-32.]

68. VICTORIAN LITERATURE. First term. Professor NORTHUP. M W F 9. Goldwin Smith 134.

Lectures on the chief characteristics and literary tendencies of the period; studies of Browning, Tennyson, and the greater writers of prose.

69. VICTORIAN LITERATURE. Second term. Professor NORTHUP. M W F 9. Goldwin Smith 134.

Studies of Arnold, Morris, Swinburne, and some other poets, and of the greater writers of fiction.

70. AMERICAN LITERATURE. First term. Professor PRESCOTT. M W F 12. Goldwin Smith 156.

American literature of the colonial and revolutionary periods; the growth of literary independence; Irving, Bryant, and Cooper.

72. AMERICAN LITERATURE. Second term. Professor PRESCOTT. M W F 12. Goldwin Smith 156.

American prose and poetry of the nineteenth century.

90. DRAMATIC STRUCTURE. Throughout the year. Professor STRUNK. T Th S 11. Goldwin Smith 156.

A study of the principles of dramatic construction based upon Greek, Elizabethan, and classical French drama (first term), and modern drama (second term).

98. TEACHERS' COURSE. First term. Professor NORTHUP. T Th 12. Goldwin Smith 227.

Lectures, readings, and conferences on the teaching of English in the secondary schools.

For Graduates

101. OLD ENGLISH LITERATURE. Either term. Professor MONROE. T Th 3, or other hours to be arranged. Goldwin Smith 162.

Reading of selected Old English works including *Beowulf* or some of the Cynewulfian poetry; studies in textual criticism and in style and metre; supplementary reading.

104. RESTORATION DRAMA. Throughout the year. Dr. MARX. Room and hour to be arranged.

Dryden, Davenant, Etherege, Shadwell, Otway, Wycherley, Congreve, Vanbrugh, Farquhar, and others. First term. Restoration tragedy and the heroic play. Second term, Restoration comedy.

110. SEVENTEENTH CENTURY LITERATURE. Throughout the year. Professor HEBEL. T 4. Goldwin Smith 339.

A study, with reports, of the problems of research in seventeenth century literature, designed to introduce the student to various modes of literary investigation.

115. EIGHTEENTH CENTURY LITERATURE. Throughout the year. Professor BROUGHTON. W 2-4. Goldwin Smith 338.

A study of the influences, tendencies, literary criticism, thought, and life of the eighteenth century.

116. WORDSWORTH AND HIS CONTEMPORARIES. Throughout the year. Professor BROUGHTON. M 4-6. Goldwin Smith 338.

First term: a detailed study of the works of Wordsworth and their influence on contemporary English thought and literature. Second term: the contemporaries of Wordsworth.

[117. PASTORAL POETRY. Professor BROUGHTON.

A study of the sources and development of the appreciation of rustic life and landscape in poetry from Theocritus to recent writers. Not given in 1931-32.]

130. ENGLISH LITERATURE, 1500-1603. First term. Professor ADAMS. M W F 12. Goldwin Smith 338.

A study of the non-dramatic literature of England from the beginning of the Renaissance to the close of the reign of Elizabeth. Members of the class will be expected to purchase as many texts as are available. The rarer works will be placed on reserve in the Hart Memorial Library.

131. METHODS AND MATERIALS IN ELIZABETHAN RESEARCH. First term. Professor ADAMS. Hours to be arranged. English Seminary Room.

Elizabethan handwriting; sixteenth and seventeenth century printing and publishing; scientific bibliography; the early calendar; the important books of reference for English scholarship; textual criticism; the editing of Elizabethan works; the technique of research.

132. SHAKESPEAREAN RESEARCH. First term. Professor ADAMS. Hours to be arranged. English Seminary Room.

Playhouse manuscripts; the transmission of Shakespeare's texts; Elizabethan theatrical conditions; the censorship of plays; the problems of textual criticism; *Hamlet* in modern scholarship.

135. NINETEENTH CENTURY FICTION. Throughout the year. Professor NORTHUP. Th 4-6. Goldwin Smith 338.

Studies in the development of the novel from Scott to Meredith.

137. MIDDLE ENGLISH LITERATURE. Throughout the year. Professor NORTHUP. M W 10. Goldwin Smith 338.

Studies of important poetry and prose from the Conquest to Malory and of leading problems needing research.

138. THE AMERICAN SHORT STORY. Second term. Professor SMITH. Room and hour to be arranged.

A study of the short story as reflecting the social background of America.

140. AMERICAN LITERATURE. First term. Professor PRESCOTT.

Emerson, Thoreau, and Whitman, and their relation to New England Transcendentalism. Hour to be arranged.

141. THE ENGLISH LANGUAGE. Throughout the year. W 3, or other hours to be arranged. Professor MONROE. Goldwin Smith 162.

A study of selected topics either independently or in connection with other courses in language and literature.

146. SHELLEY. Second term. Professor PRESCOTT.

A study of Shelley's poetical and prose works in relation to his life and time. Hour to be arranged.

150. DRAMATIC LITERATURE. Throughout the year. Professor STRUNK. T 7:30. Goldwin Smith 338.

A study of dramatic history and theory, with reading of representative plays. This course is supplementary to English 90, Dramatic Structure, which should precede or accompany it.

*COMPARATIVE STUDY OF LITERATURE

Professor LANE COOPER (Professor of the English Language and Literature); and Assistant Professor JAMES HUTTON.

Once the usual demands for entrance into the Graduate School are satisfied, no particular requirement but special fitness is made of candidates for an advanced degree who desire entrance into this field of work, which is closely related to English Philology in the broad sense of the term. Philology is here taken to mean the conjoint study of language and literature. The candidate must evince some special fitness for either the literary or the linguistic side of the work, but in any case must not be deficient in literary appreciation. He will have opportunity to prove his worth in the first year of graduate study. In general, one year of satisfactory graduate work is enough for the degree of Master of Arts. Students who are permitted to advance toward the doctoral degree commonly expect to receive it after two years more—but the attainment of the doctorate in three years must not be regarded as a fixed rule. The work for both degrees will be adapted to the needs and purposes of the individual candidate; great care will be taken to find a suitable subject for the "thesis." The work is in the main designed to develop good scholars and effective teachers for colleges and universities.

Apart from a broad culture, however attained, the best foundation for this work is undergraduate study of the classics. Those who wish to be candidates should use every opportunity to improve their acquaintance with Greek and Latin literature, whether in the original or through translations, and with mediæval literature—for example, in Old and Middle English, which had best be begun before the first year of graduate work. The graduate student must bring a love of good literature with him, and not expect to acquire it at a late date, for his special studies now presuppose that love. In general, a good candidate is one who has been drawn to read the best books, and has read them, from the age of eight or ten years on, and who has had a broad and sound course of study as an undergraduate. This course should have included one satisfactory year of French, at least two years of German, and a fair amount of Latin. For those who have

not had Greek in the preparatory school, it is desirable to begin it as early as the Sophomore year in college; but it may be begun later; and candidates who have not studied the Greek language will not be rejected on that account. A student who has had a broad general culture, and has done very well in classics, history, biology, or mathematics, may expect to succeed in the comparative study of literature.

Good doctoral dissertations will be accepted for publication in the *Cornell Studies in English*.

For Graduates and Undergraduates

1. MODERN WRITERS ON ART: RUSKIN, TOLSTOY, and NIETZSCHE. Throughout the year. Credit three hours a term. Open to sophomores and upperclassmen with the permission of the instructor. Assistant Professor HUTTON. M W F 11. Goldwin Smith 120.

A study of artistic principles and practice, with special attention to the art of prose.

3. OLD AND MIDDLE ENGLISH. Throughout the year. Credit three hours a term. Professor COOPER. M W F 10. Goldwin Smith 236.

A study of the foundations of the English language and literature, with emphasis upon literary aspects so far as a proper acquisition of linguistic knowledge shall permit. The work of the second term deals partly with Chaucer. Students may be admitted at the beginning of either term after consultation with the instructor.

The course will be of service to prospective teachers in the secondary schools.

Primarily for Graduates

4. PRINCIPLES OF LITERARY CRITICISM. Throughout the year. Credit three hours a term. Primarily for graduate students; open to upperclassmen by permission. Professor COOPER. W 11-12:50. English Seminary Room.

A study of the chief theories of poetry, and chief kinds of literature, with illustrations drawn from writers both ancient and modern.

This and the following courses are mainly designed for prospective college and university teachers.

5. DANTE IN ENGLISH. Throughout the year. Credit three hours a term. Primarily for graduate students; open to upperclassmen by permission. Professor COOPER. M 11-12:50. English Seminary Room.

Reading for the sake of literary and historical perspective, followed by a more intensive study of select cantos of the *Commedia*. A knowledge of Italian is not required.

[6. METHODS OF LITERARY AND LINGUISTIC STUDY. Throughout the year. Credit three hours a term. Open to graduate students only. Professor COOPER. Not given in 1931-32.]

Reading in the *Encyklopädie* of August Boeckh, followed by a study of more recent treatises with special reference to the ancient classics and English.

7. CHAUCER SEMINARY. Throughout the year. For graduate students only. Professor COOPER. Tuesday 7:30 p. m. English Seminary Room.

A survey of books and topics that are essential to the study of Chaucer and his age; systematic reading of his works; a detailed examination of significant problems.

*RHETORIC AND PUBLIC SPEAKING: DRAMATIC PRODUCTION

Professors A. M. DRUMMOND, G. B. MUCHMORE, H. A. WICHELNS, HARRY CAPLAN, W. H. STANTON, R. H. WAGNER, and C. K. THOMAS.

The chief aim of graduate work in rhetoric and in dramatic production is to develop competent investigators and teachers for colleges and universities.

Candidates should have the background of a thorough undergraduate course centering in literature, history, and philosophy; should be able to speak and

write good English; should have reasonable proficiency in public speaking and reading; and should be conversant with the literature of their chosen field. Candidates for the Master's degree should have a reading knowledge of French or of German; candidates for the Doctor's degree must, before admittance to candidacy, demonstrate their ability to make use of French and of German. Applicants are advised to enter into correspondence as to their qualifications well in advance of the date at which they propose to begin residence.

All candidates must attain a reasonable knowledge of speech training and phonetics; must acquire a specialist's knowledge of the literature and history of their chosen field, and must accomplish satisfactory work in research. In most cases, the work will require more than the minimum periods of residence. For the Doctor's degree, residence in this University during two academic years will be necessary.

Properly qualified students may select Speech Training and Phonetics as a minor subject.

Candidates for the Doctor's degree whose major interest is in Rhetoric, that is, in the principles, history, and criticism of public address, will be advised to make English Literature one of their minor subjects.

Candidates for the Doctor's degree whose major interest is in Drama and the Theatre will be required to take Dramatic Literature as a minor subject, unless they have already pursued systematic study in this field. Candidates for the Master's degree in Dramatic Production will require at least one academic year and one summer session of residence, and may attain the doctorate in Drama and the Theatre only after two additional years and an additional summer. Opportunities for theatre practice of which students will be expected to avail themselves are afforded by various branches of the University Theatre, especially by the Laboratory Theatre and the Summer Theatre.

Advanced Courses

15. ADVANCED PUBLIC SPEAKING. First term. Assistant Professor MUCHMORE. M W F 10. Goldwin Smith 242.

16. FORMS OF ADDRESS. Second term. Assistant Professor MUCHMORE. M W F 10. Goldwin Smith 242.

[21. HISTORY OF RHETORIC AND ORATORY. Professor WICHELS. Not given in 1931-32.]

23. CLASSICAL RHETORIC. First term. Assistant Professor WAGNER. T 11; Th 11-1. Goldwin Smith 26.

A study, in English translation, of ancient theories of public address, with special reference to Aristotle, Cicero, and Quintilian.

24. PUBLIC OPINION AND THE METHOD OF ARGUMENT. Second term. Professor WICHELS. T 11; Th 11-1. Goldwin Smith 26.

Public opinion and its formation studied with reference to the modern theory and practice of public address.

[25. BRITISH ORATORS. Assistant Professor WAGNER. Not given in 1931-32.]

[27. AMERICAN ORATORS. Professor WICHELS. Not given in 1931-32.]

31. ADVANCED PHONETICS AND SPEECH TRAINING. Second term. Assistant Professor THOMAS. T Th S 10. Goldwin Smith 26.

A study of voice training and phonetics, and of methods of improving normal and defective speech.

41. DRAMATIC INTERPRETATION. First term. Assistant Professor STANTON. M W F 12. Morse, Stage Laboratory.

Dramatic interpretation and the related principles of stage direction and production.

42. ADVANCED DRAMATIC INTERPRETATION. Second term. Professor DRUMMOND. Th 4-6. Morse, Stage Laboratory.

A practice course in direction, rehearsal, and acting, leading to public presentations in the Laboratory Theatre; special attention to oral interpretation

45. **DRAMATIC PRODUCTION:** Stagecraft. Second term. Assistant Professor STANTON. M W 12. Laboratory, T 1:40-4 or as arranged. Morse, Stage Laboratory.

The theory and practice of stage production.

[48. **HISTORY OF THE THEATRE.** Professor DRUMMOND. Not given in 1931-32.]

49. **PLAYWRITING.** Throughout the year. Professor DRUMMOND. T Th 12. Goldwin Smith 21.

51. **PROBLEMS AND METHODS.** First term. Professor DRUMMOND. W 2-4. Goldwin Smith 21.

A survey of fundamental ideas on the practice and pedagogy of public speaking, speech training, and dramatic production.

CLASSICAL AND MEDIEVAL RHETORIC. Professor CAPLAN. See Greek 33.

DRAMATIC LITERATURE. See especially English 90 and 150. Professor STRUNK.

Seminary Courses

[60. **RHETORICAL CRITICISM.** Professor WICHELNS. Not given in 1931-32.]

[61. **ENGLISH AND AMERICAN THEORIES OF PUBLIC ADDRESS.** Professor WICHELNS. Not given in 1931-32.]

62. **PHILOSOPHY OF RHETORIC.** Throughout the year. First term, Assistant Professor WAGNER. Second term, Assistant Professor WICHELNS. T 3-5. Goldwin Smith 25.

63. **SPEECH TRAINING.** Throughout the year. Assistant Professor THOMAS. W 2-4. Goldwin Smith 23.

66. **DRAMATIC PRODUCTION.** Second term. Professor DRUMMOND. W 2-4. Morse, Stage Laboratory.

A study of the chief theories of dramatic production in relation to aesthetic principles.

[67. **DRAMATIC ART.** Professor DRUMMOND. Not given in 1931-32.]

68. **MODERN THEORIES OF STAGE PRESENTATION.** Throughout the year. Assistant Professor STANTON. Th 2-4. Morse, Stage Laboratory.

GERMANIC LANGUAGES AND LITERATURES

*GERMAN

Professors A. B. FAUST, A. W. BOESCHE, P. R. POPE, and A. L. ANDREWS.

In the advanced courses in this subject the work is twofold, literary and philological. The history of German literature from the earliest period to the present day is sketched in outline lecture courses with collateral reading. Special topics are selected for detailed study such as the epic and lyric poetry of the Middle High German period, the literature of the Reformation, the classical period, the drama of the nineteenth century, and contemporary literature. The courses offered in philology include the study of Gothic and of Old and Middle High German. They also afford an introduction to the science of language.

The seminars in German literature and philology aim to impart the principles and methods of investigation. A teacher's course deals with classroom methods and theories of instruction in the modern languages.

All the work in German is greatly facilitated by an exceptional library equipment. The nucleus was formed by the acquisition of the Zarncke library, one of the largest collections of rare books for the study of German literature and philology ever brought to America. With constant enlargements the library has become one of the most serviceable in the country. The German seminary room in the University Library contains books for ready reference, including philological journals and reviews.

Candidates for advanced degrees in German are expected to have an adequate knowledge of French and Latin. A fellowship in German is awarded annually.

For Graduates and Undergraduates

LESSING'S LIFE AND WORKS. Professor POPE.
 SCHILLER'S DRAMAS. Professor ANDREWS.
 SCHILLER'S LYRICS AND PROSE. Professor BOESCHE.
 GOETHE'S LIFE AND WORKS. Professor BOESCHE.
 GOETHE'S FAUST. Professor FAUST.
 HISTORY OF GERMAN LITERATURE. Professor FAUST.
 CONTEMPORARY GERMAN LITERATURE. Professor FAUST.
 NINETEENTH CENTURY DRAMA. Professor POPE.
 MIDDLE HIGH GERMAN. Professors POPE and ANDREWS.
 HISTORICAL GERMAN SYNTAX. Professor BOESCHE.
 TEACHERS' COURSE IN METHODS. Professor FAUST. Methods of teaching modern languages; examination and criticism of textbooks available for the study of German; requirements for teachers' examinations.

Primarily for Graduates

GOthic. Professor BOESCHE. Streitberg's *Gotisches Elementarbuch: Die gotische Bibel*, ed. by Streitberg. This course will serve as a general introduction to Germanic philology.

OLD HIGH GERMAN. Professor BOESCHE. Braune's *Althochdeutsche Grammatik* and *Althochdeutsches Lesebuch*. A study, mainly linguistic, of the oldest German texts. It should be preceded by the course in Gothic.

PRINCIPLES OF GERMANIC PHILOLOGY. Professor ANDREWS. A discussion of the fundamental principles of linguistic relationships within the old Germanic dialects. Lectures and illustrative problems. This course should be preceded by those in Gothic and Old High German.

SEMINARY IN GERMAN LITERATURE. First semester, Professor FAUST; second semester, Professor POPE. A study of special literary problems, as: *Der junge Goethe*; Goethe's *Faust II*; Lessing's *Hamburgische Dramaturgie*; the Modern "Sturm und Drang" Period; German-American Literature; Problems in German Literature since 1880.

SEMINARY IN GERMAN PHILOLOGY. Professor BOESCHE. A detailed study of early German texts, such as the smaller Old High German poems, or of questions in Historical German Syntax.

*SCANDINAVIAN LANGUAGES AND LITERATURES

Professor HALLDÓR HERMANNSSON.

The Fiske Icelandic Collection of the University Library, comprising about 19,000 books and pamphlets, offers excellent facilities for advanced work in Old Norse-Icelandic language and literature, Norse mythology and heroic legends, runology, and early Scandinavian history, as well as in Modern Icelandic language and literature. The Library also has a small collection of books on the other modern Scandinavian languages and literatures to which some additions are made annually.

1. OLD ICELANDIC. Throughout the year. T Th S 11. Library, Greek and Latin Seminary.

2. OLD NORSE-ICELANDIC LITERATURE. First term. W F 12. Goldwin Smith.

ROMANCE LANGUAGES AND LITERATURES

Professors J. F. MASON, G. L. HAMILTON, O. G. GUERLAC, LAURENCE PUMPELLY, G. I. DALE, and M. G. BISHOP.

The collection of French and Spanish books in the University Library is very large, and offers excellent facilities for advanced work. Objects of special pride are the unrivalled Dante and Petrarch collections, the gift of the late Willard Fiske, who likewise presented to the University a unique collection of Rhaeto-

Romance works. Smaller collections of Portuguese, Provençal, and Catalan books are also to be found in the University Library. The seminary library contains several thousand volumes including many sets of bound periodicals. A university fellowship in Romance languages (of the value of \$400 and free tuition) is annually awarded.

The courses of study in this department are divided into three categories: those intended primarily for undergraduates, those intended alike for undergraduates and graduates, and those intended primarily for graduates. All candidates for advanced degrees in this department must possess a thorough reading knowledge of Latin, French, and German, before announcing their candidacy. A graduate student in Romance languages should have completed some formal course of study in the language and literature of the language which he intends to select as his major subject, and should have a reading knowledge at least of the languages which he selects as his minor subjects.

A candidate for the degree of Master of Arts whose major subject is in Romance languages is expected to present for the approval of the chairman of the Special Committee, within two weeks after registration day, an outline of the work planned for the year. The thesis must, before May 1, be submitted for the criticism of the chairman of the candidate's Special Committee. If not already taken, a course in the philology of the language which constitutes their major subject is required of graduate students in their first year of study.

Candidates for the degree of Doctor of Philosophy are expected to follow advanced courses given in the field in which their major subject lies and to take up such work as will give a comprehensive view of the fields in which their minor subjects lie. It is intended that the last year of preparation for this degree shall be spent chiefly upon the thesis. Further information may be obtained from the professors in this department.

*FRENCH

Professors MASON, GUERLAC, HAMILTON, PUMPELLY, and BISHOP.

16. HISTORY OF FRENCH LITERATURE.. Throughout the year. Professor MASON. M W F 11. Goldwin Smith B.

Lectures on French Literature since the Middle Ages.

17. LITERATURE OF THE SEVENTEENTH CENTURY. Throughout the year. Professor GUERLAC. M W F 11. Goldwin Smith 281.

[18. LITERATURE OF THE EIGHTEENTH CENTURY. Throughout the year. Professor GUERLAC. M W F 11. Goldwin Smith 281. Not given in 1931-32.]

[23. FRENCH HISTORICAL GRAMMAR. First term. Professor PUMPELLY. T Th 10. Goldwin Smith 277.

Lectures on the historical development of French from its origins to the present. Primarily for students intending to teach French. Not given in 1931-32.]

24. FRENCH PHILOLOGY. Throughout the year. College entrance Latin or its equivalent is a prerequisite. Professor PUMPELLY. T 10, Th 2. Room to be arranged.

Lectures on the historical development of the French language, with a detailed phonological and morphological study of the *Chanson de Roland*.

31. LITERATURE OF THE SIXTEENTH CENTURY. Throughout the year. Assistant Professor BISHOP. T Th 12. Goldwin Smith 283.

[41. OLD FRENCH TEXTS. First term. Hours and room to be arranged. Professor HAMILTON. Not given in 1931-32.]

43. OLD PROVENÇAL PHILOLOGY AND LITERATURE. Second term. Hours and room to be arranged. Professor HAMILTON.

47. MODERN FRENCH SEMINARY. Throughout the year. Professor MASON, T 2:30. Library, French Seminary.

*ITALIAN

Professor HAMILTON.

14. ITALIAN POETRY. Second term. Professor HAMILTON. T Th II. Goldwin Smith 281.

Dante, *Divina Commedia*; Leopardi, *Rime*; Carducci, *Poesie*, will be read in class. Readings and reports for extra-class work.

15. THE LITERATURE OF THE ITALIAN RENAISSANCE. Second term. Professor HAMILTON. Hours and room to be arranged.

Petrarch, *Rime*; Machiavelli, *Principe*; Ariosto, *Orlando Furioso*. Outside readings and reports.

*SPANISH

Professor DALE.

10. HISTORY OF SPANISH LITERATURE. Throughout the year. Professor DALE. M W F 12. Goldwin Smith 283.

15. DRAMA OF THE GOLDEN AGE. First term. Professor DALE. T Th S II. Goldwin Smith 277.

17. CERVANTES. Second term. Professor DALE. T Th S II. Goldwin Smith 277.

41. OLD SPANISH. Throughout the year. Professor DALE. Th 2:15. Library, Spanish Seminary.

[42. CALDERÓN AND ALARCÓN. Throughout the year. Professor DALE. Not given in 1931-32.]

[43. THE PICARESQUE NOVEL. Throughout the year. Professor DALE. Not given in 1931-32.]

HISTORY, AND POLITICAL, ECONOMIC, AND SOCIAL SCIENCE

The subjects of history, economics, and government have been united since 1887 in the President White School of History and Political Science, which bears the name of the first president of the University in especial recognition of the gift of this valuable collection of historical literature to the University Library.

The aims of the President White School are threefold: first, the advancement of knowledge by investigation and publication in the fields of history, economics, politics, jurisprudence, and social science; second, the training of scholars and teachers in these departments of study; third, the training of men and women for the public service, for business, and for professions such as law, journalism, and philanthropy.

HISTORY

Professors NATHANIEL SCHMIDT, C. H. HULL, J. P. BRETZ, CARL BECKER, PRESERVED SMITH, M. L. W. LAISTNER, A. P. WHITAKER, CARL STEPHENSON, and F. G. MARCHAM.

A graduate student in history should have a sufficient knowledge of general history and of geography. He should be able to speak and write good English. He should have a reading knowledge of French, of German, and of any other language necessary for the thorough study of his special subject. For work in Medieval History he would need a knowledge of Latin, and for Ancient History both Latin and Greek. It is highly desirable that he should have had the necessary linguistic training as an undergraduate; but deficiencies in this respect may sometimes be made up after entering upon graduate work.

The University Library contains ninety or a hundred thousand volumes dealing with history. In large part these are to be found in the room known as the White Historical Library to which graduate students have immediate access. The historical seminary rooms in the library building are furnished with atlases, dictionaries, bibliographies, and other works of reference, and afford access to the shelves of the Library proper.

It has been from the outset the policy of the University, while providing adequately for the symmetrical growth of the Library, to acquire private collections of books which eminent scholars have through a lifetime of study built up as their tools of research. Thus, for the study of Oriental History, Cornell has been endowed with the EISENLOHR COLLECTION on the history of Egypt, with the WASON COLLECTION on the history and the civilization of China, and with that of President White on the history of Palestine. For the study of the Graeco-Roman world, it acquired that of Charles Anthon. For the Middle Ages, it has notable bodies of books on the birth of the Papal state, on the rise of the Carolingian empire, and in general on the relations of Church and State. For the Renaissance, it can boast the unrivaled FISKE COLLECTIONS on Dante and Petrarch and the world of their time. For the age of the Reformation, for the history of superstition and persecution (notably for Inquisition and Index, for the story of witchcraft, for the beginnings of the sciences, for the rise of tolerance), it is equipped with the riches of the PRESIDENT WHITE LIBRARY; and for the study of the French Revolution that library has no equal on this side of the Atlantic, if anywhere outside of France. For the history of America, the University possesses the library of the historian Jared Sparks, with the MAY COLLECTION on American slavery and the SCAIFE COLLECTION on the Civil War. Professor GOLDWIN SMITH enriched it with his working library of English history; it obtained that of Professor Tuttle on Prussia; from Professor Fiske came one singularly complete on Iceland. In a multitude of other fields it has been found possible to gather for the special student materials for exhaustive research. Many of these collections are endowed with special funds for their increase; and all have been steadily built up with an eye to the needs of the mature student of history.

Three fellowships and a scholarship are annually awarded to graduate students of history. The President White Fellowship in Modern European History has a value of \$500. It may be granted as a travelling fellowship. The fellowship in American History amounts to \$400. The stipend of the George C. Boldt Fellowship in History is \$1,000. The Graduate Scholarship in History amounts to \$200. Holders of fellowships and graduate scholarships are exempt from the payment of tuition. There are several assistantships in history, which are filled preferably by the appointment of graduate students.

A seminary is conducted in each of the major fields of history and each professor is willing to direct research in his special field.

General courses, not enumerated here, are offered in oriental, ancient, medieval, modern European and English history and in American history, both political and economic. These are intended for undergraduates, but, if supplemented by individual work, one or another of them may sometimes serve the purposes of a graduate student.

*ORIENTAL HISTORY

Professor NATHANIEL SCHMIDT.

THE HISTORY OF ASIA. A general survey of the political development and the cultural life from the earliest times to the present day, with especial attention to Asia Minor, Syria and Palestine, Assyria, Babylonia, and Persia during the first term, and to India, China, and Japan during the second term. Lectures, T Th 10, and exercises in seminary in Oriental History.

Graduates making Oriental history their major subject must have had a year of Ancient history and a year of either the History of Asia or the History of Africa.

*ANCIENT HISTORY

Professor M. L. W. LAISTNER.

For Graduates only

1 (14). SEMINARY IN ROMAN HISTORICAL INSCRIPTIONS. Throughout the year. M 2-4. University Library, Classical Seminary. A reading knowledge of Latin is essential.

[2 (6). SEMINARY IN GREEK AND ROMAN HISTORIOGRAPHY. Throughout the year. M 2-4. University Library, Classical Seminary. Not given in 1931-32.]

Courses open to graduates and undergraduates

3 (3). GREEK HISTORY, 500 TO 323 B. C. Second term. M W F 11. Goldwin Smith 236.

[4 (4). THE ROMAN EMPIRE, 30 B. C. TO 180 A. D. Second term. M W F 11. Goldwin Smith 236. Not given in 1931-32.]

[5 (5). THE ROMAN REPUBLIC, 133 TO 30 B. C. First term. M W F 11. Goldwin Smith 236. Not given in 1931-32.]

6 (7). THE HISTORY OF EDUCATION. (Greek, Roman, and Early Medieval.) First term. T Th 10. Goldwin Smith 234.

The theory and practice of education in the Greek and Roman world, and in the early Middle Ages in the West to the Carolingian revival.

NOTE: The figures in parenthesis are the numbers of the courses and seminars in the Announcement of the College of Arts and Sciences.

***MEDIEVAL AND RENAISSANCE HISTORY**

Professors PRESERVED SMITH and STEPHENSON.

For Graduates and Undergraduates

25. MEDIEVAL TOWNS. Professor STEPHENSON. S 10-12. European History Seminary Room.

32. THE AGE OF THE REFORMATION. Professor SMITH. Second term. M W F 10. Goldwin Smith C. Lectures and readings on the political, religious, and social history of Europe during the period 1440-1600.

[33. HISTORY OF CULTURE FROM THE RENAISSANCE TO THE ENLIGHTENMENT. Professor SMITH. Second term. T Th 3. Goldwin Smith 234. The intellectual history of the sixteenth and seventeenth centuries. Not given in 1931-32.]

Primarily for Graduates

SEMINARY IN CHURCH HISTORY. Professor SMITH. Second term. S 10-12. Library, European History Seminary Room.

An investigation of the sources of ecclesiastical history from the beginning of the fifteenth century to the end of the nineteenth; a discussion of the problems involved; together with reading and interpretation of some of the principal documents in the original Latin.

[SEMINARY IN HISTORICAL METHOD. Professor SMITH. A study of historical method in the writings of the great historians of modern times and in the standard works on historiography. Not given 1931-32.]

***MODERN EUROPEAN HISTORY**

Professor CARL BECKER.

For Graduates and Undergraduates

THE NAPOLEONIC ERA. A study of the organization of France under Napoleon, the establishment of the empire, and the restoration of Europe in 1814-15.

THE FRENCH REVOLUTION. A study of French society before 1789, and of the Revolution from 1789 to 1795.

Primarily for Graduates

SEMINARY IN MODERN EUROPEAN HISTORY. Offers an opportunity to do research in the original sources for the French Revolution or in some closely related field of modern history.

*ENGLISH HISTORY

Professor F. G. MARCHAM.

65 a and b. HISTORY OF THE ENGLISH CONSTITUTION. Professor MARCHAM and Mr. R. G. RAMSAY. Throughout the year. T Th 10. Goldwin Smith 227.

HISTORY OF ENGLAND UNDER THE TUDORS AND STUARTS. Professor MARCHAM. Throughout the year. T Th S 9. Goldwin Smith 242.

[67 and 68. HISTORY OF ENGLAND FROM THE BEGINNING OF THE EIGHTEENTH CENTURY TO THE PRESENT DAY. Professor MARCHAM. Not given in 1931-32.]

69. SEMINARY IN TUDOR AND STUART HISTORY. Professor MARCHAM. T 4. Modern European History Seminary Room. Study of the materials for research in Tudor and Stuart History, and of some of the leading historical problems of the period, centering around a person of general importance. For the first term of 1931-32 the person will be Richard Hooker; for the second term, Francis Bacon.

*AMERICAN HISTORY

Professors C. H. HULL, J. P. BRETZ, and A. P. WHITAKER.

For Graduates and Undergraduates

[89. AMERICAN HISTORY, 1750-1848: The Settlement of the Middle West. Throughout the year. Credit two hours a term. Prerequisite, History 82, 83, or the equivalent. Professor BRETZ. T Th 9. Goldwin Smith 234. Will not be given in 1931-32.]

90. CONSTITUTIONAL HISTORY OF THE COLONIES. First term. Credit three hours. Prerequisite, courses 82 and 83. Professor HULL. M W F 12. Goldwin Smith 234.

91. THE AMERICAN REVOLUTION. Second term. Credit three hours. Prerequisite, six hours of American History in college. Professor HULL. M W F 12. Goldwin Smith 234.

92. LATIN AMERICA SINCE 1760. Throughout the year. Credit two hours a term. Prerequisite, History 82, 83, or the equivalent. Professor WHITAKER. T Th 11. Goldwin Smith 242.

A survey of the colonial system, the revolutionary era and the rise of the independent republics, with emphasis on relations between Latin America and the United States.

97. AMERICAN HISTORY. Investigation of topics in a selected field. First term. Credit two hours. For upperclassmen with majors in history. Professor WHITAKER. M 2-4, or at an hour to be arranged. Goldwin Smith 235. Consult the instructor before registering.

98. AMERICAN HISTORY. Investigation of topics in a selected field. Second term. Credit two hours. For upperclassmen with majors in history. Professor WHITAKER. M 2-4, or at an hour to be arranged. Goldwin Smith 235. Consult the instructor before registering.

99. SEMINARY IN AMERICAN HISTORY. Credit two hours a term. Professor HULL. Hours to be arranged. Library, American History Room. For graduates. First meeting, Monday, October 5, 4 p. m.

*GOVERNMENT

Professors R. E. CUSHMAN, G. E. G. CATLIN, and H. W. BRIGGS.

Graduate courses in government afford an opportunity to students to carry on research in that field. As preparation for such work a familiarity with the essentials of American political institutions and of the principal systems of European government is assumed, as well as at least an elementary knowledge of American and English or European history. For 1931-32 research in government will be directed primarily in the fields of American Constitutional Law, Political

Theory and International Law and Relations, although topics relating more generally to American or European governmental institutions and political problems may also be selected.

The attention of students desiring to do graduate work in the various fields of public law is directed to the opportunities open to them in the Law School. The courses in that School in Administrative Law, Constitutional Law, International Law, Jurisprudence, Labor Law, Municipal Corporations, Public Service and Carriers, and Competition and Combination, may be elected by graduate students with the consent of the professors in charge. (See Announcement of the Law School.) The members of the faculty of the Law School are willing to cooperate in directing the researches of students in their several fields, and to serve as members of the special committees of such students.

For Graduates and Undergraduates

10. POLITICAL PHILOSOPHY AND SCIENCE. Second term. Credit three hours. Open to qualified upperclassmen. Consult the instructor before registering. Professor CATLIN. M F 2 and other hour to be arranged. Goldwin Smith 227.

The meaning of a science of politics; the theory of authority, sovereignty, and liberty; toleration and censorship; aristocracy and representative government.

11. POLITICAL INSTITUTIONS. Second term. Credit three hours. Professor CATLIN. M W F 11. Goldwin Smith 242.

A study of the development and structure of certain political institutions, and of their function in modern society.

14. INTERNATIONAL LAW. Throughout the year. Credit three hours a term. Completion of first term is prerequisite to second. Open to qualified upperclassmen. Assistant Professor BRIGGS. M W F 12. Goldwin Smith 142.

The principles of international law and the development of international organization. The second term will be devoted to a study of international cooperation in the administration of justice, international regulation of commerce and industry, diplomatic protection and international claims, the pacific settlement of international disputes, hostile relations of states, and the law of neutrality.

Cases, readings, discussions.

16. CONTEMPORARY AMERICAN FOREIGN POLICY. Second term. Credit three hours. Open to upperclassmen and sophomores who have completed Government 9. Assistant Professor BRIGGS. M W F 9. Goldwin Smith 142.

The foreign relations of the United States during the 20th century; our Caribbean policy; the limitation of armaments; post-war relations with Europe, the League, the Permanent Court.

20. CONSTITUTIONAL LAW: THE AMERICAN FEDERAL SYSTEM. First term. Credit three hours. Open to upperclassmen. Prerequisite, both terms of Government 1 or the consent of the instructor. Professor CUSHMAN. T Th S, 11. Goldwin Smith 142.

Judicial interpretation of the constitution: the nature of judicial review; separation of governmental powers; relations between state and national government; construction of national powers.

21. CONSTITUTIONAL LAW: FUNDAMENTAL RIGHTS AND IMMUNITIES. Second term. Credit three hours. Open to upperclassmen. Prerequisite, Government 20 or the consent of the instructor. Professor CUSHMAN. T Th S 11. Goldwin Smith 142.

Privileges and immunities of citizenship; protection of civil and political rights; the obligation of contracts; due process of law and the equal protection of the law.

12. HISTORY OF POLITICAL THEORY. (See Philosophy 10.)

25. SOCIAL, LEGAL, AND POLITICAL ETHICS. (See Philosophy 7a.)

26. TRADE UNIONISM AND LABOR LAW. (See Economics 42.)

Primarily for Graduates

SEMINARY IN CONSTITUTIONAL PROBLEMS. Professor CUSHMAN. Throughout the year. Problems of current interest in American Constitutional Law will be selected for individual research. Students will be admitted upon consultation with the instructor.

SEMINARY IN INTERNATIONAL LAW AND INTERNATIONAL ORGANIZATION. Assistant Professor BRIGGS. Throughout the year. Students will be admitted upon consultation with the instructor.

SEMINARY IN POLITICS. Professor CATLIN. Second term. Discussion of papers on problems of contemporary political theory and practice.

***ECONOMICS**

Professors DONALD ENGLISH, H. L. REED, P. T. HOMAN, P. M. O'LEARY, J. L. WOODWARD, M. S. KENDRICK, and R. E. MONTGOMERY.

A student in economics should have as a preparation for graduate study at least the equivalent of elementary courses in economics, economic history, politics, and social science. If he has not this preparation, he should take such elementary courses as early as possible; he will not ordinarily be allowed to present this preliminary work as partial fulfillment of the requirement for a major or minor in any branch of economics.

The work in economics in the President White School of History and Political Science falls into four divisions: economic theory, finance, social science and statistics, and labor. These divisions aim to bring their work into close relationship with social, political, and business life. The members of the Faculty seek to keep in touch with the practical as well as with the purely scientific aspects of the problems treated, and have among their interests the preparation of students for positions in business and in public service.

Three fellowships are awarded annually to graduate students in economics and government. The President White Fellowship in Political and Social Science has a stipend of \$500 and each of the other fellowships has a stipend of \$400. In addition there are several assistantships, each yielding \$250, which are open to graduate students.

For Graduates and Undergraduates

ECONOMIC THEORY. Assistant Professor KENDRICK. First term. T Th S 10.

WEALTH AND INCOME. Professor HOMAN. Second term. T Th S 10.

MONEY AND BANKING. Professor REED. Either term. M W F 10.

FINANCIAL HISTORY OF THE UNITED STATES. Assistant Professor O'LEARY. Second term. T Th S 10.

THE FEDERAL RESERVE SYSTEM. Professor REED. First term. M W F 11.

TRADE FLUCTUATIONS. Professor REED. Second term. M W F 11.

ACCOUNTING. Professor ENGLISH. Throughout the year. M W F 8.

ACCOUNTING THEORY AND PROBLEMS. Professor ENGLISH. Second term. M W F 9.

CORPORATION FINANCE. Professor ENGLISH and Assistant Professor O'LEARY. First term. M W F 9.

TRANSPORTATION AND COMMUNICATION. Assistant Professor O'LEARY. First term. T Th S 9.

INDUSTRIAL COMBINATIONS. Professor HOMAN. Second term. T Th S 9.

PUBLIC UTILITIES. Professor HOMAN. First term. T Th S 11.

THE RISE OF MODERN CAPITALISM. Professor HOMAN. First term. T Th S 11.

LABOR CONDITIONS AND PROBLEMS. Assistant Professor MONTGOMERY. First term. M W F 9.

TRADE UNIONISM AND LABOR LAW. Assistant Professor MONTGOMERY. Second term. M W F 9.

EMPLOYMENT PROBLEMS IN INDUSTRY. Assistant Professor MONTGOMERY. Second term. M W F 10.

THE ECONOMICS OF DISSENT. Assistant Professor MONTGOMERY. First term W 2-4.

POPULATION PROBLEMS. Assistant Professor WOODWARD. First term. T Th S 11.

THE FAMILY. Assistant Professor WOODWARD. Second term. T Th S 11.

Primarily for Graduates

[SYSTEMATIC ECONOMIC THEORY. Professor HOMAN. Not given 1931-32.]

[HISTORY OF ECONOMIC THOUGHT. Professor HOMAN. Not given 1931-32.]

CONTEMPORARY ECONOMIC THOUGHT. Professor HOMAN. A survey of recent types of economic theory and methods of analysis.

MONEY AND CREDIT. Professor REED. A discussion of some of the more intricate phases of monetary and banking theory.

PROBLEMS IN INDUSTRIAL RELATIONS. Assistant Professor MONTGOMERY. Discussion and individual investigations of current and theoretical problems in the field of industrial relations.

SEMINARY IN ECONOMICS. Required of all students registered for a major or minor in economics.

RURAL ECONOMY, FARM MANAGEMENT, AND MARKETING

Professors G. F. WARREN, G. N. LAUMAN, J. E. BOYLE, G. P. SCOVILLE, E. G. MISNER, W. I. MYERS, F. A. PEARSON, LELAND SPENCER, V. B. HART, F. F. HILL, M. P. RASMUSSEN, M. S. KENDRICK, J. F. HARRIOTT, M. C. BOND, L. M. VAUGHAN, WHITON POWELL, and M. P. CATHERWOOD.

For graduate work in the various fields here represented, a knowledge of practical agriculture, scientific agriculture, and economics is usually required. For the Doctor's degree in these fields, a minor in economics is usually required.

All courses except those in accounting are primarily for graduates or for graduates and advanced students in the undergraduate courses.

*FARM MANAGEMENT

101. FARM RECORDS AND ACCOUNTS. First term. Credit three hours. Open to all students who have fulfilled the farm-practice requirement. Lectures, T Th 8. Caldwell 100. Laboratory, M 1:40-4. East Roberts 232; or T 1:40-4. Farm Management Building 102. Assistant Professor HARRIOTT and Mr. ———.

Farm inventories; cash accounts; income-tax reports; single-enterprise cost accounts; complete farm cost accounts; farm maps; other farm records. Interpretation of the results of cost accounts and their application in the organization and management of farms. Fee for materials furnished, \$3.

102. FARM MANAGEMENT. Second term. Credit five hours. Open to sophomores, juniors, and seniors who have satisfied the farm-practice requirement. It is desirable that this course should be preceded by course 101 and by as many as possible of the courses dealing with the production of crops and of animals. Lectures, M W F 10. Farm Management Building 102. One laboratory period a week, by assignment. Farm Management Building 102. On days when farms are visited, laboratory work may last longer than two and one-half hours. Professor W. I. MYERS and Mr. ———.

Farming as a business; types of farming; balance of business; size of business; rates of production; farm layout; building arrangement; labor management; machinery; marketing; ways of starting to farm; forms of tenure and leases; choosing and buying a farm; use of capital and credit; planning, organization, and management of specific farms. Four half-day field trips will be taken during April and May to visit farms in near-by regions. Fee for materials furnished, \$3.

103. BUSINESS ORGANIZATION AND MANAGEMENT OF SUCCESSFUL NEW YORK FARMS. First term. Credit three hours. Open to seniors and to graduate students. Prerequisite, permission to register. F 1:40-4, S 8-1. Farm Management Building 102. Two or three two-day trips will be taken in October or early November, on the regular class days. On days when out-of-town trips are taken, the class will usually leave before 1:40 p. m. and will not return until evening. Expenses for trips are estimated to be about \$25. Professor SCOVILLE.

[201. THE APPRAISAL OF FARM LAND. First term. Credit one hour. W 1:40-4. Farm Management Building 102. Professors WARREN and HILL.

A study of factors governing the price of land; and the appraisal of land for use, for sale, for purposes of making loans, and for taxation. Not given 1931-32.]

202. RESEARCH METHODS IN FARM MANAGEMENT. First term. Credit one hour. T 11. Farm Management Building 102. Professor WARREN.

Attention will be given to the more important methods of determining the principles of farm management and the preparation of results for publication.

203. RESEARCH METHODS IN FARM MANAGEMENT. Second term. Credit two hours. W 2-4. Farm Management Building 102. Professor MISNER.

This course is designed primarily for students who expect to engage in farm-management research. Much of the time will be devoted to the preparation and use of forms for the collection of data by the survey method. During the spring vacation several days will be spent in taking farm-management survey records. Experience will be given also in the tabulation and the study of such data and in preparing the results for publication.

209. SEMINARY. First and second terms. Open only to graduate students. M 4:10-5:15. Farm Management Building 102. Departmental staff.

*AGRICULTURAL PRICES AND STATISTICS

A section of Mathematics 4a, Analytical Geometry and Calculus, meeting at 11 o'clock with Professor ———, is designed for students specializing in business, statistics, economics, prices, farm management, or agricultural economics. Attention is called also to Mathematics 83, Probability and Statistics, and Mathematics 90, Mathematical Economics.

111. AGRICULTURAL STATISTICS. First term. Credit three hours. Open to juniors, seniors, and graduate students. Lecture, M 8. East Roberts 222. Laboratory, M 1:40-4. Farm Management Building 102. Professor PEARSON and Mr. ———.

A study of the principles involved in the collection, tabulation, and interpretation of agricultural and marketing statistics. Analysis of statistical problems with an 80-column tabulating machine. This course is designed primarily for students who expect to pursue commercial work. Fee for materials furnished, \$3.

112. AGRICULTURAL STATISTICS, ADVANCED COURSE. Second term. Credit three hours. Prerequisite, course 111. Lecture, M 8. East Roberts 222. Laboratory, M 1:40-4. Farm Management Building 102. Professor PEARSON and Mr. ———.

A study of the application of probable error, sampling, gross, partial, and multiple correlation, curve fitting to problems in this field. Methods of using 80-column tabulating equipment for multiple-correlation analysis. This course is a continuation of course 111 and is intended primarily for students who expect to do research work. Fee for materials furnished, \$3.

115. AGRICULTURAL PRICES. Second term. Credit three hours. Open to juniors, seniors, and graduate students. Lectures, T Th 8. Laboratory, W 1:40-4. Farm Management Building 102. Professor PEARSON and Mr. ———.

A study of prices of farm products in relation to agricultural and industrial conditions. Fee for materials furnished, \$3.

*MARKETING

121. ACCOUNTING. First term. Credit three hours. Should be preceded or accompanied by Economics 1. Lectures, T Th 9, Caldwell 100. Laboratory, T or W 1:40-4. East Roberts 232. Assistant Professor CATHERWOOD.

The fundamentals of the double-entry system; the theory of debit and credit; the analysis and recording of ordinary business transactions; the trial balance; closing the books; preparation and analysis of financial statements. The principles are developed mainly in terms of the merchandising business. Fee for materials furnished, \$1.

122. ACCOUNTING, ADVANCED COURSE. Second term. Credit three hours. Prerequisite, Course 121 or its equivalent. Lectures, M W F 9. Farm Management Building 102. Professor POWELL.

Accounting problems of the corporation and the coöperative association; problems of valuation and income determination; the fundamentals of cost accounting; the use of accounts by the management of the business, with special reference to the analysis and interpretation of financial statements. Fee for materials furnished, \$1.

125. BUSINESS ORGANIZATION AND MANAGEMENT. First term. Credit three hours. Open to juniors, seniors, and graduate students. Prerequisite, Economics 1. Should preferably be preceded or accompanied by Course 121. Lectures, M W F 10. Farm Management Building 102. Assistant Professor CATHERWOOD.

A general survey of the principles of organization and management of the individual merchandising enterprise, with particular reference to agricultural business. Specific problems and cases are used to develop and illustrate the principles of organization, financing, methods of distribution, price policies, credit policies, sales research and planning, market analysis, and advertising. Fee for materials furnished, \$2.

131. COÖPERATIVE MARKETING. First term. Credit two hours. Open to juniors, seniors, and graduate students. Lecture, Th 11. Farm Management Building 102. Laboratory, Th 1:40-4. Farm Management Building 102. Professor W. I. MYERS.

Business management of coöperative organizations. The coöperative corporation; legal basis of coöperative business; types of coöperative organizations; contracts; relations to members. Primary consideration will be given to a study of some of the important factors affecting the efficiency of coöperative business. Fee for materials furnished, \$1.

132. MANAGEMENT OF COÖPERATIVE ASSOCIATIONS. Second term. Open to juniors, seniors, and graduate students. Prerequisites, Courses 121 and 131. Lectures, T Th 9. Farm Management Building, 102. Professor POWELL.

A study of the problems involved in the management of coöperative associations. Specific cases will be used to illustrate problems of organization, financing, membership relations, sales policies, and economy of operation. Fee for materials furnished, \$1.

232. COLLECTIVE BARGAINING. Second term. Credit two hours. Open only to graduate students. Lectures, T Th 8. Farm Management Building. Professor BOYLE.

Collective bargaining and its use by labor, capital, and agriculture. The policy of collective bargaining. A study in price determination.

141. MARKETING. First term. Credit four hours. Prerequisite, Economics 1. Open to juniors, seniors, and graduate students. Lectures M W F 8. Farm Management Building 102. Discussion groups one hour a week. Professor BOYLE.

A study of the present organization, functions, and operation of the market structure, with particular reference to agriculture. Coöperative marketing is included. Fee for materials furnished, \$2.

142. MARKETING (FRUITS AND VEGETABLES). First term. Credit three hours. Open to juniors, seniors, and graduate students. Lectures, M W 9. Farm Management Building 102. Laboratory, W 1:40-4. Farm Management Building 102. Professor RASMUSSEN and Mr. _____.

A study of the economic factors involved in the marketing of fruits and vegetables. Regional and seasonal competition; areas of distribution; methods of handling; costs of marketing; types of marketing organizations; sales methods;

transportation and carrier services; produce law and methods of credit rating; terminal problems. Fee for materials furnished, \$2.

143. **MARKETING (DAIRY PRODUCTS).** Second term. Credit three hours. Open to juniors, seniors, and graduate students. Lectures T Th 10. Laboratory, T 1:40-4. Farm Management Building 102. Professor SPENCER.

Economic aspects of the distribution of the more important dairy products from producer to consumer, with special emphasis on market milk. One all-day trip will be arranged. Fee for materials furnished, \$2.

145. **BUSINESS LAW.** First term. Credit two hours. Open to juniors, seniors, and graduate students. Lectures, T Th 12. Farm Management Building 102. Lectures by Mr. Allan H. Treman. Registration in charge of Professor SPENCER.

Consideration is given chiefly to legal problems of particular interest to persons who expect to engage in business, including contracts, liens, mortgages, and negotiable instruments; ownership and leasing of property; wills; estates; inheritance taxation; and other practical problems.

146. **THE ORGANIZED EXCHANGES AND SPECULATION.** First term. Credit two hours. Open to graduate students and seniors with adequate preparation. Recitations, T Th 8. Farm Management Building 102. Professor BOYLE.

147. **MARKETING OF PERISHABLE FARM PRODUCTS IN NEW YORK CITY.** Second term. Credit one hour. Open to upperclassmen and graduate students, and to others by permission. The entire time of the class for one week will be spent in New York City inspecting and studying the marketing of perishable agricultural products; poultry, and poultry products; dairy products; fruits; vegetables; meat and meat products. During the college year 1931-32, this trip will be taken during the spring recess, April 4 to 9, inclusive. Necessary expenses per student should not exceed \$60. Professor RASMUSSEN or Professor SPENCER in charge. Professor WORK, HEINICKE, ROSS, HINMAN, SPENCER, RASMUSSEN, and Dr. HUTTAR will assist in the course.

148. **RESEARCH IN MARKETING.** First and second terms. Credit to be arranged. For seniors or graduate students, who have done superior work in courses 141 and 146, or their equivalent. Farm Management Building 202A, Professor BOYLE.

242. **METHODS AND RESULTS OF RESEARCH IN MARKETING.** First term. Credit two hours. For graduate students. W 4-6, Farm Management Building 102.

A critical study of research projects in marketing and practice in planning market research. The major portion of the time will be devoted to projects dealing with the marketing of fruits and vegetables. Professor RASMUSSEN.

243. **METHODS AND RESULTS OF RESEARCH IN MARKETING.** Second term. Credit two hours. For graduate students. W 4-6, Farm Management Building 102.

A critical study of research projects in marketing and practice in planning market research. The major portion of the time will be devoted to projects dealing with the marketing of dairy products. Professor SPENCER.

*RURAL ECONOMY

250. **TAXATION.** Second term. Credit three hours. Open to juniors, seniors, and graduate students who have completed a beginning course in economics. Lectures, M W F 11. Farm Management Building 102. Assistant Professor KENDRICK.

The emphasis of the course is on state and local problems connected with rural taxation. Among the subjects considered are: the growth of expenditures; the rise of modern tax problems; how various governmental divisions in New York and other States get their tax revenues; the general-property tax and its administration, and the special cases of personal-property, farm, and forest taxation; mortgage taxes; taxation of coöperatives; income, inheritance, and gasoline taxes; proposals for tax reform; problem of a proper distribution of the tax burden among the various state and local governmental units. Fee for materials furnished, \$2.

151. PUBLIC PROBLEMS OF AGRICULTURE. Second term. Credit two hours. Lectures, T Th 11. Farm Management Building 102. Professor WARREN.

A discussion of some of the more important problems of agriculture that involve collective or governmental action.

161. AGRICULTURAL ECONOMICS. Second term. Credit four hours. Prerequisite, Economics 1. Open to juniors, seniors, and graduate students. Lectures, M W F 8. Farm Management Building 102. Discussion groups one hour a week. Professor BOYLE.

A discussion of the major problems in the field of agricultural economics. A statement of these problems and the various resolutions proposed.

262. RURAL ECONOMY, ELEMENTARY COURSE. First term. Credit three hours. Prerequisite, an introductory course in economics. Open to seniors and graduate students. Lectures, M W F 9, and individual conferences. Fernow 210. Professor LAUMAN and Mr. _____.

A study of the factors underlying the present conditions in rural communities at home and abroad, and of forces at work in shaping the agriculture of the world, chiefly along economic lines.

263. RURAL ECONOMY, ADVANCED COURSE. Second term. Credit four hours. Prerequisite, course 262 or its equivalent. Lectures M W F 9. Fernow 210. Professor LAUMAN.

A more extended study, primarily theoretical, of the general economic problems of agriculture.

269. RURAL ECONOMY SEMINARY. First and second terms. Primarily for graduate students, and for seniors by invitation. T 2:30. Fernow 126. Professor LAUMAN.

The year's work is devoted to a study of Brentano, L.: "Lehrbuch der Agrarpolitik."

*HISTORY OF AGRICULTURE

171. HISTORY OF AGRICULTURE. First term. Credit three hours. Open only to seniors and graduate students. Lectures, M W F 11. Fernow 210. Professor LAUMAN and Mr. _____.

The important phases of the development of agriculture are considered historically. Special stress is laid on the rise of the agricultural classes, on the beginnings of rational agriculture, and on modern agrarian problems.

172. HISTORY OF AGRICULTURE IN THE UNITED STATES. Second term. Credit three hours. Open only to seniors in all colleges and to graduate students. Lectures, M W F 11. Fernow 210. Professor LAUMAN and Mr. _____.

This course deals with the land, its settlement, and its settlers in their economic, social, and political aspects; the technical development of agriculture; the beginnings of permanent agriculture; the rise of marketing problems and of the agrarian movements.

278. RESEARCH IN RURAL ECONOMY OR HISTORY OF AGRICULTURE. First and second terms. Credit two or three hours a term. For seniors who have done superior work in courses 171, 172, or 262, or their equivalents, and for graduate students. Fernow 126. Professor LAUMAN.

279. AGRICULTURAL HISTORY SEMINARY. First and second terms. Primarily for graduate students and for seniors by invitation. Th 2:30. Fernow 126. Professor LAUMAN.

The year's work is devoted to a general survey of Washington and agriculture.

*ECONOMICS OF THE HOUSEHOLD

Professors MARTHA VAN RENSSELAER, HELEN CANON, and DAY MONROE.

For graduate work in economics of the household, elementary courses in the various divisions of home economics and in economics are usually required. For the Doctor's degree a minor in economics is usually required.

The following courses are primarily for graduates.

ECONOMIC PROBLEMS OF THE HOUSEHOLD. Professor MONROE, first term. Professor CANON, second term. Hours to be arranged.

THE MARKETING SYSTEM AND THE CONSUMER. Professor MONROE. Second term. Hours to be arranged.

*TEXTILES AND CLOTHING, AND HOUSEHOLD ART

Professors BEULAH BLACKMORE, MURIEL BRASIE, and D. W. ERWAY.

Graduate work for the Master's degree is offered in textiles and clothing and household art.

For graduate study in these departments a general knowledge of the field of textiles and clothing and household art is prerequisite. Students majoring in clothing and textiles must minor in household art. Before registering for graduate work in these departments, consent of the department must be obtained.

HOUSEHOLD TEXTILES. Professor BLACKMORE.

PROBLEMS IN COSTUME DESIGN. Assistant Professor BRASIE.

DESIGN. Assistant Professor ERWAY.

SPECIAL PROBLEMS IN DESIGN, TEXTILES, AND COSTUME DESIGN. Professor BLACKMORE and Assistant Professors BRASIE and ERWAY.

*HOTEL ADMINISTRATION

Professors H. B. MEEK, F. H. RANDOLPH, R. S. UHRBROCK, and *Messrs.* LOUIS TOTH and JOHN COURTNEY.

Through its contacts with the American Hotel Association and its subsidiary associations and with member hotels the University has possession of and access to a wide range of research material.

Graduate work for the Master's degree is offered in Hotel Administration.

A foundation knowledge of hotel management is required of graduate students majoring in this field. Such students will choose a minor in a related or underlying field such as accounting, statistics, engineering, or one of the social sciences. Students majoring in the latter fields may find in the problems of the hotel industry a fertile field for research.

FOOD CONTROL AND COST ACCOUNTING. First term. T 2-5. Mr. COURTNEY.

HOTEL ACCOUNTING PROBLEMS. Second term. Th 2-5. Mr. TOTH.

INTERPRETATION OF HOTEL FINANCIAL STATEMENTS. Second term. Th 2-5. Mr. TOTH.

SPECIAL HOTEL PROBLEMS. Hours to be arranged. Professor MEEK.

PSYCHOLOGY FOR STUDENTS OF HOTEL ADMINISTRATION. First term. M W F 8. Assistant Professor UHRBROCK.

PERSONNEL MANAGEMENT IN HOTELS. Second term. M W F 8. Assistant Professor WINSOR.

HOTEL AUXILIARY EQUIPMENT. First term. M W F 11. Laboratory hours to be arranged. Professor RANDOLPH.

HOTEL ENGINEERING PROBLEMS. Hours to be arranged. Professor RANDOLPH.

*RURAL SOCIAL ORGANIZATION

Professors DWIGHT SANDERSON and W. A. ANDERSON.

Graduate students who desire to register in Rural Social Organization as a major subject should have had a considerable personal experience with rural life and rural institutions, and a general knowledge of sociology, psychology, and economics. Elementary courses in general sociology, rural sociology, and economics are prerequisite to graduate courses.

[111. RURAL COMMUNITY ORGANIZATION. Second term. Credit two hours. Prerequisite, either course 1 or 12 or the equivalent. Professor SANDERSON. Not given in 1931-32.]

A consideration of the aims and methods of the organization of rural communities. Typical communities are studied, their problems are analyzed, and a method of organization is discussed. The county as a unit of social organization also is considered in its relation to community organization.

121. THE FAMILY. First term. Credit four hours. Open to juniors, seniors, and graduate students. Prerequisite, course 1 or its equivalent. Lectures, discussions, group conferences, and reports. Section 1, T Th S 8; Section 2, T Th S 11, and a one-hour group conference to be arranged. Fernow 210. Professor SANDERSON.

This course considers the social problems of the family both on the farm and in the city; the history of the family, particularly during the past century; the differences between family life in the country and in the city; the function of the family in society; marriage and divorce; relations of parents and children; and how the family may be conserved. Fee for materials, \$3.50.

122. SOCIAL PROBLEMS AND PUBLIC WELFARE ORGANIZATION. Second term. Credit three hours. M W F 8. Fernow 308. Professor SANDERSON.

A study of social problems such as poverty, delinquency, crime, the physically handicapped, the feeble-minded and mentally diseased, social insurance, public health, mother's pensions, unemployment, etc.; a consideration of public and private agencies for social work and desirable public policy with regard to their organization and support.

123. FIELD WORK IN RURAL SOCIETY. Throughout the year. Open only to advanced students by special permission. All work is individual. Hours and credit to be arranged. Professor SANDERSON.

[132. RURAL LEADERSHIP. Second term. Credit two hours. Prerequisite, permission to register. Not given in 1931-32.]

A seminary course in which a descriptive account of leadership is given from a psychological point of view. General principles are discussed, with special case references to studies of rural leaders in New York and other States.

211. THE RURAL COMMUNITY. First term. Credit three hours. A seminary course primarily for graduate students. Prerequisite, courses 1 and 12 or their equivalents. Th 2-4. Fernow 308. Professor SANDERSON.

A study of the historical development of the rural community; a comparative study of types of rural communities; the rural community as a sociological group, and its place in society; methods of community development and organization.

213. RESEARCH IN RURAL SOCIAL ORGANIZATION. Throughout the year. For graduate students only. Hours and credit to be arranged. Professor SANDERSON.

[214. SEMINARY. First term. For graduate students. W 2-4. Fernow 308. Professor SANDERSON. Not given in 1931-32.]

The structural characteristics and classification of different types of social groups as related to their functions are studied.

216. SYSTEMATIC SOCIOLOGY. Second term. Credit two hours. For graduate students. W 2-4. Fernow 208. Assistant Professor ANDERSON.

This is a seminary course designed to present in a systematic way the whole field of sociology, with special emphasis on sociology theory. The work is divided between lectures giving the essential aspects of the subject, and reports on special topics.

221. SOCIOLOGICAL THEORY AND RESEARCH. First term. Credit three hours. Prerequisite, permission to register. T 2-4. Fernow 308. Professor SANDERSON.

A seminary course devoted to the critical analysis of recent and contemporary sociological theory and methods of research.

*LAW

Professors C. K. BURDICK, L. P. WILSON, R. S. STEVENS, G. J. THOMPSON, H. E. WHITESIDE, H. W. EDGERTON, G. H. ROBINSON, H. D. LAUBE, W. H. FARNHAM, and JOHN W. MACDONALD.

Group H: C. K. BURDICK, L. P. WILSON, R. S. STEVENS, G. J. THOMPSON, H. E. WHITESIDE, H. W. EDGERTON, G. H. ROBINSON, H. D. LAUBE, W. H. FARNHAM, JOHN W. MACDONALD, CARL BECKER, FRANK THILLY, DONALD ENGLISH and R. E. CUSHMAN.

Graduate work in Law is organized under the general direction of the Faculty of the Graduate School. Within that Faculty a Law Group (Group H) has been set up, consisting of the members of the Faculty of the Law School and the Chairmen of the Departments of History, Philosophy, Economics, and Government, in which group is vested authority to establish and administer rules for admission and graduation of candidates for graduate degrees in Law.

Work for the Master's degree (LL.M.) is intended primarily for those in practice or intending to enter practice who desire to increase their knowledge of the law by intensive work in special fields. Work leading to the Doctor's degree (J.S.D.) is planned to train legal scholars, and to stimulate original investigation which shall constitute a contribution to the scientific study of law, and to the solution of problems in the fields of administration of the law, and of law reform. It is desirable that candidates for the Doctor's degree shall have had some practical or teaching experience after obtaining a first degree in law.

It is considered especially advantageous that graduate work in law is organized under the general direction of the Faculty of the Graduate School. This method of organization enriches the opportunities for graduate students in law by enabling them to correlate with their work in law, work in allied fields in other departments of the University, such as those in philosophy, history, government, business and finance.

A limited number of offices will be available in the new law building, Myron Taylor Hall, for assignment to graduate students.

The Library of the Law School contains 67,000 volumes. In reports of the federal courts, and of the several American State jurisdictions, and in English, Scotch, Irish, Canadian, Australian, and English colonial reports, the law library is practically complete to date. The Earl J. Bennett collection of Statute Law, provided for by the gift of Earl J. Bennett, LL.B., 1901, embraces about 4,800 volumes of the session laws of all the States to date, and is of unusual fullness and value. The library also possesses a similarly adequate collection of text books, complete sets of substantially all law periodicals in English, digests, annotations and law encyclopedias, Railroad and Public Service Commission Reports and Bar Association Reports of the various States. Several hundred volumes of the records and briefs of cases in the Supreme Court of the United States and in the New York Court of Appeals and accounts of important foreign and domestic trials are also to be found in the library.

The University Library containing over 650,000 volumes (exclusive of the number of volumes in the Law Library) is accessible to law students in the same way as to students in the other colleges.

GRADUATE SCHOOL OF EDUCATION

EDUCATION AND RURAL EDUCATION

Professors BAYNE, BINZEL, BUTTERWORTH, EATON, FERRISS, FREEMAN, JORDAN, KRUSE, LAISTNER, MOORE, OGDEN, PALMER, SMITH, STEWART, and Dr. WINSOR, and Mr. HOSKINS, Mr. HULSE, Miss BESIG, Miss GARDNER, and Miss METCALF.

By action of the Board of Trustees in April, 1931, the University Division of Education was discontinued and a Graduate School of Education was established. Through this organization the work of the Department of Education

in the College of Arts and Sciences and of the Department of Rural Education in the College of Agriculture is further coordinated, and the administration of the professional work for the training of teachers is unified. The Graduate School of Education is an integral part of the Graduate School of the University and, as such, is subject to its general regulations.

The development of standards for public school service during the last several years promises soon to place upon the graduate level much of the professional work that has hitherto been secured through undergraduate training. Hence, those looking forward to a city superintendency, to a principalship of a city elementary or high school, to a principalship or superintendency of a village school, to high school teaching, to a supervisorship, and the like, will find it desirable, if not essential, to have training beyond a first degree. It is to give this needed professional service that the Graduate School of Education has been established. Although the emphasis will be upon the graduate work, Cornell University will, through this teacher-training organization, continue to offer those facilities that have been available to the undergraduates of the various colleges.

Two types of Master's degrees are offered: the Master's degree in Education and the regular Master's degree. The purpose of the former type of degree and the requirements set for it are outlined in a later section. The regular Master's degree requires a major in the field of Education or of Rural Education and a minor in some aspect of one of those fields or in a related field. Only one Doctor's degree is offered, that of Doctor of Philosophy. For this degree a major and two minors are required.

A separate Announcement listing the offerings in Education may be secured by writing the Director.

FACILITIES. The educational museum contains collections illustrating the work done in various school grades, statistical charts, a full assortment of textbooks for American and German schools, including a relatively complete collection of the texts used for industrial training in the German continuation schools, an extensive high school and college exhibit of the raw materials of commerce, a kindergarten and a Montessori exhibit, and other appropriate material.

The educational laboratory has a collection of apparatus for demonstration and of instruments of precision for research in connection with school hygiene, the experimental study of school children (with special reference to the conduct of physical and mental tests), and the psychological phases of education in general. This equipment is constantly being enlarged and apparatus needed for special investigations is at once procured.

REQUIREMENTS. All graduate study in education presupposes a certain degree of familiarity with the field of education. This requirement may be met by the ordinary undergraduate requirements for certification as obtained in most states or by three or more years of teaching experience if the candidate gives evidence of having been a student of educational literature during that period. Candidates for advanced degrees whose preparation is inadequate with respect to these requirements must make up this deficiency by taking appropriate courses. In advance of registration prospective students should take up either by correspondence or by personal interview with some member of the Graduate School of Education the requirements they will be expected to meet.

NEW MASTER'S DEGREES IN EDUCATION. Two new degrees, Master of Arts in Education and Master of Science in Education, have recently been authorized.

These degrees are designed for school executive officers and teachers who do not wish to enter upon a restricted course of study involving intensive research, or who wish to supplement their work in order to meet advanced requirements for certification. In general these candidates are expected to fall into one of three classes:

Class I. Men and women, graduates of standard colleges, who have been successful in educational positions, and are seeking additional preparation on the graduate level. Many of these do not want to enter upon a restricted course of

study involving intensive research. They are, however, ready to carry on systematic study of graduate grade having a direct bearing upon their professional problems.

Class II. Men and women, graduates of standard colleges, who wish to qualify as principals of high schools or as supervisors in various fields in accordance with programs of special professional preparation outlined by various states for these particular fields.

Class III. Men and women, graduates of standard colleges, who have not found it possible to include in their undergraduate programs preliminary courses in the field of Education which would qualify them to enter immediately upon graduate courses in Education, and who demand a program so planned as to enable them to satisfy these requirements in less time than would ordinarily be required as part of their graduate study leading to the Master's degree.

The character and quality of work expected for the attainment of these degrees shall be, in all respects, equivalent to the prevailing standards for the regular Master's degrees.

1. The candidate, in addition to meeting the admission requirements of the Graduate School, will be required to show evidence (satisfactory to his Special Committee) of a suitable foundation for the courses leading to the special degrees.

2. With the advice of the Director of the Graduate School of Education the candidate shall choose three members of the graduate faculty to serve on his special committee. At least two of these shall be from the staff in Education, one of the two being selected by the candidate to act as chairman.

3. The office of the Director of the Graduate School of Education shall function as an office of record and the candidate for one of these degrees shall within ten days of his registration, file in writing a statement approved by his committee showing his plan of work and course of study.

4. The candidate will be required to unify his studies and prove his competence by the successful completion of such courses, seminars, special projects and examinations as may be designated by his Special Committee. A thesis is not required, but a candidate whose interests are best served by a special investigation may offer such a study in partial fulfilment of the requirements for the degree.

5. The candidate must complete graduate courses approximating a total of thirty semester hours, at least four hours of which shall be of the seminary type. A candidate who plans to complete the residence requirements during summer sessions may elect, in lieu of seminars, such activities as may be approved by his Special Committee.

6. Upon the satisfactory completion of the work outlined by the Special Committee and the passing of a final examination, the faculty of the Graduate School of Education will recommend to the Faculty of the Graduate School that the candidate be granted the appropriate degree. Prior to scheduling this examination, all members of the staff under whom the candidate has carried course work or who have acted in any advisory or similar capacity with him shall be informed of his proposed examination and shall be asked: (1) To express an opinion regarding his fitness for such examination, and (2) To be present and take part in the examination.

For detailed information regarding these degrees write to the Director of the Graduate School of Education.

COURSES OF INSTRUCTION. In the statement of courses given below the term "Education I," "Education 6," etc., given in parenthesis following the name of the course, indicates that the course is offered by the Department of Education. "Rural Education III," "Rural Education 114," etc., means that the course is offered by the Department of Rural Education.

All courses offered by the Department of Education require Psychology I as a prerequisite. In the Department of Rural Education courses numbered under 100 are intended primarily for underclassmen; those from 101 to 200 are primar-

ily for upperclassmen or graduate students; while those numbered 201 and over are primarily for graduate students. It should be noted that courses carrying the same name are not necessarily equivalents. All courses offered by the Graduate School of Education are listed below. The undergraduate courses are included as suggestive to graduate students, who do not have all the requirements for graduate study, of the nature of the work that may be expected of them in meeting deficiencies.

GENERAL COURSES

INTRODUCTION TO PROBLEMS OF PUBLIC EDUCATION (Rural Education 1). First term. Professor MOORE.

SEMINARY IN EDUCATION (Education 20). First term. Professor RUEDIGER.

SEMINARY IN EDUCATION (Education 21). Second term. Professor JORDAN.

*PSYCHOLOGY

EDUCATIONAL PSYCHOLOGY (Education 1). Either term. Professors OGDEN and FREEMAN, and Mr. HULSE.

PSYCHOLOGY: AN INTRODUCTORY COURSE (Rural Education 100). Assistant Professor WINSOR.

PSYCHOLOGY FOR STUDENTS OF EDUCATION (Rural Education 111). Either term. Assistant Professors BAYNE and WINSOR.

PSYCHOLOGY FOR STUDENTS OF HOTEL ADMINISTRATION (Rural Education 114). First term. Assistant Professor WINSOR.

PSYCHOLOGY FOR STUDENTS OF CHILD TRAINING (Rural Education 116). Second term. Professor KRUSE.

PERSONNEL ADMINISTRATION (Rural Education 119). Second term. Assistant Professor WINSOR.

PSYCHOLOGY FOR STUDENTS OF EDUCATION (Rural Education 211a). First term. Professor KRUSE.

[PSYCHOLOGY FOR STUDENTS OF EDUCATION (Rural Education 211b). Second term. Professor KRUSE. Not offered in 1931-32.]

[PSYCHOLOGY OF LEARNING (Rural Education 212). Second term. Professor KRUSE. Not offered in 1931-32.]

SEMINARY IN EDUCATIONAL PSYCHOLOGY (Rural Education 218). Second term. Professor KRUSE.

EXPERIMENTAL EDUCATION (Education 6). Second term. Professor FREEMAN.

MENTAL DEVELOPMENT (Education 17). First term. Professor FREEMAN.

EXPERIMENTAL INVESTIGATION (Education 8). Either term. Professors OGDEN and FREEMAN.

*EDUCATIONAL METHOD

METHOD AND PROCEDURE IN SECONDARY SCHOOL TEACHING (Rural Education 121). First term. Professor FERRISS.

METHOD AND PROCEDURE IN HIGH SCHOOL TEACHING (Education 4). First term. Professor JORDAN.

OBSERVATION AND PRACTICE IN HIGH SCHOOL METHOD (Education 4a). First term. Professor JORDAN, Mr. HULSE, and Miss BESIG.

PRACTICE IN HIGH SCHOOL METHOD (Education 4b). Second term. Mr. HULSE.

THE TEACHING OF SCIENCE IN THE SECONDARY SCHOOL (Rural Education 126). Second term. Professor PALMER.

THE TEACHING OF AGRICULTURE IN THE SECONDARY SCHOOL (Rural Education 131). Both terms. Professor STEWART.

DIRECTED TEACHING OF AGRICULTURE IN THE SECONDARY SCHOOL (Rural Education 133). Either term. Professor STEWART.

THE TEACHING OF HOME ECONOMICS IN THE SECONDARY SCHOOL (Rural Education 135). Second term. Professor BINZEL.

DIRECTED TEACHING IN HOME ECONOMICS (Rural Education 136). Either term. Professor BINZEL.

[PRINCIPLES OF METHOD (Rural Education 222). Second term. Professor STEWART. Not offered in 1931-32.]

THE TEACHING OF ELEMENTARY SCHOOL SUBJECTS (Rural Education 223). First term. Professor MOORE.

RESEARCH IN SCIENCE TEACHING (Rural Education 226). Either term. Professor PALMER.

SEMINARY IN ELEMENTARY EDUCATION (Rural Education 227). Second term. Professor MOORE.

SEMINARY IN SCIENTIFIC METHOD IN EDUCATION (Rural Education 234). First term. Professor BUTTERWORTH.

METHODS IN EXTENSION TEACHING (Rural Education 239). Second term. Professor EATON.

EDUCATIONAL ASPECTS OF COOPERATIVE EXTENSION WORK IN AGRICULTURE AND HOME ECONOMICS (Rural Education 240). First term. Professor EATON.

*PREPARATION OF TEACHERS FOR NORMAL SCHOOLS AND COLLEGES

THE PREPARATION OF TEACHERS FOR NORMAL SCHOOLS AND COLLEGES (Rural Education 241). Second term. Professor BUTTERWORTH.

PROBLEMS IN COLLEGE TEACHING. (Rural Education 243). Second term. Professor EATON.

COLLEGE PREPARATION OF TEACHERS OF AGRICULTURE FOR SECONDARY SCHOOLS (Rural Education 245). Second term. Professor STEWART.

THE PREPARATION OF TEACHERS OF HOME ECONOMICS (Rural Education 248). First term. Professor BINZEL.

[SEMINARY IN AGRICULTURE EDUCATION (Rural Education 250). Second term. Professor STEWART. Not offered in 1931-32.]

*EDUCATIONAL MEASUREMENT

MENTAL AND EDUCATIONAL MEASUREMENT (Education 7). First term. Professor FREEMAN.

MENTAL AND EDUCATIONAL MEASUREMENT (Rural Education 251). Second term. Professor BAYNE.

CONFERENCES ON STATISTICAL METHODS (Rural Education 252). Throughout the year. Professor BAYNE.

STATISTICS FOR STUDENTS OF EDUCATION. (Rural Education 253). First term. Professor BAYNE.

*EDUCATIONAL ADMINISTRATION AND SUPERVISION

[PRINCIPLES OF SCHOOL ADMINISTRATION AND SUPERVISION (Rural Education 161). First term. Professor BUTTERWORTH. Not offered in 1931-32.]

CITY SCHOOL ADMINISTRATION AND SUPERVISION (Education 10). Both terms. Professor JORDAN.

[THE JUNIOR HIGH SCHOOL (Education 12). Either term. Professor JORDAN. Not offered in 1931-32.]

[THE PRINCIPALSHIP OF THE CENTRALIZED AND VILLAGE SCHOOL (Rural Education 175). Second term. Professor FERRISS. Not offered in 1931-32.]

THE ADMINISTRATION OF RURAL SCHOOLS (Rural Education 261). First term. Professor BUTTERWORTH.

SPECIAL PROBLEMS IN SCHOOL ADMINISTRATION (Rural Education 262). Second term. Professor BUTTERWORTH.

PROCEDURES AND TECHNIQUES IN SUPERVISION (Rural Education 263). First term. Professor MOORE.

[SEMINARY IN RURAL SCHOOL ADMINISTRATION (Rural Education 264). Second term. Professor BUTTERWORTH. Not offered in 1931-32.]

ADMINISTRATION AND SUPERVISION OF AGRICULTURAL EDUCATION (Rural Education 267). First term. Professor STEWART.

[THE ADMINISTRATION AND SUPERVISION OF HOME ECONOMICS EDUCATION (Rural Education 269). First term. Professor BINZEL. Not offered in 1931-32.]

PRINCIPLES OF CURRICULUM BUILDING (Rural Education 276). Second term. Professor FERRISS.

SEMINARY IN RURAL SECONDARY EDUCATION (Rural Education 278). Second term. Professor FERRISS.

*HISTORY OF EDUCATION

HISTORY OF EDUCATION (Education 3). Both terms. Professors LAISTNER and SMITH.

HISTORY OF AMERICAN EDUCATION (Education 13). Either term. Mr. HULSE.

READINGS IN THE HISTORY OF EDUCATION (Education 16). Second term. Mr. HULSE.

*PRINCIPLES OF EDUCATION

PRINCIPLES OF SECONDARY EDUCATION (Education 2). Second term. Professors JORDAN and FREEMAN.

PRINCIPLES OF EDUCATION (Rural Education 181). Second term. Professor MOORE.

EDUCATION AND VOCATIONS (Rural Education 194). First term. Professor EATON.

RURAL SECONDARY EDUCATION (Rural Education 281). First term. Professor FERRISS.

THE JUNIOR HIGH SCHOOL AND THE RURAL COMMUNITY (Rural Education 287). Professor FERRISS.

*PHILOSOPHY OF EDUCATION

PHILOSOPHY OF EDUCATION (Rural Education 294). Second term. Professor EATON.

PHILOSOPHY OF EDUCATION (Education 5). Second term. Professor OGDEN.

*NATURE STUDY

NATURE STUDY (Rural Education 7). Second term. Professor PALMER.

NATURE LITERATURE (Rural Education 102). First term. Professor PALMER.

[THE NATURE STUDY MOVEMENT AND ITS MAKERS (Rural Education 109). First term. Professor PALMER. Not offered in 1931-32.]

*CHILD DEVELOPMENT AND PARENT EDUCATION

Professors ETHEL B. WARING and MARIE B. FOWLER.

The laboratory for graduate work in Child Development and Parent Education is situated in a separate building which was at one time a large residence and which is located in the Circle near the Home Economics Building. One floor of the building is used by the nursery school children. Child Development and Parent Education library, offices and laboratories, as well as the play, rest and work rooms are located in this building with complete nursery school equipment to direct the all-around development of 20 pre-school children, ranging in age from 2 to 4 years.

For graduate work in Child Development and Parent Education the following are prerequisites: Psychology for students of Child Guidance, undergraduate courses in Child Development and Parent Education, or their equivalent, and experience with children either as a teacher, social case worker, nurse, probation officer, or parent.

Graduate work in Child Development and Parent Education involves intensive case studies of a small number of families, participation in the guidance of the parents in conference and discussion groups, and some direction of undergraduate students studying the same families. Class work and seminar integrate the various subject matters involved in Child Development and Parent Education.

PHILOSOPHY AND PSYCHOLOGY

The subjects of Philosophy and Psychology are grouped in the Susan Linn Sage School of Philosophy. This School owes its existence to the generosity of the late Henry W. Sage, who in addition to endowing the Susan Linn Sage Philosophical Professorship, made a further gift of \$200,000 for the purpose of providing permanently at Cornell University for philosophical instruction and investigation of the most varied kind and of the highest order. The endowments of the School of Philosophy enable it to secure whatever material facilities are required for the successful prosecution of philosophical studies and research. The more important philosophical and psychological journals, American and foreign, are received by the Library, which is also well equipped with philosophical and psychological works, and is particularly rich in literature relating to Plato, Spinoza, and Kant.

The larger part of the work of the Sage School is adapted to the needs of graduates of this and other institutions, who are preparing themselves to be teachers or investigators in philosophy and in allied fields of study. A student who has made a special study of philosophy during his junior and senior years may still take a graduate course of three years' work with history of philosophy, logic and metaphysics, ethics, or psychology, as his major subject. For the encouragement of higher studies and research in every branch represented by the School of Philosophy, there have been established three fellowships of the annual value of \$400 each, and six scholarships of the annual value of \$200 each. Holders of fellowships and graduate scholarships are also exempt from the payment of tuition. Of these, one fellowship and one scholarship are regularly assigned to psychology. Applicants for fellowships and scholarships should therefore state definitely whether their major subject will be in one of the several branches of philosophy or in psychology.

The School is devoted to the free and unhampered investigation of truth in regard to all those questions of human inquiry which are embraced by logic, metaphysics, psychology, ethics, aesthetics, and the history and philosophy of religion. In the courses of instruction are represented the chief branches and problems of philosophy and psychology. Work devoted to the thesis for the doctorate is intended to secure the maximum of specialized training and the power of independent inquiry and statement of results. In all divisions of Philosophy particular stress is laid upon the historical study of philosophical ideas as the best means of securing a comprehensive grasp of fundamental problems and values.

*PHILOSOPHY

Professors FRANK THILLY, G. WATTS CUNNINGHAM, G. H. SABINE, HAROLD R. SMART, RICHARD ROBINSON, RALPH W. CHURCH; *Doctor* E. T. PAINE.

The philosophical seminary room in the University Library is provided with complete sets of the leading philosophical journals, lexicons, and other books of reference, and the more important works in the several branches of philosophy and psychology. The current numbers of the philosophical journals are also to be found in the room. Liberal provision is made for the constant growth of this special library.

The Philosophical Review, established by the University, is a bi-monthly journal devoted to the interests of philosophy, embracing under that title logic, metaphysics, ethics, psychology, aesthetics, and philosophy of religion. Although supported by private endowment, it is not the organ of any institution or of any philosophical school, but by the terms of the subsidy is an absolutely free organ of contemporary philosophy.

Under the title of *Cornell Studies in Philosophy*, a series of monograph studies is published from time to time as representative of the work done by graduate students in philosophy. These monographs are issued under the editorial super-

vision of the professors of philosophy, and consist mainly of studies undertaken originally as dissertations for the doctorate. The series furnishes also a channel for the publication of research other than that of the thesis. Seventeen monographs have been issued in the series.

While any of the courses offered in the Sage School of Philosophy may be utilized by graduates, attendance at lectures is to be regarded only as an aid to the independent development on the part of the student of critical scholarship and methods of investigation. The following courses are of interest to graduate students in the school. Other courses will be found in the Announcement of the College of Arts and Sciences.

8. PLATO AND ARISTOTLE. First term. Assistant Professor ROBINSON. M W F 9. Goldwin Smith 220. Assigned readings and discussion.

8b. MEDIEVAL PHILOSOPHY. Second term. Prerequisite, Philosophy 5 (first term) or Latin 8 (first term); the prerequisite may be taken concurrently. Assistant Professor ROBINSON. M W F 9. Goldwin Smith 220. Assigned readings and discussions.

[11. CONTEMPORARY PHILOSOPHY: British and Continental. Throughout the year. Professor CUNNINGHAM. W F 10. Goldwin Smith 227. Not given in 1931-32.]

12. AMERICAN PHILOSOPHY. Second term. Professor CUNNINGHAM. T Th 12. Goldwin Smith 227.

Generalized American attitudes toward life and thought as expressed in theology, politics, education, and technical philosophy, with particular emphasis on recent systems: Royce, James, Dewey, Santayana.

15. THE PHILOSOPHY OF THE NATURAL SCIENCES. First term. Assistant Professor SMART. M W F 11. Goldwin Smith 227. A study of the process of scientific reasoning, as illustrated by the historical development of important scientific conceptions, and a discussion of some of the more recent works on the philosophy of science.

16. RECENT FRENCH PHILOSOPHY. Renouvier and Bergson. Throughout the year. Prerequisite, Philosophy 5. M W F 11. Goldwin Smith 220.

During the first term, the chief works of Renouvier will be studied in relation to the thought of some of his contemporaries; in the second term, the philosophy of Bergson will be examined and emphasis placed upon recent French criticism of his thought.

[26. THE ETHICS OF MODERN UTILITARIANISM. Throughout the year. Professor THILLY. Th 3-5:30. Goldwin Smith 220. Not given in 1931-32.]

27. READINGS IN GREEK PHILOSOPHY. Throughout the year. Assistant Professor ROBINSON. Time and place to be arranged.

Reading and interpretation of the Greek text of Plato's *Republic*, or of some other Greek philosophical text.

28. PHILOSOPHY OF VALUE. First term. Assistant Professor SMART. M W F 10. Goldwin Smith 221.

A critical analysis of the main lines of Western value philosophy with primary reference to ethics and major emphasis upon contemporary material. Lectures and discussions.

29. MODERN IDEALISTIC THEORY OF ETHICS. Throughout the year. Professor THILLY. Th 3-5:30. Goldwin Smith 220.

30. EMPIRICISM AND RATIONALISM. Throughout the year. Professor SABINE. T Th S 11. Goldwin Smith 220.

A critical analysis of the main works of Descartes, Locke, Spinoza, Leibniz, and Hume.

32. THE CRITICAL PHILOSOPHY OF KANT. Throughout the year. Professor SABINE. Hours to be arranged. Goldwin Smith 220.

A study of the *Critique of Pure Reason* and of the *Critique of Judgment*, with frequent reference to standard commentaries and to more recent interpretations.

[33. THE PHILOSOPHY OF HEGEL. Throughout the year. Goldwin Smith 220. Professor CUNNINGHAM. Hours to be arranged.

A critical study of the philosophy of Hegel, with special emphasis, on the *Phenomenology* and the *Logic*. Not given in 1931-32.]

37. SEMINAR IN ETHICS. Throughout the year. Professor THILLY. Hours to be arranged. Goldwin Smith 220.

Moral philosophy in its relations to economics, politics, and law.

39. SEMINAR IN THE HISTORY OF PHILOSOPHY AND METAPHYSICS. Throughout the year. Professor CUNNINGHAM. M 3, or hours to be arranged. Goldwin Smith 220.

Topic for the year 1931-32: Mind and Meaning.

40. SEMINAR IN LOGIC. Throughout the year. Assistant Professor SMART. F 2, or hours to be arranged. Goldwin Smith 220. The subject for the year 1931-32 will be A Study of Husserl.

42. SEMINAR IN ANCIENT AND MEDIEVAL PHILOSOPHY. Throughout the year. Assistant Professor ROBINSON. W 2-4. Goldwin Smith 220. Plato's *Laws*.

*PSYCHOLOGY

Professors MADISON BENTLEY, H. P. WELD, J. G. JENKINS; Doctor SAMUEL FELDMAN and Mr. R. B. MACLEOD.

The research department possesses a separate laboratory in Morrill Hall with rooms for general and individual research, for apparatus, for the library of periodical literature and for meetings of the seminars.

During the past year the resources of the Department have been increased by the acquisition of a sound-proof room and the most recent type of radio-oscillators. This laboratory also includes a workshop for the construction and assemblage of apparatus, and it contains the editorial offices of the *American Journal of Psychology*.

Facilities for graduate work in animal behavior are provided by the Department of Physiology with which the Department of Psychology is in close coöperation.

With the exception of the seminaries, graduate study in psychology is generally informal. For the technical training of the student stress is laid upon observational practice, and candidates for advanced degrees are urged to observe in at least three experimental investigations; so far as possible this observational practice is provided in subjects which are remote from the candidate's individual research. No formal list of prerequisites for graduate study in psychology can be laid down. It is assumed, however, that the candidate for an advanced degree will have had, at the least, a good general course in psychology as well as fundamental training in the laboratory.

The Department of Psychology offers the following courses.

1. ELEMENTARY PSYCHOLOGY. First term: T Th 11, Professor WELD; M W 12, Assistant Professor JENKINS. Second term: M W 12, Assistant Professor JENKINS. Goldwin Smith C.

2. GENERAL PSYCHOLOGY. Second term. T Th 11. Professor WELD. Goldwin Smith C.

Problems and methods of the various subdivisions of psychology.

3. INTRODUCTORY LABORATORY. M W F 2-4. Assistant Professor JENKINS. and Mr. MACLEOD. Morrill, Psychological Laboratory.

4. ADVANCED LABORATORY. Second term. M W F 2-4. Mr. MACLEOD. Morrill, Psychological Laboratory.

The psychophysical and correlational methods.

5. PERCEPTION. First term. M W F 9. Dr. FELDMAN. Morrill 41.

6. MEMORY, SKILL AND WORK. Second term. M W F 9. Dr. FELDMAN. Morrill 41.

7. READING OF GERMAN PSYCHOLOGY. Second term. Hours to be arranged. Dr. FELDMAN. Morrill, Psychological Laboratory.

The purpose of the course is to habituate graduate students who already have some reading knowledge of the language in the use of the German psychological literature. Every year some important book or series of articles is selected for reading and discussion.

8. **TECHNIQUE OF EXPERIMENTATION.** Second term. T Th 2. Assistant Professor JENKINS. Morrill, Psychological Laboratory.

A study of the fundamental techniques of psychological research. The student will learn to operate typical pieces of apparatus employed in such work, and will become acquainted with the physical principles underlying their operation. Students planning work for an advanced degree should plan to include this course in their programs as early as possible.

9. **PSYCHOLOGICAL RESEARCH: EXPERIMENTAL, THEORETICAL, AND HISTORICAL.** Professors BENTLEY and WELD, and Assistant Professor JENKINS.

10. **SOCIAL PSYCHOLOGY.** Second term. M W F 10. Professor BENTLEY. Morrill 41.

A study of the socialized individual, the conditions of socialization, the character and varieties of social groups, and the products of socialization.

11. **PHYSIOLOGICAL PSYCHOLOGY.** First term. M W F 10. Assistant Professor JENKINS. Morrill 42.

In this course systematic study is made of the experimental literature of sense-psychology and its neurological background. By means of illustrated lectures the student will be introduced to the more important facts and theories of each of the sense-departments and in many cases he will be given an opportunity to verify points by use of the original apparatus. The course is recommended for those who plan research in allied psychological fields and for students in medicine.

12. **LEGAL PSYCHOLOGY.** Second term. M W F 11. Professor WELD. Boardman Hall C.

A course in the psychological aspects of the origin and growth of the law, and of legal theory, and problems in legal responsibility and evidence. Intended for pre-legal students, but graduates in Sociology, Economics, History, and Psychology are admitted.

[13. **HISTORY OF PSYCHOLOGY.** First term. M W F 10. Professor BENTLEY. Morrill 41. Not given in 1931-32.

Derivation of current schools.]

14. **CONTEMPORARY PSYCHOLOGY.** First term. T Th S 11. Professor OGDEN. Morrill 41.

The course deals primarily with present-day psychological theories, especially Behaviorism and Gestalt-psychology.

15. **ABNORMAL PSYCHOLOGY.** Second term. W M F 10. Professor BENTLEY. Morrill 41.

An account of the deficiencies, excesses, and aberrations of the psychological functions. The psychoneuroses and psychological disorders. A comparison of the normal organism with the disturbances to be found in dreams, hypnosis, and illusory perception. Psychoanalysis and other current modes of diagnosis and treatment.

16. **APPLIED PSYCHOLOGY.** Second term. Credit three hours. A critical review of the attempts to apply psychological facts and methods to the solution of various technological problems. Prerequisite, Psychology 1. Assistant Professor JENKINS. T Th S 10. Morrill 41.

MATHEMATICS

Professors J. I. HUTCHINSON, VIRGIL SNYDER, F. R. SHARPE, ARTHUR RANUM, W. A. HURWITZ, W. B. CARVER, D. C. GILLESPIE, C. F. CRAIG, and B. W. JONES.

The graduate work provides instruction in the principal branches of mathematics and furnishes preparation and material for independent investigation.

Only a portion of the whole field can be covered by the courses given in a single year. The courses are changed, therefore, from year to year in order to meet the needs of students.

In addition to the regular instruction, individual guidance and advice are offered to any student who wishes to follow a particular line of inquiry.

Students who take mathematics as a major subject for an advanced degree must have completed previously the equivalent of the elementary course in analytic geometry and calculus, and further study in at least one more advanced subject, as for example, differential equations, advanced calculus, modern algebra, or projective or advanced analytic geometry.

The Oliver Mathematical Club, composed of teachers and advanced students, meets weekly, and has for its object the systematic presentation by the members of some specified mathematical theory of recent development, and of reports on noteworthy articles in current journals and on results of special reading and investigations.

The equipment consists of a collection of about three hundred surfaces, including the various forms of the cyclides, the Kummer surface, the surface of centers, and minimum surfaces; plaster models illustrating positive, negative, and parabolic curvature, and constant measure of curvature; plaster models illustrating the theory of functions, among them models of simply and multiply connected surfaces, and of several forms of Riemann surfaces, and models representing the real parts of algebraic, exponential, logarithmic, and elliptic functions; wooden and glass models of crystals and polyhedra, wire and thread models of twisted curves and ruled surfaces, and skeleton frames for minimum surfaces.

The library has a large collection of books on pure and applied mathematics, including collected works of mathematicians, complete sets of all the important mathematical journals, transactions and other publications of scientific societies, and doctoral theses from the leading American and European universities.

The following courses are offered. The courses mentioned in brackets will not be given in 1931-32, but are given from time to time.

*ALGEBRA

23. MODERN ALGEBRA. Second term. Prerequisite, Mathematics 4b or the equivalent. Assistant Professor JONES. T Th S 9. White 2.

Determinants, matrices, linear dependence, linear transformations, bilinear and quadratic forms, canonical forms.

29. ADVANCED THEORY OF NUMBERS. First term. Prerequisite, a first course in Theory of Numbers. Assistant Professor JONES. T Th S 9. White 2.

Topics from the theory of binary and ternary quadratic forms, and an outline of some of the more general theories of forms. If time permits, other topics of general interest will be considered.

[THEORY OF NUMBERS. Not given in 1931-32.]

[THEORY OF EQUATIONS. Not given in 1931-32.]

[INTRODUCTION TO LINEAR ALGEBRAS. Not given in 1931-32.]

[THEORY OF GROUPS. Not given in 1931-32.]

*ANALYSIS

41. ELEMENTARY DIFFERENTIAL EQUATIONS. Repeated in second term. Prerequisite, Mathematics 4b or the equivalent. T Th S 11. White 2.

42. ADVANCED CALCULUS. Throughout the year. Prerequisite, Mathematics 4b or the equivalent. Assistant Professor CRAIG. M W F 11. White 5.

A study of the processes of the calculus, their meanings and applications. It is designed to furnish a necessary preparation for advanced work in analysis and applied mathematics.

44. INFINITE SERIES. Throughout the year. Prerequisite, Mathematics 42 and some other course in Analysis. Professor HURWITZ, M W F 11. White 6.

The greater part of the course will deal with the modern theory of divergent series, with emphasis on recent research and outstanding problems.

45. THEORY OF FUNCTIONS OF A COMPLEX VARIABLE. Throughout the year. Prerequisite, Mathematics 4b or the equivalent. Professor GILLESPIE. M W F 10. White 1.

An elementary course in the theory of analytic functions of a complex variable.

[THEORY OF DIFFERENTIAL EQUATIONS. Not given in 1931-32.]

[THEORY OF FUNCTIONS OF A REAL VARIABLE. Not given in 1931-32.]

[FUNCTIONALS AND THEIR APPLICATIONS. Not given in 1931-32.]

[ELLIPTIC INTEGRALS AND FUNCTIONS. Not given in 1931-32.]

[CALCULUS OF VARIATIONS. Not given in 1931-32.]

[INTEGRAL EQUATIONS. Not given in 1931-32.]

*GEOMETRY

61. PROJECTIVE GEOMETRY. Throughout the year. Prerequisite, Mathematics 4b or the equivalent. Professor CARVER. M W F 9. White 10.

The elements of projective geometry treated synthetically.

62. ADVANCED ANALYTIC GEOMETRY. Throughout the year. Prerequisite, Mathematics 4b or the equivalent. T Th S 10. White 10.

Projective geometry of one, two, and three dimensions treated by means of homogeneous coördinates.

63. ELEMENTARY ANALYTIC GEOMETRY OF SPACE. Second term. Prerequisite, Mathematics 61 and 62 (at least the first term's work in each). Professor SNYDER. M W F 9. White 24.

An elementary course in analytic geometry of three dimensions in Cartesian and projective coördinates.

65. ALGEBRAIC CURVES. First term. Prerequisite, Mathematics 61 and 62. Professor SNYDER. M W F 9. White 24.

The geometry on an algebraic curve, including linear systems, canonical series, the Riemann-Roch theorem and its uses.

67. DIFFERENTIAL GEOMETRY. Throughout the year. For prerequisites consult the teacher. Professor RANUM. T Th S 11. White 9.

Curves and surfaces studied by the methods of the calculus.

[NON-EUCLIDEAN GEOMETRY. Not given in 1931-32.]

[GEOMETRY OF HYPERSPACE. Not given in 1931-32.]

[LINE GEOMETRY. Not given in 1931-32.]

*APPLIED MATHEMATICS

85. VECTOR ANALYSIS. First term. Prerequisite, Mathematics 4b or the equivalent. Professor SHARPE. T Th S 9. White 28.

The algebra and calculus of vectors, with applications to mechanics and electricity.

86. FOURIER SERIES AND POTENTIAL FUNCTIONS. Second term. Prerequisite, Mathematics 4b or the equivalent. Professor SHARPE. T Th S 9. White 28.

A brief course with applications to heat and electricity.

[DIFFERENTIAL EQUATIONS OF PHYSICS. Not given in 1931-32.]

[PRINCIPLES OF MECHANICS. Not given in 1931-32.]

[HYDRODYNAMICS AND ELASTICITY. Not given in 1931-32.]

[PROBABILITY AND STATISTICS. Not given in 1931-32.]

THE ENGINEERING SCIENCES

Graduate work in Engineering will be limited presumably to one field. This may be chosen in any one of the three larger subdivisions or schools of Engineering, i. e., Civil, Mechanical, or Electrical, although further subdivision will always be required. It is, however, always possible to elect work and to pursue research in two or more schools, provided one *field* only is involved, as, for example, in hydro-electric power or in hydro-electric traction.

For better teaching facilities, some duplication exists, both in subject matter and in equipment, and a student should therefore select in such a case the school naturally making the same applications that he himself desires to make. For example, in the School of Mechanical Engineering, hydraulics naturally leads towards, and is developed with a view to, pump design or hydraulic power plants. In Civil Engineering, on the other hand, hydraulics looks forward to water power installations, to canal and harbor construction, to sewerage and waterworks.

In some cases, as for example in studies on cement or steel specifications, further training in chemistry might be found imperative, though that might involve work in still another school. Such additional study is desirable, sometimes essential for successful pursuit of many kinds of graduate work in Engineering. It is particularly desirable that a thorough knowledge of all fundamental theory be in hand before any attempt is made to carry out its applications into Engineering Design or Construction.

*MECHANICS

In Civil Engineering

Professors S. G. GEORGE, E. W. RETTGER, and E. V. HOWELL.

An extensive departmental library in Lincoln Hall, in addition to the University Library, affords facilities for advanced work in the field of applied mechanics, especially in applications such as occur in structural engineering.

The prerequisite training for graduate work in this subject should cover the fundamental principles and applications in mathematics, physics, materials, mechanics and structural design required for graduation in civil engineering at Cornell University. Many of the advanced treatises are in French or German, and an ability to read technical works in these languages is extremely valuable.

ADVANCED MECHANICS. Linear arches; curved beams; special cases of flexure; problems in the mathematical theory of elasticity; thick hollow cylinders and spheres; plates variously supported; Castigliano's theorem of least work with extensive applications to deflections, beams, arches, and statically indeterminate cases of trusses, beams, frames, and arches.

SPECIAL RESEARCH AND SEMINAR COURSES IN ADVANCED MECHANICS.

TOPICS AND METHODS OF INVESTIGATION, individually arranged.

*MATERIALS OF CONSTRUCTION

Professor H. H. SCOFIELD.

The library of the School of Civil Engineering is well supplied with reference works of various kinds on the subject of structural materials, their properties, specifications, and tests. Especial effort is made to add continually the most recent investigations and researches as the results find their way into print.

The equipment is selected to make all ordinary and many special tests and investigations of the materials of construction. The testing machines range in capacities from 400,000 pounds in tension, compression, and flexure on long span beams, to 1,000 pounds. The tests of toughness, abrasion, and wear may be made upon rock, paving brick, and similar materials. Core drills, diamond saws, lap grinders, and other apparatus for the proper preparation of these test pieces are available.

The cement and concrete laboratories are equipped to make all the standard tests upon cement and the various other ingredients entering into concrete. A specialty is made in the tests and investigations of the finished concrete under various conditions, as to proportion, manufacture, and design.

MATERIALS LABORATORY. Either term. Open to graduates who lack fundamental laboratory experience. Professor SCOFIELD and Mr. VANDERLIP.

ENGINEERING RESEARCH IN MATERIALS. Either term. Special investigations of an advanced nature of the properties of structural units and the materials of construction. Proper investigational methods are insisted on so that the results shall be of the caliber and scope deemed essential for publication. Professor SCOFIELD.

HYDRAULICS AND HYDRAULIC ENGINEERING

In Civil Engineering

Major work in Experimental Hydraulics, Theoretical Hydraulics, or Hydraulic Engineering may consist in part (subject to the thesis requirement) of advanced courses selected from the subjoined list, or the entire minor work may consist of such courses accompanied by such special work and reports as may be arranged with the faculty members of the special committee.

A candidate for the degree of Master of Civil Engineering (or of Science), or Doctor of Philosophy who desires to take either a major or a minor subject in these fields of study must ordinarily have completed, preliminary to graduate work, courses in Hydraulics, Municipal Sanitation (including sewer design and construction and sewage disposal), and Water Supply, substantially equivalent to these courses as required of all undergraduates in the School of Civil Engineering. If a graduate student lacks one or more of these preliminary courses or considerable portions of any of them, more than the minimum period of residence may be necessary.

Ordinarily for major work in Hydraulic Engineering the thesis requirement of the Graduate School must be satisfied by work involving original designs, estimates, or analyses based on actual engineering data, these to be gathered by the student himself as an essential part of advanced work in this field, and the requirement may not be satisfied by the so-called descriptive type of thesis with only rather vague design based on assumed data.

For major work in Experimental (or Theoretical) Hydraulics the thesis requirement may be satisfied by individual experimental (or theoretical) investigation and a thesis based thereon. The department can usually suggest interesting subjects for investigation on some of the numerous topics of hydraulics on which scientific information is both needed and demanded by the engineering profession. Ordinarily fully half of the student's total time should be devoted to the thesis investigation. The tendency is to underestimate the time required for preliminary work and that necessary for a thorough digestion of results in preparation of the thesis. Consequently the work should be begun, if possible, early in the first term of residence.

***HYDRAULICS**

Professor E. W. SCHODER.

The unique situation and construction of the Hydraulic laboratory render practicable investigations requiring a steady gravity water supply for long periods using relatively large flows of water.

Prospective graduate students should bear in mind that only under very rare circumstances can a candidate for the Master's degree, or even the Doctor's degree, hope to carry out an experimental investigation in hydraulics involving large flows of water up to the capacity of the laboratory or involving extensive constructions. The limitations of seasonal availability of water and of weather conditions, as well as of time, labor, and expense, are such that the graduate student in this subject should look forward to investigations of lesser apparent magnitude, but often of greater scope and value.

HYDRAULIC MEASUREMENTS. The experimental work usually includes weirs, Pitot tubes, pipes, current meters, fire hose and nozzles, ordinary water meters, Venturi meters, floats in open channels, actual measurement of river discharge (on a week-end trip) and such occasional tests as opportunity offers in the laboratory or the immediate neighborhood of Ithaca.

EXPERIMENTAL HYDRAULIC INVESTIGATION. The subject and scope of the investigation should be selected by conference at the beginning of the term if not previously arranged. It is often permissible and desirable for two students to work together on the same investigation. Written reports are required but the text need not be typewritten in thesis style; these reports are kept by the department. In most cases it is necessary to arrange a definite schedule for work in the laboratory to avoid conflicts.

*HYDRAULIC ENGINEERING

In Civil Engineering

Professor F. J. SEERY.

C. E. 231. **HYDRAULIC CONSTRUCTION.** The course is devoted largely to a study of water storage and the engineering investigations and design of structures associated with stream regulation for public water supplies, water power, irrigation or navigation. Extensive problems are worked out involving the preliminary investigation of a project, exploration of dam sites, surveys of reservoir sites, the economics of storage, manipulation of storage and pondage, the preparation of an estimate of quantities, costs, plan of progress in construction, etc., for a particular project. The stability of weir dams by graphics, and the analytic design of high masonry dams by Wegmann's method, together with a study of all the factors affecting the stability and form of section of a dam, and the methods of construction are fully covered by text and in problems. Second term. M W F 1:40-4. Lincoln 22.

C. E. 232. **WATER-POWER ENGINEERING.** Recitations from assigned text and the working of lengthy problems. The course is devoted to a general study of the problems of water power development, the factors affecting the economics of a project, the engineering and commercial feasibility of developing power and the value of a mill site. A detailed study of the characteristics of modern turbine types, the selection of mechanical equipment suited to the conditions of installation and operation, the effects of load factors, pondage, storage and steam auxiliary on the capacity and cost; together with an analysis of the power capacity of a low head mill site, the speed regulation of a plant under medium head fed by a long penstock, and a thorough study of the phenomena of unsteady flow and surging, with and without surge tanks, are covered by the text and incorporated into numerical problems taken from existing plants. First term. M W F 10. Lincoln 34.

In Mechanical Engineering

Professor F. G. SWITZER.

Arrangements can sometimes be made for experimental work in the University hydro-electric plant. This plant contains a reaction turbine built by the I. P. Morris Department of the Wm. Cramp and Sons Ship and Engine Building Co., rated at 550 h.p., 600 r.p.m. at 142 ft. head. There are also four impulse turbines of the Pelton-Doble type, two of which are rated at 280 h.p., 124 r.p.m. at 135 ft. head, and the other two are rated at 50 h.p., 300 r.p.m. at 135 ft. head. The three large machines are directly connected to 60-cycle alternators; the two smaller machines are directly connected to d.c. generators. There is also a separate d.c. generator driven by a synchronous motor and the usual switchboard and control apparatus.

The hydraulic laboratory, under the direction of the Department of Experimental Engineering, is also available for the investigation of turbine and draft tube problems, centrifugal pump performance, measurement of water, etc.

The libraries of the University have a very complete collection of treatises relating to mechanics, hydraulics, hydro-electric engineering, and to similar subjects. In addition, these libraries contain the more representative engineering periodicals and the transactions of the leading engineering societies of the world.

336. **HYDRAULIC POWER PLANTS.** Professor SWITZER. Two lectures a week throughout the year. A brief survey of the problem of the consulting engineer in water power work. Considerable emphasis is placed upon the financial problems of construction and operation of the water power plant, alone, and as part of a large power system.

338. **HYDRAULIC POWER PLANT PROBLEMS.** Professor SWITZER. Applications of the work given in the preceding course to the investigation of problems of a water power plant. Problems will be chosen to meet the needs of each student.

*MACHINE DESIGN

Professors C. D. ALBERT, F. S. ROGERS, C. E. TOWNSEND, E. F. GARNER, and S. J. KOSHKIN.

Under this head is included advanced work in descriptive geometry, kinematics and dynamics, machine design and design methods, and special design problems and investigational work.

There are nine well equipped drawing rooms and a very complete collection of Kinematic models. The Department Library, the Library of the School of Mechanical Engineering, and the University Library have a very complete collection of books on drawing, kinematics, machine design and construction, mechanical technology, structural design, and other books on related subjects.

The department offers the following elective courses suitable for students pursuing graduate work:

320. GEARING. Second term. Two lectures a week. East Sibley. History and development. Form, strength, and wearing characteristics of gear teeth. Types, proportions, manufacture, and operation of gears. Assistant Professor GARNER.

321. ADVANCED KINEMATICS AND KINETICS. Second term. Two lectures and one three-hour drafting room period a week. East Sibley. Graphical and semi-graphical treatment of linear and angular velocities and accelerations and of the resulting forces and stresses due to the form, loads, and masses of the moving parts of mechanisms and machines. Vibration and balancing are treated so far as time permits. Professor ALBERT and Assistant Professor KOSHKIN.

322. MATERIAL HANDLING. Second term. Two lectures a week. East Sibley. Treatment and analysis of the known methods of handling different kinds of materials and of the principles and considerations governing a proper choice of the method of handling any kind of material in a given situation. Assistant Professor KOSHKIN.

*HIGHWAY ENGINEERING

Professors W. L. CONWELL and R. Y. THATCHER.

The laboratories for testing rocks, aggregates, other non-bituminous highway materials and concrete are in the basement of Lincoln Hall. The laboratories are equipped with a Deval machine, core drill, Page impact machine for the toughness test, ball mill, molding machine for cementation specimens, impact machine for the cementation test, rock saw, grinding lap, Dorry machine, rattler for testing paving brick, and equipment ranging in capacity from 50,000 lbs. to 400,000 lbs. for making tests in tension, compression, etc.

The laboratory for testing bituminous highway materials, bituminous mixtures and subgrade soils is housed in a separate building. This laboratory is equipped with facilities for making the standard tests of specific gravity, consistency, ductility, volatiliztion, distillation, flash and burning point, softening point, total bitumen, fixed carbon, etc., on bituminous materials, and also with apparatus for the examination of bituminous mixtures and bituminous pavements. Equipment is also available for determining the lower plastic limit, lower liquid limit, field moisture equivalent, centrifuge moisture equivalent, shrinkage limit, slaking value, wet and dry mechanical analysis, etc., of subgrade soils.

The other Laboratories of the School of Civil Engineering equipped for the purpose of investigating the properties of engineering materials and the Ceramic Laboratory of the Department of Geology, which is equipped with kilns and a brick machine, are also available for students specializing in highway engineering.

The Library of the School of Civil Engineering and the University Library contain a comprehensive collection of books on highway engineering, periodicals, publications of technical societies, etc, while the office of the Department of Railroad and Highway Engineering has on file city and state specifications and reports, government bulletins and reports, reports on highway engineering research,

standard plans and plans of highway projects, catalogues of equipment, etc., all of which are available to students.

HIGHWAY ENGINEERING, C. E. 265. This course will not be accepted as part of a major or minor subject in graduate work.

C. E. 265. HIGHWAY ENGINEERING. Seniors and graduates. Either term. Credit three hours. Prerequisite courses 260-A and 260-B. The course consists of recitations and lectures on highway economics, economics of location, subgrade soils, drainage, selection of type of surface, and the methods of construction and maintenance of earth, sand-clay and top-soil roads, gravel, waterbound macadam and new types of low cost roads; character of non-bituminous and bituminous highway materials; surface treatments, construction and maintenance of bituminous macadam, bituminous concrete, sheet asphalt, Portland cement concrete, brick, wood-block, stone-block pavements, etc. In addition to the class work there is assigned a highway design problem requiring about sixty hours of work. Professor CONWELL and Assistant Professor THATCHER.

C. E. 266. HIGHWAY LABORATORY. Elective. Seniors and graduate students. Either term. Credit three hours. Prerequisite Course 265, or may be taken concurrently with Course 265. This course includes tests for the lower liquid limit, lower plastic limit, centrifuge moisture equivalent, etc., to examine the properties of subgrade soils; the standard tests of asphalts and tars used for highway construction and maintenance; sampling aggregates and examination of their suitability for non-bituminous and bituminous highways; and trial mixtures and stability tests of sheet asphalt pavements. Professor CONWELL and Assistant Professor THATCHER.

C. E. 267. ADVANCED HIGHWAY ENGINEERING. Elective. Seniors and graduate students. Second term. Credit three hours. Prerequisite Course 265. This course is conducted as a seminar. Meetings are held once each week during an afternoon or evening. The topics for assignment and discussion include the economics of highway engineering, design, construction, and maintenance of highways, the latest research programs and reports, labor and plant organization for various kinds of highway contracts with especial emphasis on the economics of contracting, highway finance, legislation, regulation, etc. Professor CONWELL.

C. E. 268. ADVANCED HIGHWAY LABORATORY. Elective. Seniors and graduate students. Either term. Credit three hours. Prerequisite Courses 265 and 266. Testing of non-bituminous and bituminous highway materials and a study of their characteristics; testing of aggregates, soils, bituminous concrete, sheet asphalt, and asphalt paving block mixtures; study of specifications. Special investigations and tests are made to determine the properties of various combinations of materials and the effects of modifications in design. Two laboratory periods a week. Professor CONWELL and Assistant Professor THATCHER.

Occasionally during the year inspection trips are made to investigate drainage and subsoil conditions, condition of highways especially during the latter part of winter and early spring, and during the construction season various highway projects are visited, particular attention being paid to methods and contractor's equipment and organization.

Note: For larger highway structures see *STRUCTURAL ENGINEERING*.

*RAILROAD ENGINEERING

Professors F. A. BARNES, J. E. PERRY, and CARL CRANDALL.

The library of the School of Civil Engineering contains an excellent and up-to-date collection of books, periodicals, and publications of railway and other technical societies on the location, construction, maintenance, and operation of railways and on transportation. Specifications, standard plans, and maps and profiles are available for use in the study of economics of location, railway structures, signaling, yard and terminal design, etc. Instrumental equipment is available for securing additional data for special problems in relocation and in design of structures.

The following elective courses supplemented by problems as required, may be taken as part of a major or minor subject by those who may not have covered such work in their undergraduate courses:

LOCATION. Professor BARNES.

MAINTENANCE OF WAY AND STRUCTURES. Assistant Professor PERRY.

OPERATION AND MANAGEMENT. Assistant Professor PERRY.

ENGINEERING DESIGN. Professor BARNES and Assistant Professor CRANDALL.

ENGINEERING RESEARCH. Professor BARNES.

The first two consist of recitations and lectures; the latter two involve individual work on special problems or investigations. The field is so broad that the interest of the student is considered in the assignment of work.

In addition to the above courses, the student may take courses in other departments if time permits; such as courses in transportation in the College of Arts and Sciences, or in the applications of electricity to railway work in the School of Electrical Engineering.

Note. For the larger railway structures, see *STRUCTURAL ENGINEERING*.

*SANITARY ENGINEERING

Professors H. N. OGDEN and C. L. WALKER.

The courses offered to graduate students may be divided into two classes: those dealing with the design, construction, and operation of sewage-disposal plants, and water purification plants; and those fundamental studies in chemistry, biology, and bacteriology, which the undergraduate student in civil engineering may not have been able to pursue.

A sewage-disposal plant in the city of Ithaca offers opportunity for experimental study of septic action and of sedimentation. Within a short distance from Ithaca are five other plants, well adapted for critical examinations of efficiencies. Numerous other opportunities are offered for the study of similar questions.

The laboratories in all the related subjects are open to graduate students in sanitary engineering. The courses in organic chemistry are well adapted to the study of the disposal of trade wastes. The courses in mycology and botany afford excellent opportunity for studying the life history of algae and other water plants which affect both stream pollution and purification. The courses in bacteriology deal not only with water bacteria and the colon types but also with pathogenic forms interesting from the point of view of epidemiology. The courses in the Medical College enable the student to trace the effect of the pollutions of water supply and to acquire a working knowledge of the water-borne diseases. Finally, a well-equipped sanitary laboratory established in the College gives an opportunity for students to acquire not merely laboratory technique in water analysis, but also a practical training in the forms of interpretation. This laboratory is also available for experimental studies of the efficiency of water and sewage plants and of methods of dealing with the refuse from factories. The library is well provided with the literature of the various subjects bearing on municipal sanitation.

The following courses in other subjects in the University may profitably be taken by graduate students in sanitary engineering: Economics 76; Government and Public Law 7; Chemistry 305; Chemistry 615; Botany 12; Entomology 30; Veterinary College, Course 43.

In order to take advanced work in this department, the student must have had an equivalent of the following preliminary courses described in the Announcement of the College of Engineering:

Sanitary Biology; Municipal Sanitation; Purification and Control of Water Supplies; Sewage Works; Sanitary Laboratory.

Primarily for Graduates

PURIFICATION OF WATER. Professor OGDEN. Specific problems in water purification; control of watersheds; effect of sedimentation on waters of different compositions; treatment of waters for particular requirements, such as removal of hardness, sediment, bacteria, etc. A report on some existing water system will be required from each student.

CONFERENCE ON PRESENT METHODS OF SEWAGE DISPOSAL. Professor OGDEN. A critical study of the construction and operation of plants now in existence. Inspections and reports.

LABORATORY COURSE. Professors OGDEN and WALKER. Devoted to some special problem of sewage or water, such as the operation of a water-filtration plant, a sewage-disposal plant, the purification of trade wastes, the value of disinfection, etc.

***HEAT-POWER ENGINEERING**

Professors W. N. BARNARD, F. O. ELLENWOOD, R. E. CLARK, W. H. HOOK, and C. O. MACKEY.

The graduate work conducted under this heading includes original investigations in engineering thermodynamics, problems in power plant economics, the selection and arrangement of the equipment of power plants and the design of such equipment. The library is liberally provided with reference books, periodical literature, and transactions of engineering societies relating to these subjects.

As prerequisites for the graduate work in this field the student should have had the equivalent of the fundamental courses in machine design, experimental engineering, and heat-power engineering that are required of undergraduates in mechanical engineering. These courses are described in the Announcement of the College of Engineering. Those lacking the full equivalent of this training may be required to take one or more of these undergraduate courses or to do specially assigned work to make up the deficiency.

The following courses, which are described in the Announcement of the College of Engineering, are open to both undergraduate and graduate students:

HEAT-POWER ENGINEERING. Mainly Thermodynamics. Assistant Professor MACKEY.

HEAT-POWER ENGINEERING. Chiefly Plant Equipment. Professor ELLENWOOD.

STEAM POWER PLANTS. Professor BARNARD.

INTERNAL COMBUSTION ENGINES. Assistant Professor CLARK.

STEAM TURBINES. Assistant Professor CLARK.

STEAM BOILERS AND BOILER PLANTS. Assistant Professor HOOK.

PUMPING AND PNEUMATIC MACHINERY. Professor ELLENWOOD.

DESIGN AND SPECIAL PROBLEMS IN HEAT-POWER ENGINEERING. Professors BARNARD and ELLENWOOD.

***STRUCTURAL ENGINEERING**

Professors L. C. URQUHART, E. N. BURROWS, and C. E. O'ROURKE.

In this subject instruction is offered in the determination of loading and stresses and the design of roofs, buildings, bridges, arches, foundations, piers, retaining walls, and other structures of timber, steel, and concrete.

A collection of detail plans of American structures is available, together with a large number of photographs of bridges and buildings.

The library contains practically all the important books on bridge and structural engineering. It also contains a valuable collection of theses, those on original investigations relating to arch bridges, secondary stresses and rigid frames being especially noteworthy. Their results constitute an important addition to previous knowledge of the relative strength, stiffness, and weight of dif-

ferent types of construction and of the method of their investigation and design. Special facilities are available for the study of secondary stresses in bridge trusses.

To qualify for graduate work in structural engineering, a knowledge of theoretical mechanics, of strength of materials, of engineering construction, and elementary courses in stresses and design in timber, steel, and concrete are required.

The following regularly scheduled courses are open only to seniors and graduates, but satisfactory work in any of them will not be considered as completing the requirements of a minor, and further study in some related field is expected.

C. E. 272. HIGHER STRUCTURES. Professor URQUHART or Assistant Professor O'ROURKE. Either term. Statistically indeterminate structures; deflections, redundant structures, continuous beams and trusses, arches and rigid frames. (Required of all graduate students whose major or minor is in Structural Engineering.)

C. E. 273. STEEL BUILDINGS. Assistant Professor BURROWS. First term only. Design of a typical modern mill building.

C. E. 274. BRIDGE DESIGN. Assistant Professor BURROWS. Second term only. Design of a modern railroad or highway bridge of moderate span.

C. E. 275. INVESTIGATION OF EXISTING BRIDGES. Assistant Professor BURROWS. Second term only. Examination of and stress analysis of some of the local bridges.

C. E. 281. FOUNDATIONS. Professor URQUHART or Assistant Professor O'ROURKE. Either term or Summer Session. In some cases the course in Foundations, although it is a required undergraduate course, may be considered as graduate work.

C. E. 282. REINFORCED CONCRETE BUILDING DESIGN. Professor URQUHART or Assistant Professor O'ROURKE. First term or Summer Session. Design of a modern reinforced concrete building.

C. E. 283. REINFORCED CONCRETE ARCH. Professor URQUHART. First term only. Design of a railroad or highway reinforced concrete arch bridge.

C. E. 284. CONCRETE HIGHWAY BRIDGE DESIGN. Assistant Professor O'ROURKE. Second term only. Design of short span concrete bridges and abutments.

C. E. 285. REINFORCED CONCRETE DESIGN. Professor URQUHART or Assistant Professor O'ROURKE. Either term or Summer Session. Design of retaining walls, footings, bins, tanks, and towers.

C. E. 291. ENGINEERING DESIGN. Professor URQUHART. Either term. Special problems of design or investigation not covered in the above courses.

*EXPERIMENTAL ENGINEERING AND MECHANICAL ENGINEERING RESEARCH

Professors H. DIEDERICHS, W. M. SAWDON, G. B. UPTON, V. R. GAGE, and A. C. DAVIS.

THE MATERIALS TESTING LABORATORY. This laboratory is equipped for tension and compression tests with an Olsen 300,000,000-lb. machine, a Riehle 100,000-lb machine, a 200,000,000-lb. Emery hydraulic machine, an Olsen 150,000-lb. three-screw machine, an Amsler 100,000-lb. hydraulic machine, together with several other machines varying in capacity from 10,000 to 100,000 pounds. For transverse test there is a Riehle machine of 200,000 pounds capacity and a Fairbanks machine of 10,000 pounds capacity. There are one Thurston autographic torsion machine, one Olsen torsion machine of 200,000 inch-pounds capacity, and two Upton-Lewis fatigue testing machines, an Amsler-Charpy-Izod impact testing machine. The equipment includes extensometers, a cathetometer, gas furnaces, tempering baths, and all other apparatus required for the determination of the physical qualities of engineering materials under tensile, compressive, transverse, and torsional stress, and under different kinds of heat treatment.

THE STEAM LABORATORY. In this laboratory there is a 150-HP triple expansion Allis-Corliss engine so fitted up that it may be operated as a simple, compound or triple expansion engine, condensing or non-condensing. There are also several smaller engines, including a Harris-Corliss, a Payne, a Fitchburg Uni-flow, and a Troy steam engine. There are three surface condensers and one jet condenser which may be connected with these engines as desired. There are two 35-kw. horizontal Curtis turbines and a 15-kw. De Laval turbine which drive electric generators and may be run condensing or non-condensing, and a Lee turbine driving a Gould centrifugal pump. A two-stage Worthington air compressor driven by a Uni-flow engine and one airbrake pump, together with meters, nozzles, and other instruments, may be used for routine tests. This part of the laboratory also has several fans that can be arranged and equipped for testing. The apparatus and instruments used for engine testing comprise about eighty indicators of different types, about seventy-five steam gauges, a number of calorimeters for determination of the quality of steam, speed counters, tachometers, planimeters, etc., besides a number of dynamometers of various kinds. The boiler section of this laboratory has one 150-HP Babcock and Wilcox water-tube boiler of the marine type, one 100-HP Babcock and Wilcox water-tube boiler of the standard type both of which are fitted with internal super-heaters, and an 80-HP Heine water-tube boiler. The auxiliary apparatus consists of a Cochrane open heater, a Wainwright closed heater, steam pumps, traps, injectors, etc. A full set of scales, measuring tanks, gauges, flue gas apparatus, separating and throttling calorimeters, pyrometers, etc., complete the boiler equipment.

THE GAS ENGINE LABORATORY. The equipment in this laboratory is chosen with a view to providing a great variety of types as to fuel used, governing, etc. It includes an 8-HP Fairbanks gasoline engine, an 8-HP Olds gasoline engine, a 6-HP Ingeco oil engine, a 6-HP and a 15-HP Hornsby-Akroyd oil engine, a 30-HP Westinghouse gas engine with gas producer, a 25-kw. General Electric Co. gas motor set, and a 45-HP Diesel engine. High speed engines are represented by a variety of auto and airplane engines. The testing equipment includes a full set of indicators and a Midgley indicator. Dynamometers are represented by a 150-HP Sprague Electric, a 60-HP Diehl Electric, a 150-HP General Electric, and two Wheeler hydraulic good for from 100 to 300-HP at 4000 r.p.m.

THE HYDRAULIC LABORATORY. This laboratory contains the following machines and apparatus: a 6-inch single-stage DeLaval centrifugal pump; a 2½-inch two-stage Worthington centrifugal pump; a 16-inch Goulds centrifugal pump direct connected to a variable speed motor; a 12-inch Doble water wheel; a 15-inch S. Morgan Smith turbine with Lombard governor; sets of weir boxes with various types of weirs and nozzles for the determination of coefficients of discharge; various types of water meters and other apparatus for measuring the flow of water, such as Pitot tubes, Venturi meters, current meters, etc.

THE OIL TESTING LABORATORY. This laboratory contains a Cornell oil-testing machine, and a Thurston standard railway-testing machine, and several smaller testing machines. The rest of the equipment consists of several viscosimeters of different types, flash and burning test apparatus, together with the necessary hydrometers and thermometers.

THE REFRIGERATION LABORATORY. For the study of refrigeration the mechanical laboratory possesses a 2-ton York absorption machine and a very complete York refrigerating compression plant having a capacity of 15 tons of ice.

THE CEMENT LABORATORY. This laboratory contains the ordinary apparatus for the testing of cement and concrete.

THE FUEL TESTING LABORATORY. This laboratory contains a complete equipment of fuel calorimeters and other apparatus needed for the determination of the composition and calorific value of fuel, whether gaseous, liquid, or solid.

For the major work in this department the graduate student is required to select a subject in the field of mechanical engineering research. This work is in charge of officers of instruction who devote practically their entire time to it and give advice and assistance to graduate students who are carrying on investiga-

tions in the various branches of mechanical engineering. Much of the work in this subject is conducted in the several laboratories described under Experimental Engineering. The equipment and resources of all other departments of the Sibley School are likewise available, and in most instances arrangements can be made to use the equipment of the scientific and engineering departments of the other colleges of the University.

In addition to the well-equipped Sibley library containing reference books, periodical literature, bulletins and transactions of bureaus and societies, relating to mechanical engineering and allied branches of learning, the graduate student has access to the University Library and to the special libraries of the other engineering and scientific departments of the University. In the University Library is a large collection of research theses, and the Department of Engineering Research has on file the results of many investigations.

As minor subjects the department offers the following courses open to both graduate and undergraduate students:

MECHANICAL LABORATORY—EXPERIMENTAL ENGINEERING. First term. Efficiency tests of gas and gasoline engines, steam injectors, steam turbine, blowing fan, hydraulic turbine, and centrifugal pump. Reports are required to be full and complete; and to include data and results of each test under consideration, and all information necessary to understand completely the machine tested and the methods used.

MECHANICAL LABORATORY—EXPERIMENTAL ENGINEERING. Second term. A written report is required on each experiment. Detailed study of methods of testing and methods of computation in the following subjects: testing of engines and boilers, air compressors, ice machines; measurement of flow of water, etc.

MOTOR CAR CONSTRUCTION. Professor UPTON.

HEATING AND VENTILATING. Professor SAWDON. The methods of design and of construction of various forms of ventilating and heating apparatus.

APPLIED METALLOGRAPHY. Professor UPTON. Covers in historical sequence the development of knowledge of the internal structure of metals, and the relation of structure and properties; the technique of metallographic research, study of application of the laws of physical chemistry to interpretation and correlation of results. Study of stable and metastable conditions; heat treatment theory and practice. The practical aim of metallography is constantly emphasized.

*ELECTRICAL ENGINEERING

Professors P. M. LINCOLN, V. KARAPETOFF, W. C. BALLARD, R. F. CHAMBERLAIN, B. K. NORTHPROP, E. M. STRONG, L. A. BURCKMYER, M. G. MALTI, and TRUE McLEAN.

THE LECTURE EQUIPMENT. The lecture room is exceptionally well provided with display apparatus and with apparatus especially designed for demonstration purposes. All types of electrical machinery may be operated on the lecture table, and a 60,000-volt transformer is provided for insulator testing.

A HIGH-TENSION LABORATORY is being equipped, with particular reference to the needs of graduate students, the equipment being designed for moderate voltages and accurate measurements.

THE ELECTRICAL LABORATORY. This laboratory is provided with a great variety of standard and special machines for both direct and alternating-current work, along with the necessary meters and control equipment. Among the special pieces of equipment are a street-car truck with motors and also a complete outfit for exhibiting in actual operation the multiple-unit system of electric car control.

The laboratory has been provided with a large number of new machines, including an alternating-current generator which may be connected as a two-phase, three-phase, or six-phase, machine; a modern synchronous converter provided with brush-lifting device; a squirrel-cage and phase-wound induction motor; a sine-wave generating set; also a constant-current transformer and a high voltage testing transformer with a kenotron tube from which 100,000 volts d.c. may be obtained.

THE STANDARDIZING LABORATORY. This laboratory is equipped with the necessary potentiometers, galvanometers and standards for the calibration of instruments, and the testing of materials used in electrical work. An equipment of oscillographs, both G. E. and Westinghouse, is available for work on wave form and other work of a similar nature.

THE COMMUNICATION LABORATORY. This laboratory is provided with representative telegraph and telephone equipment including a complete machine-switching exchange. The radio section includes several transmitters and a number of tube sets operating as telephone and telegraph transmitters. For work with receiving circuits, an assortment of condensers and inductance coils are available in addition to the usual receiving apparatus. Precision measurements are made possible by primary standards of inductance, capacity, and frequency.

ALEXANDER GRAY MEMORIAL LIBRARY. The new library of the School of Electrical Engineering in Franklin Hall has recently been made ready for the use of students and Faculty, in addition to the facilities of the main University Library.

THE UNIVERSITY POWER PLANT. The power for the various laboratories is obtained from the University Hydro-electric Plant, which contains large three-phase alternators, direct-driven by both impulse and reaction water-wheels. This plant is complete in every respect and is used for inspection.

A graduate student working for the M.E.E. degree is expected to possess a knowledge of electrical theory and laboratory substantially equivalent to that required for the degree of E.E. at Cornell University. Graduates of other institutions with somewhat lesser preparation can, however, be admitted to the Graduate School for a term or two as "non-candidates," to take some of the fundamental senior courses and to demonstrate their fitness for graduate work.

A considerable amount of advanced theoretical investigations by the members of the faculty is going on at all times, the subjects studied in the past having been: the general properties of electric, magnetic, and electrostatic circuits, theory of machinery and lines, dielectrics, electron theory, relativity, electric waves, etc. Graduate students are not only invited but expected to participate in these researches. Some of the above topics are taken up in the courses mentioned below, especially in the Seminary and Engineering Mathematics.

Students intending to do experimental research will be given all the available resources and assistance by the faculty and by the college mechanics. Resources of the other departments of the University are also available when needed. Those intending to study a special topic or phenomenon are advised to communicate with the Director in advance, in order that they may know what facilities are available along those particular lines.

THEORY OF ELECTRICAL MACHINERY. Professor KARAPETOFF and Assistant Professor MALTI.

CHARACTERISTICS OF ELECTRICAL MACHINERY. Professor KARAPETOFF and Assistant Professor MALTI.

SOLID DIELECTRICS. Assistant Professor MALTI. A study of the anomalous behavior of solid dielectrics under varying conditions of EMF, time, frequency, temperature, pressure, humidity, and ionizing radiations.

FUNDAMENTALS OF ELECTRICAL ENGINEERING. Assistant Professor E. M. STRONG.

ELECTRIC POWER PLANTS. Professor LINCOLN.

ELECTRICAL DESIGN. Professor LINCOLN.

ELECTRICAL COMMUNICATION. Professor BALLARD and Assistant Professor McLEAN.

ELECTRICAL LABORATORY. Professor CHAMBERLAIN and Assistant Professor BURCKMYER.

ELECTRIC RAILWAY PRACTICE. Professor CHAMBERLAIN.

ENGINEERING MATHEMATICS. Professor KARAPETOFF and Assistant Professor MALTI.

THE GRADUATE SEMINARY IN ELECTRICAL ENGINEERING. Professors LINCOLN and KARAPETOFF. A topic is selected each year to suit the range of interests and the preparation of the students taking it. The primary purpose is to acquaint the students with modern research on the border line between physics and electrical engineering, in topics which are expected to become of practical importance within the next few years.

*INDUSTRIAL ENGINEERING

Professors D. S. KIMBALL, A. E. WELLS, M. A. LEE, and J. R. BANGS.

Under this heading is included the consideration of the organization, administration, and equipment of industrial enterprises. The library of the college is well supplied with literature relating to the various branches of this field of engineering, and access may be had to the special libraries on economics in the University Library and in the Department of History and Political Science. Attention is directed to the courses in History and Political Science which may be profitably pursued in conjunction with work in industrial engineering.

In order to take the advanced course in this department, the student must not only have had the equivalent of the undergraduate course in mechanical engineering, but must also have taken the courses in industrial engineering and economics required of seniors who elect the special work of this branch.

No regular courses of instruction are offered to graduate students; but the regular courses required of seniors taking the industrial engineering option in the College of Engineering are open to graduate students as courses suitable for their minor subjects. The instructing staff in this department is prepared to direct study and investigation in Industrial Organization, Industrial Management, Plant Design, and Safety Engineering and Fire Protection.

INDUSTRIAL ORGANIZATION AND ADMINISTRATION. Professors KIMBALL, BANGS, WELLS, and LEE.

DRAWING AND DESIGN. Professor LEE.

*AGRICULTURAL ENGINEERING

Professors H. W. RILEY, B. B. ROBB, J. C. MCCURDY, F. L. FAIRBANKS, L. M. ROEHL, J. E. REYNA, and F. H. RANDOLPH.

Students desiring to undertake graduate work in Rural Engineering should have, first of all, first-hand knowledge of farm life and of rural conditions generally. Adequate grounding in the engineering fundamentals of the phase studied and ability to perceive the applications of these fundamentals are most essential, since the applications of engineering practices to agriculture, though of great economic importance, are usually successful in proportion as they are direct and simple. Whether a student's preparation is adequate for any given line of advanced study can be determined only by special consideration of each case. Country life experience, alertness, originality, and interest are important factors for success. If the technical engineering phases of the proposed work largely predominate over the agricultural, the student should normally major in the appropriate school of the College of Engineering with a minor in Agricultural Engineering.

FARM MECHANICS; FARM POWER MACHINERY; HOUSEHOLD MECHANICS; FARM ENGINEERING; DRAINAGE; FARM CONCRETE; FARM STRUCTURES; FARM SHOP WORK; INSTITUTIONAL ENGINEERING; VENTILATION OF ANIMAL SHELTERS.

FARM POWER MACHINERY. An advanced course in farm tractors, power plows, and tractor plowing, with plenty of actual work with modern equipment. Knowledge of single cylinder engine principles and electric ignition theory and practice is prerequisite.

DRAINAGE. The course offers opportunity for advanced study of drainage methods through the many actual problems to be found on the college farms and

in connection with the large amount of extension work in drainage which is being constantly carried on by the extension force. Knowledge of drawing, surveying, soils, and crops is prerequisite.

FARM STRUCTURES. The course offers opportunity for drawing room work on structures in addition to special studies made in connection with the department extension work. Ventilation is of prominent interest and is being investigated by staff members. Knowledge of drawing, engineering principles, animal requirements and barn practices is prerequisite.

RESEARCH IN RURAL ENGINEERING. Professors RILEY, ROBB, MCCURDY, FAIRBANKS, and RANDOLPH.

THE PHYSICAL SCIENCES

*ASTRONOMY AND GEODESY

*TOPOGRAPHIC AND GEODETIC ENGINEERING

Professor S. L. BOOTHROYD, Astronomy and Geodesy; *Professor P. H. UNDERWOOD*, Topographic and Geodetic Engineering.

A graduate student may select a major or minor subject in Astronomy or in Topographic and Geodetic Engineering.

A major in Astronomy will be required to take Modern Astronomy, Geodetic Astronomy and Geodesy and Practical Astronomy. He must offer as preliminary to his graduate study, General Astronomy, Engineering Astronomy and such courses in Mathematics and Physics as will be determined by the nature of the graduate work which he proposes to follow in Astronomy. He is further advised to take his minors in Mathematics or Physics.

Those majoring in Topographic and Geodetic Engineering must offer as preliminary training the regular course in Civil Engineering or its equivalent, electing General Astronomy and Engineering Astronomy in that course. They will be required to take Geodetic Astronomy, Least Squares and Adjustment of Observations and Geodesy as well as advanced courses in Calculus and Mechanics.

A graduate student who desires either Astronomy or Topographic and Geodetic Engineering as a minor subject will be held to substantially the same preliminary requirements as those majoring in these lines except that the requirements in Mathematics or Physics may not be quite so rigid.

For the practical work at the Observatory the equipment includes, besides the Irving Porter Church Memorial Telescope, a superb 12-inch equatorial; an astronomical transit by Troughton and Simms; an astronomical transit and a zenith telescope by Fauth, altazimuths by Troughton and Simms and Fauth; a Howard Sidereal Clock; and other necessary equipment.

The geodetic equipment is one of the most extensive in the country and includes among other things a Mendenhall Half-second Pendulum Apparatus of the pattern used in the United States Coast and Geodetic Survey, also comparators and other equipment for the investigation of standards of length.

For Graduates and Undergraduates

(For fuller description see the Announcement of the College of Engineering.)

MODERN ASTRONOMY. Professor BOOTHROYD.

GEODETIC ASTRONOMY. Professor BOOTHROYD.

PRACTICAL ASTRONOMY. Professor BOOTHROYD.

LEAST SQUARES: ADJUSTMENTS OF OBSERVATIONS. Professor UNDERWOOD.

ADVANCED TOPOGRAPHIC SURVEYING. Professor UNDERWOOD.

GEODESY. Professor UNDERWOOD.

Primarily for Graduates

GEODETIC ASTRONOMY. Professor BOOTHROYD. In this course the student undertakes a critical study of the astronomical transit, the zenith telescope, and the altazimuth instrument, determining the instrumental constants for as many of

the instruments as time permits, besides making observations for time, latitude, and azimuth, such observations to be of the highest degree of refinement attainable.

GEODESY AND GEODETIC LABORATORY. Professors BOOTHROYD and UNDERWOOD. Special topics such as isostasy and the figure of the earth and advanced problems involving the application of the theory of least squares to the solution of geodetic problems may be considered; laboratory investigation such as the determination of the intensity of gravity or the study of standards of length or of special geodetic instruments may also be undertaken. The amount of work and the investigations undertaken will be arranged for each student.

PRACTICAL ASTRONOMY. The study of planetary detail, including micrometrical measurements on moon and planets as well as measurement of double stars, may be undertaken; also measurements of spectrograms for determination of stellar radial velocities. Complete series of spectrograms for the determination of the orbits of spectroscopic binaries may always be obtained so that such a problem may be carried through to completion.

The Department of Astronomy is not at present prepared to conduct advanced courses in Celestial Mechanics and Theoretical Astronomy or advanced work in Astronomical Spectroscopy other than that mentioned in connection with the course in Practical Astronomy. Study along these lines may be undertaken by students under the direction of the head of the department. Students contemplating an astronomical career are advised to arrange, in consultation with the head of the department, for courses in Mathematics, Physics, and Astronomy which will fit them to prepare for fellowships in some of the research observatories which give full opportunities for the development of the student's research abilities.

*PHYSICS

Professors ERNEST MERRITT, FREDERICK BEDELL, F. K. RICHTMYER, R. C. GIBBS, E. H. KENNARD, J. E. TREVOR, H. E. HOWE, C. C. MURDOCK, J. R. COLLINS, G. E. GRANTHAM, and H. A. BARTON.

Opportunities are offered for study and investigation in both theoretical and experimental physics. About forty rooms in Rockefeller Hall are set aside for research. This work is organized separately with its own equipment, stock, and apparatus room, special workshop for the use of graduate students, appliances for the production, handling and liquefaction of air and other gases, X-ray apparatus, spectroscopic apparatus including three vacuum spectrographs, a refrigerating plant, and a dynamo laboratory well equipped with various sorts of direct and alternating current apparatus. An instrument maker's shop with three mechanics and an experienced glass blower are available for the construction and repair of apparatus.

Members of the staff will be especially interested in directing research as follows: Professor Barton in ionization in gases, photo-electricity, and related topics; Professor Bedell, in electricity and magnetism, theoretical and experimental, particularly in alternating current phenomena, and in aerodynamics; Professor Collins, in spectroscopy, particularly in the infra-red; Professor Gibbs, in spectroscopy and luminescence; Professor Kennard, in theoretical physics, especially in the theory of radiation and in quantum mechanics; Professor Merritt, in experimental physics, particularly in electricity and magnetism and problems connected with luminescence; Professor Murdock in electrolytic polarization, X-rays, and crystal structure; Professor Richtmyer, in X-rays; Professor Trevor, in the theory of thermodynamics.

Members of the staff who are in residence in Ithaca during the summer often stand ready to consult with investigators.

As a major or minor subject in physics it is usual to name either a particular aspect of physics,—as general physics, theoretical physics, experimental physics, applied physics,—or some particular field in physics,—such as mechanics, heat, light, electricity. One aspect or field may be combined with another, or with a

subject outside of physics, to form a single subject. *Physics* may be named as a subject when the other subjects are outside of physics.

Prospective students should consult by letter with one or more members of the Physics staff.

GENERAL COURSES

INTRODUCTORY COURSES

3, 4. INTRODUCTORY EXPERIMENTAL PHYSICS. Both terms, three hours a week.
8, 9. INTRODUCTORY PHYSICS. Each term, three hours a week. For freshmen in Engineering.

28, 29. GENERAL PHYSICS. Each term, three hours a week. For sophomores in Engineering.

31, 32. GENERAL PHYSICS. Each term, three hours a week. For sophomore B. Chem. students.

34a, b. PHYSICAL MEASUREMENTS. Both terms, two hours a week. Laboratory to accompany Physics 28-32.

55. INTRODUCTORY PHYSICAL EXPERIMENTS. Either term, three hours a week. For sophomore pre-medical students.

60. PHYSICAL EXPERIMENTS. Both terms, three hours a week. Laboratory to accompany Physics 61-62.

61, 62. GENERAL PHYSICS. Each term, three hours a week. Follows Physics 3-4 for students in Arts and Sciences.

FOR GRADUATES AND UNDERGRADUATES

106. ADVANCED LABORATORY PRACTICE. First and second term. Prerequisite, Physics 60, 61, 62 and such special preparation as may be needed for the experiments which the student wishes to undertake. Admission only after consultation. Assistant Professor MURDOCK, other professors coöperating in the direction of the work in certain fields. T W Th F afternoons. Rockefeller 324.

Considerable time is devoted to each of a small number of experiments selected to meet the requirements of the individual student. Frequently single experiments which are parts of other advanced laboratory courses, such as Physics 573, 593, 595, 613 and 626 may be performed as part of this course.

[111. MECHANICS. First term. Prerequisite, Physics 60 and 62, and Mathematics 4. Assistant Professor MURDOCK. This course is given in alternate years. Not given in 1931-32.]

[112. PROPERTIES OF MATTER. Second term. Prerequisite, Physics 111. Assistant Professor MURDOCK. This course is given in alternate years. Not given in 1931-32.]

120. ELECTRICITY AND MAGNETISM. Throughout the year. Prerequisite, Physics 60, 61, 62, and Mathematics 4. Assistant Professor MURDOCK. T Th S 10. Rockefeller. Given in alternate years.

A study of the laws of electrostatic and magnetic fields; electromagnetism and electromagnetic waves; thermal and chemical electromotive forces; metallic, electrolytic and gaseous conduction; high-frequency and corpuscular rays.

[130. LIGHT. Second term. Prerequisite, Physics 60 and 62, and Mathematics 4 or the equivalent. Assistant Professor COLLINS. This course is given in alternate years. Not given in 1931-32.]

160. WAVE MOTION AND SOUND. First term. Prerequisite, Physics 60 and 62, and Mathematics 4 or the equivalent. Assistant Professor COLLINS. M W F 8. This course is given in alternate years.

The general properties of wave motion, considered in connection with the comparative study of elastic waves, waves on the surface of liquids and electromagnetic waves, and a detailed study of sound, based on Wood's "Textbook of Sound."

[170. INTRODUCTION TO MODERN PHYSICAL THEORIES. Throughout the year. Prerequisite, Physics 120 or 130 or the equivalent. Professor RICHTMYER. Given in alternate years, not in 1931-32.]

PRIMARILY FOR GRADUATES

211. MECHANICS. Throughout the year. Prerequisite, Physics 111 or the equivalent. Professor KENNARD. T Th S 8. Given in alternate years.

The mechanics of systems of particles and of rigid bodies; generalized coördinates; Hamilton's principle; elements of hydrodynamics and elasticity.

[220. ELECTRICITY AND MAGNETISM. Throughout the year. Prerequisite, Physics 120 or the equivalent. Professor KENNARD. T Th S 8. Given in alternate years, not 1931-32.]

[230. PHYSICAL OPTICS. First term. Prerequisite, Physics 130 or the equivalent. Assistant Professor HOWE. T Th S 11. Given in alternate years, not 1931-32.]

[240. APPLICATIONS OF THERMODYNAMICS IN PHYSICS. Second term. Professor MERRITT. Given in alternate years, not 1931-32.]

300. PHYSICS SEMINARY. Throughout the year. For seniors and graduates. Professor MERRITT. M 3:15. Rockefeller C.

SPECIAL TOPIC COURSES

415. SPECIAL TOPICS IN PHYSICS. For graduates. Reading in any branch of physics, experimental or theoretical, under the guidance of some member of the staff, supplemented by reports and regular conferences.

[417. SPECIAL TOPICS IN RECENT THEORETICAL PHYSICS. Second term. For graduates. Professor KENNARD. W F 12. Not given 1931-32.]

425. AERODYNAMICS AND THE MECHANICS OF FLIGHT. Second term. Prerequisites, Physics 34 or 65. Professor BEDELL. F 10.

[460. KINETIC THEORY OF MATTER. First term. Professor KENNARD. M W F 10. Not given in 1931-32.]

473. QUANTUM THEORY. First term. Professor KENNARD. T Th S 10. Primarily for graduates. Origin and chief applications of quantum theory; wave-mechanics of atomic structure and spectral phenomena.

480. QUANTUM MECHANICS. Second term. Professor KENNARD. M W F 10. Primarily for graduates with major in theoretical physics. The necessary special mathematics will be included.

525. THERMODYNAMICS. Throughout the year. Prerequisite, Mathematics 41. Mathematics 42 is recommended. Professor TREVOR. Day and hour to be arranged.

571. SPECTROSCOPY AND LUMINESCENCE. Throughout the year. Prerequisite, Physics 130 or its equivalent. Professor GIBBS. W F 12, or as arranged. Rockefeller.

A somewhat detailed study of the more important experimental and theoretical aspects of these fields. Lectures and assigned readings. Given in alternate years.

573. SPECTROSCOPY AND LUMINESCENCE. First term. Prerequisites, Physics 105 and 130, or the equivalent. Professor GIBBS and Mr. SHAW. Day and hour to be arranged. Rockefeller.

Laboratory work for a limited number of students.

[581. ATOMIC STRUCTURE. Second term. For graduate students only. Professor GIBBS. Given in alternate years.

The development of modern atomic theory and its application in the explanation of spectral series, resonance, ionizing potentials, and fine structure: the structure of the nucleus as revealed by radioactive and isotopic phenomena and the effects of high-speed bombardment. Not given in 1931-32.]

591. X-RAYS AND THE STRUCTURE OF MATTER. First term. Professor RICHTMYER. M W F 10. Rockefeller.

Lectures and assigned readings on the production and measurement of X-rays; laws of emission, scattering and absorption; the relation of these laws to atomic structure, quantum theory and similar problems. Given in alternate years.

592. X-RAYS AND THE STRUCTURE OF MATTER. Second term. Assistant Professor MURDOCK. M W 10. Rockefeller.

A continuation of Physics 591 dealing with the laws of X-ray diffraction and their application to the study of the structure of matter; extinction; structure factor; the electrical theory of the crystal lattice; the interaction of X-rays and crystalline matter; the diffraction of electrons. Given in alternate years.

593. X-RAYS. Second term. Prerequisite, Physics 591 or the first term of Physics 120. Professor RICHTMYER. T Th afternoons. Rockefeller 324.

Laboratory work for a limited number of students. The production and effects of X-rays, methods of study and measurement with particular reference to research methods and technique.

[595. DIFFRACTION OF X-RAYS BY CRYSTALS. Second term. Prerequisite, Physics 34 or 60. Lectures and laboratory for a limited number of students. Assistant Professor MURDOCK. Given in alternate years, not in 1931-32.]

611. ELECTRIC WAVES AND OSCILLATIONS. First term. Prerequisite, Introductory Physics. Professor MERRITT. M 12. Rockefeller B. Experimental lectures. Given in alternate years.

612. SPECIAL TOPICS IN RECENT EXPERIMENTAL PHYSICS. Second term. Prerequisite, Introductory Physics. Professor GIBBS and Assistant Professors BARTON and COLLINS. M 12. Rockefeller B. Alternated with Physics 622.

613. ELECTRIC WAVES AND OSCILLATIONS. Second term. Laboratory. Prerequisite, Physics 65 and 611, or the equivalent. Professor MERRITT and Mr. MINGINS. Day and hour to be arranged.

[621. ELECTRICAL CONDUCTION IN GASES. Prerequisite, Introductory Physics. Professor MERRITT. Experimental lectures. Given in alternate years. Not given in 1931-32.]

[622. SPECIAL TOPICS IN RECENT EXPERIMENTAL PHYSICS. Second term. Alternates with Physics 612. Not given in 1931-32.]

[623. ELECTRICAL CONDUCTION IN GASES. First term. Prerequisite, Physics 120 or the equivalent. Assistant Professor BARTON. Not given in 1931-32.]

625. ELECTRICAL CONDUCTION IN GASES. First term. Assistant Professor BARTON. A continuation of Physics 623, with which this course alternates. M W F 9.

Theory of arcs and discharges at low and ordinary pressures; radioactive changes and radiations; isotopes; the atomic nucleus.

626. ELECTRICAL CONDUCTION IN GASES. Second term. Prerequisite, Physics 60 or the equivalent. Assistant Professor BARTON. W F afternoons. Rockefeller 324.

Laboratory work for a limited number of students. The production and measurement of high vacua, thermionic and ionization currents, measurements of the charge and mass of the electron.

633. ALTERNATING CURRENTS. First term. Prerequisite, Physics 34 or the equivalent. Professor BEDELL. T Th 11. Rockefeller 155.

A study of the underlying principles of alternating currents; the development of graphical methods of analysis as a basis for testing and for the solution of practical problems.

634. ELECTRICAL LABORATORY. Either term, or throughout the year. Prerequisite, Physics 34 or the equivalent. Professor BEDELL and Mr. RICHARDS. Daily 9-1. Rockefeller.

Direct and alternating current measurement, and the investigation of special problems. The character of the work will be varied to meet individual needs.

636. ADVANCED ALTERNATING CURRENTS. Second term. Prerequisite, Physics 633. Professor BEDELL. T Th 11. Rockefeller 155.

Discussion of the theory and measurement of alternating currents. A seminary for graduates.

GEOLOGY

Professors H. RIES, G. D. HARRIS, A. C. GILL, O. D. VON ENGELN, and C. M. NEVIN.

Under the general title of geology are included dynamic and structural geology, physical geography, glaciology, mineralogy, crystallography, petrography, paleontology and stratigraphic geology, economic geology.

Graduate work in Geology may include, in addition to work done in Ithaca, the opportunity of spending part of the time in investigation under approved direction in the field away from Ithaca.

The University Library has a most extensive collection of private publications, magazines, and geological society transactions, as well as files of North American, European, and other Geological Survey reports. In the Geological Department there is the entire library of the late Professor H. S. Williams, and a collection of over 40,000 author's separates.

Special rooms are also available for graduate students for carrying on research work.

The department is provided with apparatus for different kinds of photographic work, and for polishing and sectioning ores, minerals, and rocks.

A seismograph station is situated in McGraw Hall.

*DYNAMIC AND STRUCTURAL GEOLOGY

Professor NEVIN.

Under this branch is also included work in metamorphism and sedimentation. A student taking a major in this branch of geology must first have had at least elementary work in such other branches of geology as the professor in charge may prescribe.

For Undergraduates and Graduates

102. STRUCTURAL GEOLOGY. First term. Credit three hours. Prerequisite, Geology 100 or equivalent. Assistant Professor NEVIN. Lectures, T Th 11. Laboratory, T 1:40.

Geologic structures and their causes. A basic course for all students majoring in this branch of geology.

103. SEDIMENTATION. First term. Credit three hours. Prerequisite, Geology 100. Assistant Professor NEVIN. Lectures, T Th 9. Laboratory, Th 1:40.

The principles involved in the formation of sediments. Laboratory work consists of experimentation with sedimentary processes and field investigations.

105. METAMORPHIC GEOLOGY. First term. Credit two hours. Dr. BURFOOT. M W 9.

The principles of regional metamorphism and rock alteration. Work with the petrographic microscope will be given to those students who are qualified.

Primarily for Graduates

106. SPECIAL WORK IN STRUCTURAL GEOLOGY AND SEDIMENTATION.

Directed reading and original investigation adapted to the needs of the student. Assistant Professor NEVIN.

107. GEOLOGIC SURVEYING. Given in the summer field school. Credit six hours. Assistant Professor NEVIN.

A discussion of the fundamental methods used in geologic mapping, together with practical work in the field.

*PHYSICAL GEOGRAPHY

Professor VON ENGELN.

The region around Ithaca affords exceptionally excellent and varied illustrations of physiography and glaciology. For many years the teachers and advanced students of physical geography have been engaged in an investigation of the

local field problems, and there is further opportunity of this kind. There are also excellent facilities for indoor work. The main laboratory is well equipped with topographic maps and photographs; the collection of relief models is notably complete and there is an experimental laboratory with apparatus and facilities for carrying on a variety of experiments in the development of land forms, etc.

For Undergraduates and Graduates

GEOGRAPHY OF NORTH AMERICA. The physiographic features of North America; discussion of their influence upon the settlement and development of the various sections of the continent. Second term. Credit two hours. Professor VON ENGELN. Lectures, T Th 10.

COMMERCIAL GEOGRAPHY. For students with major or minor interests in economics or history. The geographic factors affecting the production and distribution of commodities historically and in modern times. Natural geographic regions in relation to their past and prospective exploitation. Nature of city sites and factors in city growth and organization. Other topics of similar kind.

GLACIERS AND GLACIATION. This course comprises a study of living glaciers and the phenomena of the glacial period. Lectures, readings, laboratory and field work. Mapping and interpretation of glacial deposits. Second term. Credit three hours. Professor VON ENGELN. Lectures, T Th 11. Laboratory T 1:40, and all day excursion or excursions Saturday in Spring.

Primarily for Graduates

ADVANCED PHYSIOGRAPHY. Particular problems, especially those of glaciology and the relation of geological structure to topography and physiographic history; reading or field investigation, to suit the need of the student. In general graduate students with a minor in Physical Geography are expected to undertake work in this course. Throughout the year. Credit variable. Professor VON ENGELN. Time by arrangement.

SEMINARY. Reviews of current literature or the original literature on some phase of the subject. First or second term or both terms. Credit two hours. Professor VON ENGELN. Usually Monday afternoon, but adjusted to meet needs of the class if necessary.

***MINERALOGY, CRYSTALLOGRAPHY, AND PETROGRAPHY**

Professor GILL.

The laboratory equipment is relatively good as regards petrographic microscopes, apparatus for chemical and physical investigations of rocks, and apparatus for special crystallographic determinations. There are also collections of rocks and study collections of minerals, including the Benjamin Silliman, Junior, collection, acquired before the opening of the University in 1868.

Special graduate courses in this division are not offered, but advanced work is adapted to the needs of the individual. Some of the less special courses are, however, so dependent on a rather advanced knowledge of physics or chemistry or of both that they are to be considered as requiring the maturity of graduates, although open also to undergraduates with sufficient preparation.

For Undergraduates and Graduates

312. CRYSTALLOGRAPHY. First term. Credit three hours. Should be preceded by courses in Chemistry and Physics. Professor GILL. Lectures, T Th 8. Laboratory to be arranged. Mineralogy Laboratory, McGraw.

The course is based on the fundamental conceptions of crystal structure.

313. MINERALOGY. Second term. Credit three hours. Should be preceded by Course 312. Professor GILL. Lectures, T Th 8. Laboratory to be arranged. Mineralogy Laboratory, McGraw.

For students wishing to become acquainted with the commoner minerals and with the scientific and practical problems which they present.

314. BLOWPIPE DETERMINATION OF MINERALS. First term. Credit one hour. Prerequisite, a sufficient knowledge of Mineralogy and Chemistry. Mr. MAYO. Saturday morning. Blowpipe Laboratory, McGraw.

315. GENERAL LITHOLOGY. Second term. Credit one hour. Prerequisite, Geology 100 and 311 (or equivalent). Professor GILL. Lectures, laboratory, and recitations; S 8-10. Mineralogy Laboratory, McGraw.

Primarily for Graduates

316. CRYSTAL MEASUREMENT AND DRAWING. Second term. Credit two hours. Prerequisite, Geology 313. Professor GILL and Mr. MAYO. Lectures, M W. Laboratory to be arranged at time of registration. Petrography Laboratory, McGraw.

Laboratory measurement of crystals, with computation and drawing. Course 316 should be taken after course 312 by students who intend to continue in course 317, or in course 320.

317. OPTICAL DETERMINATION OF MINERALS. First term. Credit three hours. Prerequisite, Geology 313. Professor GILL and Mr. MAYO. Lectures, M W. Laboratory, to be arranged at time of registration. Petrography Laboratory, McGraw.

318. PETROGRAPHY. Second term. Credit three hours. Prerequisite, Geology 317. Professor GILL and Mr. MAYO. Lectures, M W. Laboratory to be arranged at time of registration. Petrography Laboratory, McGraw.

319. SEDIMENTARY PETROGRAPHY. Second term. Credit three hours. Prerequisite, Geology 317. Mr. MAYO. Hours to be arranged. McGraw.

The methods of investigating the mineral composition, texture, and other physical characteristics of sedimentary rocks; some of the applications of these methods to geological problems.

320. ADVANCED OR SPECIAL WORK IN MINERALOGY, CRYSTALLOGRAPHY, OR PETROGRAPHY. Throughout the year. Credit variable. Prerequisite, variable. Professor GILL and Mr. MAYO. Day and hour to be arranged. McGraw.

Adapted to the needs of the individual student.

321. SEMINARY IN MINERALOGY AND CRYSTALLOGRAPHY. Throughout the year. Credit one hour a term. Professor GILL. M 4:15. Mineralogy Laboratory, McGraw.

***PALEONTOLOGY AND STRATIGRAPHIC GEOLOGY**

Professor HARRIS.

The University is so situated that excellent exposures of Devonian formations are at its very door, and the typical sections of New York State which are of fundamental importance in American Paleozoic geology are within short excursion range. The most important of these are the Rochester and Niagara gorges, Trenton Falls and the Helderberg escarpments, the Chemung Valley, and the coal fields of northern Pennsylvania.

Excellent facilities are afforded to those desiring to study the later formations since the department has extensive collections made in the West Indies, Central and South America, as well as different parts of the United States and Europe. There is also the Newcomb collection (10,000 species) of recent shells; and an exceptional wealth of conchological literature in the geological and the general library. The *Bulletins of American Paleontology* and *Palaeontographica Americana* are published in the department.

For Graduates and Undergraduates

[402. STRATIGRAPHIC PALEONTOLOGY. Throughout the year. Credit three hours a term. Prerequisite, Historic Geology. Professor HARRIS and Mr. CAS-TER. Two lectures and a laboratory to be arranged. McGraw 28. Not given in 1931-32.]

403. INVERTEBRATE PALEONTOLOGY. PELECYPODA AND GASTROPODA. Throughout the year. Credit two hours a term. Prerequisite, Biology or Zoology. Professor HARRIS. Day and hour to be arranged. McGraw 28.

404. INVERTEBRATE PALEONTOLOGY. CEPHALOPODA AND BRACHIOPODA. Throughout the year. Credit two hours a term. Prerequisite, Biology or Zoology. Professor HARRIS. Day and hour to be arranged. McGraw 28.

405. INVERTEBRATE PALEONTOLOGY. MICROSCOPIC ORGANISMS. Repeated in the second term. Credit three hours. Prerequisite, Biology or Zoology. Professor HARRIS. Day and hour to be arranged. McGraw 28.

Primarily for Graduates

401. GENERAL STRATIGRAPHY. Throughout the year. Credit two hours a term. Prerequisite, Historic Geology, Invertebrate Paleontology and a reading knowledge of French and German. (Spanish also advisable.) Professor HARRIS. Day and hour to be arranged. McGraw 28.

An attempt is made during each year to look over the general geographic distribution of geologic systems throughout the world (using English, French, German, and Spanish literature), noting the broader structural features and the fossil contents of the rocks. Considerable attention is paid to the historic development of stratigraphic geology and paleontology with emphasis on the rôle played by each great leader in these phases of geologic science.

406. STRATIGRAPHIC AND PALEONTOLOGIC PROBLEMS. Throughout the year. Credit variable. Prerequisite, consent of the instructor. Interviews and reports to be arranged. Professor HARRIS. McGraw 26.

An informal study course, arranged to fit the needs of the student.

SPECIAL AND RESEARCH WORK. The field is so broad and the topics so various that no description can be given adequately covering desirable courses of investigation. Suffice it to say that materials are being brought together, in the form of field notes, extensive collections, and library facilities, so that this Department is justly regarded as the mecca for those desiring to work in the Cenozoic geology of the Western Hemisphere

*ECONOMIC GEOLOGY

Professor RIES.

The work in economic geology is designed to familiarize the student with the origin, occurrence, and distribution of the mineral products of economic value, and also with the practical application of geological principles. The laboratory contains an excellent study collection of economic materials from the United States, Canada, Mexico, Europe, and Africa, including ores, fuels, clays, abrasives, building stones, etc., most of these representing suites of material collected by members of the staff of instruction on geological trips. This collection is supplemented by maps and models.

In addition to the collections, the economic geology laboratory has facilities for general work and research on economic materials; the equipment for metallographic work on ores and for clay investigation is excellent.

The work of graduate instruction consists in part of lectures and in part of special work arranged to suit the needs of the individual student. Students who are registered for a major subject in economic geology are expected to engage in research, which should preferably be based on field work.

Excursions may readily be taken to the anthracite regions of Pennsylvania; to the iron, slate, cement, and talc region near Easton, Pa.; to the magnetite mines of the Adirondacks, etc. Field trips of greater or less length are taken to some of these localities every year.

For Undergraduates and Graduates

500. GENERAL ECONOMIC GEOLOGY. Throughout the year. Credit three hours a term. Prerequisite, first term, Geology 100; second term, 100 and 311. Professor RIES and Mr. JONES. Lectures, M W 10; Laboratory, F 1:40. McGraw.

The origin, nature, distribution, uses and economic value of mineral products. First term, non-metallics, including coal, oil, gas, fertilizers, etc.; second term, the ore deposits of the different metals.

PETROLEUM TECHNOLOGY. First term. Credit two hours. Prerequisite, Geology 100 or equivalent. Assistant Professor NEVIN. Lectures, M W 11.

The geologic factors affecting the development of oil properties, production technology, and valuation problems.

PETROLEUM GEOLOGY. Second term. Credit three hours. Prerequisite, Geology 100 or equivalent. Assistant Professor NEVIN. Lectures, T Th 9. Laboratory, Th 1:40.

The geology and distribution of petroleum. A survey is made of the important oil fields of the world, with special emphasis on those in the United States.

For Graduates

510. **CLAY INVESTIGATION.** Second term. Credit three hours. Prerequisite, Geology 100 or 501, and Chemistry 101, and permission of the instructor. Professor RIES and Dr. BURFOOT. One lecture and two laboratory periods to be arranged. McGraw. Open only to graduates.

511. **ADVANCED OR SPECIAL WORK IN ECONOMIC GEOLOGY.** Throughout the year. Credit variable. Prerequisite, dependent on the nature of the work. Open to seniors only by special permission. Professor RIES. Day and hour to be arranged. McGraw.

512. **SEMINARY IN ECONOMIC GEOLOGY.** Throughout the year. Credit two hours a term. Prerequisite, Geology 100 and 500. Professor RIES. Day and hour to be arranged. McGraw.

***METEOROLOGY**

Professor R. A. MORDOFF.

A broad field for investigation and research is offered in meteorology. The weather and climatic factors, in their relation to crop distribution and production and to engineering, transportation, economic and social problems, are suitable subjects for graduate study.

The library of the Weather Bureau observatory, which is located in Roberts Hall, contains the meteorological data for such correlation studies. In addition, the library of the U. S. Weather Bureau at Washington, D. C., may be drawn upon for works of reference under proper restrictions.

A graduate student in meteorology should have completed the elementary courses in meteorology and climatology, physics, mathematics, geology, and preferably elementary statistics.

CLIMATOLOGY. Second term. Lectures and recitations, M W 9. East Roberts 341. A course covering general climatology and the various climates of the United States with emphasis on those of New York State. Professor MORDOFF.

RESEARCH. First or second term. Hours by appointment. Original investigations in meteorology and climatology. Professor MORDOFF.

SEMINARY. First term. Hours to be arranged. East Roberts 341. Preparation and reading of reports on special topics. Abstracts and discussions of papers dealing with the current literature of meteorology and climatology. Professor MORDOFF.

CHEMISTRY

Professors L. M. DENNIS, W. D. BANCROFT, G. W. CAVANAUGH, E. M. CHAMOT, A. W. BROWNE, F. H. RHODES, T. R. BRIGGS, M. L. NICHOLS, JACOB PAPISH, J. R. JOHNSON, C. W. MASON, and A. W. LAUBENGAYER; Doctor C. W. MORSE.

A graduate student who desires to take either a major or a minor subject in chemistry may select any one of the following eight branches: inorganic chemistry, analytical chemistry, organic chemistry, physical chemistry, optical chemis-

try, sanitary chemistry, industrial chemistry, agricultural chemistry. Under the present procedure, both the major subject and the one minor subject, required for the degree of Master of Arts, Master of Science, or Master of Chemistry, and both the major subject and the two minor subjects required for the degree of Doctor of Philosophy may be selected from the eight divisions mentioned above, but it is desirable that candidates for the degree of Doctor of Philosophy select at least one minor subject outside of chemistry.

A graduate student who desires to take a minor subject in chemistry with some field other than chemistry as the major subject, will be required to offer introductory courses in inorganic chemistry, qualitative analysis and quantitative analysis as preliminary to his graduate study. The work upon his minor subject in chemistry may be taken in any branch of the subject that he is qualified to pursue, and may comprise advanced courses selected from the subjoined list, with the approval of his special committee.

Candidates for the degree of Master of Arts or Master of Science with major in chemistry will be required to offer, as preliminary to their graduate work, introductory courses in the following prerequisite subjects: inorganic chemistry, qualitative analysis, quantitative analysis, and organic chemistry. They will be required to take, either in connection with their major or minor work, or in addition to it the course in introductory physical chemistry, unless the substantial equivalent of this work has been offered at entrance.

Before admission to candidacy for the degree of Master of Chemistry, students must have completed the requirements for the degree of Bachelor of Chemistry at Cornell University, or must offer the full equivalent of these requirements if they enter from other institutions.

Candidates for the degree of Doctor of Philosophy with major in chemistry will be expected to offer, as preliminary to their graduate work, introductory courses in inorganic chemistry, qualitative analysis, quantitative analysis, organic chemistry, and physical chemistry, as well as courses in chemical spectroscopy, chemical microscopy, gas and fuel analysis, and advanced quantitative analysis. Graduate students entering from approved universities may take, during their residence for the advanced degree, such of these prerequisite courses as they have not already pursued. If a graduate student lacks at entrance several of these preliminary courses, more than the minimum period of residence may be necessary.

Every candidate is required to pass a Qualifying Examination before he is allowed to begin actual experimental work on his thesis problem. This examination will comprise tests in the following four Divisions of Chemistry: (A) Inorganic and General; (B) Analytical; (C) Organic, and (D) Physical. The individual tests, each consisting of a written examination covering a period of two or three hours, will be given in succession at intervals of one week.

One such Qualifying Examination is given at the beginning of each regular term, and at the end of the second regular term of the University year, on days set by the Committee on Qualifying Examinations. The candidate should present himself for the Qualifying Examination not later than the beginning of the term in which he expects to begin actual laboratory work on his thesis problem. In the light of the candidate's achievement in this examination, his Special Committee may further examine his qualifications for graduate study.

After the candidate has passed the Qualifying Examination, and has completed his minor subjects, he will be required to pass a general examination, both written and oral, on his major and minor subjects. Upon recommendation of the candidate's Special Committee, this examination may be taken toward the end of the term preceding his last year of residence. This procedure makes it possible for the candidate to devote his last year of residence to uninterrupted research on his thesis. At the close of his period of residence, and after the acceptance of his thesis, the candidate will be required to pass a final oral examination on the thesis and on related subjects.

As an alternative procedure, the general examination on major and minor subjects and on the thesis may be taken after the acceptance of the thesis.

For a description of the equipment and facilities for study in the various branches of chemistry, see the Announcement of the Department of Chemistry.

(All courses listed below are to be given in the Baker Laboratory of Chemistry.)

*INORGANIC CHEMISTRY

101. INTRODUCTORY INORGANIC CHEMISTRY. Lectures. Repeated in the second term. Credit three hours.

Two sections: M W F 11; T Th S 11. Main Lecture Room. Professor BROWNE and Assistant Professor LAUBENGAYER.

Entrance credit in chemistry does not carry with it University credit in Course 101 or 105. If a student entering the University from a preparatory school desires credit for these Courses, he must pass an examination set by the Department of Chemistry. This examination is held in Ithaca on the same day in September as the entrance examination. University credit in Courses 101 and 105 that is obtained by passing this examination does not carry with it entrance credit in Chemistry.

Examinations for those who were unavoidably absent from the final examination in Course 101 and 105 will be held at 2 p. m. on the day before instruction begins in the fall.

105. INTRODUCTORY INORGANIC CHEMISTRY. Recitations and laboratory practice. Repeated in the second term. Credit three hours.

Recitations, one hour a week, to be arranged.

Laboratory sections: M F 1:40-4; T Th 1:40-4; W 1:40-4; S 8-10:30. Room 150. Professor BROWNE, Assistant Professor LAUBENGAYER, and assistants.

Chemistry 101 and 105 must be taken simultaneously unless permission is obtained by the student from the Dean of his college and from the Department of Chemistry to take either course alone.

130. ADVANCED INORGANIC CHEMISTRY. Throughout the year. Credit three hours a term. Prerequisite or parallel courses, Chemistry 405 and 410. Professor DENNIS. M W F 11. Baker 107.

Lectures. The chemical elements are discussed in the order in which they occur in the Periodic Table of Mendeléeff, with special attention to the group properties of the elements and to the relations of the groups to one another. The rare elements and the rare earths are treated in as great detail as are the more common elements.

135. ADVANCED INORGANIC CHEMISTRY. Either term. Credit one to six hours. Prerequisite, Chemistry 305 and 310. Professors DENNIS and BROWNE and assistants. Day and hour to be arranged. Baker 178 and 122.

Laboratory practice. The preparation, purification, properties, and reactions of inorganic compounds including those of the rarer elements.

Chemistry 135 is designed to accompany Chemistry 130, but either course may be taken separately.

140. SELECTED TOPICS IN ADVANCED INORGANIC CHEMISTRY. Second term. Credit two hours. Prerequisite, Chemistry 405 and 410, or special permission. Professor BROWNE. W F 9. Baker 107.

150. THE CHEMISTRY OF GLASS. Second term. Credit one hour. Assistant Professor LAUBENGAYER. M 9. Baker 107. Open to students who have had or are taking course 405, and to others by special permission.

A discussion of the development and manufacture of glass and related ceramic ware, such as pottery and porcelain, with special emphasis on the relations between constitution and physical and chemical properties. Inspection trips to nearby ceramic plants will be arranged.

195. RESEARCH FOR SENIORS. Throughout the year. Professors DENNIS and BROWNE and Assistant Professor LAUBENGAYER.

*ANALYTICAL CHEMISTRY

205. INTRODUCTORY QUALITATIVE ANALYSIS. Repeated in the second term. Credit three hours. Prerequisite, Chemistry 101 and 105. Must be taken with Course 206. Assistant Professor NICHOLS, Mr. AVENS, and assistants.

Lectures: Assistant Professor NICHOLS, M W 9. Baker 177.

Recitations: one hour a week to be arranged.

A study of the application of the theories of general chemistry, to the systematic separation and detection of the common elements and acid radicals.

Students in science are advised, and candidates for the degree of Bachelor of Chemistry are required to take this course together with Course 206 instead of Course 210.

206. INTRODUCTORY QUALITATIVE ANALYSIS. Repeated in the second term. Credit three hours. Prerequisite, Chemistry 101 and 105. Must be taken with Course 205. Mr. AVENS and assistants.

Laboratory section: M W F 1:40-4. Baker 50.

Laboratory practice. A study of the properties and reactions of the common elements and acid radicals; the qualitative analysis of a number of solutions and solid compounds.

Students in science are advised, and candidates for the degree of Bachelor of Chemistry are required to take this course together with Course 205 instead of Course 210.

210. INTRODUCTORY QUALITATIVE ANALYSIS. Shorter course. Repeated in the second term. Credit three hours. Prerequisite, Chemistry 101 and 105. Mr. AVENS and assistants.

Lecture: Mr. AVENS, T 12. Baker 207.

Laboratory sections: T Th 8-10:30; T Th 1:40-4. Baker 50.

A study of the properties and reactions of the common elements and acid radicals and their detection in various solutions.

215. ADVANCED QUALITATIVE ANALYSIS. First term. Credit three hours. Prerequisite, Chemistry 220, 221, 305, and 310. Assistant Professor NICHOLS, Mr. AVENS, and assistants. Day and hour to be arranged. Baker 50.

Laboratory practice. Essentially a continuation of Course 206. The methods for separating and detecting a number of metals and acids not studied in Course 206, including many of the rare elements. The qualitative analysis of a number of solutions, solid mixtures, natural and commercial products will be required. For graduates and advanced undergraduates.

220. INTRODUCTORY QUANTITATIVE ANALYSIS. Repeated in the second term. Credit three hours. Prerequisite, Chemistry 205 and 206. Must be taken with Course 221. Assistant Professor NICHOLS, Mr. FLOYD, and assistants.

Lectures: Assistant Professor NICHOLS. T Th 9. Baker 207.

Recitations: one hour a week, to be arranged.

A study of the fundamental principles of gravimetric and volumetric analysis with practice in stoichiometry.

Students in science are advised, and candidates for the degree of Bachelor of Chemistry are required, to take this course together with Course 221 instead of Course 225.

221. INTRODUCTORY QUANTITATIVE ANALYSIS. Repeated in the second term. Credit three hours. Prerequisite, Chemistry 205 and 206. Must be taken with Course 220. Mr. FLOYD and assistants.

Laboratory Sections: First term, M T W 1:40-4 (First term only); T Th 10-12:30; Th 1:40-4. Baker 252.

Laboratory practice in the preparation and standardization of various volumetric solutions and the analysis of a variety of substances by volumetric and gravimetric methods.

Students in science are advised, and candidates for the degree of Bachelor of Chemistry are required, to take this course together with Course 220 instead of Course 225.

225. **INTRODUCTORY QUANTITATIVE ANALYSIS.** Shorter course. Repeated in the second term. Credit three hours. Prerequisite or parallel course, Chemistry 210. Mr. FLOYD and assistants.

Lecture: Mr. FLOYD. Th 12. Baker 207.

Laboratory sections: T Th 8-10:30; T Th 9-11:30 (Second term only); M W 1:40-4; T Th 1:40-4. Baker 252.

A study of the fundamental principles of gravimetric and volumetric analysis, and the analysis of various substances by these methods.

230. **ADVANCED QUANTITATIVE ANALYSIS.** Repeated in the second term. Credit four hours. Prerequisite, Chemistry 220 and 221. Assistant Professor NICHOLS, Mr. FLOYD, and assistants.

Recitation: one hour a week, to be arranged.

Laboratory periods: first term, M T W 1:40-4; T Th 8-12:30; S 8-1; second term, M T W Th F 1:40-4; T Th 8-12:30; S 8-1. Baker 294.

Students will be assigned to a combination of laboratory periods that will total seven and one-half hours a week.

The calibration of weights and volumetric apparatus; the analysis of ferrous and non-ferrous alloys, silicates and organic substances by various gravimetric, volumetric and combustion methods.

235. **ADVANCED QUANTITATIVE ANALYSIS.** Second term. Credit two hours. Prerequisite, first term of Chemistry 405. Assistant Professor NICHOLS. M W 12. Baker 207.

A theoretical discussion of selected topics in quantitative analysis including sampling, indicators, potentiometric and conductometric titrations, together with the development and present status of various analytical methods.

240. **ELECTROCHEMICAL ANALYSIS.** Repeated in the second term. Credit two hours. Prerequisite, Chemistry 230 and 405. Assistant Professor NICHOLS and Mr. FLOYD. Day and hour to be arranged. Baker 292.

Laboratory practice in the electrochemical methods for the determination of silver, lead, copper, tin, nickel, cobalt, zinc, iron, etc.; the analysis of alloys and ores.

250. **GAS AND FUEL ANALYSIS.** Repeated in the second term. Credit four hours. Prerequisite, Chemistry 220 and 221. Dr. MORSE and assistants.

Lectures: Dr. MORSE. M W 10. Baker 207.

Laboratory sections: first term, M T 1:40-4; W Th 1:40-4; T Th 10-12:30; S 8-1; second term, T 10-12:30, 1:40-4; Th 10-12:30, 1:40-4; S 8-1; W 1:40-4; F 10-12:30. Baker 282.

The complete analysis of coal gas, flue gas, and air; the determination of the heating power of gaseous, liquid, and solid fuels; the analysis of coal; standard methods of testing various petroleum and coal-tar products; the analysis of various substances by methods involving the use of different types of gas evolution apparatus. Problems are assigned which afford practice in the calculation and interpretation of results.

270. **SPECIAL METHODS OF QUANTITATIVE ANALYSIS.** Either term. Credit two or more hours. Prerequisite, Chemistry 230 and 235. Assistant Professor NICHOLS, Mr. FLOYD and assistants. Day and hour to be arranged. Baker 277.

Laboratory practice in the application of special methods such as indirect analysis, conductometric and potentiometric titrations, etc., to quantitative analysis and the analysis of special materials. The study of the important methods and special forms of apparatus used in scientific gas analysis.

Within certain limits the work may be selected to suit the requirements of the individual student.

275. **QUANTITATIVE MICROANALYSIS.** First term. Credit three or more hours. Prerequisite, special permission. Assistant Professor NICHOLS. Day and hour to be arranged. Baker ———.

Laboratory practice in both organic and inorganic quantitative microanalysis, according to the methods of Dr. PREGL and Dr. EMICH. Primarily for graduate students.

295. **RESEARCH FOR SENIORS.** Throughout the year. Assistant Professor NICHOLS, Dr. MORSE, Mr. AVENS, and Mr. FLOYD.

*ORGANIC CHEMISTRY

305. INTRODUCTORY ORGANIC CHEMISTRY. Throughout the year. Credit three hours a term. Prerequisite, Chemistry 210 and 225 (or 205, 206, 220 and 221). Open to those who are taking Course 220. Professor J. R. JOHNSON and Dr. TALLMAN. M W F 9. Baker 207.

Lectures and written reviews. The more important compounds of carbon, their occurrence, methods of preparation, relations and uses, illustrated by experiments and material from the museum.

310. INTRODUCTORY ORGANIC CHEMISTRY. Throughout the year. Credit three hours a term. Prerequisite or parallel course, Chemistry 305. Professor J. R. JOHNSON, Dr. TALLMAN, and assistants. Laboratory section, F 1:40-4; S 8-1. Baker 250.

Laboratory practice and oral reviews. The student prepares a large number of typical compounds of carbon and familiarizes himself with their properties, reactions, and relations.

315. ADVANCED ORGANIC CHEMISTRY. Throughout the year. Credit two hours a term. Prerequisite, Chemistry 305 and 310. Professor JOHNSON and Dr. TALLMAN. T Th 9. Baker 177.

Lectures. A presentation of important chapters of organic chemistry and a discussion of classical researches in this field.

Students may register for any term separately.

320. ADVANCED ORGANIC CHEMISTRY. Either term. Credit two to six hours a term. Prerequisite, Chemistry 305 and 310. Professor J. R. JOHNSON, Dr. TALLMAN, and assistants. Day and hour to be arranged. Baker 208.

Laboratory practice. An advanced course in the preparation of organic compounds. The original literature is consulted, and the student is required to repeat some extended and important piece of work, and to compare his results with those published.

340. METHODS OF ORGANIC ANALYSIS. Second term. Credit three to six hours. Prerequisite, Chemistry 305 and 310. Professor J. R. JOHNSON, Dr. TALLMAN, and assistants. Laboratory conference, W 1:40. Baker 207. Laboratory sections, T W Th 1:40-4. Baker 250. Laboratory work based upon Kamm: "Qualitative Organic Analysis."

365. ELEMENTARY ORGANIC CHEMISTRY. Second term. Open only to students in the College of Home Economics. Lectures only, three hours credit. With laboratory, four to five hours credit. Prerequisite, Chemistry 101 and 105. Dr. TALLMAN and assistants. Hours to be announced.

375. ELEMENTARY ORGANIC CHEMISTRY. First term. Lectures and laboratory, six hours credit. For students preparing for the study of medicine. Prerequisite, Chemistry 101, 105, 205 and 206 (or 210). Professor J. R. JOHNSON, Dr. TALLMAN, and assistants.

Lectures and written reviews, M W F S 12. Baker 207.

Laboratory sections: M W 1:40-4. Baker 250. Conference, M 1:40, Baker 207. T Th 1:40-4. Baker 250. Conference, T 1:40, Baker 207.

The student should determine the entrance requirement in Organic Chemistry for the particular medical school he wishes to enter. If more than six hours credit is required, he should register in Chemistry 305 and 310. Students may obtain 9 hours credit by taking Chemistry 305 throughout the year (6 hours) and Chemistry 310 (3 hours) during the first term.

395. RESEARCH FOR SENIORS. Throughout the year. Professor J. R. JOHNSON and Dr. TALLMAN.

*PHYSICAL CHEMISTRY

405. INTRODUCTORY PHYSICAL CHEMISTRY. Throughout the year. Credit three hours a term. Prerequisite, Chemistry 305 (or 375) and Physics 3 and 4, and 30. Professor BRIGGS. M W F 9. Baker 7.

Lectures. A systematic presentation of modern chemical theory in which special attention is paid to the following topics: Gases, liquids, and solids; the

theory of solution; reaction velocity, catalysis, and chemical equilibrium; the Phase Rule; colloid chemistry; thermochemistry; and elementary electrochemistry. Problems in physical chemistry.

It is advisable, but not obligatory, that course 410 accompany this course.

410. **INTRODUCTORY PHYSICAL CHEMISTRY.** Throughout the year. Credit three hours a term. Prerequisite or parallel course, Chemistry 405. Professor BRIGGS and assistants. Laboratory sections: M T 1:40-4; S 8-1, Baker 1.

Laboratory practice. Qualitative and quantitative experiments illustrating the principles of physical chemistry and including practice in performing physico-chemical measurements. An important feature of this course is the presentation of detailed reports based upon data obtained in the laboratory.

[415. **ADVANCED PHYSICAL CHEMISTRY.** Throughout the year. Credit two hours a term. Prerequisite, Chemistry 405. Professor BANCROFT. T Th 11. Baker 7.

An exposition of the law of mass action in its application to chemical equilibrium and reaction velocities. Not given in 1931-32.]

430. **APPLIED COLLOID CHEMISTRY.** Throughout the year. Credit two hours a term. Open to candidates for the degree of Bachelor of Chemistry if they have completed Chemistry 405, to others only by special permission. Professor BANCROFT. T Th 10. Baker 7.

Lectures. The theory of colloid chemistry and its application in the arts.

450. **APPLIED ELECTROCHEMISTRY.** Throughout the year. Credit two hours a term. Prerequisite, Chemistry 405. Professor BRIGGS. M W 12. Baker 7.

Lectures. The theory of electrolysis and electromotive force; electrolytic extraction and refining of metals; electrolytic manufacture of organic and inorganic compounds; theory and practice of storage cells; preparation of compounds in the electric furnace. Problems in electrochemistry.

455. **APPLIED ELECTROCHEMISTRY.** Throughout the year. Credit two hours a term. Prerequisite or parallel course, Chemistry 450. Professor BRIGGS and assistant. Day and hour to be arranged. Baker 1-A.

Laboratory practice. Qualitative and quantitative study of electrolysis; determination of electrical conductivity; potentiometric measurements; hydrogen ion concentration; determination of current and energy efficiencies in electrolytic and electrothermal work; electrolytic preparation of organic and inorganic compounds; tests of storage cells; preparation of compounds in the electric furnace; measurement of furnace temperatures.

460. **THEORETICAL ELECTROCHEMISTRY.** Throughout the year. Credit two hours a term. Prerequisite, Chemistry 405. Professor BANCROFT. T Th 11. Baker 7.

465. **ADVANCED PHYSICAL CHEMISTRY.** Either term. Credit variable, but not to exceed six hours a term. Prerequisite, determined in each case by the Professor in charge. Professors BANCROFT and BRIGGS and assistants. Hour and work to be arranged. Baker 94.

Laboratory practice. Students may elect in mass law, reaction velocity, or efficiency measurements with special reference to course 415; in photo-chemistry, photography, or colloid chemistry with special reference to course 430; in conductivity, or electrometric determinations with special reference to course 460; in electrolytic, or electric furnace products with special reference to course 450; in the application of physical chemical methods to organic chemistry.

495. **RESEARCH FOR SENIORS.** Throughout the year. Professors BANCROFT and BRIGGS.

*OPTICAL CHEMISTRY

505. **INTRODUCTORY CHEMICAL SPECTROSCOPY.** Repeated in the second term. Credit three hours. Prerequisite, Chemistry 210 and 225 (or 205, 206, 220, and 221). Open to those who have completed or are taking Physics 31 and 32, or by special permission. Professor PAPISH and assistants.

Lectures and written reviews. T Th 9. Baker 377.

Laboratory sections: Hours to be arranged. Baker 396.

The construction and the use in chemical analysis of the spectroscope, polariscope, refractometer, colorimeter, and nephelometer. The laboratory instruction is devoted to the training of the student in the use of these instruments in the solving of chemical problems.

Graduate students are advised to take this course the first term.

510. ADVANCED CHEMICAL SPECTROSCOPY. Either term. Credit two or more hours. Prerequisite, Chemistry 505. Professor PAPISH and assistants. Day and hour to be arranged. Baker 396.

Laboratory practice. The study of arc, spark, and absorption spectra and the application of spectroscopic methods to the identification of dyestuffs. Practice in one or more of the subjects mentioned may be selected by the student.

520. SPECTROGRAPHIC METHODS. Either term. Credit one or more hours. Prerequisite, Chemistry 505. Professor PAPISH. Laboratory hours to be arranged. Baker 396. Conference, hour to be arranged.

Laboratory practice. The application of photographic methods to arc, spark, and absorption spectroscopy. Practice is also given in the application of ultra-violet spectroscopy in chemical analysis.

530. INTRODUCTORY CHEMICAL MICROSCOPY. Repeated in the second term. Credit three hours. Prerequisite, Chemistry 210 and 225 (or 205, 206, 220, and 221) and Physics 31 and 32, or by special permission. Professor CHAMOT, Assistant Professor MASON, and assistants.

Lecture: M 10. Baker 377.

Laboratory sections: M T 1:40-4; T Th 9-11:30; Th F 1:40-4 (first term only). Baker 378.

Lectures and laboratory practice. The use of the microscope and its accessories; microscopic methods as applied to chemical and other scientific investigations; micrometry; the examination of crystalline compounds and industrial materials; recognition of textile and paper fibers, etc. The application of microscopic methods to quantitative analysis.

Graduate students are advised to take this course the second term.

535. MICROSCOPIC QUALITATIVE ANALYSIS (INORGANIC). Either term. Credit two or more hours. Prerequisite, Chemistry 530. Professor CHAMOT, Assistant Professor MASON, and assistants. Laboratory periods, to be arranged. Baker 378.

Laboratory practice in the examination and analysis of inorganic substances containing the more common elements with special reference to rapid qualitative methods and to the analysis of minute amounts of material.

540. MICROSCOPICAL METHODS IN ORGANIC CHEMISTRY. Either term. Credit two or more hours. Prerequisite, Chemistry 530, and special permission. Professor CHAMOT, Assistant Professor MASON, and assistants. Day and hour to be arranged. Baker 378.

Laboratory practice. General manipulative methods applicable to small amounts of material, crystallization procedures, determination of melting points and molecular weights; chemical tests and reactions for elements, radicals, and various types of organic compounds. Preparation of simple derivatives.

This course may be extended to cover the analytical reactions of the vegetable alkaloids, "strong drugs," or other special groups of organic substances.

545. METALLOGRAPHY. First term. Credit two hours. Prerequisite, Chemistry 530, or special permission. Assistant Professor MASON and assistants. Th F 1:40-4. Baker 384.

Laboratory practice and conferences. An introduction to the principles and methods involved in the study of the structure of metals. The relation of microscopical appearances to thermal history and mechanical properties. Preparation of specimens for macroscopic and microscopic study. Metallographic microscopes and their use.

This course is planned approximately to parallel the lectures in the first term of course 705.

[550. MICROSCOPY OF FOODS AND BEVERAGES. First term. Credit two hours. Prerequisite, Chemistry 530. Professor CHAMOT, Assistant Professor MASON, and assistants. Laboratory hours to be arranged. Baker 378. Not given in 1931-32.]

560. ADVANCED CHEMICAL MICROSCOPY. Second term. Credit two hours. Hours to be arranged. Assistant Professor MASON.

Conferences and demonstrations. Theory and applications of instruments, accessories and methods used in critical microscopy, ultramicroscopy, photomicrography, and other special fields. Typical applications of microscopic methods in research and industry.

565. SPECIAL METHODS IN CHEMICAL MICROSCOPY. Either term. Credit one or more hours. Prerequisite, special permission. Professor CHAMOT and Assistant Professor MASON. Day and hour to be arranged. Baker 378 and 382.

Laboratory practice may be elected in various fields such as photomicrography, ultramicroscopy, crystal studies, micro-manipulations, quantitative determinations, and the microscopy of industrial materials.

595. RESEARCH FOR SENIORS. Throughout the year. Professor CHAMOT, Professor PAPISH, and Assistant Professor MASON.

*SANITARY CHEMISTRY

605. INTRODUCTORY SANITARY CHEMISTRY (FOODS). First term. Credit two hours. Prerequisite, Chemistry 305 (or 210, 225, and 375). Mr. FABER. T Th 11. Baker 377.

Lectures. Chemistry of foods, beverages, and food accessories; special apparatus; adulteration and misbranding, sweeteners, preservatives, food colors, food poisonings, and methods for their detection. Relation of the chemical composition of materials used in the household to the public health.

It is advisable, but not obligatory, that Course 610 accompany this course.

610. INTRODUCTORY SANITARY CHEMISTRY (FOODS). First term. Credit two hours. Prerequisite or parallel course, Chemistry 605. Mr. FABER and assistant. Laboratory sections at hours to be arranged. Baker 352.

Laboratory practice. Laboratory exercises designed to illustrate the material presented in course 605. General and special methods of analysis of foods, beverages, and food accessories, with special reference to the detection of adulteration.

615. INTRODUCTORY SANITARY CHEMISTRY (WATER). Second term. Credit two hours. Prerequisite, Chemistry 305 (or 210, 225, and 375). Mr. FABER. T Th 11. Baker 377.

Lectures. Pollution of water; physical, chemical, bacteriological and microscopical examinations of water for household and municipal purposes; introduction to the methods of water purification, and water softening, and their control. Interpretation of analytical results and the preparation of sanitary surveys.

It is advisable, but not obligatory, that Course 620 accompany this course.

620. INTRODUCTORY SANITARY CHEMISTRY (WATER). Second term. Credit two hours. Prerequisite or parallel course, Chemistry 615. Mr. FABER and assistant. Laboratory sections at hours to be arranged. Baker 352.

Laboratory practice. Laboratory exercises designed to illustrate the material presented in Course 615.

[630. ADVANCED SANITARY CHEMISTRY (WATER). First term. Credit two hours. Prerequisite, Chemistry 615.

Laboratory practice to accompany this course may be elected under Course 635. Not given in 1931-32.]

[635. ADVANCED SANITARY CHEMISTRY. Either term. Credit two or more hours. Prerequisite, to be determined in each case by the instructor in charge. Baker 352, 356, 358.

Laboratory practice.

Students who have had adequate preparation may elect work in any branch of sanitary chemistry. Among others, work along the following lines may be taken:

The bacteriology of water.

Continuation of work offered in courses 610 or 620.

The control of water purification.

Water softening.

The work in many cases may be arranged to meet the need of the individual student. Not given 1931-32.]

695. RESEARCH FOR SENIORS. Throughout the year. Professor CHAMOT and Mr. FABER.

*INDUSTRIAL CHEMISTRY

705. INDUSTRIAL CHEMISTRY. Throughout the year. Credit three hours a term. Prerequisite, Chemistry 405. Professor RHODES. M W F 10. Baker 177.

Lectures. A discussion of various typical processes of chemical manufacturing from the standpoint of: (a) available materials, their properties and limitations; (b) standard forms of apparatus used in chemical manufacturing; (c) properties and specifications of commercial chemicals; (d) computation of costs and profits in chemical manufacturing.

710. CHEMICAL ENGINEERING. Second term. Credit four hours. Prerequisite, Chemistry 405. Professor RHODES, Mr. LEWIS, and assistants. Laboratory, day and hour to be arranged. Baker B-78. Conference, F 9. Baker 177.

The study in the laboratory, on a semi-plant scale, of the unit processes of chemical engineering, such as agitation, and mixing, filtration, fractional distillation, evaporation, drying, absorption of gases, and heat transfer.

715. SELECTED TOPICS IN CHEMICAL ENGINEERING. Second term. Credit three hours. Prerequisite or parallel course, Chemistry 705. Professor RHODES. M W F 11. Baker 177.

Lectures. A discussion of special topics in industrial chemistry. The lectures in 1931-32 will deal with the theory and design of chemical plant equipment for distillation, evaporation, drying, etc.

725. THE CHEMISTRY OF FUELS. First term. Credit three hours. Prerequisite, or parallel course, Chemistry 705. Professor RHODES. M W F 11. Baker 177.

Lectures. The chemistry of coal, coke, petroleum, tars, and the fuel gases. Particular stress is laid upon the theoretical chemistry involved in the carbonization of coal, the gasification of coal, and the distillation and refining of petroleum and tar.

730. CHEMICAL PLANT DESIGN. Throughout the year. Credit three hours a term. Prerequisite, Chemistry 705. Professor RHODES. Day and hour to be arranged.

Conferences and calculation periods. Practice in the calculation and design of chemical plant equipment.

775. ENGINEERING CHEMISTRY. Repeated in the second term. Credit two hours. Prerequisite, Chemistry 101. Not open to students who are candidates for the degree of Bachelor of Chemistry. Mr. LEWIS. M W 8. Baker, Main Lecture Room.

Lectures. Chemistry in its relations to engineering.

776. CHEMISTRY OF PULP AND PAPER. Second term. Credit two hours. Prerequisite, Chemistry 775. Open to students in Forestry, to others only by special permission. Mr. LEWIS. T Th 10. Baker 177.

Lectures. The chemistry of the manufacture of pulp and paper.

795. RESEARCH FOR SENIORS. Throughout the year. Professor RHODES and Mr. LEWIS.

*AGRICULTURAL CHEMISTRY

Students will not be allowed to register in courses in Agricultural Chemistry until after they have taken and passed Chemistry 101 and 105 or their equivalent.

805. INTRODUCTORY AGRICULTURAL CHEMISTRY (FERTILIZERS, INSECTICIDES, SOILS). First term. Credit two hours. Prerequisite, Chemistry 305 (or 375). Professor CAVANAUGH. T Th 11. Baker 302.

Lectures. The relation of chemistry to agriculture; an introduction to the study of plant growth, the composition and chemical properties of soils, fertilizers, amendments, insecticides, and fungicides.

810. **INTRODUCTORY AGRICULTURAL CHEMISTRY.** First term. Credit three hours. Prerequisite, Chemistry 205 and 220 (or 210 and 225). Professor CAVANAUGH. Baker 350.

Laboratory practice: day and hour to be arranged. Recitation: day and hour to be arranged. Practice in the methods used by the chemist in the control laboratories of the factory, of the Government, and of the Experiment Stations, where fertilizers, insecticides, fungicides, and soils are examined.

815. **INTRODUCTORY AGRICULTURAL CHEMISTRY (FOODS AND FEEDS).** Second term. Credit two hours. Prerequisite, Chemistry 305 (or 375). Professor CAVANAUGH. T Th II. Baker 302.

Lectures. Discussion of the sources, chemical composition, and properties of the principal foods and feeds such as cereals, fruits, animal products, and dairy products. Relation of methods of preservation and manufacture to the nutritive value of foods.

820. **INTRODUCTORY AGRICULTURAL CHEMISTRY.** Second term. Credit three hours. Prerequisite, Chemistry 205 and 220 (or 210 and 225). Professor CAVANAUGH and assistant. Baker 350.

Laboratory practice: day and hour to be arranged. Recitation: day and hour to be arranged. The methods of the Association of Official Agricultural Chemists are used in the examination and analysis of foods and feeding stuffs, such as milk and milk products, cereal products, canned vegetables, etc.

825. **ELEMENTARY AGRICULTURAL CHEMISTRY.** Second term. Credit three hours. Prerequisite, Chemistry 101. Professor CAVANAUGH. M W F 12. Baker 377. Candidates for the degree of Bachelor of Chemistry may not receive credit for this course toward the degree.

Lectures. The relation of chemistry to agriculture, and an introduction to the study of the composition and chemical properties of plants, fertilizers, feed stuffs, insecticides, and fungicides.

830. **ELEMENTARY CHEMISTRY OF FOOD PRODUCTS.** Second term. Credit two hours. Prerequisite, Chemistry 101. Professor CAVANAUGH. W F 10. Baker 377. Candidates for the degree of Bachelor of Chemistry may not receive credit for this course toward the degree.

Lectures. The chemical composition, physical and physiological properties, sources, and methods of manufacture of the principal food products.

835. **ADVANCED AGRICULTURAL CHEMISTRY (FERTILIZERS, INSECTICIDES, SOILS).** Either term. Credit two or more hours. Prerequisite, Chemistry 810. Professor CAVANAUGH and assistant. Day and hour to be arranged. Baker 350.

Laboratory practice. Advanced work in the chemistry of soils, fertilizers, plant composition, insecticides, or fungicides. Special topics may be selected.

840. **ADVANCED AGRICULTURAL CHEMISTRY (FOODS AND FEEDS).** Second term. Credit two or more hours. Prerequisite, Chemistry 820. Professor CAVANAUGH. Day and hour to be arranged. Baker 350.

Laboratory practice. Special topics in the chemistry of foods and food preparations.

895. **RESEARCH FOR SENIORS.** Professor CAVANAUGH.

NON-RESIDENT LECTURES

The George Fisher Baker Non-Resident Lectureship in Chemistry at Cornell University was established early in the year 1926 by a gift of \$250,000 from Mr. Baker, the income to be used by the University for the benefit and advancement of teaching and research in Chemistry and allied sciences. Under this plan the University invites eminent men of science to come to Cornell, each for one or two semesters, to present the most recent advances, and the methods and results of their own investigations, in the fields in which they have won distinction. A private office and a research laboratory are placed at the disposal

of the Non-Resident Lecturer and he is thus enabled to carry forward investigational work while in residence at Cornell.

The Non-Resident Lecturers under the George Fisher Baker Foundation deliver two lectures a week, and hold a colloquium. In some cases they also conduct experimental research with a few advanced students.

The program for these lectures is as follows:

FIRST TERM, 1931-32

Professor CECIL H. DESCH, University of Sheffield, England.

Topics of Lectures:

The Chemistry of Solids.

- A) The cohesion of solids.
- B) Residual affinity at the surface of crystals, and the influence of adsorption on growth.
- C) Chemical attack and etch figures.
- D) Chemical changes in solid solutions. Widmanstätten and Martensitic structures.
- E) The chemical properties of open-packed structures.

SECOND TERM, 1931-32

Professor ALFRED STOCK, Technische Hochschule, Karlsruhe, Germany.

Topics of Lectures: Experimental Investigations of Low-Boiling Substances.

FIRST TERM, 1932-33

Professor W. L. BRAGG, University of Manchester, England.

Topics of Lectures:

- A) Crystal structure and methods of X-ray analysis.
- B) Structure of simple and complex inorganic salts.
- C) Aliphatic and aromatic organic crystals.
- D) X-ray optics.

SECOND TERM, 1932-33

Professor OTTO HAHN, Kaiser Wilhelm Institut für Chemie, Berlin-Dahlem, Germany.

Topics of Lectures:

- A) Chemistry of the Radio-elements.
- B) The Significance of Radio-active Substances in Various Branches of Science.
- C) Applied Radio-Chemistry.

FIRST TERM, 1933-34

Professor V. M. GOLDSCHMIDT, Göttingen University, Göttingen, Germany.

Topics of Lectures:

Crystal Chemistry.
Geochemistry.

THE BIOLOGICAL SCIENCES

BOTANY AND PLANT PHYSIOLOGY

Professors K. M. WIEGAND, LEWIS KNUDSON, A. J. EAMES, L. W. SHARP, O. F. CURTIS, W. C. MUENSCHER, L. C. PETRY, and E. F. HOPKINS.

Graduate work is offered in physiology, anatomy, morphology, cytology, paleobotany, taxonomy and economic botany.

The laboratories of the department are in the Plant Science Building, one of the buildings of the College of Agriculture, and are well equipped with the necessary apparatus and collections for research. The herbarium contains abundant local and foreign material for taxonomic study.

The very rich flora about Ithaca and its accessibility make the location especially advantageous for all phases of botany, as material may be easily obtained. Gardens and green-houses are also available for the growing of experimental material.

The University Library and the library of the College of Agriculture are well equipped with special works and periodicals dealing with all phases of botanical science. A department library in which are kept the books in more constant use has been established in connection with the laboratories.

A seminary in plant physiology offers to graduate students opportunity to become familiar with current work in plant physiology and to consider the relations of this work to agricultural practices. At these meetings there are also held general conferences and discussions of opinions or methods not conveniently or appropriately dealt with in the general courses. Seminars are conducted in morphology and frequently also in the taxonomy of vascular plants. The purpose of these various seminars is not only to keep abreast of the literature of the subject, but to furnish to the student an opportunity to gain experience in presenting the results of his own research or in developing opinions respecting the work of others. Graduate students are expected to attend the seminars dealing with their special fields of work.

As a prerequisite for work in general botany, anatomy, cytology, and comparative morphology, the student will be expected to have a knowledge of the fundamental features of botanical science.

A fundamental training in botany and chemistry is required of any student who expects to major in plant physiology. If it is not possible to obtain this training before entering upon graduate work at Cornell, then the student will be expected to broaden his knowledge in botany and chemistry after beginning graduate work. The advanced courses in plant physiology are required of all graduate students in plant physiology and preferably should precede research work in this field. Those students whose interests are in the science of crop production will find plant physiology of especial value.

The University conducts a Summer School of Biology in which there is opportunity for graduate study and research in botany. The school is in session for six weeks in July and August, but a longer period of study can be arranged. A prospective student contemplating summer work in botany and plant physiology should correspond with Professor Wiegand before coming to Ithaca.

In addition to various courses in the different fields of botany that are designed primarily for undergraduate students the following courses are provided and are especially conducted for graduate students.

*PLANT PHYSIOLOGY

Professors KNUDSON, CURTIS, and HOPKINS.

231. PLANT PHYSIOLOGY, ADVANCED LECTURE COURSE. Throughout the year. Credit three hours a term. Prerequisite, training in botany and chemistry, to be determined in each case by the department. Lectures, M W F 10. Plant Science 143. *Professors* KNUDSON and O. F. CURTIS.

232. PLANT PHYSIOLOGY, ADVANCED LABORATORY COURSE. Throughout the year. Credit three hours a term. Prerequisite or parallel, course 231. Laboratory, M 1:40-4, S 8-12:30. Plant Science 241. *Professors* KNUDSON and O. F. CURTIS, and Assistant Professor HOPKINS. Laboratory fee each term, \$10; breakage deposit, \$5.

233. SEMINARY IN PLANT PHYSIOLOGY. Throughout the year. Required of graduate students taking work in the department. Conference, F 11. Plant Science. *Professors* KNUDSON and O. F. CURTIS, and Assistant Professor HOPKINS.

The presentation and discussion of current contributions to plant physiology; reports on the research problems of graduate students and members of the staff.

RESEARCH IN PLANT PHYSIOLOGY. *Professors* KNUDSON, CURTIS, and HOPKINS.

*PLANT ANATOMY

Professors EAMES, PETRY, and Doctor JACKSON.

123. PLANT ANATOMY. First term. Credit four hours. Prerequisite, course 1 or its equivalent, and permission to register. Professor EAMES and Dr. JACKSON. Plant Science 228.

Primarily for students in applied fields of botany such as pathology, pomology, or genetics. Designed to give acquaintance with the internal morphology of vascular plants, with emphasis on practice in determination and interpretation of material. Course 126 gives a less detailed training in this subject. Laboratory fee, \$5.

RESEARCH IN ANATOMY. Professor EAMES.

*CYTOLOGY

Professor SHARP.

[124. CYTOLOGY. Second term. Credit four hours. Prerequisite, course 1 or Zoology 1. Lectures, T Th 9. Plant Science 143. Laboratory, T Th or W F 10-12:30, or W 1:40-4, S 8-10:30. Small group conferences to be arranged. Plant Science 219. Professor L. W. SHARP and Dr. McCLINTOCK. Not given in 1931-32.]

Intended for those who have had some biological training. The principal topics considered are protoplasm, cells and their components, nuclear and cell division, meiosis and fertilization, and the relation of these to the problems of development, reproduction, and heredity. Both plant and animal materials are used. Microtechnic is not included. Laboratory fee, \$5.

224. SEMINARY IN CYTOLOGY. First term. M 11. Plant Science 404. Professor L. W. SHARP.

RESEARCH IN CYTOLOGY. Professor SHARP.

*MORPHOLOGY

Professors EAMES, SHARP, PETRY, and Dr. JACKSON.

(COMPARATIVE MORPHOLOGY OF FUNGI. Given in the Department of Plant Pathology.)

[126. MORPHOLOGY OF VASCULAR PLANTS. First term. Credit four hours. Prerequisite, course 1 or its equivalent. Lectures, T Th 9. Laboratory, T Th 10-12:30. Plant Science 228. Professor EAMES and Dr. JACKSON. Not given in 1931-32.]

An advanced course in the comparative morphology, life history, and phylogeny of vascular plants. Laboratory fee, \$5.

227. SEMINARY IN MORPHOLOGY. Throughout the year. Hours to be arranged. Professor EAMES.

RESEARCH IN MORPHOLOGY. Professors EAMES, SHARP, and PETRY.

*TAXONOMY

Professors WIEGAND and EAMES.

117. TAXONOMY OF THE HIGHER PLANTS. Second term. Credit four hours. Prerequisite, course 1 or its equivalent. Lecture, M 9. Laboratory, M W F 1:40-4. Plant Science 211. Professor WIEGAND.

A study of seed plants and ferns, their classification into genera, families, and orders, and field work on the local flora. Emphasis placed on wild plants, but the more commonly cultivated varieties receive some attention. Preparation of a herbarium and of keys. The course is planned to follow course 1 and to furnish an introduction to the field botany and classification of higher plants, as preparation for special work in various departments and for teaching. Those desiring advanced work on special groups or problems may follow this with course 145. Laboratory fee, \$4; deposit, \$5.

219. ADVANCED TAXONOMY OF VASCULAR PLANTS. Second term. Credit two hours. Prerequisite, course 117 or its equivalent. Hours to be arranged. Plant Science 211. Professor WIEGAND.

Special round-table discussion of topics of particular interest to the taxonomist. One hour is devoted to practical work on some group of plants.

RESEARCH IN TAXONOMY. Professors WIEGAND and EAMES.

*PALEOBOTANY

Professors PETRY and EAMES.

RESEARCH.

*ECONOMIC BOTANY

Professor MUENSCHER.

15. WEED IDENTIFICATION AND CONTROL, SEED ANALYSIS. First term. Credit three hours. Prerequisite, course 1 or its equivalent. Lecture, Th 8. Laboratory, T Th 1:40-4. Plant Science 353. Assistant Professor MUENSCHER and Mrs. CRAIG.

Designed primarily for students of agriculture, especially those preparing for work in agricultural extension, crop production, and farm management; adapted also for students of nature study, civic improvement, conservation of game birds, and related fields.

A study of the characteristics of weeds, their sources, methods of reproduction, dissemination, and migration. Consideration of the losses due to weeds, and of control. Practice in making purity tests in analyses of seeds. Laboratory fee, \$3; deposit, \$5.

RESEARCH. Economic Botany.

OTHER COURSES

141. HISTORY OF BOTANY. Second term, without credit. Not given in 1931-32.

A course of lectures given by various members of the staff with the purpose of acquainting advanced students of botany with the historical development of their science.

145. SPECIAL PROBLEMS IN GENERAL BOTANY, TAXONOMY, HISTOLOGY, CYTOLOGY, and PHYSIOLOGY. Throughout the year. Credit not less than two hours a term. By appointment. Professors WIEGAND, KNUDSON, EAMES, L. W. SHARP, O. F. CURTIS, REDDICK and PETRY, and Assistant Professors MUENSCHER and HOPKINS.

Students engaged on special problems may register in this course. They must satisfy the instructor under whom the work is taken as to preparation for the problem chosen. The laboratory fee depends on the nature of the work and on the number of credit hours.

*PLANT PATHOLOGY

Professors L. M. MASSEY, H. H. WHETZEL, DONALD REDDICK, M. F. BARRUS, H. M. FITZPATRICK, F. M. BLODGETT, CHARLES CHUPP, W. H. BURKHOLDER, H. E. THOMAS, D. S. WELCH, K. H. FERNOW, A. G. NEWHALL, W. D. MILLS, and C. E. F. GUTERMAN.

The laboratories of the department are fully equipped for teaching and research in this subject. Many pieces of apparatus for use in connection with specialized research problems are available and additional apparatus can be supplied whenever it is needed. Greenhouses having about 2,500 square feet of floor space afford facilities for experimental work and for the culture of diseased and healthy plants for class use. These houses are divided into compartments so that various artificial conditions of temperature and moisture can be maintained for diverse types of plants and kinds of experimental work. A garden near the laboratories is available for the use of graduate students. Field laboratories in im-

portant crop sections of the State are maintained through co-operation with growers. These laboratories provide certain graduate students who receive fellowships (several of which are usually available each year) with an opportunity of pursuing investigations on a large scale under most favorable commercial conditions.

The pathological herbarium includes a local collection of fungi and pathological materials and sets of well-known fungous exsiccati. The library contains most of the important works on plant pathology, mycology, and bacteriology, complete sets of the more important journals, many monographs, and practically all the experiment station literature on these subjects.

Candidates for the Doctor's degree should spend at least one season in the field in order to come into contact with the practical aspects of control problems. Students preparing for graduate work in plant pathology are urged to obtain a thorough knowledge of elementary physics and chemistry, including organic and physical chemistry, and of general botany, plant histology, and plant physiology. A reading knowledge of French and German is indispensable in phytopathological research and must be acquired before the beginning of the second year of graduate work. Candidates for advanced degrees must have fundamental training in the subjects enumerated above. Opportunity is afforded for further study in these subjects after entering the Graduate School, but a student availing himself of this opportunity can not expect to receive a degree in the minimum amount of time required for residence. Members of the staff are prepared to direct investigation in the various sub-divisions of the broader field, including that of bacterial diseases of plants.

1. GENERAL PLANT PATHOLOGY. Professor WHETZEL. First or second term. Lecture, W 8. Practice, first term, W F 1:40-4 or Th 1:40-4 and S 10:30-12:50. Practice, second term, W F 1:40-4. Plant Science 341 and 343.

A fundamental introductory course treating of the nature, cause, and control of plant diseases. Designed especially for undergraduates but required of all graduate students who have not had its equivalent. This course is also offered during the six-weeks summer session.

2. PRINCIPLES OF PLANT DISEASE CONTROL. Professor WHETZEL. Second term. Lecture, Th 8. Practice, Th 1:40-4; S 8-10:30. Plant Science 342.

A consideration of the principles and methods in plant disease control. Designed for advanced undergraduate and graduate students.

201. ADVANCED PLANT PATHOLOGY. Professor MASSEY. First and second terms. Lecture, F 8. Practice, T F 10-12:30. Plant Science 304.

A presentation and analysis of the experimental and empirical knowledge of plant diseases. The phenomena of infection, susceptibility, host reactions, and symptomatology will be critically considered. Primarily for graduate students.

121. COMPARATIVE MORPHOLOGY OF FUNGI. Professor FITZPATRICK. First term. Lecture, M W 9. Practice M W 1:40-4. Plant Science 333.

A synoptical course designed to acquaint the student with the general field of mycology. Emphasis will be placed on morphology and phylogeny, rather than on taxonomy. This course is also offered during the six-weeks summer session.

122. INTRODUCTORY MYCOLOGY. Professor FITZPATRICK. First and second terms. Lecture, M W 9. Practice, M W 1:40-4. Plant Science 333.

A general introductory presentation covering the whole field of mycology. Emphasis placed on morphology, phylogeny, and taxonomy. Primarily for graduate students.

221. MYCOLOGY. Professor FITZPATRICK. First and second terms. Lecture, M W 11. Practice, T Th 1:40-4. Plant Science 329.

An intensive study of the morphology, taxonomy, and phylogeny of the fungi (Phycomycetes and Ascomycetes). Primarily for graduate students. The equivalent of one term or the other available during the six-weeks summer session.

222. MYCOLOGY. Professor FITZPATRICK. First and second terms. Lecture, M W 11. Practice, T Th 1:40-4. Plant Science 329.

Alternating with the course just named, and dealing with the Basidiomycetes and Fungi Imperfecti. Primarily for graduate students. The equivalent of one term or the other available during the six-weeks summer session.

231. HISTORY OF PLANT PATHOLOGY. Professor WHETZEL. First and second terms. Requires a reading knowledge of French and German. Designed especially for graduate students specializing in Plant Pathology.

232. GERMAN PHYTOPATHOLOGICAL READING. Professor WHETZEL. First and second terms. For graduate and advanced students. Designed to assist graduate students in preparing for their language examination requirements in German.

241. RESEARCH. Professors MASSEY, WHETZEL, REDDICK, BARRUS, FITZPATRICK, CHUPP, BURKHOLDER, BLODGETT, THOMAS, WELCH, FERNOW, NEWHALL, MILLS, and GUTERMAN.

242. SEMINARY. Members of the staff. Biweekly.

243. LITERATURE REVIEW. Members of the staff. Biweekly.

*PLANT BREEDING

Professors R. A. EMERSON, C. H. MYERS, F. P. BUSSELL, J. H. PARKER, A. C. FRASER, R. G. WIGGANS, and J. R. LIVERMORE; Doctor ERNEST DORSEY.

The laboratories of this department are supplied with calculating machines necessary for statistical investigations, and are equipped with cameras and accessories for photographic work. The departmental library contains the principal books and periodicals dealing with plant breeding, evolution, and genetics. The department has greenhouse room approximating 2000 square feet of floor space, a part of which is available for the use of graduate students. A garden near the laboratories affords the necessary room for most of the plant material used by graduate students. For more extensive plantings, room is provided on the University farms.

In order to enter upon graduate work in plant breeding, the student should have had the equivalent of the following courses: genetics, plant breeding, general botany, general plant physiology, elementary zoology or biology, introductory inorganic chemistry, and elementary organic chemistry. In case a student has not had all these elementary courses, he should take them early in the period of his graduate study, and since he will not be permitted to present them as partial fulfillment of the requirements for a major or minor in plant breeding, he will ordinarily find it impossible to complete his graduate work in the minimum time.

Students majoring in plant breeding will ordinarily find it necessary to remain in Ithaca during the summer, or to make satisfactory arrangements for growing and studying elsewhere the plant materials used in connection with their research problems. Since the department has accommodations for only a limited number, prospective students will find it to their advantage to correspond with a member of the departmental staff some months prior to entering upon their work.

For Graduates and Undergraduates

101. GENETICS. First term. Lectures, M W F 8. Plant Science 143. One conference period, to be arranged. Laboratory, M W or F 1:40-4. Plant Science 146. Assistant Professor FRASER and Dr. DORSEY.

A general introductory course designed to acquaint the student with the fundamental principles of heredity and variation. Special attention is given to the Mendelian interpretations of the facts of inheritance. Among the topics to be discussed are: the physical basis of heredity, simple cases of Mendelian inheritance, factor interaction, the determination of sex, factor linkage, the measurement of variation, quantitative inheritance, pure lines, inbreeding and crossbreeding, maternal inheritance, and mutation, with suggestions as to the relation of genetical principles to eugenics. Laboratory studies of variation,

and of the laws of heredity as illustrated by hybrid material in plants and by breeding experiments with the fruit fly, *Drosophila*. Laboratory fee, \$3.

103. PLANT BREEDING. Second term. Lectures, T Th 8. Lecture and practice, S 8-10. Plant Science 143. Professor MYERS.

A discussion of the principles primarily concerned in plant breeding and the development of methods of breeding for different types of plants. Lectures are supplemented by periods in the laboratory, greenhouses and experimental fields to acquaint the student with the technique of hybridization, selection, seed production and distribution. The course is intended to be of value to those interested in plant production, to seed growers, county agents and teachers of agriculture in secondary schools.

For Graduates and Undergraduates

105. PLANT BREEDING (Crop Improvement). First term. Lectures, T Th S 9. Plant Science 143. Professor J. H. PARKER. (Given in 1931-32 only.)

Plant breeding principles and practices as applied to field crops, plant introduction, variety testing, mass and pedigree (pure line) selection, hybridization, mutation. Special attention to breeding crop plants for resistance to plant diseases and insects.

108. PLANT BREEDING LITERATURE. Second term. Lectures and practice, W 8. Plant Science 146. Professor J. H. PARKER. (Given in 1931-32 only.)

Descriptive and critical study of books, journals and current papers in the field of genetics and plant breeding. Use of abstract journals, bibliographic practice, etc.

Primarily for Graduates

201. ADVANCED GENETICS. Second term. Discussion periods, M F 8-10, and a laboratory problem in genetic analysis to be worked at the convenience of the student. Plant Science 146. Assistant Professor FRASER.

A course primarily for the study of methods of genetical testing and analysis. Particular attention is given to the formulation of hypotheses to explain genetical phenomena, and to the development of tests of such hypotheses. A critical study is made of a number of the best examples of genetical analysis to be found in the periodical literature. The discussions involve a consideration of newer principles of genetics. Laboratory analyses of experimental data, and of an "unknown" stock of *Drosophila*. Laboratory fee, \$3.

211. BIOMETRY. First term. For graduate students only. Th 1:40-4. Plant Science 146. Assistant Professor LIVERMORE.

A discussion of statistical methods as applied to problems in biology and genetics. The course is designed primarily to develop methods for the study of variation, correlation, curve fitting, and probable error. It is not intended solely for students in plant breeding but is of interest to all who are to engage in experimental work. Laboratory fee, \$2.00.

SEMINARY. Second term. W 11. Plant Science 146. Professors EMERSON, MYERS, BUSSELL, PARKER, and Assistant Professors FRASER, WIGGANS, and LIVERMORE.

ZOOLOGY

Professors H. D. REED, A. H. WRIGHT, A. A. ALLEN, and B. P. YOUNG.

Every facility in the way of material and equipment is placed at the disposal of the student desiring to investigate in the following fields: General and experimental zoology, taxonomy, morphology, ecology, economic zoology, protozoology, and ornithology.

The laboratories are equipped with modern compound, binocular, and dissecting microscopes, microdissecting and injecting apparatus, euscopes, microtomes and accessories, paraffine and constant temperature ovens, projection and drawing apparatus, facilities for modeling in wax, work shop, fully equipped preparation rooms, cameras and dark rooms.

The collection includes an extensive collection of invertebrates, fishes, amphibia, reptiles, birds and mammals as well as more than 15,000 specimens of fixed material for developmental and structural studies as well as an extensive collection of prepared microscopical slides of serial sections. In assembling these collections, efforts have been made to obtain material from all parts of the world illustrating biological principles.

The Cayuga basin, with its diversified topography, its extensive fauna, and its mingling of three life zones, offers unusual opportunities for ecological field work. Within the basin are three state parks and three wild life preserves, all within walking distance of the University; the former established on account of the beauty of their scenery, the latter on account of their interesting fauna and flora. There is also a woodland bird preserve in Ithaca.

The University library, together with the special libraries of the Agricultural and Medical Colleges, the Flower Library of the Veterinary College, and the Comstock Memorial Library afford unusually rich resources for the investigator in any field of Zoological research. They are particularly complete in the serial literature of zoology.

In order to undertake graduate study the student should not only be prepared in the fundamentals of Animal Biology but also have or acquire a foundation in the particular phase of this subject which he intends to pursue.

The members of the staff are prepared to direct the research work of graduate students in connection with the summer School of Biology of Cornell University.

*GENERAL ZOOLOGY AND MORPHOLOGY

Professors REED and YOUNG.

MORPHOLOGY AND COMPARATIVE ANATOMY OF INVERTEBRATES AND VERTEBRATES, including research. *Professors* REED and YOUNG.

Major students who lack a training in basic courses should consult the Announcement of the Arts College for courses 11, 16, 17, 101, 104, 302, and others in advanced Animal Biology.

*TAXONOMY

Professors WRIGHT, ALLEN, and YOUNG.

TAXONOMY OF INVERTEBRATES, OTHER THAN ARTHROPODS. *Professor* YOUNG. Arrangements may be made for the study of Protozoa, and other special groups.

ICHTHYOLOGY, HERPETOLOGY, MAMMALOLOGY, including research. *Professor* WRIGHT.

ORNITHOLOGY, including research. *Professor* ALLEN.

ZOOGEOGRAPHY. *Professor* WRIGHT.

SEMINARY IN SYSTEMATIC VERTEBRATE ZOOLOGY AND ECOLOGY. First and second terms. Credit one hour a term. Life zone plans of North America, 1817-1920. Distribution and origin of life in North America. Zoogeography of the Old World. Animal coloration, library problems, institutions of Biology and other topics to be announced. Hours to be arranged. *Professor* A. H. WRIGHT.

*EXPERIMENTAL ZOOLOGY AND PROTOZOOLOGY

RESEARCH. *Professors* REED and YOUNG.

*ECONOMIC ZOOLOGY

Professors ALLEN and WRIGHT.

ECONOMIC ORNITHOLOGY AND MAMMALOLOGY, including research. *Professor* ALLEN.

ECONOMIC ICHTHYOLOGY AND HERPETOLOGY, including research. *Professor* WRIGHT.

*ORNITHOLOGY

Professor A. A. ALLEN.

Offices, laboratories, and taxidermic room are located in McGraw Hall on the second and third floors.

Graduate students registering for either major or minor work in ornithology are required to have had the equivalent of the three undergraduate courses here listed or to take them before completing work for an advanced degree. In addition satisfactory progress, commensurate with the degree sought, must be accomplished on some piece of research by every student.

Problems may be selected in the restricted fields of taxonomy, morphology, ecology, experimental zoology, game management, or economics as applied to birds or a student may select some one bird and study it from any or all of these points of view.

Foundation courses in zoology, entomology, and botany are required of all graduate students in ornithology.

Graduate work in ornithology is intended to equip students for positions in the following fields: teachers of ornithology in universities, colleges, or normal schools; economic ornithologists with the U. S. Biological Survey or with State Conservation Departments; curators of birds in museums.

Courses:

9. GENERAL ORNITHOLOGY.

126. ADVANCED ORNITHOLOGY.

131. ECONOMIC ORNITHOLOGY AND MAMMALOLOGY.

SEMINAR IN TAXONOMY OF VERTEBRATES. Professor WRIGHT.

ENTOMOLOGY, LIMNOLOGY, ORNITHOLOGY, HERPETOLOGY,
AND ICTHYOLOGY

Professors J. G. NEEDHAM, G. W. HERRICK, O. A. JOHANNSEN, J. C. BRADLEY, R. MATHESON, C. R. CROSBY, G. C. EMBODY, E. F. PHILLIPS, P. W. CLAASSEN, A. H. WRIGHT, A. A. ALLEN, and G. F. MACLEOD.

Every facility possible in the way of material and equipment is placed at the disposal of the student desiring to investigate in the following fields: taxonomy, morphology, embryology of insects, ecology, limnology, aquiculture, parasitology, medical entomology, apiculture, economic zoology and entomology.

The laboratories are equipped with modern compound, binocular, and dissecting microscopes, microtomes and accessories, paraffine and constant temperature ovens, projection and drawing apparatus, cameras and dark rooms.

Connected with the laboratory of Insect Taxonomy are extensive collections of both indigenous and exotic insects of all orders. These have been determined by specialists and are accessible to properly prepared students for comparison. The collection includes many sets of specimens illustrative of the metamorphoses and habits of insects. There is also an extensive collection of other invertebrates, fishes, amphibia, reptiles, birds and mammals as well as more than 12,000 specimens of fixed material for developmental and structural bodies. In assembling these collections, efforts have been made to obtain material from all parts of the world illustrating biological principles.

A modern insectary is available for advanced work in the biology of insects, the rearing of parasites, and the study of aquatic insects; and also offers facilities for photographing insects and examples of their work.

A fish culture experiment station on the University farm affords exceptional opportunities for investigations in the biology of fresh water organisms.

The Cayuga basin, with its diversified topography, its extensive fauna, and its mingling of three life zones, offers unusual opportunities for ecological field work. Within the basin are three state parks and three wild life preserves, all within walking distance of the University; the former established on account of the beauty of their scenery, the latter on account of their interesting fauna and flora. There is also a woodland bird preserve in Ithaca.

The University library, together with the special libraries of the Agricultural and Medical Colleges, the Flower Library of the Veterinary College, and the Comstock Memorial Library (entomology), and the Cornell Beekeeping Library afford unusually rich resources for the investigator in any field of zoological research. They are particularly complete in the serial literature of zoology.

In order to undertake graduate study the student should not only be prepared in the fundamentals of Animal Biology but also have or acquire a foundation in the particular phase of this subject which he intends to pursue and should have a reading knowledge of French and German.

Professor Needham will devote his time during the entire growing season to the work of graduate students, mainly on field problems; and other members of the staff are prepared to direct the research work of graduate students in connection with the summer School of Biology of Cornell University.

Supplementing the major divisions of work indicated below, practice in entomological reading is given by Professor JOHANNSEN in French and in German; a course is given in the technics of the literature of entomology and zoology by Professor BRADLEY; in entomotaxy by Professor BRADLEY; and in insectary methods by Professor MATHESON.

*ENTOMOLOGY

The following undergraduate courses are accounted a part of a preparation for graduate study in entomology:

- 12. GENERAL ENTOMOLOGY.
- 15. WING VENATION AND EVOLUTION.
- 21. ELEMENTARY MORPHOLOGY OF INSECTS.
- 30a. ELEMENTARY TAXONOMY OF INSECTS.

These also are recommended for certain phases of the work:

- 11. THE ECOLOGY OF INSECTS.
- 30b. ENTOMOTAXY.
- 41. GENERAL ECONOMIC ENTOMOLOGY.
- 43. FOREST INSECTS.
- 61. GENERAL BEEKEEPING.
- 71. GENERAL LIMNOLOGY.
- 73. AQUICULTURE.
- 74. FISH CULTURE.
- 75. LABORATORY METHODS IN GENERAL BIOLOGY.

Descriptions of these courses will be found in the Announcement of the College of Agriculture.

122. INSECT MORPHOLOGY. First and second terms. Credit two hours. Prerequisite, courses 21, and 12 or 30a. Lectures, assigned reading, and reports. T Th 10. Roberts 392. Professor JOHANNSEN.

This course deals with the anatomy, histology, embryology, and post-embryonic development of insects.

124. HISTOLOGY OF INSECTS. First or second term. Credit two hours. Must be preceded or accompanied by course 122. Laboratory, two periods a week, by appointment. Roberts 391. Professor JOHANNSEN.

Technic in histological methods as applied to insects. Laboratory fee, \$3.

131. TAXONOMY OF INSECTS. This course extends through three terms, but the work of any term may be taken independently. Credit three hours. Prerequisite, courses 21, 15, and 30a. Lecture, W 10. Roberts 392. Laboratory, first term, M W; second term, W F 1:40-4. Roberts 301. Professor BRADLEY, Dr. FORBES, and Mr. PATE.

A survey of the classification of the orders of insects. For the year 1931-32, the orders to be treated are: first term, Hymenoptera, Hemiptera; second term, Orthoptera, Diptera, Minor Orders. For the year 1932-33, the orders to be treated are: first term, Coleoptera, Lepidoptera. Laboratory fee, \$4.50.

*ECONOMIC ENTOMOLOGY

241. ADVANCED ECONOMIC ENTOMOLOGY AND INSECTARY METHODS. Second term. Credit three hours. Open only to qualified seniors and graduate students. Lecture, Th 11. Roberts 392. Seminary, Th 1:40-4. Field and laboratory work by appointment. Insectary. Professor MATHESON.

Economic problems connected with applied entomology are discussed and reported on, and field observations are made. Experimental methods in breeding, photographing, investigating and controlling insects are discussed and studied. Designed for advanced students in entomology who desire to fit themselves for experiment-station work. Laboratory fee, \$2.50.

242. PRINCIPLES OF APPLIED ENTOMOLOGY. Throughout the year. Credit two hours a term. For seniors and graduate students. Prerequisite, permission to register. Conferences, M F 2-4. Professor CLAASSEN.

A conference course in problems of insect control, including research methods, planning and conducting experiments, and interpreting and presenting results. This course is given in cooperation with the entomological staff of the New York State Agricultural Experiment Station at Geneva, and the extension and research staffs of the Department of Entomology at Cornell University.

*PARASITOLOGY AND MEDICAL ENTOMOLOGY

151. PARASITES AND PARASITISM. First term. Credit two or three hours. Prerequisite, Biology 1 or Zoology 1. Lecture, T 9. Bailey Hall. Practical exercises, M or T 1:40-4, or T 10-12:30. Professor MATHESON and Mr. F. H. WILSON.

A consideration of the origin and biological significance of parasitism, and of the structure, life, and economic relations of representative parasites. A limited number of well prepared students will be permitted to take the extra hour's credit. The work will occupy one afternoon a week and will be devoted to the technique of the diagnosis of parasitic infections, preparation of material from post-mortem examinations, and advanced work in Parasitology. Laboratory fee, \$2 or \$4.

152. MEDICAL ENTOMOLOGY. Second term. Credit two or three hours. Prerequisite, Zoology 1 or Biology 1. Lecture, T 9. Bailey Hall. Practical exercises, M or T 1:40-4, or T 10-12:30. Professor MATHESON and Mr. F. H. WILSON.

This course deals with insects and other arthropods that are the causative agents of disease in man and animals, or are the vectors, or intermediate hosts, of disease-producing organisms. A limited number of well prepared students will be permitted to take the extra hour's credit. The work will occupy one afternoon a week and will consist of detailed studies of selected groups of insects in their relation to disease causation or as vectors of pathogenic organisms of animals. Laboratory fee, \$2 or \$4.

*APICULTURE

Advanced and graduate students taking courses 122 and 124, and specializing in apiculture, are permitted to use the honeybee as illustrative material in the laboratory work of these courses.

261. ADVANCED BEEKEEPING. First and second terms. Credit four hours a term. Open only to qualified seniors and graduate students. T Th 11-12:50. Dairy Building 128. Professor PHILLIPS.

A technical course covering investigations, especially those of a scientific character, in all phases of apiculture. Special consideration is given to the study of beekeeping regions, with particular reference to conditions in New York.

Designed for advanced students preparing to teach or to do research in apiculture.

262. **APICULTURAL LITERATURE AND ITS TECHNICS.** First and second terms. Credit three hours a term. Open only to qualified seniors and graduate students. Prerequisite, a reading knowledge of either French or German. T 1:40-4. Dairy Building 128. Professor PHILLIPS.

This course is planned to acquaint the student with the current technical and practical literature of beekeeping, each student being assigned certain journals for the abstracting of all important papers which they contain. Practice in the use and preparation of bibliography and abstracts, and in the preparation of technical papers for publication. Designed only for advanced students in apiculture.

GENERAL COURSES

118. **THE TECHNICS OF BIOLOGICAL LITERATURE.** First term. Credit three hours. Lectures, M F 11. Roberts 392. Library work by assignment. Professor BRADLEY.

A critical study of the biologists' works of reference. Practice in the use of generic and specific indices and of bibliographies, and in the preparation of the latter; methods of preparing technical papers for publication. This course is of a technical nature, and is intended to aid students specializing in zoology or entomology in their contact with literature.

119. **ENTOMOLOGICAL READING IN FOREIGN LANGUAGES.** French first term, German second term. Two hours a week, by appointment. Without credit. Open to advanced students in entomology who have an elementary knowledge of the languages. Professor JOHANNSEN.

*ZOOLOGY

The following undergraduate courses are prerequisite to graduate work in zoology.

8. **ELEMENTARY TAXONOMY AND NATURAL HISTORY OF VERTEBRATES.**

9. **GENERAL ORNITHOLOGY.**

Descriptions of these courses will be found in the Announcements of the College of Arts and Sciences and the College of Agriculture. Additional work in zoology is offered in the College of Arts and Sciences.

22. **ICHTHYOLOGY, ADVANCED SYSTEMATIC AND FIELD ZOOLOGY.** Throughout the year. Credit three hours a term. Professor WRIGHT and Mr. HAMILTON.

23. **HERPETOLOGY (AMPHIBIA).** First term. Credit three hours. Professor WRIGHT and Dr. HAMILTON.

24. **HERPETOLOGY (REPTILIA).** Second term. Credit three hours. See announcement for course 23. Professor WRIGHT and Dr. HAMILTON.

25. **MAMMALOLOGY.** Throughout the year. Credit three hours. Lectures, T Th 8. McGraw 7. Laboratory, F 1:40-4 or S 8-10:30. Professor WRIGHT and Dr. HAMILTON.

In the lectures, special emphasis is laid on the principal phases of animal life; the taxonomy, origin, and evolution of fossil and living groups; geographical distribution; and the literature and institutions of zoology. Laboratory periods are devoted to the identification of exotic and indigenous forms.

[126. **ADVANCED ORNITHOLOGY.** First term. Credit three hours. Prerequisite, course 8 or 9. Professor A. A. ALLEN and Messrs. KELLOGG and SAUNDERS.] Not given in 1931-32.

A consideration of the birds of the world, their structure and classification. The first part of the term is devoted to field work on the fall migration and the identification of birds in winter plumage. Laboratory fee, \$3.

131. **APPLIED ORNITHOLOGY.** First term. Credit three hours. Should be preceded by course 8 or 9, and presupposes an elementary knowledge of botany and entomology. Lecture, W 11. Laboratory and field work, M W 1:40-4 McGraw. Professor A. A. ALLEN and Messrs. KELLOGG and SAUNDERS.

This course is intended primarily for students planning professional work in

ornithology. Field collecting, preparation of specimens, and natural-history photography are emphasized, together with the food and feeding habits of birds; museum and Biological Survey methods. Laboratory fee, \$3.

RESEARCH

300. RESEARCH. Throughout the year. Prerequisite, permission to register from the professor under whom the work is to be taken. Roberts.

300a. INSECT ECOLOGY AND LIMNOLOGY. Professors NEEDHAM and CLAASSEN.

300b. INSECT MORPHOLOGY. Professor JOHANNSEN.

300c. TAXONOMY. Professors BRADLEY, NEEDHAM, JOHANNSEN and CROSBY, and Dr. FORBES.

300d. ECONOMIC ENTOMOLOGY. Professors HERRICK, MATHESON, CROSBY, PARROTT, GLASGOW, CHAPMAN, and CLAASSEN, and Assistant Professor MACLEOD.

300e. MEDICAL ENTOMOLOGY AND PARASITOLOGY. Professor MATHESON.

300f. APICULTURE. Professor PHILLIPS.

300g. AQUICULTURE. Professor EMBODY.

300h. ARACHNOLOGY. Professor CROSBY.

300i. INSECT PHYSIOLOGY. Professors PHILLIPS and MATHESON, and Assistant Professor MACLEOD.

SEMINARIES

JUGATAE. Throughout the year. M 4:10-5. Roberts 392.

The work of an entomological seminary is conducted by the Jugatae, an entomological club that meets for a discussion of the results of investigations by its members.

SEMINARY IN SYSTEMATIC VERTEBRATE ZOOLOGY. First and second terms. Hours to be arranged. Professor WRIGHT.

Life-zone plans of North America, 1817-1920. Distribution and origin of life in North America. Zoogeography of the Old World. Animal coloration. Other topics, to be announced.

SEMINARY IN INSECT PHYSIOLOGY. Throughout the year. M 6:30-8. Bailey Hall. Open to qualified graduate students. Assistant Professor MACLEOD.

*ANATOMY

Professors A. T. KERR and J. W. PAPEZ.

The laboratories for this subject are situated on the third floor of Stimson Hall and are admirably lighted and thoroughly ventilated. For gross dissection there is a large general laboratory, and adjoining the dissecting room is a smaller laboratory for special work, fitted with a hood and other facilities for digestion, maceration, corrosion, etc. In this room are also the X-ray outfit and a dark room with a fluoroscope. At the end of the main dissecting room is a large dark room with a projection outfit and facilities for drawing sections for making reconstructions. Upon this floor also is situated a dark room with a complete outfit for taking photographs of special preparations for illustrating research. In the basement is a compressed air apparatus for embalming and making special injections.

There is an abundance of anatomical material, which is embalmed and kept in cold storage so as to be ready for use when needed. The refrigerating apparatus is also used for freezing specimens for sections. In addition to the undissected material, there is an ample supply of special parts, such as bones, brains, the various abdominal and thoracic organs, special sense organs, etc.

The equipment includes microscopes, dissecting microscopes, microtomes, glassware, reagents, and other necessities of an anatomical laboratory.

In collaboration with the department of Histology and Embryology, every facility is offered for studying anatomical problems from both the gross and the developmental points of view.

In cooperation with the department of Physiology, there is suitable provision for operative and experimental work on animals.

In the library are to be found complete sets of practically all the important periodicals dealing with anatomy, and the proceedings and transactions of the learned societies. In addition, the library is well supplied with the most important anatomical monographs and books.

Graduate work in anatomy should be preceded by courses in biology, comparative and human anatomy. A reading knowledge of German and French is essential for successful research in anatomy.

ANATOMY. Dissection of the upper extremity; of the head and neck; of the thorax; of the lower extremity; of the abdominal and pelvic walls and viscera. Thoracic and abdominal viscera, section demonstrations.

CENTRAL NERVOUS SYSTEM AND ORGANS OF SPECIAL SENSE. Laboratory work on gross and microscopic preparations.

DETAILED TOPOGRAPHICAL DISSECTION AND STUDY OF ANY REGION.
RESEARCH AND ADVANCED WORK.

*HISTOLOGY AND EMBRYOLOGY

Professors B. F. KINGSBURY and H. B. ADELMANN.

The equipment for this subject comprises a supply of modern microscopes, camera lucidas, polariscopes, microspectroscopes, photomicrographic cameras, and other special apparatus, in sufficient number to give each student opportunity for learning to use them, and for applying them to any special study in which they are needed. Two projection microscopes are available for blotting paper and wax plate reconstructions. The general and research laboratories are large and are equipped with microtomes, incubators, aquaria, etc. The collection of specimens is large and constantly increasing, and comprises preserved material and embryos, as well as embryological and histological series of microscopic preparations of man, mammals, and the lower vertebrates.

In addition to the general laboratory, preparation room, and private laboratory rooms for the staff, there are for this subject a large and well-lighted advanced laboratory with three small rooms for individual workers, a photomicrographic laboratory and dark room, and a drawing and projection room. A museum of embryological models occupies the center of the advanced laboratory. The rich and varied fauna of the Cayuga Lake region affords favorable opportunity for investigation in the histology and embryology of all the main groups of vertebrates; material for the study of the development of the sheep, cow, and pig, is also available. Advanced work in histology and embryology is of necessity individual and is abundantly provided for. In addition advanced students are sometimes recommended to take some one or more of the general courses in the subject. As preliminary to graduate work, students are expected to have had the courses in the tissues and one of the following: the organs, special histology, embryology. A year's work in zoology, biology, anatomy, or physiology may with advantage precede advanced work in this subject.

107. ADVANCED HISTOLOGY AND EMBRYOLOGY. Throughout the year. Credit three hours or more a term. Prerequisite, Animal Biology 101, and 102 or 104. Professor KINGSBURY, Assistant Professor ADELMANN, and instructor. Day and hours to be arranged. Stimson 43.

Primarily for graduates. Open to undergraduates of exceptional qualifications.

115. EXPERIMENTAL EMBRYOLOGY. Second term. Credit two hours. Assistant Professor ADELMANN. Primarily for graduates and specially qualified undergraduates. The course will be conducted as a seminar. Lectures with reports by students dealing with the experimental analysis of developmental processes. Hours to be arranged. Stimson.

[120. THE THEORY OF DEVELOPMENT. First term. Credit two hours. Assistant Professor ADELMANN. Hours to be arranged. Stimson 8.

Primarily for graduates. One lecture with collateral reading and reports. A series of lectures upon some important phase of Development. Not given in 1931-32.]

108. SEMINARY. First and second terms. One hour each week. Thursday, 4:30 P. M., or time to be arranged. For the discussion of problems in the field of histology, or embryology; for the review of current literature; or for the presentation of original work by the members of the staff and those doing advanced work in the department.

Undergraduate courses 101, 102, and 104 (College of Arts and Sciences) may often be attended with advantage by graduate students. Satisfactory work in these obviates the requirement of the Qualifying Examination.

*HUMAN PHYSIOLOGY AND BIOCHEMISTRY

Professors J. B. SUMNER, H. S. LIDDELL, and J. A. DYE, and instructors.

For advanced and graduate work in experimental physiology two large laboratories and several smaller rooms are available. Laboratory A, on the first floor of Stimson Hall, is provided with electro-motor-driven shafting and Palmer recording drums of the most recent pattern, capable of giving wide ranges of speed. All necessary apparatus is available for graphic work in muscle and nerve physiology, for the investigation of problems in connection with the circulatory and respiratory systems, where objective records are desirable (for example, movements of the excised amphibian and mammalian heart), and for the experimental study of the special senses and the central nervous system. Pendulum and spring myographs are available and several forms of ergograph for the study of muscular and nervous fatigue. Each table is supplied with chronographs and time-recording tuning-forks, induction machines, keys, switches, commutators, etc. Adjoining this laboratory are two smaller rooms; one is being equipped for experimental work on animal heat and body temperature, the other contains a Ludwig kymograph with accessories, and is used primarily for experimental physiology. There is also a dark room for photographic and optical work.

Laboratory B is devoted mainly to research. The equipment includes haemomanometers and blood-pressure apparatus of the most recent type, and six large Brodie kymographs for continuous smoked paper. A time-recording clock and artificial respiration and chloroform apparatus have just been added. Plethysmographs for recording volume changes in the various bodily organs are provided and several clock driven drums are available.

In connection with this laboratory there is a workshop with a skilled mechanic who is capable of making and modifying any kind of apparatus which may be required for special research.

In the basement, on a solid concrete floor, a room has been equipped with galvanometers, capillary electrometers, shunts, rheocords, bridges, and all the other apparatus required in electrophysiology.

The biochemical laboratories on the second floor of Stimson Hall include a general laboratory, and a smaller laboratory for research, both fitted throughout with water, gas, suction pumps, and draught cupboards. Adjoining these are a room for metabolic work, a balance room, a constant temperature room, and store rooms for chemicals and apparatus.

The equipment, which is being steadily increased along many special lines, is suited to the investigation of problems connected with the chemistry and functions of the animal body, and includes, besides a stock of glass apparatus and the ordinary fittings of a chemical laboratory, several metabolism cages, large and small balances, polarimeter, large centrifuge, Buchner press, incubators, apparatus for measurement of H-ion concentration, Hilger wave lengths spectrometer, and a selection of the most important works of reference. The principal

periodicals dealing with physiology and biochemistry are also kept in the building.

Recently a field station has been added to the department within two miles of the Medical College. This consists of two fenced fields, each of about five acres of orchard and pasture land, together with barn and housing for large animals such as sheep and goats. Another fenced field of twenty acres adjacent to the station has been leased for five years and is available for pasture. On this station, which is entirely devoted to research in physiology and biochemistry, many problems are under investigation and as much of this work can be carried out by graduate students, under supervision, it may be considered as an important asset to the Graduate School.

A problem demanding original investigation is prescribed for each student, who is guided in his choice of a subject by one of the professors in charge, due consideration being given to his previous training and to the line of work in which he desires to specialize. Having selected a subject the student will be expected to concentrate his efforts upon it. While the work is done under the supervision of some one of the members of the teaching staff, and every facility provided in the way of apparatus, etc., the student is encouraged to rely on his own resources as far as possible, especially in planning and carrying out his experiments. Any special apparatus which he may require or which he may himself design, will be made for him by the laboratory mechanic. It is expected that the results of his work will be embodied in a thesis, and if this is judged to be of sufficient merit it will be published in full or in abstract in some accredited scientific journal.

The prerequisites necessary for a student intending to major in biological chemistry are inorganic chemistry, qualitative and quantitative analysis, physical chemistry, advanced organic chemistry, and physiology.

FACILITIES FOR BEHAVIOR STUDY

Cornell University offers exceptional facilities for the experimental study of behavior. The Physiological Field Station, provides accommodation for large and small animals under ideal conditions. A special laboratory with sound-proof rooms is equipped for conditioned reflex experiments and a comprehensive program of investigation has been in progress for a number of years. Provision has also been made at the Field Station for other methods of behavior study. In Stimson Hall another laboratory for the study of motor or salivary conditioned reflexes in the dog is available for advanced study and research. An extensive collection of standard physiological apparatus is also available and an instrument maker can construct equipment for special investigations.

ADVANCED WORK AND RESEARCH IN BEHAVIOR

Opportunities for experimental investigation of behavior will be available to properly qualified students. Detailed study of the experimental literature can also be pursued under supervision.

It is possible to pursue work under the personal direction of members of the Faculty during the summer.

In addition to original investigation, which may be undertaken by students who have the necessary preparation, the following systematic courses are offered to graduate students:

BIOCHEMISTRY FOR MEDICAL AND GRADUATE STUDENTS. Second term. Lecture T 8-9; W Th F S 9-10; laboratory W 10-1, Th 1-4, F 10-1, 2-5, and S 10-1. Professor SUMNER, Mr. KIRK, and assistants.

NEURO-PHYSIOLOGY. Muscle, nerve, central nervous system, and organs of special sense. Second term. Lectures and laboratory. Professor LIDDELL.

ADVANCED PHYSIOLOGY. The mechanisms of alimentation, excretion, heat regulation, and functions of the endocrine glands. First 8 weeks, second term. Lectures and laboratory, W Th F S 8; T 9-4; Th 10-1:30. Assistant Professor DYE.

PHYSIOLOGY OF RESPIRATION, VITAL DYNAMICS, CIRCULATION, AND MUSCULAR ACTIVITY. First term. Lectures, recitations, and laboratory. M W 11; M W 1:40-4. Assistant Professor DYE.

PHYSIOLOGY AND BIOPHYSICS OF RADIATION. Second term. Open to graduate students and qualified seniors. Dr. MAUGHAN. M W 2-4. Discussions and demonstrations.

EXPERIMENTAL ANALYSIS OF BEHAVIOR. First term.

This will consist of a critical review of the principal methods employed in the observation of behavior and the results obtained, preceded by a brief discussion of nerve conduction, receptors and effectors, the nature of reflex action, etc. Particular attention will be given to conditioned reflexes. Primarily for graduate students of psychology and animal biology. Seminary, T 2-5. Professor LIDDELL.

*FOOD AND NUTRITION

Professors HELEN MONSCH, ADELAIDE SPOHN, MARY HENRY, and MARION PFUND.

The laboratories for graduate work in food and nutrition are situated in the building of the College of Home Economics. Three laboratories are available for the work, an animal laboratory, adequately equipped for nutrition work with small animals, and two chemical laboratories, provided with apparatus for work in the application of chemistry to the study of food and nutrition. There is also special equipment for energy metabolism studies and a diet kitchen for use in the preparation of food for the work in human metabolism, and a nursery school for the study of feeding problems with pre-school children.

In order to take up graduate work in the chemistry of food and nutrition the student should have had the equivalent of the following courses: quantitative chemical analysis, biological chemistry, physiology or biology, nutrition and dietetics. In addition to the courses listed, a knowledge of physics and physical chemistry is highly desirable.

For Graduates and Undergraduates

131. NUTRITION OF CHILDREN. Professor MONSCH.
124. DIET IN RELATION TO THE TREATMENT OF DISEASE. Professor HENRY.
150. SPECIAL PROBLEMS. Instruction by members of the departmental staff.

Primarily for Graduates

222. FOOD AND NUTRITION. Professor ————. Advanced lecture course. First term. Primarily for graduate students but open also to seniors with the permission of the instructor. A critical study of recent advances in food and nutrition. The purpose of the course is to acquaint students with the methods and results of recent investigations in the field.

223. LABORATORY METHODS IN FOOD AND NUTRITION. Professor ————. First term. An introduction to methods in investigation in foods and nutrition.

224. HUMAN CALORIMETRY. Professor ————. Second term. Primarily for graduate students but open also to seniors with the permission of the instructor. The laboratory work in this course will consist of energy metabolism determinations using the Benedict portable metabolism apparatus. Laboratory fee, \$5.

229. RESEARCH IN FOOD AND NUTRITION. Professor ————, Professor MONSCH, Assistant Professor PFUND, and other members of the staff. This course offers opportunity for individual research in animal nutrition, human nutrition and metabolism, food chemistry, chemical changes taking place in the process of food preparation. Laboratory fee, \$25.

230. SEMINARY IN NUTRITION. Professor ————.

[231. SEMINARY IN FOOD. Assistant Professor PFUND. Not given in 1931-32.]

In place of the first two courses and the seminar in Nutrition the graduate students may substitute courses 110 and 210 respectively in Animal Husbandry as described in the Announcement of the New York State College of Agriculture at Cornell.

These courses are planned and arranged for in consultation with the student's major professor in Foods and Nutrition. Time and place of meeting will also be so arranged.

*BACTERIOLOGY

Professors J. M. SHERMAN, OTTO RAHN, C. N. STARK, and GEORGES KNAYSI.

Before taking up graduate work in bacteriology, it is desirable that the student have general chemistry, qualitative and quantitative analysis, organic chemistry, and introductory courses in the biological sciences.

Formal courses open to undergraduate and graduate students are given in the following subjects:

For Undergraduates and Graduates

1. GENERAL BACTERIOLOGY. First term. Credit six hours. Lectures, recitations, and laboratory practice, M W F 1:40-5. Dairy Building 119 and 301. Assistant Professor STARK and Mrs. STARK.

An introductory course; a general survey of the field of bacteriology, with the fundamentals essential to further work in the subject. Laboratory fee, \$10.

105. HIGHER BACTERIA AND RELATED MICROORGANISMS. First term. Credit three hours. Prerequisite, course 1. Lectures, recitations, and laboratory practice, T Th 1:40-4:30. Dairy Building 119 and 323. Dr. KNAYSI.

A study of the higher bacteria together with the yeasts and molds which are of especial importance to the bacteriologist. Laboratory fee, \$10.

106. DAIRY BACTERIOLOGY. Second term. Credit four hours. Prerequisite, course 1. Lectures, recitations, and laboratory practice, M W 1:40-5. Dairy Building 119 and 323. Professor SHERMAN and Dr. KNAYSI.

An advanced course for students in bacteriology or dairy industry. The relation of microorganisms to milk and milk products. The subject is treated from the standpoint of economic dairy bacteriology and also from the standpoint of milk hygiene and sanitary control. Laboratory fee, \$10.

210. PHYSIOLOGY OF BACTERIA. First term. Credit two hours. Prerequisite, course 1 and at least one additional course in bacteriology. Lectures, T Th 8. Dairy Building 120. Professor RAHN.

An advanced course in the physiology of bacteria and the biochemistry of microbic processes.

210a. PHYSIOLOGY OF BACTERIA, Laboratory. First term. Credit two hours. Must be preceded or accompanied by course 210. Time to be arranged. Dairy Building. Professor RAHN and Mr. WOERZ.

An advanced laboratory course dealing with the biological principles of growth, fermentation, and death of bacteria. Laboratory fee, \$10.

211. TAXONOMY OF BACTERIA. Second term. Credit two hours. Prerequisite, course 1 and at least one additional course in bacteriology. Lectures, M W 8. Dairy Building 120. Professor RAHN.

An advanced course dealing with the natural groups and variability of bacteria, with a study of the systems of nomenclature and classification.

212. BACTERIOLOGICAL LITERATURE. Throughout the year. Credit one hour a semester. For seniors and graduate students. F 8. Dairy Building 120. Professor RAHN.

Presentation and discussion of current literature in bacteriology.

213. MORPHOLOGY AND CYTOLOGY OF BACTERIA. First term. Credit one hour. For seniors and graduate students. Lecture, S 8. Dairy Building 119. Dr. KNAYSI.

The morphology, cytology, and microchemistry of microorganisms.

221. SEMINARY. Throughout the year. Without credit. Required of graduate students specializing in the department; open to undergraduate students taking advanced work. Hours to be arranged. Dairy Building. Professor SHERMAN.

For Graduates

Research problems may be selected in various phases of pure and applied bacteriology; taxonomy; physiology; technique; dairy bacteriology; food bacteriology; water and sanitary bacteriology; industrial fermentations. (For pathogenic bacteriology, see Animal Pathology and Bacteriology; for soil bacteriology, see Agronomy.)

*ANIMAL PATHOLOGY AND BACTERIOLOGY

Professors W. A. HAGAN, PETER OLAFSON, E. L. BRUNETT, and A. ZEISSIG.

The laboratories of animal pathology and bacteriology are well equipped for research in general pathological morphology, the pathology of infectious diseases and for bacteriological work, especially in connection with experimental pathology and immunology, but also with problems associated with the morphology and physiology of bacteria.

Candidates for advanced degrees electing pathology or bacteriology as their major subject must have had the corresponding general course given in this department, or its equivalent. Candidates electing a minor subject in this department may take up a research problem, if they possess sufficient preliminary training, or may pursue regular undergraduate course work, the courses taken to be subject to the approval of their committee. All graduate students electing work in this department are required to attend the seminar.

RESEARCH IN PATHOLOGY AND BACTERIOLOGY. Professors HAGAN, OLAFSON, BRUNETT, and ZEISSIG.

The following courses are open to graduate students. For a more complete list see the Announcement of the New York State Veterinary College.

38. ADVANCED WORK IN PATHOLOGY OR BACTERIOLOGY. First and second terms. Open to properly prepared students. Requirements vary according to nature of work undertaken. Ordinarily students are expected to have had at least one year's work in pathology or bacteriology. Hours to be arranged. Professors HAGAN, OLAFSON, and BRUNETT.

39. SEMINARY. First and second term. One hour. Hour to be arranged. All graduate students registered in the department are required to attend. Professors HAGAN and OLAFSON.

40. GENERAL PATHOLOGY. Second year, second term. Normal histology and one year's work in anatomy and physiology are recommended. Recitations, M 9, W 8. Professor OLAFSON.

40a. GENERAL PATHOLOGY LABORATORY. Prerequisite, normal histology. Course 40 must be taken simultaneously. Section I, W 11-1, F 10-1; Section II, T 10-1, Th 11-1. Professor OLAFSON. Laboratory fee, \$4.

43. GENERAL BACTERIOLOGY. Second year. First term. Lecture and recitation. W F 8. Professor HAGAN.

43a. GENERAL BACTERIOLOGY LABORATORY. First term. Open to students who have taken or are taking Course 6 in microscopy or its equivalent and Course 43 or its equivalent. Students outside of the College should first apply to the department before registering. Section I, M 8-10, F 9-12. Section II, W 11-1, Th 10-1. Professor HAGAN. Laboratory fee, \$10.

45. HEMATOLOGY. Optional. Second term. Hours by arrangement. Professor OLAFSON. Laboratory fee, \$2.

49. PATHOGENIC BACTERIOLOGY AND IMMUNITY. Third year, second term. Prerequisite courses 43 and 43a, or their equivalent. Lectures, W F 9. Professor HAGAN.

49b. PATHOGENIC BACTERIOLOGY LABORATORY. Prerequisite, General Bacteriology. Students must also have had or take simultaneously, Course 49. (This course is intended for students outside the veterinary college.) T 1:40-4; Th 1:40-4. Professor ZEISSIG. Laboratory fee, \$10.

(For dairy bacteriology, see Dairy Bacteriology; for soil bacteriology, see Agronomy.)

*VETERINARY PHYSIOLOGY

Professors ————— and C. E. HAYDEN.

The department has a suitable equipment for the study of physiological problems in connection with the domesticated animals. The laboratories situated in the Veterinary College are ample and are provided with modern apparatus for such research as can best be conducted in the laboratories. In the same building there is a well-assorted collection of recent books and periodicals on comparative physiology, which may be supplemented by the many works on general physiology in the University Library.

The Veterinary Experiment Station, controlled by the College, and not far distant, can be utilized for field observations and the study of those problems outside of the scope of the laboratory. This unusual combination of field and laboratory research should be conducive to important results.

As a preparation and aid in this research, attendance at the general lecture and laboratory courses in veterinary physiology is recommended.

10. THE PHYSIOLOGY OF THE NUTRITION AND SECRETION OF THE DOMESTICATED ANIMALS. The lectures of this course are devoted to the basic principles of physiology, the organs of digestion and their respective functions, the absorption and assimilation of the digested food, the sources and functions of the vitamins, the blood and lymph systems. The relation of the various systems to nutrition is stressed. First term, M W F 9. Second term, M W F 10. Auditorium, James Law Hall. Professor HAYDEN.

11. PHYSIOLOGY RECITATIONS. Recitations deal with the blood, lymph, and respiratory systems, digestion, skin, urine, endocrine organs, nutrition, animal heat, and the muscular system. First year. Second term. Section I, M 8; T 9; Th 12. Section II, M 12; T 8; W 9. Section III, W 8; Th F 9. Second floor, James Law Hall. Professor HAYDEN and Instructor SAMPSON.

12. PHYSIOLOGY RECITATIONS. Recitations deal with the nervous system, the special senses, the physiology of the processes of generation and development, growth and decay, the secretion of milk, and the chemical status of the body. Second year, first term. Section I, T 8; Th 9. Section II, T 9; Th 8. Section III, W 9; S 8. Second floor, James Law Hall. Professor HAYDEN and Instructor SAMPSON.

13. THE PHYSIOLOGY OF THE MUSCULAR AND NERVOUS SYSTEMS. Second term, second year. Lectures are given twice a week, M W 10. North lecture room, James Law Hall. Professor HAYDEN.

14. PHYSIOLOGICAL LABORATORY. A portion of the course is devoted to chemical physiology. Artificial digestive juices are tested upon the various kinds of foodstuffs by the students and careful notes kept of the various changes. Bile and blood are also studied. A portion of the work is devoted to a study of the phenomena associated with the circulatory, respiratory, muscular, and nervous systems. Students are required to obtain and preserve graphic records of these phenomena, whenever possible. Certain experiments requiring special apparatus and special care are performed as demonstrations by the instructors, with the assistance of the students when possible. First term, second year. Five hours a week. M 11-1, T 10-1, W 11-1 and Th 10-1. Second floor, James Law Hall. Professor HAYDEN and Instructor SAMPSON. Laboratory fee, \$7.50.

15. URINE ANALYSIS. Laboratory work devoted to the comparative study of urine. Examinations are made of human urine and that of the domesticated animals, especially the horse. In addition to the chemical examination some at-

tention will be devoted to a microscopic study of urinary deposits. Third year, second term. Three hours a week, F 10-1; or S 10-1. Second floor, James Law Hall. Professor HAYDEN and Instructor SAMPSON. Laboratory fee, \$4.50.

16. **ADVANCED PHYSIOLOGY.** This course will be adapted to the needs of the students and will consist principally of laboratory work supplemented by such reading and reports as may be necessary. Five or more hours a week. Professor HAYDEN and Instructor SAMPSON.

***VETERINARY MEDICINE, AMBULATORY CLINIC, AND OBSTETRICS
INCLUDING DISEASES OF THE GENITAL ORGANS**

Professor D. H. UDALL, Doctors M. G. FINCHER, W. J. GIBBONS, and S. D. JOHNSON.

Opportunity for the clinical study of internal diseases of animals is afforded by material in the ambulatory clinic. This clinic has gradually developed until it demands a large part of the time of two clinicians. Especially abundant are affections of dairy animals. Students are required to report their observations. Files of notes on completed cases are available for additional information. Special and research students will be given individual instruction to meet their requirements, and may supplement their clinical experience with further study in the various laboratories and museums of the College.

***DISEASES OF BREEDING CATTLE**

Professors R. R. BIRCH and H. L. GILMAN.

The department has available for research in connection with the diseases of cattle a herd with a complete history of each animal. There is also an extensive collection of material illustrating various morbid conditions of the genital organs of cattle. Ample facilities are at hand for the study of the clinical and bacteriological aspects of this group of diseases.

Extensive researches are being conducted on the diseases of the genital organs of cattle, with special reference to abortion, sterility, and kindred phenomena.

***VETERINARY PHARMACOLOGY AND DISEASES OF SMALL ANIMALS**

Professors H. J. MILKS and H. C. STEPHENSON.

The laboratories of the department are well equipped for research in veterinary pharmacology. The clinic supplies abundant material for research both in external and internal diseases of small animals.

There is an operating room with modern equipment and facilities for handling approximately sixty animals. The library facilities are good.

***VETERINARY SURGERY**

Professor J. N. FROST.

The laboratory in surgery is well equipped for research and special study along surgical lines especially in connection with diseases of bones, tendons, and tendon sheaths.

Candidates for advanced degrees should have as preliminary preparation, general pathology, physiology, general and special surgery.

SPECIAL SURGERY. Professor FROST.

RESEARCH IN SURGICAL DISEASES. Professor FROST.

THE AGRICULTURAL SCIENCES

***AGRONOMY**

Professors T. L. LYON, J. A. BIZZELL, H. O. BUCKMAN, J. K. WILSON, L. G. ROMELL, and B. D. WILSON.

Special laboratories are provided for graduate students; they are equipped for chemical and bacteriological investigations of soils and of crop production. Greenhouses provide opportunity for conducting crop and soil tests during the

winter, and for experiments with nutrient solutions and sand cultures. A field for plant experiments gives ample facility for work on a larger scale. In this field a series of lysimeters, each holding between three and four tons of soil have been built. Pipes from these tanks carry the drainage water into a tunnel where it is collected for measurement and analysis. These varied and extensive facilities afford opportunity for students trained in any one or more of the several sciences to investigate soil or plant nutrition problems.

A complete set of the soil maps of the United States is arranged in form for ready reference. The University Library is well supplied with the publications in which the literature of soil science is to be found.

A graduate student who desires to make agronomy his major subject should have had sufficient training in analytical chemistry and in bacteriology to give him a command of the technique as well as the principles of the subject. It is also desirable that he should have had enough technical agriculture to enable him to see the agricultural bearing of the work.

SEMINARY. Members of the department.

*AGRICULTURAL SOILS

Primarily for Graduates

SOILS, ADVANCED COURSE. Professor BIZZELL. First term. Students must consult Professor Bizzell before registering for the course. An advanced course designed particularly for students specializing in soil technology. The lectures deal with the important properties of soils from the theoretical and technical standpoints. Review of the literature and preparation of papers are important parts of the work.

SOILS, ADVANCED LABORATORY COURSE. Professor BIZZELL. First term. A course designed primarily for special training in methods used in soil investigation.

SOIL BACTERIOLOGY. Professor J. K. WILSON. Second term. A course in biological soil processes designed primarily for graduate students. The laboratory work will be supplemented by reports and by abstracts of important papers on the subject. Laboratory fee, \$5.

RESEARCH. Professors LYON, BIZZELL, BUCKMAN, and J. K. WILSON, and Assistant Professor B. D. WILSON.

*FOREST SOILS

RESEARCH. Professor ROMELL.

*FLORICULTURE AND ORNAMENTAL HORTICULTURE

Professors E. A. WHITE, R. W. CURTIS, J. P. PORTER, and C. J. HUNN.

The field of investigation and research in floriculture and ornamental horticulture is a broad one, and there are excellent opportunities for original work in these subjects. Studies in variation, nutrition, or in regard to the culture and improvement of plants may be undertaken. Monographic studies on the various genera of ornamentals offer an important field of research. Summer work is of special importance in studying plant materials, and it is desirable that candidates for the Master's degree spend at least one summer at the University. This is required of all candidates for the Doctor's degree.

Every candidate for an advanced degree must have had a thorough training in general biology, botany, economic entomology, soils, fertilizers, and genetics. A student who takes his major subject in the department must already have had the courses noted below or their equivalent, excepting only the advanced courses. A student who takes his minor subject for the Master's degree in this department of study may register for these courses. Each student is required to deposit a typewritten copy of his thesis with the department.

In addition to the classroom and laboratory equipment, a range of greenhouses, aggregating sixteen thousand square feet of glass, is now available for instructional purposes. The department has about thirty acres of land devoted to nurseries of ornamental plants and to field experiments with peonies, gladioli, irises, roses, asters, and other perennial plants. This area also furnishes material for laboratory exercises.

The library equipment consists of a large and steadily increasing collection of works of reference, comprising a number of the rarer books of the ancients, and an unusually full assortment of the garden herbals of the sixteenth, seventeenth, and eighteenth centuries, and the leading monographs and manuals of modern times, supplemented by complete sets of a large number of the horticultural journals of Europe and America. The largest bound collection of seed, plant, and nursery catalogues in the United States is in the library of the department. This collection is very useful to students monographing horticultural plants. Students have access to an herbarium comprising about thirteen thousand cultivated plants.

The University campus affords an excellent collection of woody plants in mature condition, and an arboretum is rapidly being developed which exhibits all the useful plant forms in arrangement for type study and also in their grouping for various uses.

Graduate students who have been trained in general horticulture and who have not had specialized courses in Floriculture and Ornamental Horticulture may be required to take certain undergraduate courses.

*FORESTRY

Professors R. S. HOSMER, S. N. SPRING, A. B. RECKNAGEL, JOHN BENTLEY, jr., C. H. GUISE, J. N. SPAETH (Absent on leave), and L. G. ROMELL.

Students who wish to do graduate work in forestry, either for a Master's degree or for a Doctor's degree, are offered opportunity for advanced study or research in silviculture, forest management, forest policy, forest protection, and forest utilization.

The Matthias H. Arnot Forest of 1850 acres, located 20 miles south of Ithaca, recently conveyed to Cornell University for the use of the Department of Forestry, offers exceptional opportunities for graduate work in Forestry. The Arnot Forest is, over the greater part of its area, made up of second growth hardwoods, and hemlock.

Candidates for the Master's degree register for one major and one minor subject and pursue either advanced study or research along these lines. This year is normally devoted to individual work done under the direction of a member of the Forestry Staff, not to undergraduate class work taken by graduate students, although in special cases a part of the student's time may be so spent.

Candidates for the degree of Master in Forestry must show adequate preparation in the following fundamental subjects or their equivalents: English, inorganic chemistry, solid geometry, trigonometry, plain and topographic surveying, introductory physics, dynamic geology, general botany, plant physiology, general biology, zoology, general entomology, economics. They must also have satisfactorily completed forestry courses the equivalent of those offered in the four-year undergraduate course in the Department of Forestry, New York State College of Agriculture, leading to the degree of Bachelor of Science. (See the Announcement of the New York State College of Agriculture at Cornell University.) In addition they must have had at least three months' experience in forestry work, satisfactory proof of which is to be a signed statement, or an examination in woodsmanship, or both. 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 satisfactory training in fundamental sciences. If they lack this, it will require a correspond-

ingly longer time to get the Master's degree. Prospective students should write to the Department of Forestry for information regarding the special lines of graduate work which they desire to follow.

A student entering the Graduate School as a candidate for the degree of Master in Forestry should enter at the beginning of the first (autumn) term. Otherwise it will be difficult to arrange his work satisfactorily. The student will be advised whether he should attend the forestry summer camp.

In connection with the recently established Professorship in Forest Soils, excellent opportunity is available for research work in this subject. Students interested in graduate work in the field of forest soils, should consult the Department of Agronomy.

Advanced Work and Research

Advanced work and research may be done in the following sub-fields:

*SILVICULTURE. Professors SPRING and BENTLEY.

*FOREST MANAGEMENT. Professor RECKNAGEL, Professor BENTLEY, and Assistant Professor GUISE.

*FOREST POLICY. Professor HOSMER.

*FOREST PROTECTION. Professor HOSMER.

*FOREST UTILIZATION. Professor RECKNAGEL, Professor BENTLEY, and Assistant Professor GUISE.

Graduate Courses

ADVANCED FOREST MANAGEMENT. Professor RECKNAGEL and Assistant Professor GUISE. Advanced work in organizing a forest property for management. An important part is the critical study of working plans.

FOREST FINANCE. Assistant Professor GUISE. Economics of Forest Finance, including the problems of compound interest; costs of growing and holding timber; valuation of forests devoted to sustained yield; stumpage appraisal; appraisal of damages to forest property; financial aspects of taxation of forests, and insurance of standing timber.

SEMINARY. Field and classroom conferences on important phases of forestry. Conducted by members of the forestry staff.

*POMOLOGY

Professors A. J. HEINICKE, L. H. MACDANIELS, D. B. CARRICK, G. W. PECK, and JOSEPH OSKAMP.

The large experimental and varietal orchards of different fruits at Ithaca and at Geneva are available for graduate use. Representative varieties of all domesticated species that grow in this climate may be found in these orchards. Each year a large collection of exotic fruit is brought together at the College; herbarium and preserved material is also available. Modern apparatus for research work on pomological problems involving chemical, histological and physiological technique is available in the departmental laboratories. Special opportunity for investigation of fruit storage problems is afforded by a modern cold storage plant which is equipped for experimental purposes. The important pomological literature required for research is found in the libraries at Cornell and at the State Station.

In order to enter upon graduate work in Pomology, the student should have the equivalent of the following courses: General Botany, Elementary Plant Physiology, Economic Entomology, Elementary Plant Pathology, Introductory Inorganic and Elementary Organic Chemistry, Elementary Pomology and Systematic Pomology. In addition, students are required as part of their graduate work in Pomology to take advanced courses in Plant Physiology and Chemistry, unless minors are chosen in those subjects. They are urged, however, to choose a minor in some phase of Botany, particularly Plant Physiology.

On account of the nature of the work, it is very desirable that graduates studying for the Master's degree should spend one summer at Ithaca or in the field investigating their special subject. This is expected of graduates working for a Doctor's degree.

121. ECONOMIC FRUITS OF THE WORLD. First term. Given in alternate years. Lectures, T Th 11. Plant Science 107. Laboratory, W 1:40-4. Professor MACDANIELS. A study of all species of fruit-bearing plants of economic importance not considered in previous courses, such as the date, the banana, citrus fruits, nut-bearing trees, and newly introduced fruits, with special reference to their cultural requirements in the United States and its insular possessions. Emphasis is placed on botanical relationships and fruit structure.

131. ADVANCED POMOLOGY. First term. Discussion, M W F 9. Plant Science 141. Professor HEINICKE. A systematic study of the sources of knowledge and opinion as to practices in pomology; methods and difficulties in experimental work in pomology, and results of experiments that have been concluded or are being conducted.

202. SPECIAL TOPICS IN POMOLOGY. Throughout the year. Conference periods to be arranged. Plant Science 141. Professor HEINICKE, Professor CARRICK, or Professor MACDANIELS.

Different topics will be considered each term, the aim being to cover the entire field in two years. In this course the student is expected to review critically and evaluate the more important original papers relating to pomological practice and research. Interpretation of the literature will be made on the basis of the fundamental principles of plant biology and recent experimental methods.

201. RESEARCH PROBLEMS IN POMOLOGY. First and second terms. Plant Science 135. Varietal, taxonomic, histological and morphological, Professor MACDANIELS; nutritional, Professor HEINICKE; winter injury of fruit tree tissues, and cold storage of fruits, Professor CARRICK; various phases of general fruit culture, members of the staff.

200. SEMINARY. Members of the staff. First and second terms. M 11. Plant Science 141.

*VEGETABLE CROPS

Professors H. C. THOMPSON, PAUL WORK, E. V. HARDENBURG, J. E. KNOTT, and ORA SMITH.

Opportunity is offered for research in such lines of vegetable growing and handling as the student may select. There are excellent opportunities for original work in this subject.

The facilities available include the regular classrooms and laboratories; research laboratories, with the necessary equipment for chemical and physiological work; cold storage and common storage rooms; greenhouse space of approximately 7,500 square feet; hotbeds and cold frames, and about 15 acres of land devoted to teaching and research work. Special equipment is obtained as needed for students majoring in this field.

In order to enter upon graduate work in this field, the student should have the equivalent of the following courses: Botany 1 and 31, Plant Pathology 1, Entomology 12, Agronomy 1, Vegetable Crops 1, 2, 11, and 12. These courses are outlined in the Announcement of the College of Agriculture. In case a student has not had all of these courses, he should take them early in his period of graduate study. Students taking either a major or a minor in vegetable crops are required to take the course in Types and Varieties of Vegetables and the course in Advanced Vegetable Crops, and to attend the seminar.

Students majoring in vegetable crops will ordinarily find it necessary to spend one summer in Ithaca, in order to grow and study plant materials used in their research work.

11. VEGETABLE FORCING. Second term. Credit three hours. Prerequisite, course 1. Lectures, W F 8. East Roberts. Laboratory, W 1:40-4. Vegetable Greenhouses. Professor WORK.

Growing vegetables under glass; greenhouses for vegetables; management problems; the greenhouse crops, their requirements and culture. Laboratory work consists chiefly of practical exercises in crop production. A one- or two-day excursion to Rochester to visit greenhouses is required; approximate cost, \$9. Laboratory fee, \$2.

12. GRADING AND HANDLING VEGETABLE CROPS. First term. Credit three hours. Lectures, T Th 10. East Roberts. Laboratory, T or Th 1:40-4. Professor WORK.

Geography of vegetable production and distribution. Factors of environment, culture, and handling as affecting quality, condition, and marketing of vegetable crops. Harvesting, grades and grading, packing, shipping-point and terminal market inspection, transportation, refrigeration, and storage are discussed with reference to the various crops. A two-day trip is required; approximate cost, \$10. Laboratory fee, \$2.

13. TYPES AND VARIETIES OF VEGETABLES. First term. Credit three hours. Prerequisite, course 1. Lecture, T 8. East Roberts. Laboratory, W 1:40-4. East Ithaca Gardens. One week of laboratory work precedes beginning of regular instruction, Sept. 24-30, 1931. Professor WORK.

Taxonomy, origin, history, characteristics, adaptation, identification, classification, exhibition, and judging, of kinds and varieties of vegetables. Characteristics, production, and handling of vegetable seeds. The leading varieties of the vegetable crops are grown each year. Laboratory fee, \$2.

101. ADVANCED VEGETABLE CROPS. Second term. Credit three hours. Lectures, M W F 9. East Roberts. Professor THOMPSON.

This course is devoted to a systematic study of the sources of knowledge and opinions as to practices in vegetable production and handling. Results of experiments that have been concluded or are being conducted are studied and their application to the solution of practical problems are discussed.

221. RESEARCH. Members of the staff are prepared to direct investigations in the various lines of vegetable production and handling.

222. SEMINARY. Professors THOMPSON, WORK, HARDENBURG, KNOTT, and SMITH. Recent literature is taken up for general study and discussion. All graduate students in vegetable crops are required to take part in this seminary. Time to be arranged. East Roberts.

*ANIMAL HUSBANDRY

Professors F. B. MORRISON, M. W. HARPER, E. S. SAVAGE, L. A. MAYNARD, R. B. HINMAN, C. M. McCAY, and S. A. ASDELL.

Among the herds and flocks belonging to the College of Agriculture are a dairy herd of one hundred cows, a herd of beef cattle, studs of draft horses, a flock of about 150 sheep, and a herd of breeding swine. The equipment for animal husbandry includes a very full collection of the herd and flock registries of all the breeds of domestic animals kept in this country, amounting to more than one thousand volumes, and affording excellent facilities in heredity and genetics.

The animals of the herds and flocks and their records provide opportunity for studying problems of nutrition, breeding, and production.

Colonies of white rats and rabbits are available for research in the principles of animal nutrition and animal genetics.

Laboratories are provided adequately equipped for the study of the chemistry and physiology of nutrition, the chemistry of feeding stuffs and of animal products, and the histology of animal tissue. Slaughter and meat laboratories are available for the study of the relation of breeding and nutrition to anatomical structure and to chemical composition and food value. The college animals are available for studies relating to production and the processing, sale, grading, and measuring of their various products such as milk, meat, and horse power including animal mechanics.

Graduate students may elect animal husbandry as the major field and select a problem dealing with the breeding, feeding or management of one of the classes of farm animals or they may elect animal breeding or animal nutrition or some branch of production as a major or minor.

SEMINARY. Members of the staff.

RESEARCH.

*ANIMAL BREEDING

Professors HARPER and HINMAN.

In order to enter upon graduate study in animal breeding the student should have had the equivalent of the following courses. Elementary human or veterinary physiology, elementary biology, elementary genetics, principles of animal feeding and breeding, and production courses in dairy and beef cattle, horses, sheep and swine.

PROBLEMS IN ANIMAL GENETICS. Professor HARPER.

SPECIAL TOPICS IN ANIMAL BREEDING. Professors HARPER and HINMAN.

RESEARCH.

*ANIMAL NUTRITION

Professors MAYNARD, McCAY, MORRISON, and SAVAGE.

In order to enter upon graduate work in animal nutrition the student should have had the equivalent of the following courses: introductory inorganic chemistry, elementary organic chemistry, introductory physics, elementary zoology or biology, elementary human or veterinary physiology, an introductory course in the feeding of animals and an introductory course in animal breeding or genetics.

ANIMAL NUTRITION. Professors MAYNARD and McCAY.

SPECIAL TOPICS IN ANIMAL NUTRITION. Professors MAYNARD, McCAY, and ASDELL.

RESEARCH.

*ANIMAL PRODUCTION

Professors MORRISON, HARPER, HINMAN, and SAVAGE.

In order to enter upon graduate study in animal production, the student should have the equivalent of the following courses. Elementary feeds and feeding, elementary breeding and the elementary production courses in dairy and beef cattle, horses, sheep, and swine.

SPECIAL TOPICS IN ANIMAL PRODUCTION. Professors MORRISON, HARPER, HINMAN, and SAVAGE.

RESEARCH.

*DAIRY INDUSTRY

Professors J. M. SHERMAN, H. E. ROSS, H. C. TROY, P. F. SHARP, E. S. GUTHRIE, and W. E. AYRES.

The laboratories of the department are well equipped for special work and offer excellent opportunities to graduate students for research.

Before taking up graduate work in dairy industry, it is desirable that the student have general chemistry, qualitative and quantitative analysis, organic chemistry, and general bacteriology, in addition to the elementary courses in the particular field in which he wishes to do his graduate work.

Formal courses open to undergraduate and graduate students are given in the following subjects:

For Undergraduates and Graduates

101. ANALYSIS AND CONTROL OF DAIRY PRODUCTS. Second term. Credit three hours. Lecture and laboratory practice, T 1-6. Dairy Building 218. Professor TROY and Mr. HERRINGTON.

The application of chemical methods to commercial dairy practice; analysis by standard chemical and factory methods; standardization and composition control; tests for adulterants and preservatives. Laboratory fee, \$5.

102. MARKET MILK AND MILK INSPECTION. Second term. Credit three hours. Must be preceded or accompanied by course 1, should be preceded or accompanied by Bacteriology 1 or its equivalent. Lecture and laboratory practice, W 1-6. Dairy Building 218 and 146. Professor ROSS.

Attention is given to the production and control of market milk, with special reference to its improvement; milk as food; shipping stations; transportation and sale; pasteurizing; standardizing; clarification; certified milk; milk laws; commercial buttermilk; methods of cooling; harvesting and storage of ice; duties of milk inspectors; apparatus and buildings. The practice includes visits to dairies in the vicinity of Ithaca. A required two-day inspection trip in the neighboring counties may be arranged. Laboratory fee, \$5.

103. MILK-PRODUCTS MANUFACTURING. First term. Credit five hours. Prerequisite, course 1. Lectures, recitations, and laboratory practice, T Th 1-6. Dairy Building 120. Professor GUTHRIE and Assistant Professor AYRES.

The principles and practice of making butter, cheese, and casein, including a study of the physical, chemical, and biological factors involved. Consideration is given also to commercial operations and dairy-plant management. Laboratory fee, \$5.

104. MILK PRODUCTS MANUFACTURING. Second term. Credit five hours. Prerequisite, course 1; should be preceded or accompanied by course 101. Lectures, recitations, and laboratory practice, F 1-6, S 8-1. Dairy Building 120. Assistant Professor AYRES.

The principles and practice of making condensed and evaporated milk, milk powders, ice cream, and by-products, including a study of the physical, chemical, and biological factors involved. Laboratory fee, \$5.

105. DAIRY CHEMISTRY. First term. Credit two hours. Prerequisite, qualitative and quantitative analysis and organic chemistry. Lectures, M W 8. Dairy Building 119. Professor P. F. SHARP.

A consideration of milk and dairy products from the physico-chemical point of view.

DAIRY BACTERIOLOGY. (See Bacteriology 106.)

200. MILK PRODUCTS. Throughout the year. Credit two hours each term. Must be preceded or accompanied by course 105. Lectures, T Th 8. Dairy Building 218. Professor P. F. SHARP.

An advanced consideration of the scientific and technical aspects of milk products.

202. SEMINARY. Throughout the year. Without credit. Required of graduate students specializing in the department; open to undergraduate students taking advanced work. Hours to be arranged. Dairy Building. Professor SHERMAN.

For Graduates

Graduate students may elect research problems in any of the various fields of dairy industry: the analysis of milk and its products; the sanitary production and control of market milk; the manufacture and technology of milk products; dairy chemistry.

*POULTRY HUSBANDRY

Professors J. E. RICE, G. F. HEUSER, H. E. BOTSFORD, L. C. NORRIS, and G. O. HALL; Doctors J. C. HUTTAR and A. L. ROMANOFF.

This department of study is well equipped with facilities for carrying on advanced work. The equipment includes special appliances and a flock of over 2,000 fowls with which to conduct investigations in feeding, breeding, housing,

incubation, marketing, and artificial illumination. Laboratories provide means for doing the anatomical and analytical work required in poultry experiments.

The University Library, the library of the College of Agriculture, the Poultry Department Library and other departmental libraries offer very excellent and complete collections of references, including books, bulletins and periodicals.

The Poultry Husbandry Building and auxiliary buildings and Poultry Experimental Farm furnish facilities for graduate work along many lines of instruction and research.

Owing to the fact that many colleges do not give the undergraduate courses in poultry husbandry which are prerequisite to graduate work in the subject, students coming from other institutions cannot in all cases enter immediately upon graduate study. Many students will find it necessary or desirable to spend a year in preliminary study taking undergraduate courses before beginning graduate work. The preliminary courses include Poultry Nutrition; Poultry Incubation and Brooding; the Breeds of Poultry and Judging; Poultry Breeding; Poultry House Design and Construction; Marketing Poultry Products; Poultry Farm Management; the Field of Poultry Husbandry.

Instruction of an advanced nature and investigation may be taken along the lines of poultry nutrition, illumination, poultry farm management, house construction, breeding, experimental embryology in relation to the artificial incubation, and marketing; in co-operation with the Staff of the Veterinary College, in poultry disease investigations; and in co-operation with the staff in histology and embryology, in incubation experiments.

Primarily for Graduates

SEMINARY. Professors RICE, HEUSER, and BOTSFORD; Assistant Professors NORRIS and HALL.

RESEARCH. Professors RICE, HEUSER, and BOTSFORD; Assistant Professors NORRIS and HALL; *Doctors* HUTTAR and ROMANOFF.

ADVANCED POULTRY NUTRITION. Professor HEUSER and Assistant Professor NORRIS.

ADVANCED POULTRY MARKETING. Dr. HUTTAR.

COURSES

2. POULTRY NUTRITION. Second term. Credit three hours. Not open to freshmen. Lectures, T Th 9. Practice, Th 1:40-4. Poultry Building 325. Professor HEUSER and Research Assistant Professor NORRIS.

The principles of poultry nutrition, including: methods of feeding for egg production, rearing, and fattening; the study of feeds suitable for poultry; the compounding of rations; and practice in poultry-feeding management.

102. ADVANCED POULTRY NUTRITION. First and second terms. Credit one hour a term. For seniors taking course 141 and graduate students. Prerequisite, course 2. Registration by appointment only. Weekly discussion, time to be arranged. Poultry Building 325. Professor HEUSER and Research Assistant Professor NORRIS.

A study of experimental methods involved in conducting research projects in poultry nutrition, together with a critical review of current literature about poultry nutrition and allied subjects.

3. POULTRY INCUBATION AND BROODING. Second term. Credit three hours. Lecture, F 11. Practice, F 1:40-4; also reporting three times daily, including Sunday, for approximately six weeks, hours to be arranged by appointment. Poultry Building 325. Mr. ———.

Principles and practice of incubation and brooding. Daily practice for three weeks in operating incubators and for three weeks in the management of a brooder and a flock of chickens,

11. THE BREEDS OF POULTRY, AND JUDGING. First term. Credit two hours. Lecture or recitation, F 11. Poultry Building 325. Practice, Th or F 1:40-4. Breed Observation House. Assistant Professor HALL.

The origin, history and classification of breeds of domestic poultry; judging the principal breeds for fancy and production points by score-card and comparison methods; fitting fowls for exhibition. A required trip is made to one of the leading poultry shows the second or third week of January.

12. POULTRY BREEDING. Second term. Credit two hours. Prerequisite, course 11. Lecture or recitation, M 11. Poultry Building 375. Practice, M 1:40-4. Poultry Building 325. Assistant Professor HALL.

The principles and practices of poultry breeding. Trips to near-by farms are made.

31. MARKETING POULTRY PRODUCTS. First term. Credit three hours. Lecture or recitation, M W 11. Poultry Building 325. Practice, M or T 1:40-4. Poultry Building 100. Dr. HUTTAR.

Preparation of poultry and eggs for market, and study of marketing problems. A weekly market news letter is prepared by students in the class. A class trip to New York City markets is required of all students. A three-day study of marketing in all its phases is made on this trip, which immediately follows the Christmas recess. The total necessary expense is about \$35.

31a. ADVANCED POULTRY MARKETING. Second term. Credit two hours. Prerequisite, course 31. Recitations, T Th 11. Poultry Building 325. Dr. HUTTAR.

An analysis of market reports is taken up in this course. Further studies in statistical information bearing upon better and more intelligent marketing of poultry products are made, and the preparation of the weekly market letter is continued.

135. POULTRY MANAGEMENT AND HOUSING. Second term. Credit four hours. Prerequisite, eight hours credit in poultry courses, and accompanying registration in six hours more of poultry courses. Lectures, T Th S 10. Laboratory, W 1:40-4. Poultry Building 375. Professor RICE and Extension Professor BOTSFORD.

The principles of farm management as applied to poultry farming. Selection of the farm, consideration of the construction, design, and arrangement of buildings, and a study of the principles of poultry-house construction. The farm layout, and a study of farm records.

141. RESEARCH. First or second term, or throughout the year. Credit one or more hours a term. Prerequisite, permission to register. Time arranged by appointment. Poultry Building. Members of the departmental staff.

An original investigation of a problem in poultry husbandry, to be presented as a written thesis. Frequent conferences are required of all students electing this course.

242. SEMINARY. Throughout the year. Required of all graduate students in poultry husbandry and of seniors taking course 141. Time to be arranged. Poultry Building 325. Members of the departmental staff.

A discussion of advanced work in poultry husbandry.

THE NEW YORK STATE AGRICULTURAL EXPERIMENT STATION AT GENEVA

Professors R. S. BREED, D. C. CARPENTER, R. C. COLLISON, H. J. CONN, A. C. DAHLBERG, H. GLASGOW, G. J. HUCKER, J. G. HORSFALL, M. T. MUNN, W. T. TAPLEY, P. J. PARROTT, C. S. PEDERSON, W. H. RANKIN, F. C. STEWART, H. B. TUKEY, C. B. SAYRE, L. R. STREETER, G. P. VAN ESELTINE, RICHARD WELLINGTON.

Since July 1, 1923, the State Agricultural Experiment Station at Geneva has been under the administration of Cornell University, the research workers of its staff are eligible to membership on the faculty of the Graduate School, and its facilities for research are available to graduate students.

The Station has a farm of approximately two hundred acres which is used almost exclusively for field experimental work with fruit and vegetable crops and certain special soil studies. It has laboratory buildings devoted exclusively to research in agricultural bacteriology, agricultural chemistry, agricultural botany, dairying, economic entomology, pomology, and vegetable crops. It has also a research reference library, permanent exhibits and records of progress of its research, suitable conference rooms, and adequate facilities for publication and distribution of results of station work.

Certain phases of the investigations now being conducted at the Station and other problems for which the facilities of the Station are suitable may be used as thesis problems by graduate students.

There is opportunity at the Station for graduate research in the following lines, under the direction of members of the staff as indicated:

AGRICULTURAL BACTERIOLOGY

DAIRY BACTERIOLOGY. Professors BREED and HUCKER.

SOIL BACTERIOLOGY. Professor CONN.

BIOLOGICAL STAINS. Professor CONN.

FERMENTATION BACTERIOLOGY. Professors BREED and PEDERSON.

SYSTEMATIC BACTERIOLOGY. Professor BREED.

AGRICULTURAL CHEMISTRY

CHEMISTRY OF MILK AND ITS PRODUCTS. Professor CARPENTER.

CHEMISTRY OF PLANT TISSUES. Professor CARPENTER.

CHEMISTRY OF INSECTICIDES AND FUNGICIDES. Professor STREETER.

AGRICULTURAL BOTANY

PLANT DISEASE. Professors STEWART, RANKIN, and HORSFALL.

SEED CONTROL AND IMPROVEMENT. Professor MUNN.

DAIRYING

DAIRY PRODUCTS. Professor DAHLBERG.

ECONOMIC ENTOMOLOGY

ORCHARD INSECTS. Professors PARROTT and GLASGOW.

CANNING CROPS INSECTS. Professor GLASGOW.

POMOLOGY

GENETICS OF FRUIT BREEDING. Professor WELLINGTON.

FRUIT PROPAGATION AND MANAGEMENT. Professor TUKEY.

SYSTEMATIC BOTANY OF HORTICULTURAL PLANTS. Professor VAN ESELTINE.

VEGETABLE CROPS. Professors SAYRE and TAPLEY.

THE MEDICAL SCIENCES

AS PRESENTED IN THE MEDICAL COLLEGE IN NEW YORK CITY

For a full description of the work in the Medical College in Ithaca and in New York City, see the Announcement of the Medical College. Students desiring to enter the Graduate School for work in the medical sciences can obtain application blanks at the office of the Dean of the Medical College. Professor C. R. STOCKARD, Chairman of the Group, may be consulted for additional information.

The Medical College in New York City comprises the main building on First Avenue opposite Bellevue Hospital and the adjacent Loomis Laboratory on Twenty-sixth Street.

THE MAIN BUILDING occupies the entire block between Twenty-seventh and Twenty-eighth Streets, on First Avenue, extending back one hundred feet, thus

affording an available space nearly 20,000 square feet on each of its seven floors. The Department of Anatomy occupies the entire fifth floor. In addition to a commodious and well lighted dissecting room there are numerous smaller rooms for investigation and research in anatomy, histology and embryology, preparation rooms, storage rooms, etc. The fourth floor is devoted entirely to pathology, bacteriology, and the College Library. There are several rooms for investigators and assistants, preparation rooms, classrooms, a teaching museum, and a library containing current numbers and many back files of the important journals devoted to medical sciences, in English, French, and German. The facilities offered by the departmental libraries in the medical school are readily amplified by use of the various libraries in New York City, several of which are within easy reach of the college buildings. Among these the library of the New York Academy of Medicine, the second largest medical library in the country, is worthy of special mention. The departments of Physiology and Chemistry occupy the third floor of the Main Building and are equipped with laboratories devoted to the problems of research, in addition to those used by students in the course leading to the M. D. degree. Organic chemistry, physiological chemistry, and chemical pathology are thus especially provided for. One large room is set aside for calorimetry and another has been equipped as an operating room in connection with the work in experimental physiology. The lower floors of the Main Building contain the college offices, the dispensary, lecture rooms, classrooms, and a power plant.

THE LOOMIS LABORATORY, besides the pharmacological laboratories for medical students, contains laboratories for research in bacteriology, hygiene, physiological chemistry, experimental medicine, and pharmacology. Facilities are thus furnished to graduates who may desire to pursue further study or research in the various departments of laboratory investigation. The second floor of this laboratory is devoted entirely to pharmacology and its allied sciences; the first and third floors provide accommodations for the Department of Experimental Medicine with research laboratories for physiological chemistry and chemical pathology. The fourth and fifth floors are devoted to research in public health, hygiene, and experimental surgery; they also provide ample accommodations for photomicrography.

BELLEVUE HOSPITAL, whose gates open directly opposite the college buildings, furnishes ample opportunity for extending the problems of the laboratory to the bedside, besides offering many intricate problems for solution in the laboratory. The Hospital is organized in four divisions, one of which has, by the Trustees of the Hospital, been placed at the disposal of the Faculty of the Cornell University Medical College for medical research and instruction. The services thus intrusted to the College include, continuously, ninety medical beds, ninety surgical beds, sixty beds to genito-urinary diseases, a neurological service, and, for one-half the year, fifty-four obstetrical beds. Moreover, the College has general privileges in the other divisions, which afford it continuous opportunity for instruction and research in the wards devoted to the treatment of alcoholic diseases, tuberculosis, gynecology, and the psychopathic diseases.

NEW YORK HOSPITAL. The Medical College, through the courtesy of the Governors of the New York Hospital, had long been accorded certain privileges for instruction in its wards, but on the 1st of January, 1913, a definite arrangement was established between Cornell University and the New York Hospital, through the donation to the hospital of a generous fund which was presented by Mr. George F. Baker, one of the governors of the hospital, upon the condition that thereafter half the entire medical, surgical, and pathological services of the institution should be definitely assigned to the Cornell University Medical College for the advancement of its teaching and research. By this most advantageous arrangement the University nominates the visiting staff and laboratory staff of its division and secures the admission of its students to the wards as clinical clerks, which enables the college to make a definite provision in its courses of in-

struction and research for work in the New York Hospital, and this is now closely correlated in the curriculum with the similar work which had hitherto been done in Bellevue Hospital. Furthermore, the laboratory staffs of the different departments of the Medical College are placed at the service of the hospital for the purposes of extending its scientific works. The hospital service thus assigned to the college comprises 100 beds. This service is exceedingly active. It includes several thousand acute and emergency cases brought in annually from a large ambulance and dispensary district. The services thus supplied to the College are ample for advanced research as well as for undergraduate instruction.

MEMORIAL HOSPITAL. Through the generosity of the late Dr. James Douglas, who gave this Hospital an endowment for the study and treatment of cancer and allied diseases, the Memorial Hospital became affiliated in 1914 with the Cornell University Medical College. The conditions under which this union was consummated place upon Cornell University Medical College the responsibility for the medical and surgical activities of the Hospital, subject however, so far as administrative action is concerned, to the approval of its Board of Managers. The Cornell University Medical College is required to approve the five medical members of the Board of Managers of the Memorial Hospital and to nominate their successors in case of vacancies, and to name the medical and surgical staff, subject to the approval of the Board of Managers of the Hospital.

THE JOHN E. BERWIND MATERNITY CLINIC. An affiliation having been consummated between the John E. Berwind Maternity Clinic and Cornell University Medical College, the medical direction of the clinic is placed under the control of Cornell. The medical staff, including the resident and house staffs, are appointed by the clinic only on nomination by the Medical College. Cornell students are definitely assigned to the clinic for practical instruction under the direction of the Professor of Obstetrics. Cornell students having been provided for, vacancies in the student staff are filled by appointment. Application for such assignments should be made to the Superintendent of the Clinic at 125 East 103rd Street, New York City.

THE RUSSELL SAGE INSTITUTE OF PATHOLOGY. The Russell Sage Institute of Pathology has been affiliated with the Second Medical (Cornell) Division of Bellevue Hospital since 1913. Endowed by Mrs. Russell Sage in 1907, it has provided funds for research work in pathology and medicine. Laboratory space has been generously given by the trustees of Bellevue Hospital and clinical facilities have been furnished by the Cornell Medical Division. The Institute has constructed and equipped a respiration calorimeter and has maintained a metabolism ward adjacent to the general wards of the division. The research workers have been members of the hospital staff and have assisted in the care of patients and the instruction of students. The metabolism ward, chemical laboratories, and calorimeter furnish unusual facilities for teaching the diseases of metabolism.

*ANATOMY

Professors C. R. STOCKARD, C. V. MORRILL, G. PAPANICOLAOU, J. F. NONIDEZ, and P. B. ARMSTRONG.

Abundant material and sufficient apparatus are available for advanced study and work in the various branches of anatomy, embryology, histology, comparative morphology, descriptive anatomy, and experimental anatomy. Students desiring to pursue graduate work in any of these branches must have had in their college courses preliminary training in general zoology and comparative anatomy. A reading knowledge of German and French is essential.

New York City offers exceptional advantages for obtaining fresh human materials. The large slaughter-houses are accessible for comparative mammalian tissues and organs. The extensive collections of specimens and models in the city museums are extremely helpful and instructive to the advanced student.

The members of the staff offer courses in the various phases of anatomy in which they are especially engaged. The courses offered for the medical students appear in the Announcement of the Medical College, and are particularly recommended to those students who have not pursued work of this kind. Technical and practical anatomical work are fully provided.

Preliminary Requirements: Physics, Chemistry, and Biology as required for admission to the Medical College.

MORPHOLOGY, EMBRYOLOGY, HISTOLOGICAL TECHNIC, GENERAL HISTOLOGY, MICROSCOPIC ANATOMY AND ORGANOLOGY, DESCRIPTIVE ANATOMY, including courses in dissection of the human body, DEMONSTRATIONS ON THE CADAVER, LIVE ANATOMY, TOPOGRAPHICAL ANATOMY, NEURO-ANATOMY AND NEURO-HISTOLOGY, APPLIED ANATOMY, ORGANS OF SPECIAL SENSE, ANATOMICAL RESEARCH.

ANATOMY OF THE LIVING BODY. Professor STOCKARD.

SPECIAL AND TOPOGRAPHICAL STUDIES OF DIFFERENT REGIONS. Professors STOCKARD and MORRILL.

HUMAN HISTOLOGY AND HISTOGENESIS. Professor NONIDIZ.

EXPERIMENTAL MORPHOLOGY. Professor STOCKARD.

ANATOMY OF THE INFANT AND POSTNATAL DEVELOPMENT. Professor STOCKARD.

*PHYSIOLOGY

Professors GRAHAM LUSK, DAYTON J. EDWARDS, McKEEN CATTELL, and WILLIAM H. CHAMBERS.

Students desiring to elect physiology as a major course, in addition to completing the course in general physiology given to medical students, will be required to undertake some special problems, preferably dealing with aspects of nutrition or circulation. Students electing physiology as a minor course may select either the work in general physiology given to medical students or may select only a portion of this course (e. g., nutrition, circulation, etc.) provided an additional amount of special work in these subjects is undertaken.

A preliminary knowledge of chemistry—analytical, organic, and physiological—as well as of physics, is requisite for those who select physiology as a major.

GENERAL PHYSIOLOGY. Comprising nerve muscle physiology, central nervous system, special senses, respiration, circulation, secretion, digestion, metabolism.

PHYSIOLOGY OF NUTRITION. Professor LUSK and Assistant Professor CHAMBERS.

PHYSIOLOGY OF CIRCULATION. Professor EDWARDS.

PHYSIOLOGY OF MUSCLE AND NERVE. Assistant Professor CATTELL.

*PHYSIOLOGICAL CHEMISTRY AND CHEMICAL PATHOLOGY

Professor S. R. BENEDICT.

The laboratories available for advanced work and research in physiological chemistry and chemical pathology include those of the Department of Chemistry, in the Main Building, and a research laboratory in the General Memorial Hospital. These laboratories provide adequate equipment for investigation in a great variety of special problems in the chemistry of the plant, animal, or human organism in health or disease, by chemical, physical, or optical methods. In the college library the principal journals relating to these subjects are on file.

Students expecting to pursue investigation in physiological chemistry or chemical pathology should have adequate preliminary training in inorganic, analytical, and organic chemistry, as well as in physics, physiology, and physical chemistry, though a study of these latter subjects could be pursued at the College, together with more advanced work in special lines.

ORGANIC AND PHYSIOLOGICAL CHEMISTRY: RESEARCH.

PHYSIOLOGICAL CHEMISTRY.

CHEMICAL PATHOLOGY.

***PATHOLOGY, BACTERIOLOGY, AND DEPARTMENT OF PUBLIC HEALTH
AND PREVENTIVE MEDICINE**

Professors JAMES EWING, W. J. ELSE, O. H. SCHULTZE, J. C. TORREY, E. S. L'ESPERANCE, JAMES DENTON, L. W. SMITH, A. F. COCA, and M. C. KAHN.

The laboratories of pathology, bacteriology, and the Department of Public Health and Preventive Medicine occupy the fourth floor of the main building and the third and fourth floors of the Loomis Laboratory. The equipment includes all the means commonly employed in research in these fields and much new and original apparatus. These laboratories are provided with suitable quarters for the care of animals. The library includes about 8,000 bound volumes and a large and valuable collection of monographs and reprints. There is an extensive collection of specimens illustrating pathological histology, much material for histological study, and a museum containing about 3,000 specimens. The recent material from the autopsies at several hospitals is constantly available for study, and furnishes a supply of problems in many fields, which is practically inexhaustible. Applicants who have been admitted to the Graduate School are urged to present the degree of Doctor of Medicine for admission to these courses.

Preliminary requirements: Anatomy, including Histology and Embryology.

GENERAL PATHOLOGY, SPECIAL PATHOLOGICAL ANATOMY, MEDICO-LEGAL PATHOLOGY, AUTOPSY TECHNIQS, EXPERIMENTAL PATHOLOGY, BACTERIOLOGY, IMMUNOLOGY, PUBLIC HEALTH AND PREVENTIVE MEDICINE.

***PHARMACOLOGY**

Professor R. A. HATCHER.

The Department is well equipped for general work and research in both the chemical and pharmacodynamic aspects of Pharmacology. Special opportunities will be afforded for the investigation of the action of drugs on the circulation. An electrocardiograph and other special apparatus are available. Arrangements can be made in special cases for correlating laboratory and clinical results of pharmacologic studies.

The departmental library is sufficient for the immediate needs of workers and its facilities are readily amplified by that of the college, and others nearby, which furnish every opportunity for extending the work.

A knowledge of chemistry and physiology is required.

MATERIA MEDICA AND PHARMACY; PHARMACOLOGY.

RESEARCH IN PHARMACODYNAMICS.

TOXICOLOGY.

FELLOWS: SCHOLARS: ROSTER OF DEGREES

FELLOWS AND GRADUATE SCHOLARS IN 1930-31

RESIDENT DOCTORS

- Elam Jonathan Anderson, A.B. (Drake) 1912, A.M. (Cornell) 1915, Ph.D. (Chicago) 1924.
 Sarah Harriet Brown, A.B. (Washington) 1923, A.M. (Cambridge) 1924, Ph.D. (Radcliffe) 1927.
 Niels Fabricius Buchwald, Cand. Mag. (Copenhagen) 1924.
 Charles Russell Burnham, A.B., M.S., Ph.D. (Wisconsin) 1924, 1925, 1929.
 Alden Springer Crafts, B.S., Ph.D. (California) 1927, 1930.
 Elmer Augustine Culler, Ph.D. (Chicago) 1922.
 Alfred Lawrence Dresser, B.S. (Colgate) 1926, Ph.D. (Cornell) 1930.
 Joel Wallace Elliott, B.S.A. (New Mexico A. and M.) 1915, M.S.A. (Texas A. and M.) 1921, Ph.D. (Cornell) 1931.
 Aasulo Loddesol, Cand. Agr., Dr. Agr. (Royal Agricultural College of Norway) 1920, 1929.
 Leon Lortie, A.B. (Montreal) 1923, D.Sc. (Paris) 1928.
 Otto Bernard Noltenius, Ph.D. (Gottingen) 1927.
 George Merritt Robison, A.B., A.M. Ph.D. (Cornell) 1916, 1917, 1919.
 George Rudolf Schulz, Ph.D. (Koenigsberg) 1927.
 Benjamin Martin Schaub, M.E., M.S., Ph.D. (Cornell) 1925, 1928, 1929.
 Amos Martin Showalter, A.B. (Goshen) 1918, A.M., Ph.D. (Wisconsin) 1920, 1922.
 Laura Lee Weisbrodt Smith, B.S. (Miami) 1925, M.S. (Iowa State) 1927, Ph.D. (California) 1930.
 Herman Martinus Stoker, B.S. (Pretoria) 1927, Ph.D. (Cornell) 1931.
 Ambrogio de Tomasi, Ph.D. (Milan) 1924.
 Winifred Carolina Warning, B.S. (Michigan) 1898, A.M., Ph.D. (Chicago) 1925, 1930.

UNIVERSITY FELLOWS

- The Charles E. Bennett Fellowship in Latin and Greek:* Mary Frances Tenney, A.B. (Oberlin) 1917, A.M. (Bryn Mawr) 1923.
The George C. Boldt Fellowship in History: Richard Merrill Saunders, A.B., A.M. (Clark) 1924, 1925.
The Charles Bull Earle Memorial Fellowship in Mechanical and Electrical Engineering: Alexander Berry Credle, E.E. (Cornell) 1930.
The Edgar J. Meyer Memorial Fellowship in Engineering Research: Kenneth Gordon Kugler, B.S. in M.E. (Rochester) 1930.
The Charles Lathrop Pack Fellowships in Nature Education and Forestry: Robert A. Greene, B. S. (Alfred) 1916, A.M. (Columbia) 1926; Leon Hadsall, A. B., A. M. (Bucknell) 1928, 1929; Antoinette Press, B.S. (Miami) 1929.
The Goldwin Smith Fellowship in Botany: Cecil A. Lamb, B.S.A. (British Columbia) 1921, M.S.A. (McGill) 1924.
The University Fellowship in Agriculture: Guy Robertson Stewart, B.S. (California) 1906.
The Schuyler Fellowship in Animal Biology: Roy C. Tasker, A.B. (Hillsdale College) 1921, A.M. (Michigan) 1922.
The Sage Fellowship in Chemistry: Harold Dwaine Allen, B.S. (Illinois Wesleyan) 1928, M.S. (Iowa) 1929.
The McGraw Fellowship in Civil Engineering: Pu Kung Kao, B.S. in C.E. (Tangshan) 1927, M.C.E. (Cornell) 1929.
The Sibley Fellowship in Engineering: Yu Tsuan Ku, B.S. (Nanyang) 1927, M.M.E. (Cornell) 1929.

- The Cornell Fellowships in English*: Giles Dawson, A.B. (Oberlin) 1925, A.M. (Cornell) 1926; Virginia Thomas, A.B. (Randolph-Macon) 1921, A.M. (Cornell) 1930.
- The University Fellowship in German*: Imre Domonkos, A.B. (Cornell) 1927.
- The Fellowship in American History*: Elizabeth Drewry, A.B., A.M. (George Washington) 1929, 1930.
- The President White Fellowship in Modern History*: Freeland Franklin Peaney, A.B., A.M. (Kansas) 1928, 1929.
- The Erastus Brooks Fellowship in Mathematics*: William R. Hutcherson, A.B., A.M. (Kentucky) 1922, 1924.
- The Susan Linn Sage Fellowships in Philosophy*: Charles M. Wiltse, A.B. (West Virginia) 1929; Carl M. White, A.B. (Oklahoma Baptist University) 1925, A. M. (Mercer) 1928.
- The President White Fellowship in Political and Social Science*: Laurence W. Lange, B.S. (New York) 1930; Harold W. Metz, A.B. (Cornell) 1930.
- The Fellowships in Political Economy*: Kurt A. W. Anderson, A.B. (Pittsburgh) 1930; George F. Reeves, A.B. (Cornell) 1930.
- The University Fellowship in Romance Languages*: Boyd R. Ewing, A.B. (Earlham College) 1922, A.M. (Lehigh) 1925, A.M. (Princeton) 1927.
- The University Fellowship in Physics*: Louis Malter, B.S. (College of the City of New York) 1926.

SPECIAL TEMPORARY FELLOWS

- The American Creosoting Company Fellowship*: Ira Erickson, B.S. (Whitman) 1929.
- The American Rose Society Fellowship*: Bruce Parsons, B.S. (Wyoming) 1930.
- The Bausch and Lomb Research Fellowship in Chemical Spectroscopy*: Henry C. Ketcham, B.Chem. (Cornell) 1929.
- The Bean Disease Investigation Fellowship*: Clifford Charles Wernham, A.B., A.M. (Western Ontario) 1929, 1930.
- The Calumet Baking Powder Company Fellowship in Chemical Spectroscopy*: Albert Cornwell Shuman, A.B. (Cornell) 1930.
- The Genesee-Orleans Vegetable Growers Co-operative Association Fellowship*: William W. Stuart, B.S. (Utah State College) 1928.
- The Grasselli Fellowship in Chemistry*: Preston L. Brandt, B.S. (Washburn) 1928.
- The Holstein-Friesian Association Fellowship*: Kenneth L. Turk, B.S. (Missouri) 1930.
- The Eli Lilly Fellowship*: John Enoch Rutzler, B.Chem. (Cornell) 1927.
- The Nassau Farm Bureau Fellowship*: Pascal Pompey Pirone, B.S. (Cornell) 1929.
- The Niagara Sprayer and Chemical Company Fellowship*: Cyril Galloway Small, B.S. (Cornell) 1928.
- The N. V. Potash Export My. Fellowship*: Arnold Baur, B.S. (Michigan State) 1929.
- The du Pont Fellowship in Chemistry*: Raymond C. Ingraham, B.S., M.S. (Iowa State University) 1928, 1929.
- The Smith Incubator Fellowship*: Laura L. Smith, B.S. (Miami) 1925, M.S. (Iowa State) 1927, Ph.D. (California) 1930.
- The Williamson Co-operative Vegetable Association Fellowship*: Arthur L. Harrison, B.S.A. (Ontario Agricultural College) 1929.

GRADUATE SCHOLARS

- The Graduate Scholarship in Animal Biology*: Elton J. Dyce, B.S.A. (Ontario Agricultural College) 1923, M.S. (McGill) 1928.
- The Graduate Scholarship in Chemistry*: John Wright Ackerman, B.Chem., M.Chem. (Cornell) 1928, 1929.

- The Graduate Scholarship in Civil Engineering*: Khalil Hafezi, B.S. in C.E. (Robert College) 1930.
- The Graduate Scholarship in Comparative Philology and Archaeology*: Elizabeth Roberts, A.B. (DePauw) 1929, A.M. (Cornell) 1930.
- The Graduate Scholarship in English*: Francis W. Weitzmann, B.S. (Niagara) 1927, A.M. (Vermont) 1929.
- The Graduate Scholarship in Geology*: Marcellus H. Stow, A.B., A.M. (Cornell) 1926, 1927.
- The Graduate Scholarship in History*: Anne Lydia Eastman, A.B. (Wells) 1924.
- The Graduate Scholarships in Latin and Greek*: Mary A. Brightbill, A.B. (Dickinson) 1927, A.M. (Cornell) 1930; Evelyn Carlson, A.B. (DePauw) 1929, A.M. (Cornell) 1930; Robert O. Fink, A.B. (Indiana) 1930.
- The Graduate Scholarship in Mathematics*: Thomas Watkins Hatcher, B.S. M.E. (Virginia Polytechnic Institute) 1922, 1923.
- The Susan Linn Sage Scholarships in Philosophy*: Merrill Bush, A.B. (Dartmouth) 1930; Bertram Morris, A.B. (Princeton) 1930; Mary E. Rall, A.B. (Goucher) 1923; Salvatore Russo, A.B. (Rochester) 1929.
- The Susan Linn Sage Graduate Scholarship in Psychology*: Mary E. Bulbrook, A.B. (Rice Institute) 1926, A.M. (Cornell) 1930.
- The Graduate Scholarship in Veterinary Medicine*: Lyman Vawter, D.V.M. (Kansas State Agricultural College) 1918.

ADVANCED DEGREES CONFERRED IN 1929-30 MASTERS OF ARTS

CONFERRED SEPTEMBER 25, 1929

- Annie Bainbridge, A.B.: American History, English History. Thesis: *A Sketch of the Career of Daniel D. Tompkins, 1774-1825*.
- Helen Rutherford Bigham, A.B.: Early Nineteenth Century English, Victorian Period. Thesis: *Wordsworth as a Metrist*.
- Mary Elizabeth Bulbrook, A.B.: Psychology, Philosophy. Thesis: *What is an Experiment in Psychology?*
- Sophie Weygandt Eldridge, B.S. in Ed.: Experimental Physics, Electricity and Magnetism. Thesis: *The Influence of Magnetic Impurities in a Galvanometer Coil on its Period and Sensitivity*.
- Elizabeth Goepf, A.B.: Dramatic Production, Public Speaking and Rhetoric. Thesis: *Molière's Theatre and Drama*.
- William Lawrence Greene, B.S.: Education, American History. Thesis: *A Brief History of Training and Certification of Teachers with Special Reference to Negroes in Representative Southern States, 1875-1900*.
- Doris Weiss Haldeman, B.S. in Ed.: Ornithology, Rural Education. Thesis: *A Study of the Song Sparrow, Melospiza Melodia*.
- Emily de Jarnette Hall, A.B.: Latin, History. Thesis: *Translation of the Aetna*.
- Harold Friend Harding, A.B.: Rhetoric, Literary Criticism. Thesis: *Burke's Leading Ideas, Excerpts from His Speeches and Writings*.
- Vivian Streeter Lawrence, jr., B.S., B.M.E.: Mathematical Analysis, Geometry. Thesis: *Bertrand's Theorem on Central Orbits*.
- Sylvia Lillian Lerner, A.B.: Nineteenth Century English, Middle English. Thesis: *A Group of Trollope's Parliamentary Novels*.
- Abel Ross Miller, A.B.: Physiology, Neurology. Thesis: *A Verification of I. P. Pavlov's Fundamental Experiments on Conditioned Salivary Reflexes*.
- Arthur Ulric Moore, A.B.: Dramatic Production, Rhetoric. Thesis: *A Translation of Adolphe Apolais' Die Musik und die Ausenierung, with Introduction and Notes*.
- John Wesley Parlette, A.B.: Dramatic Production, Rhetoric. Thesis: *A Review of Literary and Dramatic Criticism Bearing on the Stage*.

- Carlyle Conwell Ring, B.S.: Education, Psychology. Thesis: *The Relations between the Principal and the Board of Education in the Smaller Schools of New York State.*
- Theodore Schwartz, A.B.: Dramatic Production, Play Writing. Thesis: *The Theatrical Theory and Practice of Henry Irving.*
- Anne Elizabeth Seabury, A.B.: English, Rural Education. Thesis: *A Brief Study of Four Sonnet Sequences.*
- Herbert Earl Spencer, B.S.: Mathematics, Physics. Thesis: *The Sequence of Fibonacci and Related Topics.*
- Eugene James Sullivan, B.S.: School Administration, Mental Measurements. Thesis: *A Critical Study of the Three-Teacher, Four-Year High Schools of Pennsylvania.*
- Marie Eugenie Vigneron, A.B.: Dramatic Production, Dramatic Structure. Thesis: *Charles Lamb's Theory of the Theatre.*
- Ellen Thirza Wheeler, A.B.: American History, Government. Thesis: *A Study of Social Responsibility in Respect to Minors as Revealed in the Institution of Apprenticeship in New York during the English Colonial and Early Constitutional Periods.*
- Evan Charles Williams, A.B.: American History, European History. Thesis: *Pennsylvania's Economic Interest in Reconstruction Following the Civil War.*

CONFERRED FEBRUARY 5, 1930

- Elizabeth Baker, A.B.: Physical Geography, Stratigraphy. Thesis: *Tentative Evaluation of Some of the Factors Influencing Topographic Development in Central New York State.*
- Margaret Cabell Boles, A.B.: Elizabethan Literature, Old English. Thesis: *Robert Mead: The Combat of Love and Friendship with Introduction and Notes.*
- Edith Rosaline Britton, A.B.: American History, Government. Thesis: *The Constitutional Prohibition of the Acceptance by an Officer of the United States of Presents from any Foreign Prince or State.*
- Constance Connor Brown, A.B.: Dramatic Art, English Literature. Thesis: *The Revolution of the Theatre: a translation of "Die Revolution des Theaters" by Georg Fuchs and of "Das Munchner Kunstler-Theater," a Monograph by Professor Max Littman, with Notes by the Translator.*
- Myron Bonham Deily, Ph.B.: Spanish, History of Spanish Painting. Thesis: *A Study of the Porto Rican Idiom.*
- Josephine Anita Hill, A.B.: French, Spanish. Thesis: *The Moral Ideas of Marcelle Tinayre.*
- Bertram Lucius Hughes, A.B.: English History, Modern European History. Thesis: *Parliamentary Representation of Wales Under the Tudors.*

CONFERRED JUNE 16, 1930

- Leonard Palmer Adams, A.B.: Economics, Labor. Thesis: *Agricultural Depression and Farm Relief in England, 1813-1852.*
- Oscar Altman, A.B.: Finance, Economics. Thesis: *Branch Banking and Related Developments in the United States.*
- Richard Arms Angus, B.S.: American History, European History. Thesis: *A Study of the Origins of the Pennsylvania Insurrection of 1794.*
- Mildred Elizabeth Barr, A.B.: English Fiction, American Literature. Thesis: *Clerical Portraiture in Trollope's Barsetshire.*
- Sarah Elizabeth Beatty, A.B.: Literary Criticism, Elizabethan Literature. Thesis: *A Portrait of Jane Austen.*
- Mary Alene Brightbill, A.B.: Latin, Greek. Thesis: *The "Ars Rhetorica" of C. Chirius Fortunatianus, Rendered into English with Introduction and Notes.*

- Thaddeus Cecil Brown, B.S.: History, Philosophy. Thesis: *Sectionalism South of the Potomac during the Colonial Period.*
- Ruth Mary Burns, A.B.: Nineteenth Century Literature, Contemporary Literature. Thesis: *George Meredith and the Liberation of Womanhood.*
- Robert Horton Cameron, A.B.: Analysis, Algebra. Thesis: *Periodicity of Transformations.*
- Berta Gamboa de Camino, A.B.: Spanish, French. Thesis: *Angel-Ganivet-Su Labor De Maestro-Y-Su Actitud-Hacia-Hispano-America.*
- Evelyn Carlson, A.B.: Latin, Comparative Study of Literature. Thesis: *"Laborintus", Rendered into English with Introduction and Notes.*
- Grace Cheeseman, Ph.B.: Dramatic Production, Dramatic Literature. Thesis: *Marionettes and the Theatre.*
- John Alston Clark, B.S.: Analysis, Algebra. Thesis: *Riemann Sums.*
- Maynard A. Connell, Ph.B.: Literary Criticism, Classics. Thesis: *A Study of Accidie, with Translations from Alardus Gazeaus and Bonaventure.*
- James Thomas Culbertson, B.S.: Entomology, Parasitology. Thesis: *Histological Study of the Alimentary Canal of the Larval Crane-fly, Tipula Abdominalis, Say.*
- Lillian Pauline Daleo, A.B.: English Fiction, American Literature. Thesis: *Humor in the Novels of George Eliot.*
- Jeanne Marie Christine Danforth, A.B.: Old and Middle English, Classics. Thesis: *'Longinus' and the Latin Hymns.*
- Ruby Kathleen Davis, A.B.: Elizabethan Literature, Dante. Thesis: *Ideal Friendship in the English Renaissance.*
- Harry Curtis Diener, B.S.: Education, American History. Thesis: *A Study of the Factors Involved in the Behavior of High School Teachers Relative to the Development of a Code for Use in the Schools in Cities of Five to Ten Thousand Population.*
- William Nathan Etkin, A.B.: Anatomy, Histology and Embryology. Thesis: *The Growth of the Thyroid Gland of Rana Pipiens in Relation to Metamorphosis.*
- Anna May French, B.S.: Entomology, Nature Study. Thesis: *Observations on the Mordellid Beetle, Mordellistena Nigricans, Melsheimer.*
- Ruth Frances Gillespie, A.B.: Paleontology, Sedimentary Petrography. Thesis: *Bartonian Foraminifera and Ostracods.*
- Melanie Elson Guillemont, B.S.: Philosophy, Literary Criticism. Thesis: *John Grote's "Exploratio Philosophica."*
- Roy Stanley Hanslick, B.S.: Organic Chemistry, Inorganic Chemistry. Thesis: *The Synthesis of Isohexyl and Isoheptyl Alcohols.*
- Joseph Roosevelt Houchins, A.B., LL.B.: Economics, Government. Thesis: *The Negro Worker and Organized Labor.*
- Gwladys Francis Hughes, A.B.: Ecology, Entomology. Thesis: *Parasites of the Goldenrod Gall Fly, Eurosta Solidaginis.*
- Marie Catherine Jann, A.B.: Rural Sociology, Statistics. Thesis: *A Study of Public Outdoor Relief in Tompkins County, New York.*
- Esther Helen Johnson, A.B.: Latin, Comparative Study of Literature. Thesis: *The "Ars Poetica" of Horace in English Literature.*
- Charles Williams Jones, A.B.: Literary Criticism, Classics. Thesis: *An Essay on Bede with Special Reference to the "De Temporum Ratione."*
- Verner Everett Jones, A.B.: Economic Geology, Structural Geology. Thesis: *Chromite Deposits of Sheridan, Montana.*
- Agnes Grace Kelly, A.B.: Vertebrate Zoology, Entomology. Thesis: *Early Fauna of Central New York State.*
- Elizabeth Eaton Kent, A.B.: Eighteenth Century English, Nineteenth Century Poetry. Thesis: *Goldsmith and His Booksellers.*
- Edna Catherine Kleinmeyer, A.B.: Sixteenth Century Literature, History of Culture. Thesis: *"A Match at Midnight," by William Rowley, Edited with Introduction and Notes.*

- Martha Peace Knight, A.B.: Modern Poetry, American Literature. Thesis: *The Poetry of Edwin Arlington Robinson.*
- Marion Kommel, A.B.: Elizabethan Literature, Education. Thesis: *Thomas Heywood's "The Rape of Lucrece", with Introduction and Notes.*
- Claude Livingston Kulp, B.S.: Administration and Supervision, Educational Method. Thesis: *Building Requisites for the Junior High Population of Ithaca, New York.*
- Fu-te Kwan, A.B. in Ed.: Educational Psychology, Educational Administration. Thesis: *A Survey of Research in Educational Psychology from 1920-1929.*
- Jean Lee Latham, B.O.E., A.B.: Modern Poetry, Middle English. Thesis: *Contrasting Tendencies in Contemporary American Poetry.*
- Grace Lynette Lawrence, A.B.: Literary Criticism, Modern Writers on Art. Thesis: *An Application of the Poetics of Aristotle to the Iliad.*
- Celia Irene Little, A.B.: Literary Criticism, Modern Writers on Art. Thesis: *"Comus" and an Aristotelian Theory of Comedy.*
- Muriel Henrietta McCulla, A.B.: Nineteenth Century Poetry, Short Story Writing. Thesis: *Realistic Elements in Thackeray's Treatment of Women.*
- Louis McGalliard, A.B.: Victorian Literature, American Literature. Thesis: *The Religious Development of John Ruskin.*
- Virgil Andrew Mason, A.B.: Histology and Embryology, Anatomy. Thesis: *On the Fate of the Ultimobronchial Body in the Cat (Felis Domestica) with Special Reference to Cyst Formation.*
- Marguerite Marie Mathie, A.B.: American Literature, Middle English Literature. Thesis: *A History and Criticism of Negro Creative Literature.*
- Lila Evans Moore, A.B.: Old and Middle English, Literary Criticism. Thesis: *'Longinus' and the Commedia of Dante.*
- Arthur Ervin Arnold Mueller, A.B.: Finance, Labor. Thesis: *The Economic Consequences of Installment Selling.*
- Margaret Eleanor Osborne, A.B.: Economic Geology, Structural Geology. Thesis: *Some Ore Deposits in Western Massachusetts.*
- Edith Watson Ouzts, A.B.: Keats, Education. Thesis: *Keats as Conscious Artist.*
- Arthur Joseph Pelletier, A.B.: French, Education. Thesis: *Criticism of Ecclesiastical Architecture in the Works of Joris Karl Huysmans.*
- Oscar Scofield Powers, A.B.: Greek, Latin. Thesis: *Dionysius of Halicarnassus: On the Style of Demosthenes, Rendered into English with a Brief Introduction.*
- Edith Elizabeth Rae, A.B.: Histology and Embryology, Physiology. Thesis: *The Development of the Hypophysis Cerebri in the Guinea Pig.*
- Sarah Louisa Ridgway, A.B.: Physical Chemistry, Organic Chemistry. Thesis: *Reaction Between Glucose and Potassium Permanganate in Acid Solution.*
- Elizabeth Roberts, A.B.: Latin Literature, Latin Language. Thesis: *"De Imitatione" from the "Elementa Rhetorices" of Philip Melancthon, Rendered into English.*
- Elizabeth Ann Robertson, B.S.: English, Spanish. Thesis: *The Poetic Principles of Jonathan Swift.*
- William Brunner Robertson, B.S.: English, Spanish. Thesis: *The Relation of Wordsworth to Science.*
- Homer Rosenberger, B.S.: Government, Economics. Thesis: *The Circuit Courts of Appeals.*
- Carleton Lewis Safford, A.B.: Elizabethan Literature, American Literature. Thesis: *"A New Wonder; A Woman Never Vexed." Edited with Introduction and Notes.*
- Anson Van Loven Serson, A.B.: Rural Education, School Administration. Thesis: *A Suggested Method for the Determining of Building Facilities Needed in Union Free School Districts of New York.*
- Selma May Shultz, A.B.: Public Health and Hygiene, Immunology. Thesis: *A Study of Certain Epidemiological Factors in the Pneumonia of Children.*

- Cecile Marie Priest Sinden, A.B.: Child Guidance, Educational Psychology. Thesis: *A Study of Social Groups Among Nursery School Children.*
- Mary Fay Skinner, A.B.: Latin, Spanish. Thesis: *Selections from the "Ecclesiastes" of Desiderius Erasmus. Rendered into English with an Introduction and Notes.*
- Elizabeth Rose Sloan, A.B.: American Literature, English History. Thesis: *The Treatment of the Supernatural in Poe and Hawthorne.*
- Dorothy Helen Smith, A.B.: Elizabethan Literature, Education. Thesis: *"The Dumb Knight," Edited with Introduction and Notes.*
- Helen Alta Smith, B.S.: Analysis, Geometry. Thesis: *Derivatives and Derived Functions.*
- Sidney Dennison Terr, A.B.: Modern European History, English History. Thesis: *Robespierre and his Place on the Committee of Public Safety.*
- Virginia Evelyn Thomas, A.B.: Wordsworth, History of Philosophy. Thesis: *A Study of Wordsworth's Acquaintance with Rustic Characters.*
- Nan Stephens Trammell, A.B.: Structure of the Lyric, Philosophy. Thesis: *Studies in Shelley's Imagery.*
- Annie Mell White, A.B.: Psychology, Rural Social Organization. Thesis: *Position versus Intensity as a Determinant of Attention of Left-Handed Observers.*

MASTERS OF SCIENCE

CONFERRED SEPTEMBER 25, 1929

- David Berry Carlton, A.B.: Bacteriology, Physical Chemistry. Thesis: *Studies on the Propionic Acid Bacteria.*
- Florence Elizabeth Clippinger, A.B.: Botany, Education. Thesis: *An Experimental Study in Methods of Teaching Biology in Roosevelt High School, Dayton, Ohio.*
- Cornelia Baker Cornish, B.S.: Rural Education, Geography. Thesis: *The Geography and History of Cortland County.*
- Hidden Toy Cox, A.B.: Experimental Physics, Theoretical Physics. Thesis: *The Geiger Counter.*
- Evan Pugh Dargan, B.S.: Farm Management, Marketing. Thesis: *Index Numbers of Prices Received by Producers for Farm Products in Arkansas.*
- Fordyce Charles Deitz, B.S.: Pomology, Rural Education. Thesis: *Strawberry Nutrition.*
- Morris Gordon, A.B.: Bacteriology, Physical Chemistry. Thesis: *The Death of Certain Bacteria and Yeasts by Physical and Chemical Agents.*
- William Harold Hayes, B.S.A.: Geography, Rural Education. Thesis: *The Geography of New Brunswick.*
- Nancy Ethel Owen, B.S.: Child Guidance, Sociology. Thesis: *A Report on a Method of Teaching Parents, by Means of Certain Text Book Material, to Study, Analyze, and Guide the Behavior of Young Children.*
- Anne Louise Steger, Ph.B.: Zoology, Nature Study. Thesis: *The Prong-Horned Antelope of America.*
- Ernst Otto Storm, B.S.: Agricultural Economics, Dairy Industry. Thesis: *Economic Factors Affecting the Cold Storage Movement of Butter.*
- Lillian Clara Thomsen, B.S.: Biology, Ornithology. Thesis: *The Biology of Cricotopus Trifasciatus.*

CONFERRED FEBRUARY 5, 1930

- Ernst Cleveland Abbe, B.S.: Botany, Genetics. Thesis: *The Morphology and Anatomy of the Staminate Inflorescence and Flower of the Betulaceae.*
- Howard Wayland Beers, B.S.: Rural Sociology, Agricultural Economics. Thesis: *The Money Income of Farm Boys in a Southern New York Dairy Region.*
- Lucy Elizabeth Boothroyd, A.B.: Botany, Zoology. Thesis: *The Morphology and Anatomy of the Inflorescence and Flower of the Platanaceae.*

- Harold Fred Dorn, B.S.: Rural Social Organization, Agricultural Economics. Thesis: *The Social and Economic Areas of Yates County, N. Y.*
- Harold Clayton Grinnell, B.S.A.: Farm Management, Rural Education. Thesis: *A Study of the Operation and Organization of a Large New York State Farm.*
- Stephen Moi Kee Hu, B.S.: Medical Entomology, Taxonomy. Thesis: *Preliminary Investigations on the Transmission of Dog Filaria, Dirofilaris Immitis Leidy, in Central New York Area.*
- Chien Yu Tsao, A.B.: Plant Physiology, Organic Chemistry. Thesis: *The Protective Effect of Various Sugars against the Destruction of Amylase and Its Bearing on the So-called Regulatory Production of Enzymes.*

CONFERRED JUNE 16, 1930

- Mihran Avedis Aristakes, B.S.: Plant Breeding, Farm Crops. Thesis: *Methods of Seed Distribution in New York State and their Application to the Agricultural Conditions in Iraq.*
- Donald Nelson Ball, B.S.: Organic Chemistry, Physical Chemistry. Thesis: *A Study of Nitro Derivatives of Furane.*
- Helen Besley, A.B.: Cytology, Bacteriology. Thesis: *Non-transmission of an Extra B-liguleless Chromosome through the Pollen of Zea Mays.*
- Bradford Bissell, A.B.: Stratigraphy, Paleontology. Thesis: *The Devonian Section at Roche Miette, Alberta.*
- Ho Tseng Chang, B.S.: Plant Physiology, Plant Anatomy. Thesis: *Studies on The Effect of the Local Application of Temperature on the Seed-stalk Development of Celery.*
- Olin Mitchell Clark, B.S.: Rural Education, Farm Management. Thesis: *College Achievement of Pupils Admitted to the New York Academic Diploma in Agriculture to the New York State College of Agriculture at Cornell University.*
- John Courtney, B.S.: Statistics, Accounting. Thesis: *Typical Operating Ratios for Hotels.*
- Robert Alden Cushman, M.E.: Electrical Engineering, Physics. Thesis: *A New System of Picture Transmission.*
- Ralph Milton Edeburn, B.S. in Ed.: Rural Education, Ecology and Limnology. Thesis: *A Study to Determine the Preparation of Teachers in Service and of Teachers in Training, as Related to the Teaching of Elementary Science or Nature Study.*
- William Jephtha Edens, B.S.: Agricultural Education, Agricultural Economics. Thesis: *Determining Emphasis in Training Teachers of Agriculture: A Study in Nineteen States.*
- Frank Custer Edminster, jr., B.S.: Ornithology, Vertebrate Zoology. Thesis: *A Study of Ornithological Terms in Common Use.*
- Harold Parker French, B.S.: Rural Education, Rural Social Organization. Thesis: *The Records of a District Superintendent of Schools in New York State.*
- Claude Coe Gillette, B.S.: Apiculture, Insect Morphology. Thesis: *A Quantitative Determination of Catalase in Honey.*
- Ernest Aiken Grant, B.S.: Rural Education, Rural Social Organization. Thesis: *Proposed Changes in the Curriculum in Agriculture for the State Agricultural and Mechanical College of South Carolina, on the Basis of the Farm Enterprises of Sixteen Negro Vocational School Communities of the State.*
- Carrie Estelle Herring, B.S.: Home Economics Education, Psychology. Thesis: *A Study of the Home Economics Department of the Ithaca Junior High School.*
- Henry Edwin Hill, B.S.: Cytology, Plant Breeding. Thesis: *A Cytological and Genetical Study of Certain Trisomic Types in Zea Mays L.*
- Wilbert Clayton Hopper, B.S.A.: Agronomy, Farm Management. Thesis: *Depth of Fertilizer Application.*

- Gideon Tingwei Lew, B.S.: Limnology, Economic Entomology. Thesis: *Head Characters of Odonata*.
- Mayor Dennis Mobley, B.S.A.: Agricultural Education, Rural Economics. Thesis: *An Evaluation of Evening Class Instruction in Terms of Changed Practices. A Study of Members of Two Evening Classes in Cotton Growing in Georgia*.
- Ana Maria Molina, B.S.: Genetics, Animal Husbandry. Thesis: *The Analysis of the Genetic Constitution of a Male Rabbit—No. 846.4*.
- Mildred Pladeck, B.S.: Economic Botany, Mycology. Thesis: *A Study of the Effect of Certain Factors on the Germination of Some Weed Seeds*.
- Joseph Charles Rintelen, jr., B.S. in Chem.: Optical Chemistry, Zoology. Thesis: *The Hemoglobin Crystals of the Amphibians*.
- Sid Robinson, B.S.: Limnology, Systematic Vertebrate Zoology. Thesis: *Notes on the Food of the Stone-Fly Larvae and the Muscular Functioning of the Mouth-parts in Perla and Pteronarcys*.
- Francisco Montalbo Sacay, B.S.: Rural Education, Farm Management. Thesis: *A Study of the Agriculture of the Philippines as a Basis for Building a Program of Agricultural Education*.
- Gilbert Weaver Scott, B.S.: Cytology, Plant Breeding. Thesis: *Cytological Studies on Petunia*.
- Jennie Reece Shuman, B.S.: Child Guidance, Educational Psychology. Thesis: *A Pictorial Study of Children's Behavior in Response to Environment*.
- Mildred Louise Swift, B.S.: Home Economics, Education, Child Guidance. Thesis: *A Study of Collegiate Recognition of Secondary Home Economics*.
- Nicolas F. Vasquez, Eng. Agr.: Agronomy, Plant Physiology. Thesis: *Relation between Ammonia Content and Reaction of Soils*.
- Leah Irene Wells, A.B.: Physics, Mathematics. Thesis: *The Effect of Series Inductance on the Vacuum Spark Spectra of Tin*.
- Maynard Fayette Witherell, B.Chem.: Physical Chemistry, Sanitary Chemistry. Thesis: *Adhesion of Glue*.
- Michiya Yasuda, B.S.: Cytology, Plant Breeding. Thesis: *The Influence of X-Rays and Electric Currents on Growth and Mitotic Division in Certain Crop Plants*.

MASTERS OF SCIENCE IN AGRICULTURE

CONFERRED SEPTEMBER 25, 1929

- Richard McVay Riley, B.S. in Ed.: Vegetable Gardening, Plant Physiology. Thesis: *Some Effects of Paper Mulch on the Growth of Vegetable Crops*.

CONFERRED FEBRUARY 5, 1930

- Lambert Rudolf van Graan, B.S.: Vegetable Production, Rural Education. Thesis: *The Effect of Early Defoliation of Vegetable Plants on Subsequent Growth and Production*.

CONFERRED JUNE 16, 1930

- Howard William Higbee, B.S.: Soils, Plant Physiology. Thesis: *Studies Concerning the Number and Distribution of Sulphur Oxidizing Organisms that Occur in New York Soils*.
- Chong-Yah Tang, B.S.: Plant Breeding, Agronomy. Thesis: *Methods of Breeding and Testing Wheat*.

MASTERS IN FORESTRY

CONFERRED SEPTEMBER 25, 1929

- David Percy Beatty, B.S.: Forest Management, Forest Utilization. Thesis: *The Arnot Forest: Its Foundation for Management*.
- Carl Oswald Rudolph Spalteholz, B.S.: Silviculture, Ornamental Horticulture. Thesis: *The Effect of Soil Covering on Development of Red Pine*.

Ralph Furness Wilcox, B.F.: Forest Management, Forest Utilization. Thesis: *The Financial Management of the Arnot Forest, Schuylar County, New York.*

CONFERRED JUNE 16, 1930

Frederick John Erdmann, B.S.: Forestry, Marketing. Thesis: *The Organization of the Pulp and Paper Industry.*

Carl Frederick Olsen, B.S.: Silviculture, Plant Pathology. Thesis: *Volume Increase in Young Pine—A Statistical Analysis of the Rate of Annual Increase in Foliage Volume and an Interpretation of Its Significance.*

MASTER OF FINE ARTS

CONFERRED JUNE 16, 1930

James Walter Grimes, jr., B.F.A.: Portrait Painting, Landscape Painting. Thesis: *A Painting: St. Paul Preaching.*

MASTER OF CHEMISTRY

CONFERRED JUNE 16, 1930

Thomas Jackson Potts, B.Chem.: Organic Chemistry, Agricultural Chemistry. Thesis: *An Examination of the Seed Oil of Calycanthus Floridus.*

MASTERS OF CIVIL ENGINEERING

CONFERRED FEBRUARY 5, 1930

Jacinto Samonte Ponco, B.S.M.E., B.S.C.E.: Structural Engineering, Highway Engineering. Thesis: *A Comparative Study of Steel and Reinforced Concrete Rainbow Arch Bridges.*

CONFERRED JUNE 16, 1930

Yu-jen Chen, B.S. in Ed.: Railroad Engineering, Highway Engineering. Thesis: *Economic Study of the Theory and Design of Railroad Location.*

Cheng Tao Ching, B.S. in C.E.: Structural Engineering, Sewerage and Sewage Disposal. Thesis: *Moment Coefficients of Three Bent Rigid Frames.*

Charles Lun Chou, B.S.: Hydraulic Engineering, Sanitary Engineering. Thesis: *A Study of Hongchow City Water Supply Plans.*

Chin Cheng Liu, B.S.: Hydraulic Engineering, Sanitary Engineering. Thesis: *A Study of the Economics of the Development of Water Power on Fall Creek.*

Kong Huai Shih, B.S.C.E.: Railroad Engineering, Hydraulic Engineering. Thesis: *Design of a Water Front Terminal at Shanghai, China.*

Edward Ray Stapley, C.E.: Municipal Water Works, Concrete Designs. Thesis: *An Analysis of Imhoff Tank Design.*

James Erh Pin Tai, C.E.: Railroad Engineering, Reinforced Concrete Design. Thesis: *Railway Arch Bridges. A Comparative Study.*

Feng Tu Tang, B.S.C.E.: Railroad Engineering, Highway Engineering. Thesis: *Grade Crossings.*

MASTERS OF MECHANICAL ENGINEERING

CONFERRED SEPTEMBER 25, 1929

Leonard Cassell Price, M.E.: Experimental Engineering, Industrial Organization. Thesis: *Design of an Experimental Gas Engine.*

CONFERRED JUNE 16, 1930

John Strother Miller, 3rd, M.E.: Experimental Engineering, Chimney Research. Thesis: *Comparison of Methods of Determining the Mechanical Efficiency of Automotive Engines.*

Knut Gundersen Nipedal, M.E.: Experimental Engineering, Industrial Engineering. Thesis: *Comparison of Methods of Determining the Mechanical Efficiency of Automotive Engines.*

Herbert Albert Julius Weiss, M.E.: Experimental Engineering Research, Industrial Engineering. Thesis: *The Theories of Combined Stress as Applied to Machine Design.*

MASTERS OF ELECTRICAL ENGINEERING

CONFERRED JUNE 16, 1930

Hui Huang, B.S. in E.E.: Electrical Engineering, Water Power Engineering. Thesis: *A Contribution to the Theory of Traveling Electric Waves.*

Donnell Dixon MacCarthy, E.E.: Electrical Engineering, Physics. Thesis: *Breakdown Voltages of Sphere Gaps at Reduced Air Pressures.*

Harry Sohon, E.E.: Electrical Communications, Physics. Thesis: *Audio Frequency Pick-Up Apparatus for a Low Power Radio Station.*

DOCTORS OF PHILOSOPHY

CONFERRED SEPTEMBER 25, 1929

Hashem Amir Ali, B.Agr.: Rural Social Organization, Rural Education, Farm Management. Thesis: *Social Change in the Hyderabad State in India as Affected by the Influence of Western Culture.*

Elsa Guerdrum Allen, A.B.: Zoology, Ornithology, English. Thesis: *Studies in the Life History of the Eastern Chipmunk.*

Frederick Llewellyn Baumann, Ph.B., A.M.: Medieval History, European History, English History. Thesis: *A Guide to the Utopia of Sir Thomas More.*

Roland Franklin Bucknam, B.S.: Farm Management, Rural Engineering, Economics. Thesis: *An Economic Study of Farm Electrification in New York State.*

Wilbur Kingsley Butts, B.S., M.S.: Ornithology, Botany, Entomology. Thesis: *A Study of the Chickadee and White-Breasted Nuthatch by Means of Marked Individuals.*

William Lane Cavert, Ph.B., B.S. in Agr.: Farm Management, Statistics, Economics. Thesis: *Sources of Power on 538 Minnesota Farms.*

Hettie Morse Chute, A.B., A.M.: Morphology, Bacteriology, Taxonomy. Thesis: *The Morphology and Anatomy of the Achene.*

John B. Cotner, B.S., M.S.: Plant Breeding, Soils, Plant Physiology. Thesis: *Inheritance of Ruvia Oats.*

Raymond Bridgman Cowles, A.B.: Vertebrate Zoology, Ornithology, Entomology. Thesis: *The Life History of Varanus Niloticus (Linnaeus) as Observed in Natal, South Africa.*

James White Crowell, A.B.: Spanish, French, Italian. Thesis: *El natural desdichado by Augustin de Rojas Villandrando.*

Albert Martin Field, B.S., M.S.: Rural Education, Educational Psychology, Education. Thesis: *An Evaluation of Certain Phases of Theory and Practice in the Supervision of Instruction in Vocational Agriculture with a Suggestive Program for Improvement.*

Henry George Good, B.S., M.S.: Insect Morphology, Vertebrate Zoology, Systematic Entomology. Thesis: *The Wing Venation of the Cerambycidae.*

Myron Gordon, B.S., M.S.: Zoology, Limnology, Genetics. Thesis: *The Morphology of Heritable Characters in Platypocilus, Xiphophorus, and Hybrid Fishes.*

James Squier Gutsell, A.B.: Ecology, Aquiculture, Analytical Chemistry. Thesis: *Natural History of the Bay Scallop.*

Everett Wesley Hall, A.B.: Logic and Metaphysics, Ethics, Psychology. Thesis: *The Problem of Identity as Revealed in the Meaning of Idea for F. H. Bradley and Bernard Bosanquet.*

- Allen Dudley Keller, B.S.: Physiology, Neurology and Anatomy, Histology and Embryology. Thesis: *Observations on the Respiratory and Vaso-Motor Mechanisms in the Brain-Stem of the Cat.*
- Claude Willard Leister, B.S.: Ornithology, Systematic Zoology, Entomology. Thesis: *Food and Feeding Habits of the Ducks of the Cayuga Lake Region.*
- Raymond Harvey Lounsbury, A.B., A.M.: Finance, Economic Theory, Marketing. Thesis: *Cyclical Fluctuations in Industrial Output, 1921-27.*
- Harvey Blount Mann, B.S., M.S.: Soils, Physical Chemistry, Plant Breeding. Thesis: *Availability of Manganese and of Iron as Affected by Applications of Calcium and Magnesium Carbonates to the Soil.*
- Sven Axel Nilson, A.B., A.M.: Ethics, History of Philosophy, Logic and Metaphysics. Thesis: *Problems of Value.*
- John Highberger Patterson, A.B.: Finance, Economic Theory, Accounting. Thesis: *The Development of Recent Concepts of Money and Credit, and of Their Relation to Prices in English Monetary Theory.*
- Mary Louise Porter, Ph.B., A.M.: Middle English, French, American Literature. Thesis: *Richard Rolle's Latin Commentary on the Psalms.*
- Hubert John Sloan, B.S., M.S.: Poultry Husbandry, Physical Chemistry, Physiology. Thesis: *The Seasonal Variation in the Antirachitic Portion of Sunshine and Its Transmission through Various Window Glazing Materials.*
- Genevieve Spencer, A.B.: Physical Chemistry, Agricultural Chemistry, Marketing. Thesis: *The Formation of Pectin Jellies by Sugar.*
- Philip Holcomb Stephens, B.S.: Farm Management, Economics, Marketing. Thesis: *Successful Management of the New York Dairy Farms as Affected by the Proportion of the Factors of Production.*
- Morris Albion Stewart, B.S., M.S.: Medical Entomology, Parasites of Fishes, Ecology. Thesis: *A Synopsis of the Siphoneptera of North America, North of Mexico.*
- Alan Stone, B.S.: Economic Entomology, Histology and Embryology, Bacteriology. Thesis: *A Study of the Flies of the Family Tebanidae with Especial Reference to the Biology of the New York State Species.*
- Robert Whitney Tucker, A.B.: Indo-European Philology, Greek and Latin, Archaeology. Thesis: *Quantity and Quality of Vowels in Latin.*
- Jake Luidens Wierda, B.S.: Anatomy, Physiology, Zoology. Thesis: *Some Changes in the Dimensions and Structure of the Intestine of the White Rat Induced by Diet.*
- Earle Irving Wilde, B.S., M.S.: Floriculture, Genetics, Taxonomy. Thesis: *Studies of the Delphinium.*

CONFERRED FEBRUARY 5, 1930

- George Wells Beadle, B.S.: Genetics, Cytology, Plant Physiology. Thesis: *Genetic and Cytological Studies of Mendelian Asynapsis in Zea Mays.*
- W. Storrs Cole, B.S., M.S.: Paleontology, Structural and Sedimentary Geology, Physical Geography. Thesis: *Contributions to the Tertiary Paleontology of the Tampico Embayment Area.*
- Troy Mansell Currence, B.S.A.: Plant Breeding, Plant Physiology, Vegetable Gardening. Thesis: *Inheritance Studies in Phaseolus Vulgaris.*
- Alfred Alexander Dixon, B.S., A.M.: Experimental Physics, Applied Physics, Theoretical Physics. Thesis: *The Dependence of Fluorescence upon Concentration in Liquid and Solid Solutions.*
- Victor Lyle Dowdell, A.B.: Comparative Study of Literature, Classics, Philosophy. Thesis: *Aristotle's Influence on John of Salisbury.*
- Walter Hetherington Durfee, A.B., M.C.E.: Analysis, Geometry, Physics. Thesis: *Summation Factors which are Powers of a Complex Variable.*
- Raymond Herbert Fleckenstein, B.Chem.: Inorganic Chemistry, Physical Chemistry, Industrial Chemistry. Thesis: *Zinc Diethyl: Its Purification, Properties, and Manipulation. The Action of Zinc Diethyl on the Chloroforms of Carbon, Silicon, and Germanium.*

- Lehman Edward Hoag, B.Chem.: Spectroscopy, Astronomy, Organic Chemistry. Thesis: *Quantitative Separation of Germanium from Silicon*.
- Everett Clark Hughes, A.B.: Organic Chemistry, Physical Chemistry, Spectroscopy. Thesis: *The Optical Properties of Furan and Its Derivatives*.
- Robert Edwin Hulse, B.S., M.S.: Inorganic Chemistry, Organic Chemistry, Optical Chemistry. Thesis: *The Preparation and Properties of Germanium Monoxide and Monosulphide*.
- Richard Elmer Jagers, A.B., A.M.: Administration, Supervision, Rural Social Organization. Thesis: *Budgetary Procedures in County School Systems in Kentucky*.
- Walter John Jebens, B.S., M.S.: Industrial Chemistry, Physical Chemistry, Organic Chemistry. Thesis: *Studies in the Plasticity of Paints*.
- Avis Leone Kidwell, A.B., A.M.: Literary Criticism, Elizabethan Literature, Middle English. Thesis: *Sir John Davies' "Orchestra," Edited with a Life of Davies*.
- Charles Grover McBride, B.S., M.S.: Marketing, Farm Marketing, Corporation. Thesis: *The Development of Market Milk Areas in Northeastern Ohio*.
- Donald Joseph McGinn, A.B., A.M.: Elizabethan Literature, Old and Middle English, Philosophy. Thesis: *The Influence of "Hamlet" on English Dramatic Literature from 1600 to 1642*.
- Guy Franklin MacLeod, B.S.: Economic Entomology, Morphology of Insects, Physics. Thesis: *Effects of Ultra-Violet Radiations on the Bean Weevil Bruchus Obtectus Say*.
- Dean Richmond Marble, B.S., M.S.: Poultry, Farm Management, Plant Breeding. Thesis: *A Statistical Study of Factors Affecting Egg Weight*.
- William Guy Meal, B.S.: Marketing, Farm Management, Vegetable Gardening. Thesis: *An Economic Study of the Production and Marketing of New York State Lettuce*.
- Amy Grace Mekeel, A.B., A.M.: Zoology, Botany, Entomology. Thesis: *Pulmonary Development in the Lungless Salamanders*.
- Wilfred Douglas Mills, B.S., M.S.: Plant Pathology, Plant Physiology, Entomology. Thesis: *The Seasonal Development of Apple Scab in Western New York*.
- Ethel Isabel Moody, A.B., A.M.: Geometry, Analysis, Philosophy. Thesis: *A Cremona Group of Order Thirty-two of Cubic Transformations in Three-dimensional Space*.
- Robert Gustav Nel, B.S.: Entomology, Insect Morphology, Bacteriology. Thesis: *A Comparative Study of Aonidiella Aurantii Mask. and Aonidiella Citrinus Coq. with Special Reference to the Anatomy of the Latter*.
- James Beckley Palmer, B.S.: Rural Education, Educational Psychology, Entomology. Thesis: *Causal Factors in the Development of the New York State Elementary Course of Study from 1776 to 1904*.
- Dickson Ward Parsons, B.S., M.S.: Rural Education, Rural Social Organization, Animal Husbandry. Thesis: *An Analytical Study of the Activities and Problems of County Agricultural Extension Agents*.
- Vera Louise Peacock, A.B., A.M.: French Literature, French Philology, English Literature. Thesis: *The Works of Marie Leneru*.
- Clarence Ritchie Phipps, B.S., M.S.: Economic Entomology, Morphology of Insects, Taxonomy. Thesis: *A Biological and Ecological Study of the Insects Affecting the Blueberry and Huckleberry*.
- Margaret Louise Plunkett, A.B., A.M.: American History, Modern European History, American Literature. Thesis: *A History of the Liberty Party with Emphasis upon its Activities in the Northeastern States*.
- Katherine Harriet Porter, A.B., A.M.: Eighteenth Century English, American Literature, Elizabethan Literature. Thesis: *Margaret, Duchess of Portland*.
- George Frederick Potter, B.S.A., M.S.A.: Pomology, Plant Breeding, Plant Physiology. Thesis: *Composition and Fruit Bud Formation in Non-bearing Spurs of the Baldwin Apple*.

- Paul Holland Price, A.B., M.S.: Structural Geology, Economic Geology, Physical Geography. Thesis: *The Appalachian Structural Front*.
- William Walter Reitz, B.S., M.S.: Rural Education, Farm Management, Economics. Thesis: *A Vocational Guidance Program Based on the Needs and Resources of a Rural Community*.
- Paul Arthur Reynolds, A.B., A.M.: History of Philosophy, Ethics, Education. Thesis: *Emergent Evolution and the Nature of Mind*.
- Richard Robinson, B. Litt., A.M.: Logic, Ancient Philosophy, Ancient History. Thesis: *Cook Wilson on the Province of Logic*.
- Charles Blackmer Rutenber, B.Chem.: Physical Chemistry, Physics, Philosophy. Thesis: *The Interaction Between Solutions of Arsenious Oxide and the Hydroxides of Certain Metals*.
- Mabel Louise Ruttle, A.B., A.M.: Botany, Mycology, Zoology. Thesis: *Cytological and Embryological Studies of the Genus Mentha*.
- Karl Heinrich Schnepel, A.B., A.M.: German Literature, Germanic Philology, Mediaeval History. Thesis: *The Expression of Grabbe's Personality as Revealed in His Dramatic Characters*.
- Norman Alexander Skow, B.S., M.S.: Inorganic Chemistry, Industrial Chemistry, Optical Chemistry. Thesis: *Extraction of Germanium and Gallium from Germanite. Preparation and Properties of Germanium Monohydride*.
- George Frederick Sprague, B.S., M.S.: Genetics, Plant Physiology, Cytology. Thesis: *The Inheritance of Scutellum Colors in Maize*.
- Gustav Ivar Steffen: Bacteriology, Physiology, Biological Chemistry. Thesis: *The Gaseous Metabolism of B. Tetani*.
- Forrest Wilbur Stemple, A.B., M.S.: Rural Education, Entomology, Agronomy. Thesis: *Science Needs of Pupils in Small High Schools Based on an Activity Analysis*.
- John Hall Stewart, A.B., A.M.: Modern European History, Mediaeval History, English History. Thesis: *The Life and Works of Jean Paul Rabaut de Saint-Etienne*.
- George Robert Stibitz, A.B., M.S.: Theoretical Physics, General Physics, Mathematics. Thesis: *Vibrations of Non-planar Membranes*.
- Charles Kenneth Thomas, A.B., A.M.: Public Speaking, American Literature, English Language. Thesis: *The Rhetoric of Thomas Henry Huxley*.
- Ralph Tuck, B.S., A.M.: Economic Geology, Structural Geology, Petrography. Thesis: *The Geology and Origin of a Lead-Zinc Deposit at Geneva Lake, Ontario*.
- William Dwight Warren, B.S., M.S.: Inorganic Chemistry, Rural Social Organization, Education. Thesis: *Equilibrium in Binary Systems with Ammonia as the Volatile Component*.
- Frederick Pattison Weaver, B.S., M.S.: Agricultural Economics, Economics, Farm Management. Thesis: *A Survey of Some Public Produce Markets in Up-State New York*.
- James Shepard Webb, B.S., M.S.: Experimental Physics, Applied Physics, Theoretical Physics and Biophysics. Thesis: *The Effect of Magnetic Fields on the High Frequency Resistance of Ferromagnetic Conductors*.
- Arthur Albert Wedel, A.B.: Structural Geology, Paleontology, Economic Geology. Thesis: *Geologic Structure of the Devonian Strata of South Central New York*.
- Everett Pepperrell Wheeler, A.B., M.S.: Petrography, Metamorphic Geology, Spectroscopy. Thesis: *A Study of Some Diabase Dikes of the Labrador Coast*.
- Herbert Sedgwick Wilgus, jr., B.S.: Poultry Nutrition, Physical Chemistry, Biochemistry. Thesis: *The Calcium and Phosphorus Requirements of Growing Chicks*.
- Eldon Wittwer, B.S.: Marketing, Agricultural Economics, Economics. Thesis: *Allocation of Costs in Wholesale Distribution with Special Reference to Hardware, 1927-1929*.

- Louis Edward Wolf, A.B., M.S.: Zoology, Aquiculture, Botany. Thesis: *The History of the Germ-Cells in the Viviparous Teleost Platypoecilus Maculatus*.
- Ralph Hicks Woods, B.S., M.S.: Agricultural Education, Secondary Education, Agricultural Economics. Thesis: *A Method of Determining the Relationship between Types of Farming, Content in Vocational Agriculture, and the Technical Training of Teachers of Agriculture*.
- Alexander Zeissig, B.S., D.V.M., M.S.: Pathogenic Bacteriology, Diseases of Breeding Cattle, Blood Chemistry. Thesis: *A Study of the Complement-Fixation Test in the Detection of Acid-Fast Infections of Cattle*.
- Clarke Courson Zelif, A.B., M.S.: Parasitic Protozoology, Vertebrate Zoology, Pathogenic Bacteriology. Thesis: *Studies of Protozoa of the Genera Oxymonas, Kirbyella, Gen. Nov., and Polymastix, with the Description of a New Species of Cestode*.

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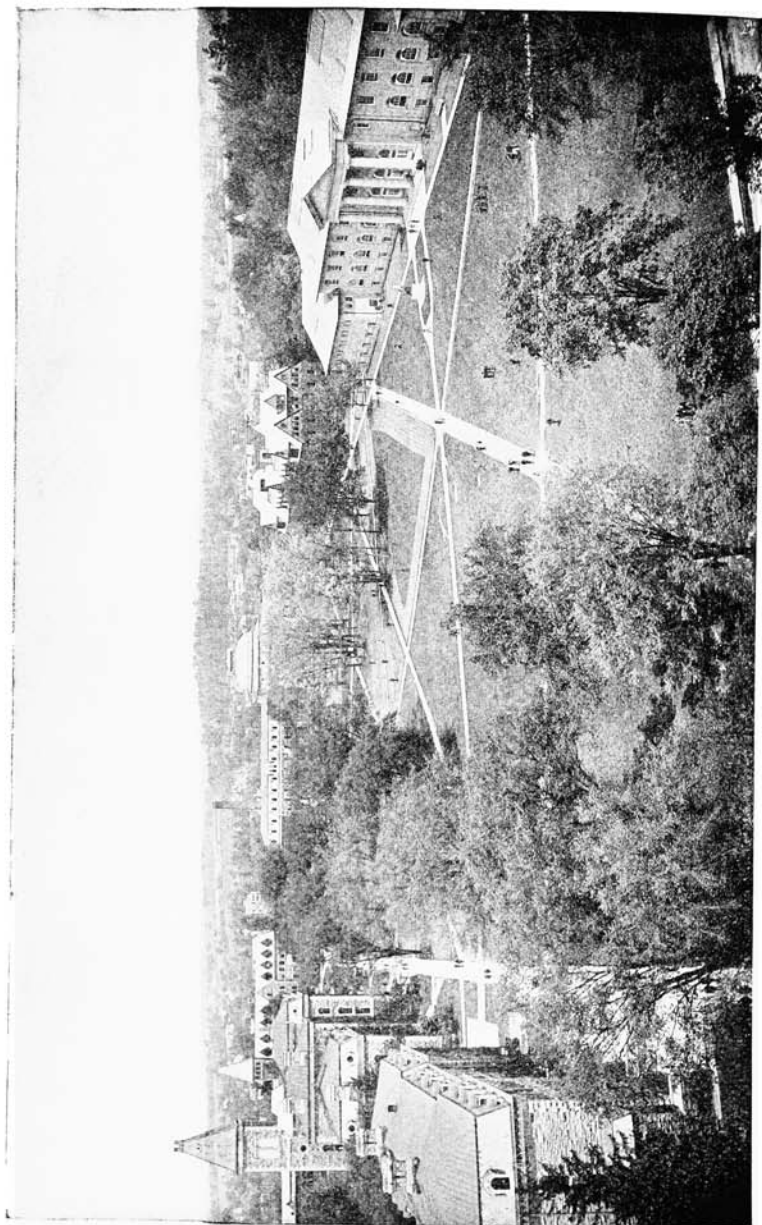
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CORNELL UNIVERSITY'S MAIN QUADRANGLE

The principal buildings of the College of Engineering are here shown at the farther end of the Quadrangle.