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School of Mines

1908-1909

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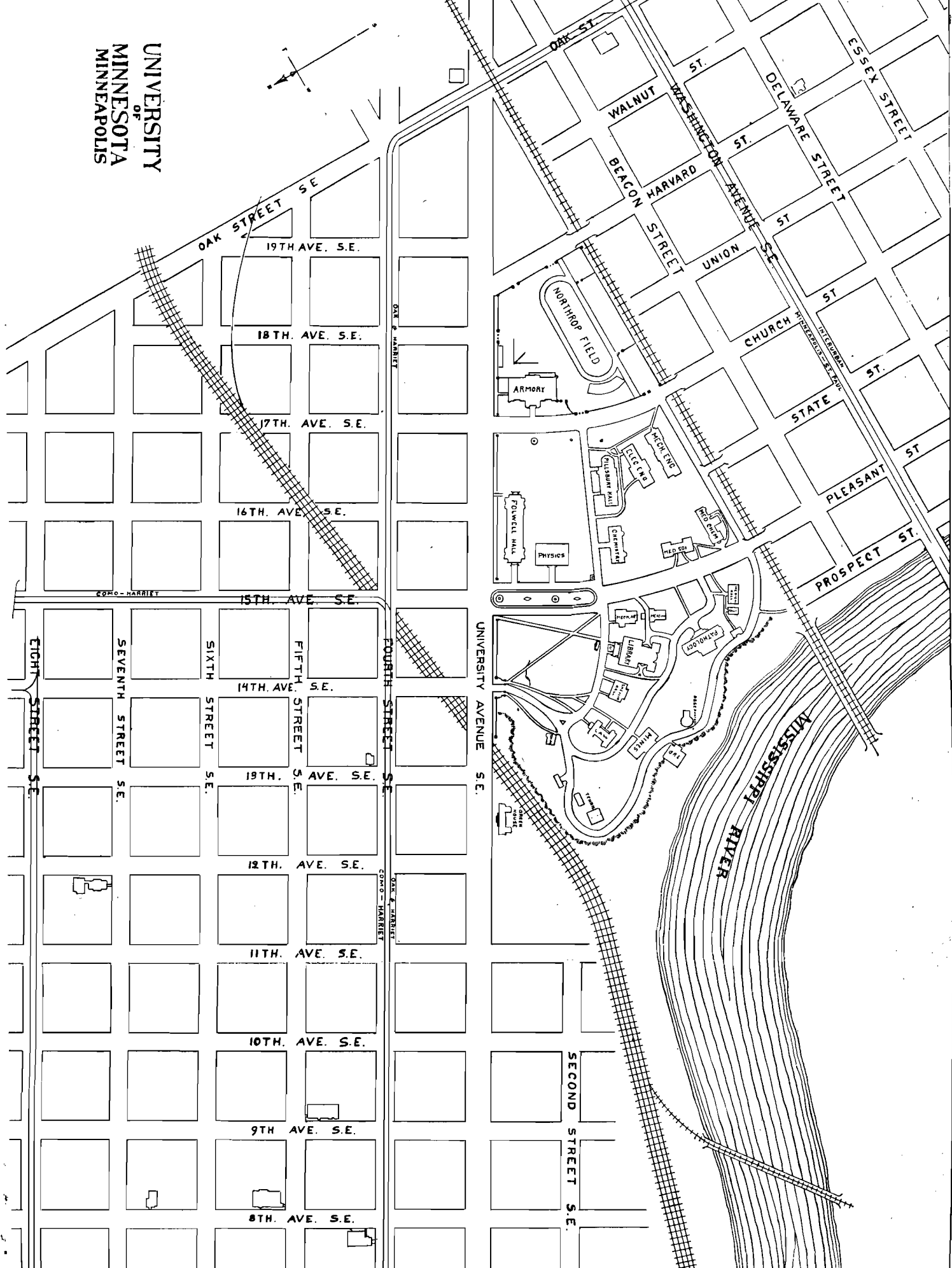
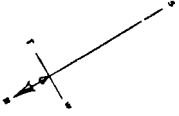
The University catalogues are published by authority of the Board of Regents, as a regular series of bulletins. One bulletin for each college is published every year, and in addition a bulletin of general information outlining the entrance requirements of all colleges of the University, and embodying such items as University equipment, organizations and publications, expenses of students, loan and trust funds, scholarships, prizes, etc. Bulletins will be sent gratuitously, postage paid, to all persons who apply for them. In calling for bulletins, please state the college or school of the University concerning which information is desired. Address,

THE REGISTRAR,

The University of Minnesota,

Minneapolis, Minnesota.

UNIVERSITY
of
MINNESOTA
MINNEAPOLIS



CALENDAR FOR 1908-1909

1908

1909

MAY

S.	M.	T.	W.	T.	F.	S.
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3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
31

JUNE

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JANUARY

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FEBRUARY

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MARCH

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University Calendar

1907-1908

THE UNIVERSITY YEAR

The University year covers a period of thirty-eight weeks beginning on the second Tuesday in September. Commencement day is always the second Thursday in June.

FEBRUARY	4 T	Second semester begins—classes called for regular work
	12 W	Lincoln's birthday—legal holiday
	22 S	Washington's birthday—legal holiday
APRIL	17 F	Good Friday. Recess two days
MAY	2 Th	Regular meeting Board of Regents
	25 M	Senior examinations begin
	30 S	Decoration Day—legal holiday
JUNE	1 M	Semester examinations begin
	6 S	Semester examinations close

COMMENCEMENT WEEK, 1908

SUNDAY	June 7	Baccalaureate service
MONDAY	June 8	Senior class exercises
TUESDAY	June 9	Phi Beta Kappa address. Senior promenade
WEDNESDAY	June 10	Alumni Day. Regular meeting Board of Regents
THURSDAY	June 11	Commencement Day. The thirty-sixth annual commencement
FRIDAY	June 12	Summer vacation begins

1908-1909

SEPTEMBER	7-14	Entrance examinations, condition examinations and registration
	15 T	Classes called for regular work. Twenty-first annual session
OCTOBER	1 Th	Regular meeting Board of Regents
	5 M	Regular meeting University Council
NOVEMBER	26 T	Thanksgiving Day. Recess three days
DECEMBER	7 M	Regular meeting University Council
	8 T	Annual meeting Board of Regents
	19 S	Holiday recess begins (no classes)
JANUARY	5 T	Work resumed in all departments
	23 S	Semester examinations begin
	30 S	Semester examinations close
FEBRUARY	2 T	Second semester begins—classes called for regular work
	12 F	Lincoln's birthday—legal holiday
	22 M	Washington's birthday—legal holiday
APRIL	5 M	Regular meeting University Council
	9 F	Good Friday—Recess two days

The School of Mines

3

MAY	6 Th	Regular meeting Board of Regents
	24 M	Senior examinations begin
	31 M	Decoration Day—legal holiday
JUNE	1 T	Semester examinations begin
	5 S	Semester examinations close
	7 M	Regular meeting University Council

COMMENCEMENT WEEK, 1909

SUNDAY	June 6	Baccalaureate service
MONDAY	June 7	Senior class exercises
TUESDAY	June 8	Sigma Xi address. Senior promenade
WEDNESDAY	June 9	Alumni Day. Regular meeting Board of Regents
THURSDAY	June 10	Commencement Day. The thirty-seventh annual commencement
FRIDAY	June 11	Summer vacation begins

PROGRAM—ENTRANCE EXAMINATIONS

MONDAY,	September 7, 9	A. M.	3 Botany
			3 Zoology
			1 Astronomy
			3 Geology
		2 P. M.	2 American Government
			2 Political Economy
TUESDAY,	September 8, 9	A. M.	2 History
			5 Physics
		2 P. M.	4 Chemistry
			3 Physiography
WEDNESDAY,	September 9, 9	A. M.	1 English
		2 P. M.	1 German
			1 French
			1 Latin
			1 Scandinavian
THURSDAY,	September 10, 9	A. M.	6 Elementary Algebra
			3 Commercial Geography
		2 P. M.	6 Higher Algebra
FRIDAY,	September 11, 9	A. M.	6 Plane Geometry
		2 P. M.	6 Solid Geometry

1 Folwell Hall, 2 Library Building, 3 Pillsbury Hall, 4 Chemical Laboratory, 5 Physics Building, 6 Mining Building.

PROGRAM—SUPPLEMENTARY EXAMINATIONS

TUESDAY,	Sept. 8,	9:00-12:00	Mathematics and Mechanics
		2:00-5:00	Mining Engineering Subjects
WEDNESDAY,	Sept. 9,	9:00-12:00	Chemistry
		2:00-5:00	Drawing and Descriptive Geometry
			Mechanical Engineering subjects
THURSDAY,	Sept. 10,	9:00-12:00	Metallurgical subjects
		2:00-5:00	Physics
FRIDAY,	Sept. 11,	9:00-12:00	Electrical Engineering subjects
		2:00-5:00	Geology and Mineralogy

The University

THE UNIVERSITY OF MINNESOTA comprises the following named schools, colleges and departments:

THE COLLEGE OF SCIENCE, LITERATURE AND THE ARTS

THE COLLEGE OF ENGINEERING AND THE MECHANIC ARTS

THE DEPARTMENT OF AGRICULTURE, including—

The College of Agriculture

The School of Agriculture

Short Course for Farmers

The Dairy School

The Crookston School of Agriculture

THE COLLEGE OF LAW

THE COLLEGE OF MEDICINE AND SURGERY

THE COLLEGE OF HOMEOPATHIC MEDICINE AND SURGERY

THE COLLEGE OF DENTISTRY

THE COLLEGE OF PHARMACY

THE SCHOOL OF MINES

THE SCHOOL OF ANALYTICAL AND APPLIED CHEMISTRY

THE COLLEGE OF EDUCATION

THE GRADUATE SCHOOL

The Regents of the University have entrusted to their charge:

THE EXPERIMENT STATIONS, including—

The Main Station at St. Anthony Park

The Sub-Station at Crookston

The Sub-Station at Grand Rapids

THE GEOLOGICAL AND NATURAL HISTORY SURVEY

Bulletins of these schools, colleges and departments may be obtained upon application to the University Registrar.

The Board of Regents

CYRUS NORTHROP, LL.D., MINNEAPOLIS	<i>Ex-Officio</i>
The President of the University	
The HON. JOHN LIND, MINNEAPOLIS	1914
The President of the Board	
The HON. JOHN A. JOHNSON, ST. PETER	<i>Ex-Officio</i>
The Governor of the State	
The HON. JOHN W. OLSEN, ALBERT LEA	<i>Ex-Officio</i>
The State Superintendent of Public Instruction	
The HON. THOMAS WILSON, ST. PAUL	1909
The HON. A. E. RICE, WILLMAR	1909
The HON. B. F. NELSON, MINNEAPOLIS	1910
The HON. DANIEL R. NOYES, ST. PAUL	1910
The HON. PIERCE BUTLER, ST. PAUL	1910
The HON. S. M. OWEN, MINNEAPOLIS	1913
The HON. W. J. MAYO, ROCHESTER	1913
The HON. HENRY B. HOVLAND, DULUTH	1914

C. D. DECKER, MINNEAPOLIS,
Secretary of the Board

Executive Officers

THE UNIVERSITY

CYRUS NORTHROP, LL. D., *President*

ERNEST B. PIERCE, B. A., *Registrar*

JAMES T. GEROULD, B. A., *Librarian*

C. D. DECKER, *Purchasing Agent*

J. D. BREN, *Cashier*

THE COLLEGES

JOHN F. DOWNEY, M.A., C.E., *Dean of the College of Science, Literature, and the Arts*

FREDERICK S. JONES, M.A., *Dean of the College of Engineering and the Mechanic Arts*

EUGENE W. RANDALL, *Dean and Director of the Department of Agriculture*

WILLIAM S. PATTEE, LL. D., *Dean of the College of Law*

FRANK FAIRCHILD WESBROOK, M.A., M.D., C.M., *Dean of the College of Medicine and Surgery*

EUGENE L. MANN, B.A., M.D., *Dean of the College of Homeopathic Medicine and Surgery*

ALFRED OWRE, D.M.D., M.D., *Dean of the College of Dentistry*

FREDERICK J. WULLING, Phm.D., LL.M., *Dean of the College of Pharmacy*

WILLIAM R. APPLEBY, M.A., *Dean of the School of Mines*

GEORGE B. FRANKFORTER, Ph.D., *Dean of the School of Chemistry*

GEORGE F. JAMES, Ph.D., *Dean of the School of Education*

HENRY T. EDDY, C.E., Ph.D., LL.D., *Dean of the Graduate School*

ADA L. COMSTOCK, M.A., *Dean of Women*

The University Council

At the regular meeting of the Board of Regents of the University, May 31st, 1905, a University Council was established according to the following plan:

I. The name of the body shall be The University Council. It shall consist of the President of the University, the Deans of the various colleges and schools, one elected representative from each college or school for each 400 students or major fraction thereof, and one representative of the general alumni association.

II. The elected members shall serve for a period of one year. They shall be chosen from the various faculties at the time of the selection of standing committees. The representative of the general alumni association shall be chosen by that body at its annual meeting from among the alumni who are not members of the University.

III. The Council shall be authorized to—

a) Appoint the following committees, or the faculty representation thereon:

The University auditing committee.

The University press committee.

The committee on athletics.

The committee on University relations to other institutions of higher learning.

The committee on health and sanitation.

The committee on commencement and other University functions.

The committee on catalogue, programs and courses of study.

The committee on student entertainments and social affairs.

And such other committees as the general University interests may require.

b) Receive reports from such committees and to make such recommendations as may be required.

c) Consider and act upon any matter of general University interest beyond the province of a single faculty which may be referred to it by the President of the University or any faculty.

IV. The Council shall hold stated meetings upon the first Monday of October, December, April and June, and such other meetings as the President of the University may call.

Representatives to the Council

The University

PRESIDENT CYRUS NORTHROP

The College of Science, Literature and the Arts

DEAN JOHN F. DOWNEY

PROFESSOR JOHN H. GRAY

PROFESSOR J. C. HUTCHINSON

PROFESSOR H. F. NACHTRIEB

PROFESSOR NORMAN WILDE

The College of Engineering and the Mechanic Arts

DEAN FREDERICK S. JONES

PROFESSOR GEORGE D. SHEPARDSON

The College and School of Agriculture

DEAN EUGENE W. RANDALL

PROFESSOR HARRY SNYDER

PROFESSOR SAMUEL B. GREEN

The College of Law

DEAN WILLIAM S. PEARCE

PROFESSOR HENRY J. FLETCHER

The College of Medicine and Surgery

DEAN F. F. WESBROOK

PROFESSOR THOMAS G. LEE

The College of Homeopathic Medicine and Surgery

DEAN EUGENE L. MANN

The College of Dentistry

DEAN ALFRED OWRE

The College of Pharmacy

DEAN FREDERICK JOHN WULLING

The School of Mines

DEAN WILLIAM R. APPLEBY

The School of Chemistry

DEAN GEORGE B. FRANKFORTER

The College of Education

DEAN GEORGE F. JAMES

The Graduate School

DEAN HENRY T. EDDY

General Alumni Association

DAVID P. JONES

University Council Committees

The University Auditing Committee

PROFESSORS ANDERSON, FLETCHER, OWRE, SIGERFOOS, SPRINGER

The Committee on Athletics

PROFESSORS PAIGE, BROOKE, HARDING, D. P. JONES, LITZENBERG

The Committee on Grounds and Sanitation

PROFESSORS FLATHER, BASS, BRACKEN, HICKMAN, RANDALL, SIDENER,
WESBROOK

The Committee on Catalogue, Programs and Course of Study

DEANS APPLEBY, EDDY, FRANKFORTER, JAMES, JONES, MANN, OWRE,
WULLING; PROFESSORS FLETCHER, JOHNSTON, SCHLENKER, SNYDER,
E. B. PIERCE

The Press Committee

PROFESSORS SCHAPER, BAUER, CONSTANT, ERDMANN, JAMES

The Committee on Commencement and other University Functions

PROFESSORS NACHTRIEB, JENKS, OWRE, PATTEE, RANDALL, SCHLENKER,
WASHBURN

The Committee on Student Entertainments and Social Affairs

PROFESSORS FRANKFORTER, BASS, COMSTOCK, COOKE, MULLEN, PIKE

The Committee on University Relations to other Institutions of Higher Learning

PROFESSORS DOWNEY, BOTHNE, EDDY, GRAY, GREEN, JAMES, LEE

The Committee on University Extension and University Lectures

PROFESSORS WEST, HAECKER, RANKIN, SCHLENKER, SHEPARDSON

The Committee on the Library

PROFESSORS EDDY, FLETCHER, F. S. JONES, LEE, REYNOLDS,
VAN BARNEVELD, WEST

The School of Mines

FACULTY

CYRUS NORTHROP, LL.D., *President*

WILLIAM R. APPLEBY, M. A., *Dean and Professor of Metallurgy*

CHARLES E. VAN BARNEVELD, B.A., Sc., E.M., *Professor of Mining Engineering*

PETER CHRISTIANSON, B.S., E.M., *Assistant Professor of Assaying*

JOHN J. FLATHER, Ph. B., M.E., *Professor of Mechanical Engineering*

GEORGE B. FRANKFORTER, Ph. D., *Professor of Chemistry*

BENJAMIN F. GROAT, B.S., *Professor of Mechanics and Mathematics*

CHRISTOPHER W. HALL, M.A., *Professor of Mineralogy and Geology*

FREDERICK S. JONES, M.A., *Professor of Physics*

WILLIAM H. KAVANAUGH, M.E., *Professor of Experimental Engineering*

WILLIAM H. KIRCHNER, B. S., *Professor of Drawing and Descriptive Geometry*

EDWARD P. MCCARTY, E.M., *Assistant Professor of Mining*

EDWARD E. NICHOLSON, M.A., *Assistant Professor of Chemistry*

LEVI B. PEASE, M.S., *Assistant Professor of Metallurgy*

GEORGE D. SHEPARDSON, M.A., M.E., *Professor of Electrical Engineering*

CHARLES F. SIDENER, B.S., *Professor of Chemistry*

INSTRUCTORS AND ASSISTANTS

ELTING H. COMSTOCK, M. S., *Instructor in Mathematics*

FRANCIS C. FRARY, M. S., *Instructor in Chemistry.*

FRANK F. GROUT, B.S., *Instructor in Mineralogy*

ALOIS F. KOVARIK, M. A., *Instructor in Physics.*

L. W. MCKEEHAN, *Assistant in Descriptive Geometry*

NORMAN W. ROSE, M. E., *Instructor in Drawing*

FRANK B. ROWLEY, B. S.; M. E., *Instructor in Drawing*

WILLIAM T. RYAN, E. E., *Instructor in Electrical Engineering*

CHARLES F. SHOOP, B.S., *Instructor in Mechanical Engineering*

ADMISSION

Examinations for admission will be held at the beginning of the year. See calendar and program of examinations.

All candidates for admission must take entrance examinations in Algebra and Geometry to the extent indicated in syllabi, pages 15 and 16. These examinations will be held in Room 23, School of Mines Building.

No student will be registered for first semester's work after September 26th, 1908, or for second semester's work after February 13th, 1909.

All applicants should present themselves to the registrar who will furnish them with application blanks and directions covering examinations and registration.

Women will not be admitted to any course offered in the School of Mines.

GENERAL REGULATIONS GOVERNING ADMISSION

- I. Students will be admitted to the freshman class on passing the regular entrance examinations.
- II. No student will be admitted if conditioned in more than three half-year subjects, or their equivalent. No conditions, however, in entrance mathematics shall be allowed except upon special permission of the Department of Mathematics.
- III. Graduates of any Minnesota State high school will be admitted without examination, except in Mathematics, provided—
 - (1) That the school maintain a full four-year course of high school work.
 - (2) That the applicant present to the registrar the principal's certificate showing the satisfactory completion of all the studies required for admission to the desired University course.
- IV. Graduates of Minnesota State high schools who are deficient in not more than three half-year subjects or their equivalent, may be excused from entrance examinations in such subjects as the enrollment committee may decide upon; such candidates should present themselves to the committee not later than Tuesday of examination week.
- V. Graduates of Minnesota State high schools whose principal's certificate shows them to be deficient in more than three half-year subjects or their equivalent, even though they have made such additional preparation as they deem necessary, must take, nevertheless, the regular entrance examination in all subjects, as provided in sections

- I. and II., unless excused by vote of the faculty; and persons wishing to present reasons for such excuse should report to the enrollment committee not later than Tuesday of examination week.
- VI. Graduates of the advanced courses of Minnesota normal schools will be admitted upon the same terms as graduates of State high schools.
- VII. Any Minnesota high school or academy not under supervision of the State High School Board, but requiring for graduation a four-years' course, exclusive of the common school branches, conforming essentially in distribution of time to the entrance requirements of at least one of the University courses, will, upon application, be inspected by a committee, and, after favorable recommendation, may be accredited by the faculty in all respects as are the State high schools, provided—
- (1) That the school be open to inspection at any time by the University:
 - (2) That it take such supplementary examinations as may be prescribed from time to time.
- VIII. Graduates from schools in other states, whose diplomas admit to reputable colleges in the state in which the school is located, will be received subject to the regulations that apply to graduates of Minnesota State high schools.
- IX. Applicants from schools not coming within any of the above classes must take the regular entrance examinations or present State High School Board certificates, and take examinations in entrance Mathematics.

In all cases the faculty reserves the right to require a student to take supplementary examinations if he does not sustain himself creditably in his course.

The enrollment committee will meet every day during the week commencing September 7th, in School of Mines Building, room 25, at 9 o'clock, a. m.

REQUIREMENTS FOR ADMISSION TO THE FRESHMAN CLASS

N.B.—Time element, as indicated with each subject, is essential:—

English, four years, including:

- (a) Classics
- (b) Principles of composition
- (c) Practice in written expression

Algebra, elementary, one year

Algebra, higher, one-half year

Geometry, plane, one year

Geometry, solid, one-half year

In addition to the above named required subjects, for which no substitutes will be accepted, the student shall present evidence of having completed work in any of the following subjects, entitling him to eight year-credits:

Latin, four years

Grammar, one year

Caesar, four books, one year

Cicero, six orations, one year

Virgil, six books, one year

Greek, two years

Grammar, one year

Anabasis, four books, one year

German, two years

Grammar, one year

Literature, one year

French, two years

Grammar, one year

Literature, one year

Spanish, two years

Grammar, one year

Literature, one year

Swedish, Danish-Norwegian, Icelandic, two years

Grammar, one year

Literature, one year

History

Ancient to Charlemagne, one year

Modern from Charlemagne, one year

England, one half year

Senior American, one half year

American Government, one half year

Political Economy, one half year

Physics, one year

Chemistry, one year

Botany, one half or one year

Zoölogy, one half or one year

Astronomy, one half year

Geology, one half year

Physiography, one half year

Commercial History and Commercial Law, one year.

Freehand Drawing, one year

Mechanical Drawing, one year

Book-keeping, one half year

Syllabi

The following statements indicate, in a general way, the ground expected to be covered in the study of the various subjects accepted for admission:

English (four years)

In order to secure a definite plan of study and unity of method on the part of preparatory schools, the entrance requirement in English is outlined below somewhat in detail. Where texts are mentioned they are merely suggestive and not arbitrary. Equivalents will be accepted in lieu of any of the texts mentioned. The entrance requirement in English covers four years of the high school course, and not less than four hours a week should be devoted to the subject. The headings under which instruction will naturally fall are:

- (a) English Classics
- (b) The Principles of Rhetoric
- (c) Practice in Written Expression
- (a) English classics should include a critical reading, in class, of English masterpieces. The following are suggested as well adapted for such study: Shakespeare's "Macbeth," Milton's "Paradise Lost," books one and two; Burke's "Conciliation with America"; Carlyle's essay on "Burns." In the study of these works the student should come to know the leading facts connected with the author and his time; he should become familiar with the subject-matter of the work; thoroughly at home with the story, and have a clear idea of the form and structure of the work as a whole.

A less critical knowledge of other standard or classic works, which may perhaps be read by the student at home, with written reports and brief oral discussion in class, is desirable. The following works are noted as indicative of the minimum amount of work expected: at least two of Shakespeare's plays, beside the one read in class, one of Irving's works, one of Hawthorne's novels, one of Stevenson's novels, and one of Webster's orations.
- (b) The work in the Principles of Composition should include the principals and technical terms of ordinary texts upon the subjects, whether acquired by direct study of such texts or mainly by the study of selected English masterpieces. It should not be forgotten that this is not an end in itself, but simply a means of teaching the student the correct use of English.
- (c) Not less than one hour each week throughout the four years of the high school course should be devoted to practice in written expression. The instructor may choose such topics as local conditions may require or make most profitable, but whatever line of work is pursued, the student should be taught to use language correctly and forcibly, and learn to express himself clearly and logically in writing.

Elementary Algebra (one year)

The four fundamental operations for rational algebraic expressions; factoring; highest common factor; lowest common multiple; fractions, including complex fractions; linear equations, both numerical and literal, containing one or more unknown quantities; problems involving linear equations; binomial theorem for positive integral exponents; powers and roots of rational algebraic expressions and of numbers.

Higher Algebra (one half year)

This course should begin with a thorough review of the work of the previous course, to the end that principles should be learned and theorems and rules rigorously demonstrated. Numerous problems which involve putting questions into equations should be solved, attention being paid to gaining an understanding of the principles involved rather than to mere dexterity in solution.

The new topics to be treated are:—theory of exponents; surds; quadratic equations, both numerical and literal; equations with one or more

unknown quantities that can be solved by the methods of quadratic equations; progressions; graphs.

Plane Geometry (one year)

The usual theorems and constructions contained in the best text books, including the general properties of plane rectilinear figures; the circle and measurement of angles; similar polygons; areas; regular polygons and the measurement of the circle.

Special emphasis should be placed upon developing the ability to solve original exercises, loci problems, and problems involving the mensuration of lines and surfaces.

Solid Geometry (one half year)

The usual theorems and constructions contained in the best text books including the relations of planes and lines in space; the properties and measurement of prisms, pyramids, cylinders and cones; the sphere and spherical triangle.

Original exercises, loci problems and problems involving the mensuration of surfaces and solids should form an important part of the course.

ADVANCED STANDING

The University accepts records from other colleges for credit to advanced standing. Such records are accepted as far as they are equivalent to the work in this University, subject to the approval of the departments concerned. In bringing records from other institutions, the certificates must be on the official blanks of the institution granting the certificate, and should show:

1. The subjects studied and ground covered
2. The time spent upon each subject
3. In case of laboratory subjects, a concise statement of work done
4. The result—it is sufficient to state that the subjects were creditably completed.

Students who desire to obtain advanced standing must present their applications and certificates to the enrollment committee who will consult the departments concerned in determining the credit to be given.

DAILY ROUTINE

The daily session is divided into eight recitation periods of fifty minutes each, four in the morning and four in the afternoon. The morning session begins at 8:30 and closes at 12:35 o'clock. A general assembly of the faculty and students is held at 10:25 o'clock, at which there are brief and simple religious exercises. The noon hour extends from 12:35 to 2 o'clock. The afternoon session begins at 2:00 o'clock, and continues until 5:40. Work extends through six days of the week.

EXAMINATIONS

Students failing to receive a semester mark of 75 per cent in any subject shall have the privilege of a supplementary examination before the opening of the following year.

Students failing to receive a semester mark of 50 per cent in any subject shall not be allowed to pursue any dependent subject.

The faculty will exclude students from attending classes in any subject upon recommendation of the department concerned.

Students failing to pass supplementary examinations must register the next year for those subjects in which they have failed. They may take in addition other subjects appearing in courses of instruction, pages 33 to 40, with the exception of Mining and Metallurgical courses, based upon requirements of the various courses and daily program. They may also take certain electives in other colleges, provided suitable arrangements can be made.

Each student must obtain from the Registrar his yearly average in all subjects and present himself for supplementary examinations, according to the program given on page 4.

All students must report in time to make suitable arrangements with departments concerned in case of conflicts in program.

No other supplementary examinations will be given. Students failing to report for supplementary examinations will be compelled to take work over in class as in case of failures.

Students failing to present themselves for final examination at the end of the first or second semester will be given zero on the examinations.

Students whose absences in either semester exceed four weeks in the aggregate are not permitted to take examinations without special permission of the faculty.

A fee of five dollars per subject is required for each special examination.

UNCLASSED STUDENTS

No unclassified students will be admitted to the School of Mines.

GRADUATION

Students completing courses of study to the satisfaction of the faculty are entitled to receive the appropriate degrees. Any person may undergo, at suitable times, examinations in any subject. If such person pass in all the studies and exercises of a course, he is entitled to the appropriate degree, **provided**, that at least one full year be spent at the University before such degree shall be granted, and **provided**, the examination in every case be held before a committee of the faculty appointed for that purpose.

THESES

Every member of the Senior class is required to prepare a type-written thesis which must be submitted for approval not later than April 10th. Theses must be handed in properly bound, together with original drawings, tracings, negatives and one set of clear blue prints therefrom, not later than May 1st.

The subject for the thesis will be the development, exploitation and equipment of a mining property or metallurgical plant. Considerable latitude is allowed in selecting conditions and location, subject, however, to the final approval of the professor in charge of the department.

The selection must be made and work must begin prior to the Christmas vacation. Students are expected to devote at least twelve hours a week to the preparation of their theses during the second semester.

Special Information

In the School of Mines there are two regular courses of study, viz.: Mining Engineering and Metallurgy, leading to the degree of Engineer of Mines (E. M.), and Metallurgical Engineer (Met. E.) respectively.

The degree of Met. E. may be conferred upon a candidate who received the degree of E. M. in four years, and vice versa, provided such a candidate completes an additional year's work at the school and presents a suitable thesis.

Students in the college of science, literature and the arts, in the college of engineering and mechanic arts, and school of technical and applied chemistry, who contemplate taking a degree in this school after completing their course, are recommended to select their electives with reference to as full a preparation as possible for the technical work of the course they propose to enter.

FEES

A registration fee of fifteen dollars is required at the beginning of each semester from residents of the state, and thirty dollars from non-residents.

The various laboratory fees are as follows:

Chemical laboratory (Qualitative).....	Per semester	\$5.00
Chemical laboratory (Quantitative).....	"	7.00
Mineralogical laboratory	"	3.00
Assaying laboratory	"	15.00
Experimental laboratory	"	6.00
Electrical laboratory	"	5.00
Ore testing laboratory	"	10.00

The trip to the mines made by the junior class costs the student from one hundred to one hundred and seventy-five dollars.

Books cost about as follows:

Freshman year	\$12.00 to \$15.00
Sophomore year	8.00 to 10.00
Junior year	18.00 to 25.00
Senior year	10.00 to 30.00

A number of books are recommended to the student, but the purchase of them is optional. The lower estimates given will cover the cost of books that must be purchased.

Each member of the freshman class must be provided with a set of draughting instruments. The necessary instruments will cost about fifteen dollars.

A number of valuable catalogs and pamphlets are loaned members of the senior class in the study of mechanics. A deposit of \$3.00 shall be made with the Accountant by each member, to be refunded upon the return in good condition of all such matter.

SUMMARY OF EXPENSES

FRESHMAN YEAR

*Incidental fee	\$30.00
Chemical laboratory fee	10.00
Mineralogical laboratory fee	6.00
Assaying laboratory fee	15.00
Books	13.00
Draughting instruments	15.00
Note book and supplies	6.00
	<hr/>
	\$95.00

SOPHOMORE YEAR

*Incidental fee	\$30.00
Chemical laboratory fee	14.00
Books	8.00
Note books and supplies	2.00
	<hr/>
	\$54.00

JUNIOR YEAR

*Incidental fee	\$30.00
Steam laboratory	2.00
Trip to the mines	\$100.00 to 175.00
Books	20.00
Note books and supplies	2.00
	<hr/>
	\$154 to \$229.00

SENIOR YEAR

*Incidental fee	\$30.00
Chemical laboratory fee	10.00
Electrical laboratory fee	5.00
Ore testing laboratory fee	10.00
Experimental laboratory fee	6.00
Books	30.00
Note books and supplies	2.00
	\$93.00

*For non-residents the incidental fee is \$60 per year.

Good board can be obtained at a cost varying from \$2.50 to \$4.00 per week. Room rent varies from \$5.00 to \$10.00 per month. With two occupying one room, the rent per student would be considerably lower.

ORGANIZATION

The organization of the School of Mines dates back to 1889, when the general faculty of the University recommended to the Board of Regents its establishment. In 1891 the Legislature of the State of Minnesota voted an appropriation for establishing and equipping the school. Two annual appropriations have since been made for its support. The legislature of 1901 appropriated \$47,500 for a new School of Mines building. In 1903 the legislature appropriated \$25,000 for completing and equipping the School of Mines building, and in 1905 an additional sum was provided for equipment.

SCHOOL OF MINES BUILDING

The School of Mines building is designed to accommodate only the technical work of the School of Mines, as adequate building accommodations and equipment have already been furnished for chemistry, geology, mineralogy, drawing and mechanical and electrical engineering. The building is 150 feet long by 65 feet wide. It is a brick building three stories high. The lower floor is occupied by the assaying and metallurgical laboratories; the second floor contains offices, two large lecture rooms, department library, and a museum; the third floor provides two quiz rooms, a large, well lighted draughting room, thesis room, a dark room and a blue print room. This building makes possible the development of the work already begun and offers facilities for more extended work along technical lines.

LOCATION

The University of Minnesota is located in the city of Minneapolis, on the east bank of the Mississippi river. The School of Mines has its buildings and laboratories on the same ground. Students of the School of Mines have, therefore, all the opportunities afforded by a large university.

Minneapolis is surrounded by and is in direct communication with several important mining and smelting districts. As the city is a railroad center, all possible transportation facilities are available.

FIELD WORK

Field work is conducted at the iron mines in the northern part of this state, in the copper and iron regions of Michigan, in the mines and smelters of Montana, Colorado, Utah and California, and in the coal mines of Pennsylvania.

At least one of these districts will be visited by each class, affording splendid opportunities for study and observation.

The field work in mining and metallurgy consists of one trip at the close of the Junior year. For details see pages 24 and 30.

Students must deposit with **Accountant**, at least **two weeks** before time set for the departure of class, a sum sufficient to cover following expense items:

- 1st. Board and lodging
- 2nd. Necessary mine supplies

Incidental expenses are not included in the above items and must be met individually.

A statement of expenditures will be rendered at the close of the work and any balance existing will be refunded.

The amount of deposit required will vary, according to the locality visited, and will be announced each year when arrangements for the trip are completed.

THE ELLIOT SCHOLARSHIP LOAN FUND

To fulfill the wish of the late Dr. A. F. Elliot to aid young men who find their efforts to obtain a practical education embarrassed through lack of means, the sum of \$5,000 was placed in the hands of the Board of Regents as a scholarship fund. The income from this fund is loaned students in the School of Mines on the following conditions:

The financial needs of the applicant, his scholarship, moral character, enthusiasm shown in his work and promise of usefulness in his profession. When money is available it may be loaned to pay expenses of

worthy students during sickness. The loans are to be repaid, without interest, at the earliest convenience of the recipients.

LIBRARY

The library consists of about two thousand two hundred volumes. This number represents only those works that treat directly of mining and metallurgical subjects.

The school has a complete set of the leading mining and metallurgical journals, and other similar books of reference. The leading periodicals are accessible to all. Constant references in lectures compel the student to keep himself well informed as to the latest methods, machinery and changes in practice going on in his special line of work.

In addition to the above, many thousand volumes on chemistry, mineralogy and geology complete a most valuable working and reference library. A card index is kept of all articles of value and interest appearing in the leading periodicals.

PHOTOGRAPHY

Photographs of surface and underground appliances, metallurgical plants, copies of drawings and other photographs are indispensable to the study of mining and metallurgy. With the report of his field work every student is expected to present photographs, as well as sketches, of various objects under consideration. There is also a very complete set of lantern slides illustrating the principal methods of underground workings and metallurgical plants, at home and abroad. Several hundred slides have been made in the department's laboratory which bear directly on the work done in Minnesota and the neighboring northwest. Many valuable photographs are constantly being made. Blue prints of these are given students as illustrations. Much time is thus saved, usually spent in making sketches and diagrams.

CLASSIFICATION OF SUBJECTS

The work falls under the following subdivisions, supplemented by thorough courses in mechanics, mathematics, physics, chemistry, mineralogy and geology:

(a) **Assaying**—to determine if ore has value for treatment. (b) **Mining engineering**—to furnish material for treatment. (c) **Ore testing**—To determine best method of treatment. (d) **Ore dressing**—furnishing products for metallurgical treatment. (e) **Metallurgy**—smelting and refining ores and ore dressing products; reduction to metals.

DEPARTMENT OF MINING ENGINEERING

Mining engineering extends through sophomore, junior and senior years. The subjects given together with the sequence necessary, are treated in the accompanying outline of the course.

Until the first semester of the junior year, the course consists of lectures and recitations only. In the subsequent work, text-books are used in connection with the lectures.

In the senior year, problems in hoisting, hauling, pumping, ventilation and similar subjects become an important part of the work.

DESIGNS AND SPECIFICATIONS

The student makes in connection with his thesis work working drawings of mine cars, skips and other parts of mine equipment that are usually designed and made at the mine.

MINE SURVEYING

The work in surveying is given in the first semester of junior year and is designed solely for mining engineers.

The work begins with the elements of plane surveying with special reference to the computations necessary, followed by the higher theoretical work in plane surveying and its application to the problems met in underground surveying. This is followed by a course in mine mapping during the second semester of junior year and six weeks of field work as follows: Beginning with the first Monday in May the class meets daily for the practice of plane surveying at some readily accessible locality (to be announced each year). The duration of this course is four weeks. Eight hours a day.

The students are divided into squads of two or four, and each is required to complete satisfactorily the following exercises and surveys:

1. Chaining
2. Compass reading
3. Adjustment of hand levels and practice in leveling
4. Adjustment and use of wye levels
5. Adjustment of mining transit
6. Reading angles
7. Traverse with steel tape
8. Azimuth traverse with stadia
9. Determination of meridian, latitude and time by solar and stellar observations

10. Survey of mining claim according to the regulations of the U. S. Government
11. Measurement of earthwork
12. Laying out railroad tangents, curves and crossings

Each squad must provide itself with a 6-foot steel tape, graduated to hundredths.

After the completion of this work from ten days to two weeks are spent in the actual underground survey of a mine or part of a mine in some mining district in Minnesota or Michigan.

A full equipment of surveying instruments of the latest and best makes is furnished to each squad for this work.

Students who furnish satisfactory evidence of proficiency in this work may be given credit therefor. The department, however, reserves the right in any case to require such students to take a theoretical or a practical examination or both.

FIELD WORK IN MINING

During the second semester arrangements are made by the department with various representative mines in the West to give students an opportunity to gain practical underground mining experience, and at least six weeks of such work is required of the student during the vacation following junior year. This work must be done at a mine selected by the department (the preference of the student will be consulted in so far as possible) subject to the following conditions:

Upon the termination of the metallurgical work about June 20th (this work follows immediately upon completion of the mine surveying) the student will report to the superintendent of the particular mine to which he is assigned. On no account is he to report later than July 1st. For fifteen days he will be set to work in various parts of the mine without remuneration. For the remainder of the summer he must engage in regular miner's work for which he may be paid current wages.

Four weeks of such work will be *required*. He will be subject to the regular mine discipline. In case he is discharged no attempt will be made by the department to investigate, but the student will be allowed to make up the work at the end of senior year. His degree will be withheld until all work is completed.

In the event of unforeseen contingencies, such as accidents, the sudden closing down of a mine, etc., the work must be made up at the first opportunity.

The student must keep a diary and record therein, in minute detail, all work done, his observations, sketches, etc. This diary shall be handed

in to the department not later than Sept. 10th of each year, together with an affidavit to the effect that it is authentic and is a true record of the work done by him. Prior to registration for the second semester of senior year the student must submit a typewritten report fully illustrated with sketches drawn to scale, covering all the mining and milling operations together with details of plant and equipment.

ORE DRESSING

The lectures and recitations in ore dressing extend through the second semester of the junior year, and comprise the detailed study of ore dressing and concentrating machinery, together with the study of typical combinations of dressing machines as found in the several mining districts of the United States.

In connection with the theoretical work, the ore dressing and testing plant of the school is utilized for practical illustrations.

COURSE IN MINING ENGINEERING

FRESHMAN YEAR

FIRST SEMESTER

Chemistry 1, eight hours, Mr. Frary
Descriptive Geometry 3, one hour, Professor Kirchner
Drawing 1, six hours, Professor Kirchner and Assistants
Mathematics 1, five hours, Mr. Comstock
Mineralogy 1, eight hours, Professor Hall and Mr. Grout

SECOND SEMESTER

Chemistry 2, eight hours, Assistant Professor Nicholson and Mr. Frary
Descriptive Geometry 4, two hours, Professor Kirchner
Drawing 2, four hours, Professor Kirchner and Assistants
Mathematics 2, five hours, Mr. Comstock
Metallurgy 1, twelve hours, Professor Appleby, Assistant Professor Christianson and Assistant Professor Pease
Mineralogy 2, four hours, Professor Hall and Mr. Grout

SOPHOMORE YEAR

FIRST SEMESTER

Chemistry 3, eight hours, Professor Sidener
Drawing 5, eight hours, Professor Kirchner and Assistants
Mathematics 3, five hours, Professor Groat and Mr. Comstock
Metallurgy 3, three hours, Assistant Professor Christianson
Physics 1, four hours, Professor Jones and Mr. Kovarik

SECOND SEMESTER.

Chemistry 5, eight hours, Professor Sidener
Drawing 6, four hours, Professor Kirchner and Assistants
Mathematics 4, five hours, Professor Groat and Mr. Comstock
Metallurgy 4, three hours, Assistant Professor Christianson
Mining 1, four hours, Assistant Professor McCarty
Physics 1, four hours, Professor Jones and Mr. Kovarik

JUNIOR YEAR

FIRST SEMESTER

Geology 3, two hours, Professor Hall
Experimental Engineering 1, four hours, Mr. Shoop
Geology 9, four hours, Mr. Grout
Mechanics 5, five hours, Professor Groat
Metallurgy 5, four hours, Assistant Professor Pease
Mining 2, five hours, Professor van Barneveld

Mining 3, five hours, Professor van Barneveld and Assistant Professor McCarty

SECOND SEMESTER

Geology 10, four hours, Mr. Grout

Experimental Engineering 2, four hours, Mr. Shoop

Mechanics 6, five hours, Professor Groat

Metallurgy 6, four hours, Assistant Professor Pease

Mining 2, five hours, Professor van Barneveld

Mining 5, five hours, Assistant Professor McCarty

Mining 8, five hours, Assistant Professor McCarty

Mechanical Engineering 18, two hours, Professor Flather

Field work. Months of May, June, July and August

Mine Surveying 7 beginning about May 1st. Six weeks

Professor van Barneveld

Assistant Professor McCarty

Professor Appleby

Assistant Professor Christianson

Assistant Professor Pease

Professor van Barneveld

Assistant Professor McCarty

Metallurgy 8, one week

Practical Mining 9, six weeks

SENIOR YEAR

FIRST SEMESTER

Chemistry 14, eight hours, Professor Sidener

Electrical Engineering 4, six hours, Mr. Ryan

Geology 12, four hours, Professor Hall

Mechanics 7, five hours, Professor Groat

Metallurgy 2, ten hours, Professor Appleby, Assistant Professor Christianson and Assistant Professor Pease

Mining 4, five hours, Professor van Barneveld

Mining (Thesis) 10, two hours, Professor van Barneveld and Assistant

SECOND SEMESTER

Chemistry 18, eight hours, Professor Sidener

Experimental Engineering 9, four hours, Professor Kavanaugh

Geology 3, four hours, Professor Hall

Mechanics 8, three hours, Professor Groat

Mining 4, five hours, Professor van Barneveld

Mining (Designs and Specifications) 6, eight hours, Professor van Barneveld and Assistant

Mining (Thesis) 10, four hours, Professor van Barneveld and Assistant

DEPARTMENT OF METALLURGY

This department is well supplied with representative ores of all the most important metals, drawings of furnaces, models and samples of all the different furnace products. The lectures treat of all the principal methods now in use.

The practical work consists in visits to smelting and refining works which are accessible. The work in metallurgy extends through three years.

ASSAYING

The lectures treat of and describe apparatus, reagents, assay furnaces, fuels, etc., in connection with this subject. The principles of assaying and sampling are fully explained. A collection of representative ores of various metals with a collection of corresponding slags are shown, and instruction is given as to nature and quantity of fluxes. Special and rapid methods of testing slags and metallurgical products as employed in western smelting works are emphasized.

The laboratory course includes preparing and testing reagents, making cupels, etc., and assaying samples of ore, furnace and mill products, and bullion; different charges are tried and practical conclusions drawn.

Great importance is attached to the work in the laboratory. A large well ventilated furnace room in which are located muffle and crucible furnaces, and another room of similar dimension equipped with desks, pulp and bead balances, afford accommodations to a large number of students. Ores of various metals of known value are given the students, who are required to make up the necessary charges and submit their reports in detail. This work is offered to students completing the necessary courses in mineralogy and chemistry.

The Assay Laboratories are located in the School of Mines Building and consist of:

1st Preparation room. This room is 62 feet long by 36 feet wide and accommodates 66 students. Here samples and reagents are weighed preparatory to assaying. Each student is furnished with a complete set of apparatus, including a pulp balance for individual use. All operations are therefore conducted with the greatest economy of time and entirely apart from the furnace room. The separation of the preparation room from the furnace room is of greatest importance. Nearly all ores are crushed and pulverized by suitable machines run by electric motors. Students are compelled to pulverize by hand a minimum number of samples, thereby saving much time for extended and advanced work in special lines.

2nd. Furnace room. This room is 60 feet long by 42 feet wide. The

high ceiling and special ventilation provided for this room make it a most comfortable assay furnace room. It provides for the accommodation of twelve double-decked muffle furnaces, twenty-four crucible furnaces and twelve gasoline furnaces. After the sample has been placed in a suitable vessel for fusion, it is taken to the furnace room, which communicates directly with the preparation room.

3rd. Balance room. This room is 31 feet long by 16 feet wide. In this room are various types of balances for accurately weighing gold and silver beads and bullion. The room is specially lighted by electric cove lights from the ceiling. The balances are placed on heavy brick piers which are independent of the walls of the building.

ORE TESTING

The lectures treat of the use and purposes of all the machinery connected with the subject, supplemented with detail drawings.

There are complete testing works connected with the department where the student may see the working of, and handle for himself, crushers, rolls, Huntington mill, concentrating machinery, such as vanners, buddles, jigs, pan for amalgamation, settlers, reverberatory furnaces for oxidizing and oxidizing-chloridizing roasts, leaching and chlorination plants, as well as sizing apparatus and hydraulic separators. Sufficiently large amounts of ore are given to make the necessary tests upon the different machines, and the students report the best method of treatment. The first semester of the senior year is devoted to instruction and laboratory work, and is required of students both in mining and metallurgy.

The ore testing works meet educational as well as commercial needs.

Educational. The ore testing plant acquaints the student with the construction and manipulation of the principal typical machines used in the leading ore dressing establishments of the country. It is here that students in mining and metallurgical engineering get the requisite practical experience. They handle all machines and operate on sufficiently large amounts of material to determine the methods best suited to a given ore to extract the largest amount of metal with the least possible loss.

Commercial. Ore testing works are an important factor in mining and metallurgical projects. The commercial object is to determine the best method of treating a given ore so as to yield the largest percentage of the metal it contains at the least possible cost. Samples varying from 500 pounds to car load lots can be treated by various methods.

The ore testing works are located on the east bank of the Mississippi between the Great Northern and Northern Pacific railroads. Located at this point on the University campus, it offers the very best facilities for both educational and commercial purposes.

As the funds appropriated for the erection of such a plant were sufficient to purchase only the necessary machinery, the business men of Minneapolis generously provided a suitable building. This building, 94x66 feet, is built of brick and stone.

Machinery. The plant contains all the machinery necessary to illustrate the various processes of ore testing, viz.: A Bridgman mechanical sampler, size B; a link belt bucket elevator; a pulley feeder complete; a pair of 12½ x12 geared rolls complete; a four compartment spitzkasten; a three compartment Hartz jig; a Collum jig complete with cone for driving; a three and a half foot Huntington mill complete; a three stamp mill, 275-pound stamps; a five stamp mill, 850-pound stamps; a Challenge automatic feeder for five-stamp battery; a suspended Challenge feeder for three-stamp battery; a Tulloch feeder for Huntington mill; a single deck buddle, twelve feet in diameter; a four-foot plain belt Frue vanner; a Cammett concentrator; a Hooper pneumatic concentrator; a Century drop motion jig; a three-foot amalgamating pan; a five-foot settler; a Bruckner roasting furnace, with fire box on wheels; a chlorination barrel; a battery tightener; a two-horse power vertical boiler; a steam drying pan; three trommels, with driving arrangement and gears; a one-thousand pound Reedy elevator, complete with worm gear; two overhead crawls, each with eighty-foot track; one-ton pulley block; a quarter-ton pulley block; a scoop car, with flat wheels; two twenty-horse power electric motors; three MacDermott automatic samplers, etc.

FIELD WORK

At the end of junior year opportunity is given the student to study metallurgical operations at one or more smelting works. This work will begin about June 15th. Not over one week's time will be devoted to this work. The student must keep a diary and note in detail all work done, including sketches, etc. This diary must be submitted to the department not later than Sept. 10th before registering for senior year.

Prior to registration for the second semester senior year, the student must submit a type written report fully illustrated with sketches drawn to scale covering work completed in the field.

COURSE IN METALLURGY

FRESHMAN YEAR

FIRST SEMESTER

Chemistry 1, eight hours, Mr. Frary
Descriptive Geometry 3, one hour, Professor Kirchner
Drawing 1, six hours, Professor Kirchner and Assistants
Mathematics 1, five hours, Mr. Comstock
Mineralogy 1, eight hours, Professor Hall and Mr. Grout

SECOND SEMESTER

Chemistry 2, eight hours, Assistant Professor Nicholson and Mr. Frary
Descriptive Geometry 4, two hours, Professor Kirchner
Drawing 2, four hours, Professor Kirchner and Assistants
Mathematics 2, five hours, Mr. Comstock
Metallurgy 1, twelve hours, Professor Appleby, Assistant Professor Christianson and Assistant Professor Pease
Mineralogy 2, four hours, Professor Hall and Mr. Grout

SOPHOMORE YEAR

FIRST SEMESTER

Chemistry 3, eight hours, Professor Sidener
Drawing 5, eight hours, Professor Kirchner and Assistants
Mathematics 3, five hours, Professor Groat and Mr. Comstock
Metallurgy 3, three hours, Assistant Professor Christianson
Physics 1, four hours, Professor Jones and Mr. Kovarik

SECOND SEMESTER

Chemistry 5, eight hours, Professor Sidener
Drawing 6, four hours, Professor Kirchner and Assistants
Mathematics 4, five hours, Professor Groat and Mr. Comstock
Metallurgy 4, three hours, Assistant Professor Christianson
Mining 1, four hours, Assistant Professor McCarty
Physics 1, four hours, Professor Jones and Mr. Kovarik

JUNIOR YEAR

FIRST SEMESTER

Geology 3, two hours, Professor Hall
Geology 9, four hours, Mr. Grout
Experimental Engineering 1, four hours, Mr. Shoop
Mechanics 5, five hours, Professor Groat

Metallurgy 5, four hours, Assistant Professor Pease
Mining 2, five hours, Professor van Barneveld
Mining 3, five hours, Professor van Barneveld and Assistant Professor
 McCarty

SECOND SEMESTER

Geology 10, four hours, Mr. Grout
Mechanics 6, five hours, Professor Groat
Experimental Engineering 2, four hours, Mr. Shoop
Metallurgy 6, four hours, Assistant Professor Pease
Mining 2, five hours, Professor van Barneveld
Mining 5, five hours, Assistant Professor McCarty
Mining 8, five hours, Assistant Professor McCarty
Mechanical Engineering 18, two hours, Professor Flather
Field work. Months of May, June, July and August.
 Mine Surveying 7, Beginning about May 1st.
 Six weeks Professor van Barneveld
 Assistant Professor McCarty
 Metallurgy 8, one week Professor Appleby
 Assistant Professor Christianson
 Assistant Professor Pease
 Practical Mining 9, six weeks. Professor van Barneveld,
 Assistant Professor McCarty

SENIOR YEAR

FIRST SEMESTER

Chemistry 14, eight hours, Professor Sidener
Electrical Power, Electrical Engineering 4, six hours, Mr. Ryan
Geology 12, four hours, Professor Hall
Mechanics 7, five hours, Professor Groat
Mining 4, five hours, Professor van Barneveld
Metallurgy 2, ten hours, Professor Appleby, Assistant Professor Christian-
 son and Assistant Professor Pease

SECOND SEMESTER

Chemistry 18, eight hours, Professor Sidener
Chemistry 16, six hours, Professor Frankforter and Mr. Frary
Experimental Engineering 9, four hours, Professor Kavanaugh
Mechanics 8, three hours, Professor Groat
Metallurgy 7, three hours, Assistant Professor Christianson
Metallurgy 9, four hours, Professor Appleby and Assistants
Mining 4, five hours, Professor van Barneveld

Courses of Instruction

CHEMISTRY

GEORGE B. FRANKFORTER, *Ph. D., Professor of Chemistry*

CHARLES F. SIDENER, *B. S., Professor of Chemistry*

EDWARD E. NICHOLSON, *M. A., Assistant Professor of Chemistry*

FRANCIS C. FRARY, *M. S., Instructor in Chemistry*

1. GENERAL AND QUALITATIVE ANALYSIS PROFESSOR NICHOLSON AND MR. FRARY
Five credits (two lectures, six laboratory hours per week)
Required of freshmen. First semester
The course includes special general chemistry and the reactions of the metals as applied to their separation and identification.
2. QUALITATIVE ANALYSIS PROFESSOR NICHOLSON AND MR. FRARY
Five credits (two lectures, six laboratory hours per week)
Open to students completing 1. Required of freshmen. Second semester
The work in this course will include examination of alloys, minerals, slags and other compounds.
3. QUANTITATIVE ANALYSIS PROFESSOR SIDENER AND ASSISTANTS
Five credits (two lectures, six laboratory hours per week)
Open to students completing 2. Required of sophomores. First semester
The course includes an introduction to quantitative and a beginning of gravimetric analysis.
5. VOLUMETRIC ANALYSIS PROFESSOR SIDENER AND ASSISTANTS
Five credits (two lectures, six laboratory hours per week)
Open to students completing 3. Required of sophomores. Second semester
The course includes an introduction to volumetric determinations with a discussion of standard solutions and the necessary stoichiometric calculations.
14. SPECIAL PROBLEMS PROFESSOR SIDENER AND ASSISTANTS
Five credits (two lectures, six laboratory hours per week)
Open to students completing 5. Required of seniors First semester
The course includes the working out of various mineralogical technological and metallurgical problems, with work on ores of base metals, limestone, slags, etc.
16. ELECTRO-CHEMICAL ANALYSIS PROFESSOR FRANKFORTER AND MR. FRARY
Four credits (two lectures, four laboratory hours per week)
Open to students completing 14. Required of seniors in Metallurgy. Second semester
The course includes the qualitative and quantitative separation of metals by electrolysis.

NOTE.—A credit is one recitation or lecture hour per week per semester. Two laboratory hours are equal to one credit.

18. IRON AND STEEL ANALYSIS PROFESSOR SIDENER AND ASSISTANTS
 Five credits (two lectures, six laboratory hours per week) Second semester
 Open to students completing 14. Required of seniors.
 The course includes the rapid determination of iron by the various methods, as well as the determination of associated elements, sulphur, phosphorus, silicon, manganese, carbon and others.

DRAWING AND DESCRIPTIVE GEOMETRY

WILLIAM H. KIRCHNER, B. S., *Professor of Drawing and Descriptive Geometry*

FRANK B. ROWLEY, B. S., M. E., *Instructor in Drawing*

NORMAN W. ROSE, M. E., *Instructor in Drawing*

L. W. MCKEEHAN, *Assistant in Descriptive Geometry*

1. DRAWING MR. ROSE, MR. MCKEEHAN AND MR. ROWLEY
 Three credits (six laboratory hours per week) First semester
 Required of freshmen.
 The elements of general drafting, mechanical drawing as a language. Lines, views, dimensions, standards, signs, abbreviations and explanatory notes.
 Sketching, lettering, tracing and blue printing. Representation of details of machines and structures, and the interpretation of working drawings.
2. DRAWING MR. ROSE, MR. MCKEEHAN AND MR. ROWLEY
 Two credits (four laboratory hours per week) Second semester
 Open to students completing 1. Required of freshmen.
 Continuation of Course 1 as outlined above.
3. DESCRIPTIVE GEOMETRY PROFESSOR KIRCHNER
 One credit (one recitation per week) First semester
 Required of freshmen.
 Projection—central and special cases; principles and applications, representation of lines, planes and solids, and of their relations; tangencies, intersections and developments. Recitations, lectures and solution of problems.
4. DESCRIPTIVE GEOMETRY PROFESSOR KIRCHNER
 Two credits (two recitation hours per week) Second semester
 Open to students completing 3. Required of freshmen.
 Continuation of Course 3 as outlined above.
5. DRAFTING PROFESSOR KIRCHNER AND ASSISTANTS
 Four credits (eight laboratory hours per week) First semester
 Open to students completing 4. Required of sophomores.
 Graphics, machine drafting, structural drafting and topography. Instruction in drafting room methods. Preparation required. Courses 1, 2, 3, and 4.
6. DRAFTING PROFESSOR KIRCHNER AND ASSISTANTS
 Two credits (four laboratory hours per week) Second semester
 Open to students completing 5. Required of sophomores.
 Continuation of Course 5 as outlined above.

ELECTRICAL ENGINEERING

GEORGE D. SHEPARDSON, M. A., M. E., *Professor of Electrical Engineering*

WILLIAM T. RYAN, E. E., *Instructor in Electrical Engineering*

4. ELECTRIC POWER

MR. RYAN

Six credits (three lectures, six laboratory lectures hours per week)
First semester

Open to students completing Physics 1. Required of seniors.
Elements of theory and practice of electrical measurements,
wiring, dynamos, motors and electric lighting

EXPERIMENTAL ENGINEERING

WILLIAM H. KAVANAUGH, M. E., *Professor of Experimental Engineering*

CHARLES F. SHOOP, B. S., *Instructor in Experimental Engineering*

1. STRENGTH OF MATERIALS

MR. SHOOP

Two credits (four laboratory hours per week) First semester
Open to students completing Mechanics 5. Required of juniors.

Laboratory work investigating the strength and physical
qualities of iron, steel, brass, copper, belting, chains,
beams, brick and stone.

2. STEAM LABORATORY

MR. SHOOP

Two credits (four laboratory hours per week) Second semester
Open to students completing 18. Required of juniors.

Exercises in valve setting, indicator practice, calibration of
steam gauges, efficiency of screws and hoists.

9. EXPERIMENTAL LABORATORY

PROFESSOR KAVANAUGH

Two credits (four laboratory hours per week) Second semester
Open to students completing 2. Required of seniors.

Hydraulic measurements. Calibration of weirs, nozzles, meters
and other hydraulic apparatus; calorimetry; tests of pumps,
engines and boilers.

MINERALOGY AND GEOLOGY

CHRISTOPHER W. HALL, M.A., *Professor of Mineralogy and Geology*

FRANK F. GROUT, B.S., *Instructor in Mineralogy*

1. GENERAL MINERALOGY

MR. GROUT

Six credits (four lectures, four laboratory hours per week) First semester

Required of freshmen

The physical and chemical characters of minerals; a study
of the native elements and the ores of the common metals;
the occurrence and association of economic minerals.

Descriptive mineralogy and classification; rock-forming min-
erals; genetic relationships and distribution.

Laboratory work consists of tests illustrating the range of
minerals and the application of chemical and blowpipe anal-
yses to the determination of species; and introduction to
the methods of quantitative blowpipe analysis; special
topics; reference reading and discussions.

2. **PHYSICAL MINERALOGY** MR. GROUT
 Three credits (two lectures, two laboratory hours per week)
 Open to students completing 1. Required of freshmen.
Second semester
 An introduction to crystallography; physical characters of
 greatest service in rapid determination. Hand specimen
 practice preparatory to rock study.
3. **PHYSICAL GEOLOGY** PROFESSOR HALL
 Two credits (two lectures per week) First semester
 Open to students completing 2. Required of juniors.
 1. Geodynamics, discussing the atmosphere, water, terres-
 trial heat, plants and animals as geological agents. 2.
 Structural geology, explaining stratification, displace-
 ments, dislocations, fractures, induced rock-structures and
 mineral veins in their relation to the arrangement of mat-
 erials in the earth. 3. Physiographic geology, point-
 ing out the more prominent earth features and discussing
 their origin, significance and the agencies affecting them.
 Field excursions are required. Scott's Introduction.
9. **ELEMENTS OF ROCK STUDY** MR. GROUT
 Two credits, (four laboratory hours per week) First semester
 Open to students completing 3. Required of juniors.
 Structures, textures, mineral and chemical composition of rocks.
 A practical study of rock types, with laboratory and field
 practice. A study of their origin, occurrence, variation and
 alteration, with view to accurate description. Introduction
 to the use of the microscope. Kemp's Handbook of Rocks,
 and reference reading.
10. **PETROGRAPHY** MR. GROUT
 Two credits (four laboratory hours per week) Second semester
 Open to students completing 9. Required of juniors.
 The application of optical study of minerals to the description
 of crystalline rocks. Rock structures as seen with a micro-
 scope. Alteration of rocks. The stratigraphic relation of
 rocks, and an examination of some Minnesota groups of
 crystalline rocks. Preparation of material for microscopic
 study, Lu Quer, Minerals in Rock Sections, and reference read-
 ings.
12. **ORE DEPOSITS** PROFESSOR HALL
 Four credits (four lectures per week) First semester
 Open to students completing 10. Required of seniors.
 History of mineral discovery and development in the Ameri-
 cas; a discussion of the origin and distribution of ore de-
 posits, embracing the chemical processes involved in their
 formation and subsequent alterations. A description of
 the geology and mineralogy of ore bodies, particularly
 those yielding gold, silver, copper, iron, lead and zinc.
 Kemp's Ore Deposits.
13. **SPECIAL PROBLEMS** PROFESSOR HALL
 Two credits (four laboratory hours per week) Second semester
 Open to students completing 12. Required of seniors in mining.
 The investigation of problems, involving the field and laboratory
 work of some particular formation and reading incident to the
 study of the material collected. The methods of systematically
 recording and interpreting geological and mineralogical data as
 observed in the field; keeping of notebook, preparation of geo-
 logical maps, profiles and sections will be taught.

MECHANICS AND MATHEMATICS

B. F. GROAT, B. S., *Professor of Mechanics and Mathematics*ELTING H. COMSTOCK, M. S., *Instructor in Mathematics*

1. ALGEBRA AND TRIGONOMETRY MR. COMSTOCK
 Five credits (five recitations per week) First semester
 Required of freshmen.
 Rational integral functions, factors and roots of general quadratic, factor and remainder theorems, factors and values of $f(x)$, graphs, cube roots of unity, progressions and notation, development of $f(x)$, and undetermined co-efficients, convergence, divergence, equivalence, exponential theorem, logarithmic series and logarithms, summation of series, derived functions, theory of equations, trigonometric ratios, right triangles, general definitions of functions, analytic relations, trigonometric equations, oblique triangles.
2. ALGEBRA AND ANALYTIC GEOMETRY MR. COMSTOCK
 Five credits (five recitations per week) Second semester
 Open to students completing 1. Required of freshmen.
 Spherical formulae and solution of spherical triangles, permutations and combinations, determinants, systems of co-ordinates, loci, straight line, transformation, equations of the conics, limits, areas and limits of sums, differentiation and integration of elementary forms, probabilities.
3. ANALYTIC GEOMETRY AND INFINITESIMAL ANALYSIS MR. COMSTOCK
 Five credits (five recitations per week) First semester
 Open to students completing 2. Required of sophomores.
 Properties of the conics, equation of 2d degree, higher plane curves, co-ordinates in space, point, plane, straight line, quadric surfaces, review of nature of differentiation and integration, elementary forms, geometric applications, successive derivatives, expansion of functions, indeterminate forms, rates, partial derivatives, maxima and minima, change of variable, applications to analytic geometry
4. DIFFERENTIAL AND INTEGRAL CALCULUS MR. COMSTOCK
 Five credits (five recitations per week) Second semester
 Open to students completing 3. Required of sophomores.
 Applications continued, rational fractions, rationalization, formulae of reduction, multiple integration, various systems of co-ordinates, approximate integration, some differential equations of mechanics, least squares.
5. STATICS AND MECHANICS OF MATERIALS PROFESSOR GROAT
 Five credits (five recitations and lectures per week) First semester
 Open to students completing 4 and Physics 1. Required of juniors.
 Mathematical conditions of equilibrium, frames, theory of elasticity, beams, shafts, columns, boiler plates, etc.
6. KINETICS AND HYDRAULICS PROFESSOR GROAT
 Five credits (five recitations and lectures per week) Second semester
 Open to students completing 5. Required of juniors.
 Motion of rigid bodies; numerous problems in work, power, energy, friction and hydraulics.
7. WATER POWER PROFESSOR GROAT
 Five credits (five recitations and lectures per week) First semester
 Open to students completing 6. Required of seniors.

Estimation of power to be developed at a power site. Dams. Riparian rights. Number and type of units to install. Speed control. Power houses. Appendages. Transmission.

8. THERMODYNAMICS PROFESSOR GROAT
 Three credits (three recitations and lectures per week) Second semester
 Open to students completing 7. Required of seniors.
 Properties of gases. Steam engine. Gas engine. Steam and gas turbines. Power plants. Pumping.

MECHANICAL ENGINEERING

JOHN J. FLATHER, Ph. B., M. E., *Professor of Mechanical Engineering*

18. STEAM ENGINE PROFESSOR FLATHER
 Two credits (two lectures per week) Second semester
 Open to students completing Mechanics 5. Required of juniors.
 Mechanics of the steam engine. Work in cylinder; effect of reciprocating parts; steam distribution. Mechanism of steam engines. A study of the details of modern steam engines. Valve and valve gears. A study of the slide valve, link motions and other reversing gear; automatic cut-off gears and the Zeuner diagram. The steam engine indicator. Principles and operation of the instruments, indicator rigging; indicator cards, compounding.

METALLURGY

WILLIAM R. APPLEBY, M. A., *Professor of Metallurgy*

PETER CHRISTIANSON, B. S., E. M., *Assistant Professor of Assaying*

LEVI B. PEASE, M. S., *Assistant Professor of Metallurgy*

1. ASSAYING PROFESSOR APPLEBY AND ASSISTANTS
 8 credits (four lectures and eight laboratory hours per week) Second semester
 Open to students completing Mineralogy 1. Required of freshmen.
 Determination of values of ores, metallurgical products and bullion.
2. ORE TESTING PROFESSOR APPLEBY AND ASSISTANTS
 Six credits (two lectures and eight laboratory hours per week) First semester
 Open to students completing 1 and Mining 5. Required of seniors.
 Determination of methods of ore treatment, stamping, concentration, cyanidation, roasting, chlorination, lixiviation and amalgamation.
3. GENERAL METALLURGY AND METALLURGY OF IRON ASSISTANT PROFESSOR CHRISTIANSON
 Three credits (three lectures per week) First semester
 Open to students completing 1. Required of sophomores.
 Including the subjects of combustion, fuels, refractory material and furnaces. Lectures and recitations on metallurgy of iron.
4. METALLURGY OF WROUGHT IRON AND STEEL ASSISTANT PROFESSOR CHRISTIANSON
 Three credits (three lectures per week) Second semester

Open to students completing 3. Required of sophomores.
Consideration of the principles of manufacture, details of plant construction and chemical and physical phenomena.

5. **METALLURGY OF THE BASE METALS** ASSISTANT PROFESSOR PEASE
Four credits (four lectures per week) First semester
Open to students completing 4. Required of juniors.
Lead, copper, zinc and mercury. Consideration of smelting methods and principles involved refining methods.
6. **METALLURGY OF THE PRECIOUS METALS** ASSISTANT PROFESSOR PEASE
Four credits (four lectures per week) Second semester
Open to students completing 5. Required of juniors.
Gold, silver and platinum. Methods and principles of cyanidation, chlorination, amalgamation and lixiviation as applied to the treatment of the above.
7. **ELECTRO-METALLURGY** ASSISTANT PROFESSOR CHRISTIANSON
Three credits (three lectures per week) Second semester
Open to students completing 6. Required of seniors in Metallurgy.
This course considers the treatment of ores by electricity, as well as electrolytic separation and refining of metals.
8. **FIELD WORK IN METALLURGY** PROFESSOR APPLEBY AND ASSISTANTS
Two credits (eight hours per day in field for seven days) June following second semester
Open to students completing 6. Required of juniors.
Study of metallurgical operations at smelters and mills. Detail report is required covering plants visited.
9. **THESIS AND SPECIFICATIONS** PROFESSOR APPLEBY AND ASSISTANTS
Four credits (four hours conferences and laboratory) Second semester
Open to students completing 8. Required of seniors in Metallurgy.
Detail investigations of ore treatment, with report including designs and specifications for suitable plants.

MINING ENGINEERING

CHARLES E. VAN BARNEVELD, B.A., Sc., E.M., *Professor of Mining Engineering*

EDWARD P. McCARTY, E.M., *Assistant Professor of Mining*

1. **MINING** ASSISTANT PROFESSOR McCARTY
Four credits (four lectures per week)
Open to sophomores in regular standing. Required of sophomores.
Explosives, blasting, air compressors and quarrying.
2. **MINING** PROFESSOR VAN BARNEVELD
Five credits (five lectures per week) First and second semester
Open to those who have completed 1. Required of juniors.
Mode of occurrence of ore bodies; prospecting, shaft-sinking, tunneling, drifting, stoping, timbering. Methods of metal mining. Methods of coal mining. Hydraulic mining.
3. **MINE SURVEYING** PROFESSOR VAN BARNEVELD AND ASSISTANT
Five credits (five lectures per week) First semester
Open to those who have taken mathematics 1, 2, 3 and 4 and mining 1. Required of juniors.

Computations, platting and problems with special reference to mine surveying.

4. MINING AND MINING ENGINEERING PROFESSOR VAN BARNEVELD
Five credits (five lectures per week) First and second semester
Open to those who have completed mining 2 and 3. Required of seniors.
Mine management. The examination of a mining property.
Sampling ore reserves, etc. Mine accounts. Mine accidents.
Mining law. Mining machinery, underground transportation,
hoisting, pumping and ventilation. Electricity applied to
mining.
5. ORE DRESSING ASSISTANT PROFESSOR McCARTY
Five credits (five lecture hours per week) Second semester
Open to those having completed sophomore work. Required of juniors.
Mechanical preparation of ore for the market, for metallurgical
treatment, etc.
6. DESIGNS AND SPECIFICATIONS PROFESSOR VAN BARNEVELD AND ASSISTANT
Four credits (eight laboratory hours per week) Second semester
Open only to seniors in regular standing. Required of seniors.
Designs of mine cars, skips, head-frames, etc., in connection with
thesis work.
7. FIELD WORK PROFESSOR VAN BARNEVELD AND ASSISTANT
Eight credits (eight hours a day for six weeks) Second semester
Open to those who have completed mining 3. Required of juniors.
Practice in plane surveying during month of May. Practice in
underground mine surveying during first two weeks of June.
8. MINE MAPPING ASSISTANT PROFESSOR McCARTY
Two and one-half credits (five laboratory hours per week) Second semester
Open to those who have completed 3. Required of juniors.
9. PRACTICAL MINING PROFESSOR VAN BARNEVELD AND ASSISTANT
Eight credits (eight hours per day, six weeks) Summer vacation
Open to those who have completed 1, 2, 3, 7 and 8. Required of juniors.
Study of mining operations. Mine plant and equipment and
practical mining work at a mine to be selected by department
during months of July and August. Open to those who have
completed 1, 2, 3 and 8.
10. THESIS PROFESSOR VAN BARNEVELD AND ASSISTANT
Two and four credits (two and four hours conferences) First and second semesters
Open only to seniors in regular standing. Required of seniors.
Conference with individual students. This work is based upon
a review of the preceding technical work and field work.

PHYSICS

FREDERICK S. JONES, M.A., *Professor of Physics*

ALOIS F. KOVARIK, M.A., *Instructor in Physics*

1. GENERAL PHYSICS PROFESSOR JONES AND MR. KOVARIK
Four credits (four lectures and recitations per week) First and second semester
Open to students completing mathematics 2. Required of sopho-
mores.
Recitations and experimental lectures. . . .

School of Mines

SENIORS—15

Boyle, Patrick J., Brainerd.
Cullyford, James A., Duluth.
Dahl, C. F., St. Hilaire.
Deichen, William A., St. Paul.
Edwards, Frank R., Bowdle, S D.
Goodwin, W. R., Minneapolis.
Grimes, John Aiden, Minneapolis.
Strong, John L., St. Paul.

Kilpatrick, R. L., Minneapolis.
Hooas, Ole G., McIntosh.
Kennedy, J. J., St. Paul.
Knickerbocker, Arthur, Staples.
Locke, Alfred, Minneapolis.
Olmstead, John S., St. Paul.
Peterson, Joseph S., Minnesota.

JUNIORS—17

Bischoff, Harry, St. Paul.
Cole, Willard, Libson, N. D.
Conkey, Charles R., Minneapolis.
Crowley, Jay, Stillwater.
Fletcher, Robert H., Minneapolis.
Fritzberg, Ernest A., Biwabik.
Gavin, Lawrence F., Staples.
Grant, Roy C., Duluth.
Williams, Homer A., Minneapolis.

Halladay, F. C., Brainerd.
Hognason, G. B., Minnesota.
Hoyt, Samuel, Minneapolis.
Rood, Lynn, St. Paul.
Santo, Julius H., Janesville.
Swanson, Axel, Monticello.
Taylor, Harold G., Minneapolis.
Tyler, Adin P., Minneapolis.

SOPHOMORES—43

Anderson, A. T., Lamberton.
Barclay, Durant, Stillwater.
Bills, E. L., Minneapolis.
Carson, Clarke J., Glenwood.
Chesley, J. G., Minneapolis.
Devereux, Lawrence, Minneapolis.
Dickinson, Roy E., Minneapolis.
Duncan, Kenneth J., Fergus Falls.
Elliot, Jay R., Minneapolis.
Farnam, Henry E., Minneapolis.
Giltinan, George M., St. Paul.
Goodrich, Norman P., Minneapolis.
Graves, Arthur R., Minneapolis.
Harmon, Benjamin G., St. Paul.
Heath, Clarence L., Janesville.
Heidel, Charles S., Minneapolis.
Herring, William E., Blue Earth.
Hill, Arthur S., Minneapolis.
Holler, Fred W., St. Paul.
Holman, Charles F., Minneapolis.
Hyatt, Frank L., Minneapolis.
Jacobsen, Harry, Fergus Falls.

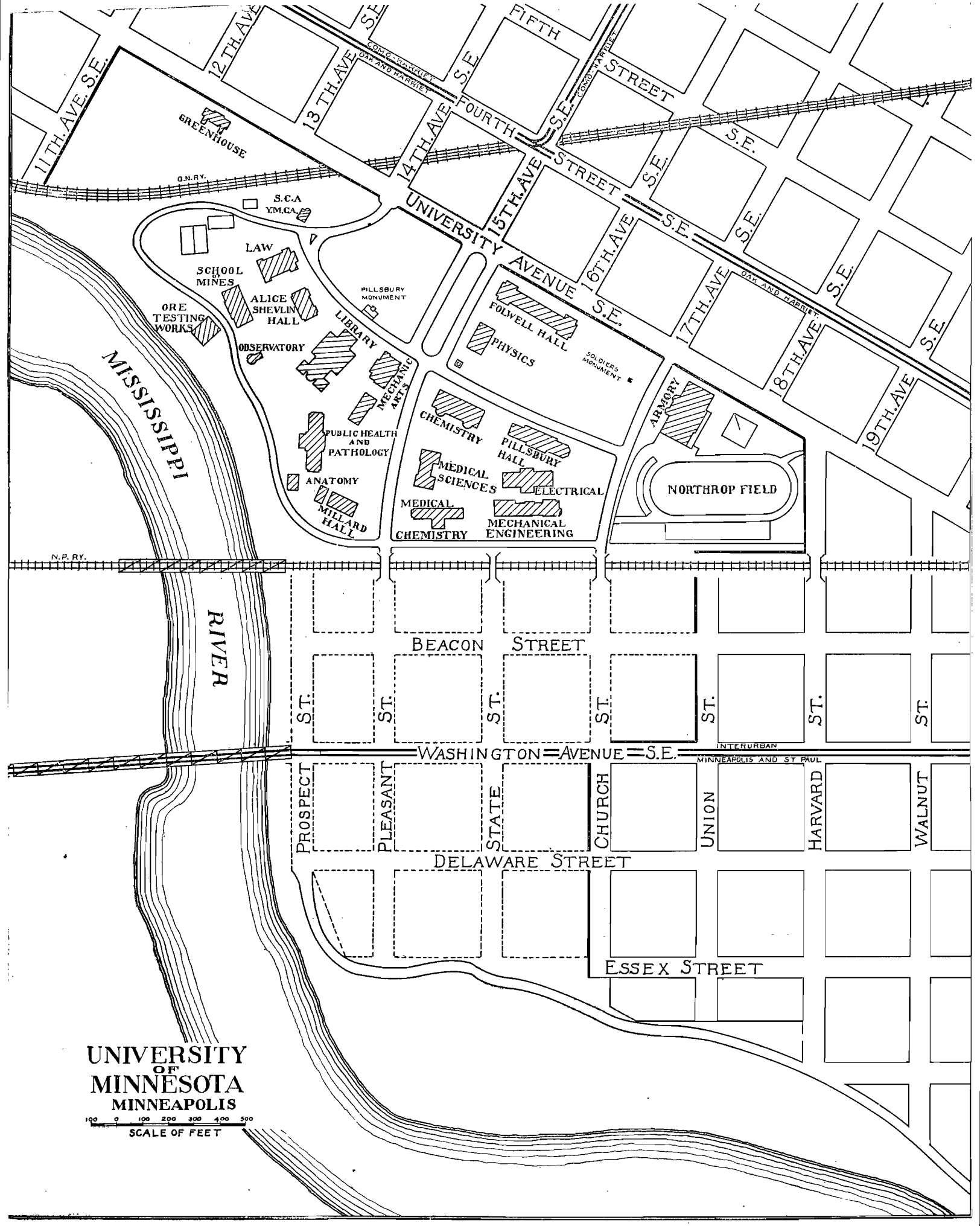
Jaques, Robert A., Duluth.
Johnson, Algot F., Cannon Falls.
Johnson, Milford, Albert Lea.
Jones, Ernest, Red Wing.
Kennedy, Arthur T., Duluth.
Kleinschmidt, Clarence, St. Paul.
Larson, Clarence L., Waseca.
Leonard, Forest M., Minneapolis.
McKenzie, James R., Adrian.
Moir, Arthur D., Minneapolis.
Moody, R. G., Minneapolis.
Ostrand, Peter M., Atwater.
Poppe, Walter H., Minneapolis.
Quade, Edward H., Janesville, Minn.
Simpson, William F., Minneapolis.
Stewart, Gordon, Monticello.
Strane, Archie, St. Paul.
Sundness, Odin A., Fergus Falls.
Thomas, Clarence J., Minneapolis.
Turner, H. Milton, Crookston.
Wharton, N. Earl, Ashland, Wis.

FRESHMEN—73

Abbott, Le Roy, St. Peter.
Abbott, Theodore S., St. Paul.
Anderson, Joseph, Florence.
Anderson, Walter C., Hopkins.
Bailey, Paul T., Minneapolis.
Baker, Emory P., Minneapolis.
Beck, Chas. S., Lewiston.

Borgeson, Anshelm C., Minneapolis.
Burns, Donald S., South St. Paul.
Campbell, Chas. A., Duluth.
Claypool, J. Verner, Duluth.
Collins, Loren F., Minneapolis.
Cooks, Hamilton, St. Louis, Mo.
Crouse, Stevens, Minneapolis.

De Vey, Don W., Duluth.
Drake, George M., Madelia.
Ekloff, Victor E., Cokato.
Engesser, Edward J. W., St. Peter.
Englund, Arthur, Starbuck.
Fixen, Victor L., Minneapolis.
Fosness, Arthur W., Lakefield.
Halloran, Joseph E., Langdon, N. D.
Heaner, Henry W., Stillwater.
Heily, Frank, Graceville.
Hoskins, Wallis A., Hibbing.
Hurley, John J., Pine City.
Jahn, William F., Winona.
Kibbe, G. E., Hampton, Iowa.
Kingsley, Neil S., Minneapolis.
Lange, Edward J., St. Paul.
Lawton, J. Edward, Worthington.
Lewis, John W., Minneapolis.
Lindholm, Milton, Ortonville.
McCarthy, Earl P., Minneapolis.
McCullough, Erwin, Minneapolis.
Martin, Dean W., Minneapolis.
Martin, Lynn, Grand Meadow.
Maves, Theodore W., St. Peter.
Melchior, Claude B., Hutchinson.
Meyer, William, Minneapolis.
Miller, Emil J., Hopkins.
Milnor, Walter S., Minneapolis.
Moore, Mark D., Owatonna.
Murphy, Edward E., Winona.
Ober, Fred L., Duluth.
O'Brien, Charles, St. Paul.
Olson, Alfred W., Argyle.
Pattee, Gordon, Minneapolis.
Perry, Joe B., Minneapolis.
Pettigrew, Paul F., Sioux Falls, S. D.
Rahilly, Harold, Minneapolis.
Reusswig, Frank E., Grand Rapids.
Robbins, Raymond S., Anoka.
Schuster, Carl H., Rochester.
Serum, Philip C., Jackson.
Sherburne, Arthur, Minneapolis.
Smith, C. C., St. Paul.
Snyder, Leslie, Minneapolis.
Stevens, Howard E., Stillwater.
Swinborne, John A., Highwood.
Tetlie, John R., Canton, S. D.
Toms, Arthur, Ely.
Tupper, Orval W., Worthington.
Underhill, Russell, Stillwater.
Victor, Albin F., Lindstrom.
Waldon, Clarence A., Minneapolis.
Walker, E. Harold, Minneapolis.
Walters, Chas. W., St. Paul.
Wasson, Harold J., Minneapolis.
Wehr, Arthur J., St. Paul.
Whitson, Lloyd R., Fergus Falls.
Wilkinson, Gilbert C., Minneapolis.
Williams, James, Ely.



**UNIVERSITY
OF
MINNESOTA
MINNEAPOLIS**

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SCALE OF FEET



The
University of Minnesota
Bulletin

School of Agriculture

1908-1909

Volume XI

March 10, 1908

No. 2

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in Minneapolis as second-class matter
MINNEAPOLIS, MINN

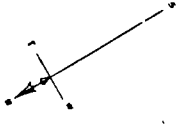
The University catalogues are published by authority of the Board of Regents, as a regular series of bulletins. One bulletin for each college is published every year, and in addition a bulletin of general information outlining the entrance requirements of all colleges of the University, and embodying such items as University equipment, organizations and publications, expenses of students, loan and trust funds, scholarships, prizes, etc. Bulletins will be sent gratuitously, postage paid, to all persons who apply for them. In calling for bulletins, please state the college or school of the University concerning which information is desired. Address,

THE REGISTRAR,

The University of Minnesota.

Minneapolis, Minnesota.

UNIVERSITY
OF
MINNESOTA
MINNEAPOLIS



CALENDAR FOR 1908-1909

1908

1909

MAY

S.	M.	T.	W.	T.	F.	S.
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The University

THE UNIVERSITY OF MINNESOTA comprises the following named schools, colleges and departments:

THE COLLEGE OF SCIENCE, LITERATURE AND THE ARTS

THE COLLEGE OF ENGINEERING AND THE MECHANIC ARTS

THE DEPARTMENT OF AGRICULTURE, including—

The College of Agriculture

The School of Agriculture

Short Course for Farmers

The Dairy School

The Crookston School of Agriculture

THE COLLEGE OF LAW

THE COLLEGE OF MEDICINE AND SURGERY

THE COLLEGE OF HOMEOPATHIC MEDICINE AND SURGERY

THE COLLEGE OF DENTISTRY

THE COLLEGE OF PHARMACY

THE SCHOOL OF MINES

THE SCHOOL OF ANALYTICAL AND APPLIED CHEMISTRY

THE COLLEGE OF EDUCATION

THE GRADUATE SCHOOL

The Regents of the University have entrusted to their charge:

THE EXPERIMENT STATIONS, including—

The Main Station at St. Anthony Park

The Sub-Station at Crookston

The Sub-Station at Grand Rapids

THE GEOLOGICAL AND NATURAL HISTORY SURVEY

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The President of the University	
The HON. JOHN LIND, MINNEAPOLIS	1914
The President of the Board	
The HON. JOHN A. JOHNSON, ST. PETER	<i>Ex-Officio</i>
The Governor of the State	
The HON. JOHN W. OLSEN, ALBERT LEA	<i>Ex-Officio</i>
The State Superintendent of Public Instruction	
The HON. THOMAS WILSON, ST. PAUL	1909
The HON. A. E. RICE, WILLMAR	1909
The HON. B. F. NELSON, MINNEAPOLIS	1910
The HON. DANIEL R. NOYES, ST. PAUL	1910
The HON. PIERCE BUTLER, ST. PAUL	1910
The HON. S. M. OWEN, MINNEAPOLIS	1913
The HON. W. J. MAYO, ROCHESTER	1913
The HON. HENRY B. HOVLAND, DULUTH	1914

C. D. DECKER, MINNEAPOLIS,
Secretary of the Board

The School of Agriculture

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E. W. RANDALL, *Dean.*
DEXTER D. MAYNE, *Principal, Economics, Practicums.*
SAMUEL B. GREEN, B. S., *Horticulture, Forestry.*
J. A. VYE, *Secretary and Treasurer, Accounts.*
HARRY SNYDER, B. S., *Agricultural Chemistry, Soils.*
T. L. HAECKER, *Dairy Husbandry, Animal Nutrition.*
M. H. REYNOLDS, M. D., V. M., *Veterinary Science.*
J. M. DREW, *Registrar, Blacksmithing, Poultry.*
ANDREW BOSS, *Agriculture, Animal Husbandry.*
WILLIAM BOSS, *Carpentry, Power Machinery.*
JUNIATA L. SHEPPERD, M.A., *Cooking, Laundering, Home Economy.*
MARGARET BLAIR, *Sewing, Household Art.*
MARY L. BULL, *Cooking, Laundering.*
JOHN A. HUMMEL, B. Agr., *Agricultural Chemistry.*
FREDERICK L. WASHBURN, M. A., *Zoology, Entomology.*
COATES P. BULL, B. Agr., *Agriculture.*
LEROY CADY, B. S. in Agr., *Horticulture.*
C. C. LIPP, D. V. M., *Comparative Physiology.*
EDITH SNELL, B. L., *Algebra, Geometry.*
D. A. GAUMNITZ, M. Agr., *Animal Husbandry.*
A. D. WILSON, B. S., in Agr., *Agriculture.*
A. G. RUGGLES, M. A., *Entomology.*
W. L. OSWALD, *Agricultural Botany.*
KARL A. MACHETANZ, B. A., *Director of Gymnasium, History.*
ALVAH M. BULL, *Drawing, Farm Buildings.*
ESTELLE COOK, *English.*
GRACE B. WHITRIDGE, *Physical Training.*
FANNIE C. BOUTELLE, *Preceptress, Social Culture.*
A. L. EWING, M.S., *Agricultural Physics.*
D. B. HOWELL, Ph. B., *Mathematics.*
E. C. PARKER, B. S., in Agr., *Agriculture.*
EDWARD SIGERFOOS, Ph. B., *Capt. 5th U. S. Infantry, Military Science and Tactics.*
E. G. CHEYNEY, A. B., *Forestry.*
L. B. BASSETT, *Farm Machinery.*
ETHEL E. BUSH, *English*
EDITH STAPLES, *Asst. in Sewing.*
JOSEPHINE CRAIG, *Domestic Chemistry.*
AGNES ERICSON, *Assistant in Chemistry.*
MARTHA B. MOORHEAD, M. D., *Lecturer in Domestic Hygiene.*
MINNIE CHERMAK, *Assistant in Cooking.*
MARY L. COFFIN, *Music.*
GERTRUDE V. COLLINS, *Farm Accounts.*
S. B. DETWILER, B. S., in Agr., *Forestry.*
W. H. FRAZIER, B. S., *Agricultural Chemistry.*
E. M. FREEMAN, Ph. D., *Agricultural Botany.*
AVIS HALL, *Assistant in Sewing.*
A. R. KOHLER, B. S. A., *Assistant in Vegetable Gardening.*
EVA MCCABE, *Assistant in Sewing.*
A. J. MCGUIRE, B. Agr., *Assistant in Dairying.*
C. SCHROEDER, B. S. in Agr., *Assistant in Animal Husbandry.*
BLANCHE STRUNK, *Assistant in Drawing.*
H. J. THOM, *Assistant in Blacksmithing.*

Committees, School of Agriculture

LIBRARY: Mayne, Reynolds, Snyder, McIntyre, Green.

CATALOG: Vye, Snyder, Drew.

MILITARY DRILL: Sigerfoos, Green, Haecker.

ENTERTAINMENT: Mayne, Boutelle, A. Boss.

HEALTH: Reynolds, Mayne, Boutelle, Washburn.

DAIRY SCHOOL: Haecker, Wm. Boss, Snyder.

SHORT COURSE FOR FARMERS: Mayne, A. Boss, Green.

AUDITING: Reynolds, Hummel.

ATHLETICS: Green, Mayne, Machetanz

The School of Agriculture

TIME OF OPENING.

The School of Agriculture will open Monday, October 5th, 1908 and close March 24th, 1909. The fall term closes at 4:30 p. m., Wednesday, December 23rd, and the winter term begins Monday, January 4th, 1909.

Instruction begins promptly at the opening of each term, and students are required to be present the first day of the term and to remain until the close of the term.

Students are advised to correspond with the registrar of the school, J. M. Drew, St. Anthony Park, St. Paul, Minnesota, prior to coming to the institution and to make the necessary preliminary arrangements for registration. Students registered in the fall term will not be received after the second day of the winter term, unless a reasonable excuse is presented for the delay.

LOCATION.

The School of Agriculture is located on University Farm, St. Anthony Park, St. Paul, Minnesota, about midway between the business portions of the cities of St. Paul and Minneapolis. Directions for reaching the school are given on page 7. The School of Agriculture is a part of the University of Minnesota and is governed by the University Board of Regents.

PURPOSE.

The School of Agriculture was organized in 1888 with the object of giving a practical education to the young men and women who are unable to pursue the full college course in agriculture. It offers a practical course of study designed to fit young men and young women for successful farm life, and aims to give to its students the necessary preparation for useful citizenship.

COURSE OF STUDY.

The course of study offered covers a wide range of subjects and is largely technical in character, but provision is made for some instruction in English and mathematics. The course is briefly outlined on pages 11 and 12. Instruction is given in the work shop, laboratories, barns and fields, as well as in the class room. The course requires three winters of six months each for completion, and is co-educational. Much of the work is taken in common by the young men and the young women. Some of the subjects, such as blacksmithing, carpentry, field work, handling grain and machinery are taken by the young men, while the young women pursue cooking, sewing, laundering and household art. The methods of

instruction tend to educate students toward the farm instead of away from it, and to develop in them a love for farm life by showing them its possibilities. In this respect the school has been very successful as over 80 per cent of its graduates continue agricultural pursuits.

HOW TO GET TO THE SCHOOL.

Check all baggage to St. Paul or Minneapolis.

Monday and Tuesday, October 5th and 6th, members of the Y. M. C. A., wearing lettered badges, will be at the Union Station in St. Paul, and at the Union, Milwaukee, Great Western, Soo and St. Louis Stations in Minneapolis, to meet and direct new students. Take the Como-Harriet or Como-Hopkins car from either St. Paul or Minneapolis and get off at Commonwealth avenue. A charge of 25 cents is made for transporting trunks at the opening of the school. No charge is made for the return of the baggage, at the close of school, provided it is ready to go on the days assigned.

ADMISSION.

All male students are required to have had six months' farm practice before entrance.

Parents are advised not to send pupils under fifteen years of age, unless they are unusually proficient in the common branches.

Students who have completed eighth grade work in the common schools are admitted without examination.

Applicants for admission who do not have state certificates or county diplomas showing completion of eighth grade work should send to the registrar for certificates of admission which, when properly filled out by former teachers or superintendents, will be accepted in place of entrance examinations.

Applicants whose home schools do not afford complete instruction in the common branches may be admitted with not more than two conditions which must be removed according to instructions given the student upon admission.

Students from city or grade schools will not be admitted before finishing eighth grade work nor until their former school records have been passed upon by the registrar. These records must be presented at least three weeks prior to the opening of the school.

State High School Board Certificates are accepted for work in English, physiology, algebra, geometry and civics.

HOME LIFE ON THE CAMPUS.

The life of the students while attending the School of Agriculture is subject to supervision.

Students residing in the school dormitories are not allowed to leave the grounds without permission.

The home life of each student is carefully guarded, and everything done to promote a healthful moral atmosphere.

The use of tobacco and of spirituous liquors of all kinds is strictly forbidden. No person will be admitted as a student who is known to have the cigarette habit.

Upon entrance students are provided with a copy of the rules and regulations to which they are required to subscribe.

Any one not in accord with these restrictions and not willing to lend a hand toward a strong moral growth should not come to the School of Agriculture.

CLASSIFICATION OF STUDENTS.

No student with incomplete C or preparatory work, or more than one incomplete B subject will be classified as an A, excepting high school graduates.

No student with incomplete preparatory work, or more than one incomplete C subject, excepting high school graduates, will be classified as a B.

No student with incomplete C or preparatory work will be made a commissioned military officer.

STUDENTS IN DORMITORIES.

The Principal of the School of Agriculture has charge of the boys in their dormitory and social life, and the Preceptress has charge of the girls in their dormitory and social life.

From 8:15 a. m. to 4:30 p. m. students not at recitations or chapel are expected to be in their rooms or the library studying or reading, also after 7 in the evening.

The rooms shall at all times be quiet, especially in the evening, so that no student may be disturbed.

The cadet officers shall make daily inspection of the boys' dormitories, under proper supervision of the instructors.

HOLIDAYS.

On Lincoln's birthday, February 12th, the regular classes of the last two periods in the forenoon will be omitted and a suitable program substituted.

Washington's birthday, February 22nd, will be observed by appropriate exercises.

REQUIREMENTS FOR GRADUATION.

First—The completion of the prescribed course of study with an honorable standing in department.

Second—An essay of not less than one thousand words upon a topic connected with agriculture or home economics.

Third—For young men, a practical experience in field work at the University farm or elsewhere, as shall appear in reports received from responsible sources.

FEEES.

With the exception of an entrance fee of \$5 to residents, and \$10 to non residents, the school makes no charge.

EXPENSES.

The necessary expenses for the year do not exceed \$85. This amount does not include the cost of the required military suit for the young men, traveling and personal expense.

The cost to the student for board, heat, light and laundry is the actual cost of maintaining the table (including management), and caring for the buildings. This has not exceeded \$3 per week. Each month's board is paid in advance. The buildings are all lighted by electric lights and warmed by steam. The sleeping rooms are each furnished with a bedstead, mattress, dressing bureau, chair and table.

No deductions in charges are made for absence of less than four days. If students are compelled to be absent for that length of time they are allowed half rates if they make arrangements before leaving.

Text books are furnished at a rental of \$2 per year to students who do not desire to purchase.

A gymnasium fee of 25 cents per term is charged all students.

Each student is required to pay for breakage of apparatus used in practical work.

A competent nurse is kept on the ground to care for the sick. To meet this expense each student pays one dollar per term.

For the purpose of supplying, calcimining and painting the sleeping rooms, a reserve fund is created by assessing each one occupying them \$2.00.

A deposit of \$5 is required of each student, as a guaranty for the return of all books and other articles borrowed.

On entering school the student makes a payment of \$12 board; \$5 deposit; \$2 book rent and reading room; \$1 maintaining nurse; \$5 entrance fee; 2 reserve fund; 25 cents gymnasium fee; total \$27.25.

All male students are required to provide themselves with the prescribed uniform, which consists of navy blue blouse, trousers and cap,

and is as neat and economical a dress as the student can obtain. The suit complete, to measure, is furnished under special contract for \$14.50.

Each student provides four sheets, one pair of blankets, one quilt, one bed spread, one pillow, three pillow cases, towels, napkins, comb and brushes.

An assignment of rooms will be made at 9 a. m., March 20th, which will hold good until 8 p. m., the first day of the following school year. Students wishing to retain their rooms, after vacation, must be on hand when the second term opens, or pay one-half the price of board and room for the time they are late. Students arriving after the dormitories are filled are compelled to find rooms elsewhere, but are allowed a rebate of \$3 per month.

STUDENTS' DEBATING SOCIETIES.

Societies for the purpose of improvement in elocution and debate, and for obtaining instruction in the form of lectures, give excellent opportunities for entertainment and culture.

Each student should associate himself with one of these societies as early in his course as possible.

LECTURE COURSE.

During the school year, a lecture and entertainment course, usually consisting of six lectures and concerts, is given in the chapel at a cost of seventy-five cents for the series. These entertainments are strictly high grade, and furnish a pleasant relaxation from school work, as well as mental stimulus.

The following program, which was provided during the past year, shows the general character of the entertainments:

Monday, October 21, "America Facing the Far East".....	Dr. John M. Driver
Friday, November 15, "O, Brave New World" of Texas (Illus.)	Gilbert McClure
Saturday, December 14, Music.....	Lyric Glee Club
Friday, November 22, "Seeing Things" (Illustrated).....	Pitt Parker
Thursday, January 9, "The Story of Dugan".....	Judge Willis Brown
Monday, February 3, Music.....	Hungarian Orchestra
Wednesday, March 11, "Sunshine and Awkwardness".....	S. W. Gillilan

STUDENTS' CHRISTIAN ASSOCIATIONS.

The Young Men's and the Young Women's Christian Associations have for their objects, social fellowship and moral and spiritual development. To this end two receptions are held each year, and Bible classes are held Sunday mornings at 8:30. A general religious service is held each Sunday at 3 p. m., and a mid-week prayer meeting each Wednesday, at 6:30 p. m. The associations are non-sectarian, so that all students may find in them an opportunity for Christian activity and mutual helpfulness.

Course of Study

FIRST (C) YEAR

FIRST TERM

Agricultural botany [5]

*Drawing [2]

Music [2]

Farm Mathematics [5]

*Blacksmithing [2]
*Carpentry [2]
Military Drill [2]
Agriculture [3]
Gymnasium [2]
*Practicums [2]

or

*Cooking [2]
Physical training [2]
*Sewing [3]
Social culture [1]
Field agriculture [3]

SECOND TERM

Agricultural botany [5]

English [5]

Music or literary society work [2]

Comparative physiology [5]

Study of breeds [5]

*Drawing (farm buildings) [2]
*Carpentry [2]
*Blacksmithing [2]
Military drill [2]
Gymnasium [2]
*Practicums [2]

or

*Laundering [2]
*Drawing (farm houses) [2]
Physical training [2]
*Farm Accounts [2]

SECOND (B) YEAR

FIRST TERM

English [2]

Agricultural physics [5]

Dairy chemistry [2]

*Dairy husbandry [2½] { Dairy lectures
Dairy practice
Dairy breeds

Fruit growing [3]

Music [2]

*Farm Accounts [4]
*Stock judging [1]
Breeding [2]
Military drill [2]
Gymnasium [1]

or

*Farm Accounts [2]
*Cooking [2]
Household art [1]
Physical training [2]
*Sewing [2]

SECOND TERM

English [2]

Agricultural chemistry [5]

*Dairy husbandry [2½] { Dairy stock lectures
Dairy practice
Dairy feeding

Music [2]

Agricultural physics [5]

Vegetable gardening [3]

Field crops [5]
Military drill [2]
Gymnasium [1]

or

*Cooking [2]
Home management [1]
Physical training [2]
*Sewing [2]

*The University of Minnesota*COURSE OF STUDY—*Continued*

THIRD (A) YEAR

FIRST TERM

Agricultural chemistry [7]		
Forestry [3]		
Entomology and zoology [3]		
Poultry [3]		
Algebra [5] Optional		
Handling grain & machinery [1]	} or }	*Cooking [2]
*Veterinary science [2½]		*Sewing [2]
Gymnasium [1]		Music [2]
Music or military drill [2]		

SECOND TERM

Civics or geometry [4]		
Plant propagation [3]		
Entomology and zoology [3]		
Algebra [5] Optional		
Dressing and curing meats [1]	} or }	Meats [1]
*Stock judging [1]		Home economy [1]
Feeding [3]		*Cooking [3]
Soils and fertilizers [5]		Domestic chemistry [3]
*Veterinary science [2½]		*Sewing [3]
		Domestic Hygiene [1]

*Figures in brackets indicate the number of periods per week in which the subject is pursued. All work in subjects marked thus * extends through double time in the daily program.

ASSEMBLY.

On each school day at 11:40 a. m. the students assemble in the chapel. After the opening exercises brief talks are given by the principal, members of the faculty, or invited guests.

During the year the list of speakers includes prominent state and national officials, business men, particularly those connected with the agricultural industries, professional men, prominent clergymen of all denominations, educators from other institutions, and successful farmers. It has been found that this plan gives to the students an opportunity to hear men of prominence discuss a wide range of topics, many of which relate to rural and agricultural problems.

Members of the graduating class at times present essays, and discuss topics as assigned.

Courses of Instruction

AGRICULTURAL BOTANY.

This subject is taught with special reference to its bearing upon the every day problems that present themselves to the farmer and gardener. It is profusely illustrated with plants and flowers from the greenhouses and nursery. Some instruction is given in the use of the compound microscope. Students are thus enabled to study intelligently, in an elementary way, the tissues of plants. By this means they get a clear idea of the general principles of plant structure and vegetable physiology.

AGRICULTURAL CHEMISTRY.

In agricultural chemistry one term is given to the study of the elements and compounds which are of most importance in agriculture. This work is planned to prepare the student for intelligent study of the subject of the chemistry of foods, soils and fertilizers, and at the same time to familiarize him with the more important chemical changes which take place in every-day life. Laboratory practice forms a prominent feature of the work. In the chemistry of foods, the composition of plant and animal bodies, the chemistry of the plant and of its food and growth, the chemistry of animal nutrition, digestibility and value of foods, and the laws governing the economic uses of foods, are some of the subjects considered. The composition and the utilization of farm crops for food purposes, and the application of the principles of chemistry to plant and animal life, form the basis of this work.

AGRICULTURAL PHYSICS.

In this department it is the aim to enlist the student's interest in a more keen appreciation of the principles that underlie the practices of his vocation. To this end the facts with which he is already somewhat familiar are used to reach the fundamental law. For example, from his knowledge of the relation of weight to bulk in grains, soil and water, he is led to a knowledge of volume, mass, density, weight, force, draft, specific gravity, and fluid pressure. In the laboratory he makes definite determinations along these lines. Likewise the somewhat vague and indefinite notions the young people have from their use of pulleys, eveners and other farm machinery, form fitting stepping stones to definite mathematical results readily reached by them under proper guidance.

The varied questions of soil physics, soil formation, the movements of water and air thru soil, soil temperatures, soil grains and granules, and pore space, are matters studied from the practical side and used as avenues to far reaching laws.

AGRICULTURE.

It is purposed in teaching this subject to cover the elementary principles governing soils, field and farm management. The work covers the origin, formation, and cultivation of soils; the movement and control of soil moisture; selecting and planning farms; subdividing fields; drainage; irrigation; roads; fences; buildings; water supply; groves and wind breaks; farm life; the relations of science to agriculture; a general consideration of farming as a business; and methods of farming.

ALGEBRA.

Algebra is optional during the third year. This work covers Wells' New Higher Algebra through simple equations. Special attention is given to literal notation, negative numbers, the equation and factoring.

BLACKSMITHING.

The students are instructed in the management of the forge and fire, and in bending, shaping and welding iron and steel. They are required to make links, rings, hooks, bolts, clevises, whiffletree-irons, tongs, cold-chisels, punches, in short, to become familiar with all the operations necessary to enable them to do their own repair work when they return to the farm. Particular attention is given to rapid and accurate welding and to the shaping and tempering of steel tools. The forges used are such as any farmer can make for himself, and each student is taught to make his own tools, so that he will be able to furnish his shop with very little outlay.

BREEDING.

Students receive instruction in the principles that govern breeding; on the influences that affect heredity and in the care and management of breeding stock. Pedigree receives careful consideration, and each student is required to make out pedigrees of two or more pure bred animals. They are also required to become familiar with methods of keeping live stock records of all kinds.

CARPENTRY.

Instruction is given by means of lectures on the care and use of the common carpenter tools, such as should be found on every farm; also on methods of farm building construction, framing, laying out rafters, stairways, estimating building material, painting, etc. In the carpenter shop students are required to make such exercises as will give them some practice in using carpenter tools. They are required to make mortise joints, splices, drawing boards, hammer handles, eveners, cupboards, etc.

Each student is required to file his own saws, sharpen his planes, chisels, etc., and to lay out rafters for buildings.

CIVICS.

During the last term of the course students receive instruction in this science, and graduate with a good understanding of the origin, necessity, nature and various forms of government, and the machinery employed to carry on public works, establish justice and provide for the common defense; of the organization and management of local institutions—the town, the village, the city and the county; the manner in which states are created and the affairs administered; the three departments—legislative, judicial and executive—and the functions of each; the interdependence of the state and its citizens, as well as the powers and obligations of each, by due attention to which the state may be strengthened and the condition of its citizens ameliorated.

The relations of the state to the general government, the constitution and the power it confers, and the provisions for amendments, are taught. The more important principles of commercial law, including contracts, agency, partnership, corporations and commercial paper, receive attention. Instruction is also given in the United States method of surveying public lands.

COMPARATIVE PHYSIOLOGY.

During the first year students take one term of applied physiology. This is an effort to connect technical physiology with the necessities of every day life. The work includes a study of the general plan and structure of the body and the various individual tissues of which it is composed; also sources of heat and energy, digestion and the relation of food materials to the various tissues of the body. Considerable attention is given to diseased and innutritious foods, food adulterations and narcotics. The circulation is studied with special reference to the relation of the blood and lymph to tissue nutrition and tissue waste.

Accidents, including poisoning, are studied for the purpose of giving a practical knowledge of what to do in emergencies. Considerable attention is given to the subject of clothing, the various materials in use being considered with reference to fitness for special purposes. Some time is also given to the study of common physiology, of the organs of circulation, digestion, respiration, nervous system, and the relations of bacteria to the common diseases, especially such diseases as consumption, typhoid fever, etc. A brief study is also given to the subject of digestion in the lower animals.

The class work is illustrated by means of large charts, skeletons, manikins, and dissections. Important points of difference between human and animal

physiology are pointed out in preparation for the third year's work in the veterinary class. Matters of home and personal hygiene are interwoven with the physiology work.

COOKING.

Cooking extends through five terms of the curriculum. The subjects covered in each term are as stated below:

First term, C year: Furniture and equipment needed in a home kitchen; best methods of managing kitchen work, caring for kitchen and dining room utensils, furniture, etc.; the place of measuring and weighing in cookery; the preparation and serving of vegetables, cereals and bread.

First term, B year: Cooking is again taken up, the special topics being preservation of fruits and vegetables by canning, preserving, pickling and jelly making. The selection, preparation and serving of meats of all kinds is also considered. A sufficient amount of practical work is given in each case to illustrate the principles brought out. A special study of table service is begun during this term and extends through the year, a practice dinner being given by a portion of the class in the class dining room each month.

Second term, B year: Eggs are considered as to selection, preservation, food value, different ways of cooking and serving. The preparation and serving of soups and beverages is considered together with their food value. The subject of salads is considered in a similar way.

First term, A year: This is devoted to the marketing and care of food. The preparation and serving of dairy foods and made-over dishes and dishes for invalids receive special attention.

Second term, A year: This is devoted to the preparation and serving of desserts and to the study of food rations, dietaries, bills of fare, confections, etc. A free use is made of the U. S. Bulletins during the year in the hope of arousing a greater interest in the food question.

DAIRY CHEMISTRY.

The chemical and allied changes which take place in the handling of milk and its manufacture into butter and cheese, and the application of these principles to the production of milk and its products form the basis of this work.

DAIRY HUSBANDRY.

Farm dairy lectures.—A course of lectures is given in farm dairying, giving instruction in the care of milk and utensils, explaining the principles involved in creaming milk by the gravity and centrifugal processes and giving full instruction in regard to running farm separators and the manufacture of butter and cheese in the farm dairy.

Dairy practice.—Students receive instruction in the most advanced methods of creaming milk, ripening cream, churning, working and packing butter, the manufacture of sweet curd cheese, and measuring the value of milk by the Babcock test and lactometer. This practice work begins the third week of the first term and continues through the school year.

Dairy stock.—During the last half of the first term students receive instruction in regard to the characteristics of the various breeds of dairy cattle, their origin and comparative adaptability for the dairy. Lectures are given upon the points desirable in animals intended for the dairy. The students have practice work in judging dairy stock.

Feeding.—During the second term lectures are given covering both the scientific and practical phases underlying the principles of feeding. Practice work is given in compounding rations and estimating the comparative value of food stuffs.

DOMESTIC CHEMISTRY.

The composition of human foods and their combinations to form balanced rations, dietary studies of families, cost and value of foods, chemical changes and losses in the cooking and preparation of foods, cereal food products, animal food products, fruits, adulterations of foods and their detection, fuels, soaps, disinfectants, dye stuffs and colors, composition of common household utensils, the household water supply, preparation of home-made baking powders, bakers' chemicals, the composition, food value and characteristics of tea, coffee, chocolate, cocoa, molasses, honey, vinegar, spices, flavors, extracts, etc., the grading and testing of wheat flour, the chemistry of bread making and household sanitation, form the essential parts of this work.

Laboratory practice is given in study of the composition and detecting adulteration of different foods, such as milk, cream, butter, oleomargarine, lard, cheese, coffee, tea, vinegar, catsups, jellies, flavors and extracts, baking powders, cereal breakfast foods and flour. The aim of this work is to give students an idea of composition, uses and value of food materials and the part chemistry takes in sanitation and household affairs.

DOMESTIC HYGIENE.

Several lectures by a physician will be given upon maidenhood, maternity and infancy. These special lectures will be supplemented by the regular lectures which consider the health of the family as dependent upon pure food, pure water, personal cleanliness and proper habits as well as upon heredity. The aim is to impress the truth that a knowledge of and obedience to the laws of hygiene are essential to the preservation as well as the restoration of health.

DRAWING.

The student is taught the practical value of drawing for the purpose of designing and arranging buildings, machinery, etc. He makes drawings of the shop exercises, then works from his own drawings, thereby learning the application.

Designs are made for dwellings, barns, outbuildings, and machinery. As practical subjects for their designs, students are requested to bring from home data for plans of buildings needed on their farms. Estimates are made of the amount of material required and cost of construction.

DRESSING AND CURING MEATS.

The instruction given the boys consists of demonstration lectures on the preparation of meat for farm use. They are required in addition to take two weeks' practice in dressing, cutting and curing such meat as is likely to be used on the farm. Work is also given them in selecting and judging fat stock, and in judging dressed meats.

ENGLISH.

(C) Applicants for admission to the "C" class in English should be familiar with the inflections of nouns, pronouns and verbs, the definitions and classifications of phrases and clauses, and the common case constructions. The first year's work consists of the study of Mayne's "Modern Business English," with almost daily practice in writing the simpler forms of composition. Two periods a week are given to the study of one of the classics.

(B) The second year's work consists of Maxwell and Smith's Writing in English. Once a week a short essay is prepared and submitted for criticism.

(A) At the option of the English Department a series of literary programs will be presented in chapel by the members of the graduating class. The numbers include abstracts of leading magazine articles, biographical sketches, book reviews and selections from fiction. Special prominence is given to authors depicting American life.

ENTOMOLOGY AND ZOOLOGY.

The class in entomology receives instruction of a practical nature. The course is divided as follows:

Classification of insects; habits and life histories of injurious forms with special attention to insect pests found in Minnesota. The nature of different insecticides and methods of application are discussed. The student spends some time in becoming acquainted with the appearance and habits of beneficial insects. Each student must collect fifty insects representing at least twenty-five different kinds.

The four-footed pests of the farm—rabbits, gophers, squirrels, etc., as well as injurious and beneficial birds, are also studied.

FARM ACCOUNTS.

The work in accounts is applied to the transactions which the student meets in the various duties on the farm. He is taught to keep his accounts.

that he may know at any time the profit or loss of any department of his business, and is thus enabled to plan intelligently.

FARM ARITHMETIC.

Instruction in this subject consists of the application of its principles to all kinds of farm problems where measurements of material, extension, capacity, etc., are required. The student is prepared also to handle with ease the mathematics of the technical courses in the school.

FEEDING.

The principles of feeding as applied to the production of horses, beef cattle, sheep and swine are taught. Special attention is given to the choice and preparation of food for animals during different periods of growth and during the time they are used for breeding purposes and to summer feeding and pasturage. Practice is given in compounding rations that will include in the best manner the food stuffs commonly produced on the farm. Practical lessons in feeding are given at the barns under the supervision of an experienced feeder. Each student thus learns the requirements of each class of stock.

FIELD AGRICULTURE.

This work consists of a study of those portions of geology relating to soil formation; effect of the glaciers on the soils of Minnesota; origin of soils in the various agricultural regions of Minnesota; classification of soils; soil moisture and soil tillage; land areas and the planning of fields and farms; the classes of field crops as grain, grass, and cultivated crops; the relation of these crops to each other in a systematic rotation and in their relation to soil fertility; the origin, distribution, and uses of cereal crops and other field crops.

FIELD CROPS.

Students are admitted to this subject after having finished the work of agriculture and receive instruction as follows:

Crop rotations, farm management, and planning farms under various conditions; production and care of farm manures and green manure crops; fertility as related to weeds, crop production and profits; preparation of land; planting, cultivating, harvesting, storing, and marketing of grains, roots fiber, sugar, grass and other forage crops; meadows and pastures; treatment of field crop diseases; selecting, breeding and judging seed.

FORESTRY.

Includes the consideration of the formation and care of wind breaks and shelter belts; the laying out and planting of home grounds; discussion of the hardiness, habits and value of our native and introduced trees; and the methods of propagating them.

FRUIT GROWING.

Fruit growing is taught with reference to raising fruit for market and in the home garden.

GEOMETRY.

Geometry is offered in the second term of the third year as an elective in place of civics to those who wish to prepare for a college course. This work covers the first two books of Wells' Essentials of Plane Geometry.

GYMNASIUM WORK.

The gymnasium is a large, well lighted, two story brick building. It is well supplied with heavy apparatus for general gymnastic and athletic exercises, together with such appliances as are necessary for the development of a symmetrical body. Besides being fitted up with the finest apparatus, it possesses space and equipment for sprinting, pole vaulting, hurdling, high and broad jumping, shot putting, etc.

Class work in physical training is required of all undergraduate young men not excused on account of physical disability. Courses are offered on the heavy apparatus, in corrective work, class drills and athletic training. In addition to the regular class drill, a certain part of which consists of training in athletic sports, the school is represented by a strong basket ball team, a track athletic team, hand ball team, and an indoor tennis team.

HANDLING GRAINS AND MACHINERY.

Practical suggestions for the best methods of harvesting, shocking, stacking and storing of cereal grains; adaptation of the various kinds of machinery with reference to the soil, weeds and seasons are given; adjustment with special reference to durability, convenience in manipulation, etc.

HOME ECONOMY.

The lectures are a study not only of the just proportion between expenditure and income, but of definite proportion in the expenditures made for existence, comfort, culture and philanthropy. A study is made of the sources of income, especially of the income from the farm in the form of house, food and luxuries; the purchase of necessities such as household stores and furnishings is considered from the standpoint of the suitable and desirability shown of saving something to be used in securing things which promote culture and comfort. The relation of cash and credit to cost is also considered. Attention is given to saving and forms of investment, a book account and the use of a check book. Students are required to submit an account setting forth in detail the use of a certain named income expended in the support of a family for one year, embracing not only every item of necessary home expense, but also an outlay made for travel, luxuries, accident, sickness, or other emergencies. The habit of keeping a household account is calculated to strengthen the judgment in the wise use of money.

HOME MANAGEMENT.

The subject includes both housekeeping and home-making, and the instruction is based on the belief that housekeeping is a business as important as it is difficult, and that home-making is the noblest form of human endeavor. The care of the house and household belongings, of the food, utensils, plumbing, etc., as well as the general ordering of family life, are considered in their relation to an adequate plan for home management. To start the student in the right way of becoming mistress of the business of housekeeping and home-making is the end sought. The practical benefit to be derived from the knowledge students gain in the cookery, sewing, dairy, laundry and other classes, is emphasized and shown in its relation to an adequate plan for the daily program for the home.

HOUSEHOLD ART.

Lectures are given upon house and grounds, noting the distinctive character of the country home; the sanitary conditions involved in the selection of the site of the house; also the influence of the outlook; an elementary study of architecture in connection with planning a house which will provide "a place for everything" required in housekeeping operations and family life; instruction in the fundamental value of color, form and design; training the taste and emphasizing the laws of hygiene that should influence the selection of materials and styles in the furnishings and furnishings of the house.

LAUNDERING.

Second term, C. year: The aim is to give the students a knowledge of the best means of cleansing all fabrics with little injury to the cloth or color. Approved methods of cleansing by the use of chemicals, as removing grease spots, stains, etc., are given.

LIBRARY.

The agricultural library now contains ten thousand books and about seven thousand pamphlets, including reports and bulletins. Aside from the large number of pamphlets and other publications of the different agricultural institutions and societies, a large number of the most important technical and

agricultural magazines are kept on file, bringing together all the agricultural literature of any importance.

LITERARY SOCIETY WORK.

Any student belonging to a recognized literary society of the school may receive credit in the course of study for the work done therein by registering at the beginning of the term, and submitting to the teacher in English all essays to be read by such student before the literary society and rehearsing to said instructor all essays, readings, or recitations with a view to correct pronunciation, expression, etc.

MEATS.

The instruction given to the girls in the subject of meats pertains to the selection and value of different classes of meat, and to the best methods of curing and preserving.

MILITARY DRILL.

Under the provisions of the Act of Congress of 1862, establishing the "Land Grant Colleges" of the United States, instruction in Military Science and Tactics is required to be given at all colleges which are its beneficiaries. For this purpose the United States Government furnishes the Department of Agriculture with the necessary arms and equipments, and details an officer of the regular army to take charge of military science and tactics.

All male students of classes B. and C. not physically unfit are required to attend military drill. For the A. Class drill is an elective.

Military instruction is intended to be so conducted as to develop a soldier-like bearing and foster a spirit of gentlemanly courtesy, soldierly honor and obedience to lawful authority, as well as to familiarize students with battalion manoeuvres, guards and the theoretical and practical use of firearms.

The officers and non-commissioned officers are required to be good students in the other departments, soldier-like in the performance of their duties, exemplary in their general deportment and able to pass a creditable examination in drill regulations.

In general, the officers are selected from the "A" class; sergeants and corporals from the "B" class.

MUSIC.

Instruction in this department takes in elementary theory, sight singing and music history. The course is planned to give the students a basis for musical appreciation and culture, as well as a practical knowledge of musical forms and terms. Special attention is given to habits of breath control and enunciation of words, and a thorough system of *solfeggio* is employed.

For students whose voices and training will admit them, there is offered a chorus class, consisting of a mixed chorus, a women's chorus, and a male chorus. This offers special advantages for musical development and experience.

A student orchestra is maintained, which assists in public exercises given by the school.

PHYSICAL TRAINING.

The work done in this department aims at symmetry, co-ordination and control rather than mere physical strength. It is planned to improve the functional activity of the body and to counteract and correct tendencies toward incorrect development, especially those resulting from the artificial life of civilization. The work of the beginning class is free hand, based upon Swedish principles, and directed especially to deep breathing, correct carriage and posture. The work of the advanced class includes light apparatus and aesthetic movements for grace and suppleness in action. Vigorous games are given to both classes.

PLANT PROPAGATION.

In this subject the principles underlying the development of cultivated varieties of plants and seed testing are taught; also the propagation of plants by seed, cuttings, grafting and budding. The work of the class room is illus-

trated by the orchards, nurseries, forest plantations, gardens and greenhouses on the grounds of the experiment station, and by visits to commercial nurseries and greenhouses near by.

POULTRY.

The instruction in this subject will include the following topics: History and characteristics in the leading breeds of poultry; breeding, rearing and management of fowls for eggs and for the market; planning, building and arrangement of poultry houses; managing incubators and brooders. A model poultry house, containing pens of the most improved breeds, incubator cellar, work-room, etc., has been provided, where experimental work and practical instruction are carried on.

PRACTICUMS.

During the first year the young men spend four hours each week in a series of lessons and exercises in the barns and fields, taking up such practical lines of work as land surveying, laying tile drains, building fence, setting up farm machinery, soldering, pipe-fitting, splicing rope, making rope halters, etc.

SEWING.

Instruction is given in the principles and use of healthful and appropriate clothing and in the needlework of the home. The course provides for five terms' work. During the first term instruction is given in the elements of sewing, including different stitches, seams, hems and the various kinds of mending; also practical talks on the use and care of the sewing basket, touching the history of the various implements used, and upon the textiles used—cotton, wool, linen and silk.

In the second year instruction is given in cutting and making plain garments, drafting underwear, shirt waists and cotton dresses—taught by a simple method in which only a tape line and square are used.

In the third year the more difficult work of dressmaking is taken up, pattern drafting, cutting and fitting dresses. A practical aid to the work in this subject is offered by a museum of exhibits. These exhibits are kept in the class rooms and include primitive and modern sewing implements, weaving processes and the various cloth fibers.

Lectures are given on the utilitarian and art values of various textiles, and in connection with the selection of materials practical lessons in shopping are given. Attention is paid to harmony in color.

SOCIAL CULTURE.

A course of lectures is given on the usages of society, including manners, behavior, the voice, conversation, forms of address, invitations, etc. Suggestions are made in reference to reading, literary taste and the choice of books. Special stress is given to the thought that the family life ought to be the highest expression of good society, and that next to the power of thinking correctly is the power of approaching others with ease and speaking with tactful directness.

SOILS AND FERTILIZERS.

Some of the topics studied are: The formation of soils, adaptability of crops to different kinds of soils, chemical composition of soils, physical analysis of soils, interpretation of soil analysis, the judging, rating and scaling of soils, alkali soils, acid soils, humus and its relations to soil fertility, the factors governing the increase and decrease of the nitrogen of the soil, farm manures—their composition and uses, and their action upon soils—green manures, commercial fertilizers, special purpose fertilizers and their use; the influence of different methods of cultivation upon the fertility of the soil, the food requirements of farm crops, the rotation of crops as affecting the fertility of the soil, the income and outgo of fertility from farms where different systems of farming are followed, the general principles of soil exhaustion and soil improvement and the various factors which affect the fertility of soils. The class room work is supplemented by laboratory practice.

STOCK JUDGING.

Score cards are used to an extent sufficient to familiarize students with that method of judging, and special efforts are made to do systematic and

closely critical work in the selection of animals representative of the breeds and for breeding purposes. Living specimens are used and rings made up for the student contests in stock judging. In connection with the work in dressing and curing meats, the judgment passed on live animals for the block is verified by score cards, judgment of the dressed carcasses and by actual block tests. These tests are made by the students and bring out the percentage of meat in each commercial cut of the carcass. The quality of meat is passed upon in this connection by experts, and a careful report made to ascertain the type of animals best calculated for the production of the most meat of the best quality.

STUDY OF BREEDS.

The market classes of horses, cattle, sheep, and swine are taken up briefly to bring out the form, quality, and condition desirable and common to the different classes. This is followed in each class of stock with the most common and valuable breeds for the state. These are studied carefully as regards their characteristics and origination, and as to their adaptability to the different Minnesota conditions. This work is illustrated with stock from herds and flocks maintained at University Farm for this purpose.

VEGETABLE GARDENING.

Vegetable gardening embraces the study of garden tillage, irrigation, and rotation of crops; transplanting; formation and care of hotbeds; study of garden insects; and the growth of various vegetable crops.

VETERINARY SCIENCE.

During the A year the student takes up a course of study in veterinary medicine, the purpose of which is to fit him for intelligent care of his farm stock. In this course the teaching is done by means of lectures and reviews and clinical work at the hospital maintained for this purpose. Lectures are illustrated by means of stereopticon charts, manikin of horse, skeleton of horse, and various other appliances.

The work covers the following subjects: Elementary anatomy; elementary pathology; cause and prevention of diseases, diagnosis and treatment of common diseases; examination for soundness; and a final short course on common medicines; studying their effects, uses and doses. At the hospital clinics students are enabled to examine and care for a variety of cases and to learn the elements of diagnosis for the more common diseases and forms of lameness.

STUDENTS' TRUST FUND.

The class of 1902 left with the school a fund of \$100 "to assist by temporary loans at a reasonable rate of interest, deserving students needing such help, who are not below the B class in the school of agriculture." This fund is in charge of a committee consisting of the secretary, the principal, the preceptress, and the president of the A class.

THE LUDDEN TRUST.

The Honorable John D. Ludden, of St. Paul, gave the University of Minnesota \$5,000 to be held, invested and re-invested by the University, through its Board of Regents, and the income thereof to be collected, received and applied by said Board of Regents to the financial assistance of students of either sex in the school of agriculture. Mr. Ludden delivered into the hands of the regents for the principal sum one Northern Pacific registered prior lien railway land grant gold bond of the denomination of \$5,000, payable to the University of Minnesota and its assigns in gold coin, on the first day of January 1997, with interest at 4 per cent per annum, payable quarter-yearly in like gold coin, the fund to remain so invested until the bond matures, unless by reason of changed conditions a re-investment shall be sooner deemed judicious by the Board of Regents for the safety, conservation or continued productiveness of the fund. The premium on the purchase of this first grade security was \$212.50, and was paid by Mr. Ludden, thus enlarging his donation by that amount.

Mr. Ludden imposes the following conditions: "The beneficiaries must be youths who are residents of the state of Minnesota; they must be and continue of unblemished moral character, and of temperate and industrious habits, and they must be such as by examination and trial shall evince and maintain a taste, habit and aptitude for study and improvement; and any student who shall fail to come, or shall cease to be, within the above conditions shall forfeit all claims to the benefit of such fund. Subject to these conditions the administration of such income is entrusted to the said board of regents, which may make such rules therefor as they may deem judicious."

This fund produces \$200 a year. Those wishing to avail themselves of its benefits should apply to the executive committee of the Board of Regents of the University of Minnesota.

Mr. Ludden has since donated another \$5,000 for a like purpose so that the yearly income is now \$400

Intermediate Year

For Graduates of the School of Agriculture who wish
to enter the College of Agriculture

The course of study in the School of Agriculture extends over three years, and the school year is six months long. This does not give sufficient time for preparation for college work, and it has been found necessary to supplement the course offered in the School of Agriculture by an additional year's work in general academic branches. The subjects offered in the intermediate year can be taken elsewhere in any accredited high school before entering the School of Agriculture. This intermediate year enables graduates of the School of Agriculture to enter the College of Agriculture on the same basis of preparation as students enter other departments of the University. English and mathematics are given prominence in the intermediate year.

The following prescribed course, or its equivalent taken in some other school, is required of graduates of the School of Agriculture, who desire to gain admission to the College of Agriculture:

FIRST TERM.	SECOND TERM.
Elementary algebra [5]	Higher algebra [5]
Plane geometry [5]	Solid geometry [5]
English [5]	English [5]
General History [4]	Economics [4]

The courses in mathematics for the intermediate year cover Wells' New Higher Algebra from simultaneous equations to logarithms; Downey's Higher Algebra, Part I. and Wells' Essentials of Plane Geometry, beginning with Book III. The work preliminary to these courses is done by the student in the A year in the School of Agriculture.

Students who have completed higher algebra and plane geometry in the A year of the School of Agriculture may be admitted to the freshman class in the College of Agriculture conditioned in solid geometry and English; these conditions must be removed during the freshman year.

The course in English extends through both terms. Two periods a week are devoted to composition, with Scott & Denny's Composition-Rhetoric as a text-book, and three to the study of literature, which will also be made the basis of considerable written work. The characteris-

tic works of the following authors will be studied: Shakespeare, Bacon, Milton, Addison, Gray, Goldsmith, Burns, Wordsworth, Lamb, Macaulay, Ruskin, Browning and Tennyson. Individual members will be assigned readings from various other authors.

CROOKSTON SCHOOL OF AGRICULTURE.

The Crookston School of Agriculture Crookston, Minn., established by the legislature of 1905, is in active operation and offers to the young men and young women of the Red River Valley a three years' course in practical farming and home-making. The school year for 1908-9 will open October 13, 1908 and close April 6, 1909. For further information address Crookston School of Agriculture, Crookston, Minn.

THE FARM STUDENTS' REVIEW.

The Farm Students' Review is a monthly agricultural paper owned and published by the Alumni Association of the School of Agriculture. The paper is intended to be a medium by which the former students of this institution shall be kept in touch with each other and also with the School and Experiment Station. It also endeavors to bring the farmers throughout the state generally, into closer connection with the institution and to this end strives to present the latest progress in experimental work at the various Stations. It is the official organ of the Alumni Association and of the Farmers' Club.

THE FARMERS' CLUB.

The Farmers' Club of Minnesota is an organization composed of students and ex-students and members of the faculty of the School of Agriculture. Any one who has ever registered as a student in the regular, dairy or short course or who is or has been a teacher in the School of Agriculture, is eligible to membership. The objects of the Association are to foster and strengthen the ties between the School and its former students and to extend the work of the School and Experiment Station among the farmers of the state. To this end the members of the State Club have formed County Clubs which hold annual meetings for the benefit of the farmers of the community. To quote from the annual address of its president: "The School of Agriculture is an institution of the farmers, for the farmers, and supported in a large measure by them, and each student of the School should use his knowledge to better the conditions about him. The State has invested from one to several hundred dollars in his education and expects to realize on that investment by the knowledge which he will distribute."

Dairy School

FACULTY

- CYRUS NORTHROP, LL.D., *President.*
E. W. RANDALL, *Dean.*
T. L. HAECKER, *Professor of Dairy Husbandry and Animal Nutrition.*
J. A. VYE, *Creamery Records and Accounts.*
HARRY SNYDER, B.S., *Dairy Chemistry.*
M. H. REYNOLDS, M.D., V.M., *Diseases of the Dairy Cow.*
J. M. DREW, *Forage, Farm Buildings.*
WILLIAM BOSS, *Instructor in Practical Engineering.*
H. L. RUSSELL, Ph.D., *Dairy Bacteriology.*
E. K. SLATER, *Creamery Management.*
H. T. SONDERGAARD, *Chief Instructor.*
I. O. DYBEVICK, *Instructor in Creamery.*
E. L. ALLEN, *Instructor in Cultures and Starters.*
A. W. PARKIN, *Instructor in Cheesemaking.*
C. B. MOAK, *Instructor in Dairy Laboratory.*
M. P. MORTENSON, *Assistant in Cultures and Starters.*
J. C. JOSLIN, *Assistant in Creamery.*

The next session of the Dairy School will open Monday, November 16th, 1908, and continue four weeks.

This course is designed to furnish persons who are actually engaged in the manufacture of butter and cheese in creameries and cheese factories an opportunity to become more skilled in their work and also to study the many problems which have a direct bearing upon the dairy industry. Recognizing the fact that such persons cannot be away from business for a long period, the term has been so arranged that the time of each student is fully occupied by lectures and actual work in the creamery training room every hour of every working day of the term.

The rapid growth of the dairy industry in the Northwest calls for constant enlargement in equipments for dairy hall.

With each succeeding year, as dairy products manufactured in our creameries take higher rank in quality and finish, the character of the

instruction given must be of high order. To meet these requirements the training rooms are each year equipped with the best apparatus, and the corps of instructors is composed of the most skillful workmen and best instructors.

No pains will be spared to maintain the high standard which the school has attained. Each member of the faculty has special qualifications for the duties to which he has been assigned. The lecture course and practical instruction are arranged with special reference to giving the greatest amount of training and practice possible in a four weeks' session.

Instruction is divided into seven courses:

- 1st. Lectures covering the entire field of dairy husbandry.
- 2d. Practical work daily in the butter room.
- 3d. Practical work daily in the cheese room, where the manufacture of flats, cheddars, Swiss, brick, Edam and Gouda cheese is carried on.
- 4th. Practice work in the laboratory, examining milk, making daily composite tests, and the pasteurization of milk and cream.
- 5th. Practical engineering, steam fitting and plumbing.
- 6th. Practical work in factory bookkeeping.
- 7th. Practical work with cultures and starters.

I.—LECTURES.

The course of sixty lectures furnishes in a plain and concise form the most valuable information for those who are interested in any branch of agriculture, covering, as it does, the most important points in the breeding, rearing, feeding and general management of dairy stock, the economical production of milk, growing and preserving of forage and grain crops, the management of meadows and pastures, management of barns, stables and yards, construction of silos, co-operative dairying, creamery and cheese factory management, judging and marketing dairy products, the chemistry of milk, dairy bacteriology, engineering, animal hygiene and treatment of the common diseases of the dairy cow.

II.—BUTTER MAKING.

The running of separators; ripening and churning of cream; how to ripen cream to secure best flavor; how to churn, wash and salt butter so as to avoid specks and mottles; to secure good grain and best methods of preparing for market—are some of the points which receive special attention. As all creamery men should be able to judge butter from a commercial standpoint, students are trained daily in the art of scoring butter by the score card.

III.—CHEESE MAKING.

The work in the cheese room is conducted on a large scale, including the manufacture of several brands of fancy cheese. The fact that there is a demand for these at highly remunerative prices has induced the Regents to provide the necessary means for carrying on this work.

A complete record of every step taken is required of each student. Here is a good opportunity for cheese makers to meet, investigate new methods, make experiments on doubtful points, compare notes, and thus gather in a few weeks knowledge that otherwise would take years to acquire.

IV.—MILK TESTING.

It has been found that the value of milk for both butter and cheese is measured by the per cent of fat content, and nearly all our factories and creameries now base the payment for milk on the fat content. It is therefore necessary for every factoryman to familiarize himself with the best methods

of milk testing. The chemist gives a general outline of the work, but in order that each student may have thorough training in milk testing daily exercise is given. Steam turbine and hand power machines and other apparatus are provided and operated in the laboratory.

The pure and wholesome milk and cream supply for our cities is a matter of vital importance, and there is great need for improved methods of handling milk intended for this purpose. To meet this, milk and cream pasteurizing apparatus of the latest and most improved makes has been provided for the dairy school, and a few advanced students will be given instruction in this work.

V.—MOTIVE POWER.

The work in engineering consists of practical talks on the construction, care and management of creamery engines and boilers, pumps, injectors, heaters, etc., and work in the practice room.

In the practice room are provided an eight horse power, simple, slide-valve engine, three types of boiler feed pumps, two types of deep well pumps, one injector, two milk pumps and a steam gauge, which the students have the privilege of examining and operating. Instruction is also given in pipe fitting, placing shafting, babbitting bearings, soldering, etc.

It is the aim to make this work as practical as possible. Questions of interest on the subject are freely discussed.

VI.—FACTORY BOOKKEEPING.

All the essential features of factory accounting from the receipt of the milk to the returns in net proceeds are thoroughly considered. Paying for the milk according to the fat content, or otherwise, is fully explained. The students do, in books provided, the actual one month's accounting of a creamery.

VII.—STARTERS AND CULTURES.

Since all students who are admitted to the school have had some experience in the routine work of running separators and since the most important part in butter making is the art of uniformly making a product having a fine flavor and good keeping qualities, special attention is given to cultures, starters and pasteurization. Constant additions will be made to the equipment needed to make this course inviting to those who wish to fit themselves for masters of the art of creamery butter making.

REQUIREMENTS FOR ADMISSION.

Experience has shown that students who have had some practical training in the creamery or cheese factory before coming to the dairy school are, as a rule, the ones who are able to make the most of the course; it is therefore required that persons who intend to take this course shall have had at least one season's experience before coming to the school. No entrance examination is required.

EXPENSE.

A registration fee of \$15 is required of each student. Students can board in either city and reach the school by street car, or board can be secured near the school for from \$3.50 to \$4.00 per week. Each student is required to supply himself with two white suits, including caps, to be worn during working hours in the creamery and cheese rooms. The suits may be procured for about \$1 each.

DAIRY CERTIFICATES.

The Regents will grant dairy certificates to students who have taken the course and passed a satisfactory examination and in addition have demonstrated by at least one year's work in a factory that they have acquired special skill in the art of butter and cheese making, and are thoroughly qualified to take charge of a creamery or cheese factory.

To reach the school from either St. Paul or Minneapolis, take the Como-Hopkins or Como-Harriet street car and get off at Commonwealth avenue.

Address applications for admission to T. L. Haecker, St. Anthony Park, St. Paul, Minn.

Short Course for Farmers

FACULTY

CYRUS NORTHROP, LL.D., *President.*

E. W. RANDALL, *Dean.*

SAMUEL B. GREEN, B.S., *Horticulture, Forestry.*

J. A. VYE, *Business Methods.*

HARRY SNYDER, B.S., *Agricultural Chemistry, Soils.*

T. L. HAECKER, *Dairy Husbandry and Animal Nutrition.*

M. H. REYNOLDS, M.D., V.M., *Veterinary Science.*

J. M. DREW, *Poultry, Workshop Hints.*

A. BOSS, *Live Stock, Dressing and Curing Meats.*

WM. BOSS, *Farm Mechanics.*

F. L. WASHBURN, M.A., *Insect Enemies.*

E. M. FREEMAN, Ph. D., *Plant Diseases.*

COATES P. BULL, B.Agr., *Farm Implements, Grains.*

W. L. OSWALD, *Farm Botany.*

D. D. MAYNE, *Parliamentary Practice.*

A. L. EWING, M.S., *Farm Physics.*

JUNIATA L. SHEPPERD, *Domestic Science.*

MARGARET BLAIR, *Domestic Art.*

This course of instruction is provided by the faculty of the School and College of Agriculture to meet the needs of men and women of mature years who are actively interested in the work of the farm.

The next term will be open on Friday, Jan. 15th, and will continue for four weeks, closing on Friday, Feb. 12th, 1909.

This is a lecture course, covering the more important branches of agriculture, horticulture, live stock, farm botany, farm chemistry, entomology, poultry, dairying, etc. Special instruction will be given in the judging of grains, soils, and animals.

A series of lectures especially fitted to the needs of farmers' wives will be given. The daily program will so arranged as to allow the ladies to take the lectures in Entomology, Botany, Horticulture, Poultry, and other subjects of the short course in which they would naturally be interested in common with the men.

Work will begin at 8:15 o'clock a. m. and close at 3:40 p. m. During the course there will be no work on Monday, but this day will be spent in visiting places of interest such as the stock yards, stock farms, flour and flax mills, etc.

For the entire course, or any part thereof, a registration fee of \$5.00 will be charged.

Those taking this course should register and secure boarding places not later than Thursday, January 14th, as work will begin promptly at 8:15 on Friday, January 15th.

Board may be secured in either of the Twin Cities at \$3.50 to \$4.50 per week.

Farmers wishing to register for the course, or desiring further information, should write to D. D. Mayne, Principal, or Jas. M. Drew, Registrar, St. Anthony Park, Minn.

The course of lectures and study is outlined as follows:

Agriculture: The selection of farms and soils suitable for specific crop production; planning farms; developing the fields, drainage, roads, fences; developing the farmstead and its buildings; managing fields and growing, cultivating, harvesting and preserving forage and grain crops; the rotation of grain, cultivated and grass crops; the use of live stock; and general farm management.

Dairy stock judging: The instruction given in judging dairy stock will be based upon the actual performance of animals bred and reared in the dairy division, the records covering a period of five years and giving the annual yield of milk and butter fat, cost of production and profits.

Dairy husbandry: The lectures in dairy husbandry will cover the characteristics of the various breeds of dairy cattle, their comparative adaptability for the various phases of dairying and the style or type of cow that has demonstrated her ability as a large and economical producer. The scientific and practical phases of feeding for milk production will be explained and practical instruction and training given in calculating rations for milk production.

Animal husbandry: A series of lectures will be given on animal breeding. These lectures will include the known laws of breeding, such as heredity, variation and atavism. Attention will be given to such features as the selection of prepotent sires and dams, to cross breeding, in-breeding, and other matters of interest to the breeder of live stock. Pedigrees will be discussed and the students made familiar with the registration and transfer of pure bred stock. The feeding and management of horses, beef cattle, sheep and swine will also be discussed. Foods suitable to each class of animals, and methods of preparing and feeding them will be among the subjects receiving attention, together with directions for the practical management of stock while in the stable and pasture.

Soils: Lectures are given on the conservation of the fertility of the soil, the composition and use of farm and commercial manures, the draft of different farm crops upon the soil and the methods of making the fertility of the soil available by the rotation of crops and other means so as to secure the necessary changes in the soil to produce the highest degree of fertility. The judging of soils is made a feature of this work and includes the testing of soils and the determination of the type to which a soil belongs, the methods of cultivation and the crops most suitable to grow upon the soil.

Agricultural chemistry: The chemistry of plant growth and the chemical principles involved in farm life and their application to the production of crops forms the basis of this work.

Farm mechanics: The instruction given in this subject will consist of lectures on farm mechanics, taking up such subjects as pumps, farm water systems, windmills, the general principles of steam and gasoline engines, placing shafting, pulleys and belts, pipe fitting, soldering, etc. Some instruction will

also be given in sharpening and using hand tools, such as saws, planes, chisels, and other tools necessary in farm practice.

Farm implements: The lectures on farm implements will be illustrated, as far as possible, by samples. Stereopticon views will be made use of in illustrating machines that cannot well be taken to the class room. It is the aim in these lectures to bring out the lines covering the draft of implements and the objects attained by their use. Suggestions will be made on selection of implements adapted to various kinds of work. The care of implements when not in use will also be discussed, and an attempt made to give as fully as possible all information that will be beneficial in the care and handling of farm machinery.

Dressing and curing meats: The work in dressing and curing meats will be given in a course of demonstration lectures. In demonstrating these lectures the animals will be dressed before the class and the reason for each operation fully explained. The methods of cutting up the dressed carcass for different purposes will also be shown before the class and the use and value of each cut explained. Sausage making, lard rendering, and the "working-up" of all parts of the animals will be taught in a simple and direct way.

Farm accounts: A series of lectures will be given on business forms, business arithmetic and the keeping of simple farm accounts and records.

Farm botany: Eight lectures will be given on the phases of botany of special interest to farmers; for example, the pollination of flowers, weeds and weed seeds, poisonous plants, fungus diseases of plants and how to deal with them.

Farm horticulture: Lectures will be given on the care and management of the apple and plum in this climate, including such subjects as location of the orchard, selection of the trees, planting, cultivation, green manuring; preparation for winter; advantages and disadvantages of root grafting, budding, and top working; diseases injurious to orchards. Lectures on the care and management of small fruits will consider the subjects of selection of varieties, planting and cultivation, origin of new varieties, propagation, marketing, winter protection, also the insects and diseases injurious to raspberries, blackberries, currants, gooseberries, strawberries and grapes. Under vegetable gardening will be considered the growing of potatoes, tomatoes, celery, onions, squash and cucumbers.

Veterinary science: This work includes a series of lectures on elementary anatomy, animal foods and digestion; and causes, prevention and treatment of common diseases of farm stock. An especial effort is made to have this work practical and helpful to men who are actually handling farm stock.

Poultry: Lectures will be given on this subject with special reference to the needs of the Minnesota farmer. The following subjects will be considered: Location and construction of poultry buildings and yards; a study of the breeds best adapted to the farmer's use; the hatching, rearing and management of the farmer's flock; feeding for eggs and for fattening; killing and dressing fowls, and packing for market; marketing eggs.

Economic entomology: The entomologist will give a course of lectures on injurious and beneficial insects, and will discuss the various insecticides and methods of application. The four-footed pests of the farm—rabbits, gophers, etc., are also studied, and a few lectures are given on practical bee-keeping. If there be sufficient demand for warrant, and time permits, a few lectures will be given on birds and their relation to agriculture.

Parliamentary practice: A debating club is made up of the members of the short course class and weekly meetings are held which give opportunity for learning how to conduct public meetings and for practice in public speaking.

Physics: This course consists of six lectures with illustrative experiments. In these exercises the following topics are discussed: The principles of draft in the horse; the causes of draft in wagons, including the effect of road-bed; the effect of grades or hills, involving the principle of the inclined plane; the various questions involved in eveners, road construction and maintenance; including the question of reducing grades, the power at which a horse works in to secure the necessary changes in the soil to produce the highest degree of plowing, hauling, etc.; horse power; farm drainage; weather forecasting.

Workshop hints: In addition to the above, four lecture periods will be devoted to farm workshop hints, such as splicing rope, making rope halters and rope belting, and tempering simple tools.

Short Course for Teachers

FACULTY

- CYRUS NORTHROP, LL.D., *President.*
JOHN W. OLSEN, *State Superintendent of Public Instruction.*
E. W. RANDALL, *Dean.*
D. D. MAYNE, *Principal*
SAMUEL B. GREEN, B. S., *Horticulture, Forestry.*
HARRY SNYDER, B. S., *Agricultural Chemistry, Soils.*
T. L. HAECKER, *Dairy Husbandry, Animal Nutrition.*
M. H. REYNOLDS, M. D., V. M., *Veterinary Science.*
ANDREW BOSS, *Agriculture, Animal Husbandry.*
FREDERICK L. WASHBURN, M. A., *Entomology.*
E. M. FREEMAN, Ph. D., *Plant Pathology.*
WILLIAM BOSS, *Farm Mechanics.*
J. A. VYE, *Secretary and Treasurer, Accounts.*
J. M. DREW, *Registrar, Blacksmithing, Poultry.*
FANNIE C. BOUTELLE, *Domestic Economy.*
JUNIATA L. SHEPPERD, M. A., *Domestic Science.*
MARGARET BLAIR, *Domestic Art.*
JOHN A. HUMMEL, B. Agr., *Assistant in Agricultural Chemistry.*
COATES P. BULL, B. Agr., *Assistant in Agriculture.*
LEROY CADY, B. S., in Agr., *Assistant in Horticulture.*
D. A. GAUMNITZ, M. Agr., *Assistant in Animal Husbandry.*
A. D. WILSON, B. S. in Agr., *Assistant in Agriculture.*
A. G. RUGGLES, M. A., *Assistant in Entomology.*
E. C. PARKER, B. S. in Agr., *Assistant in Agriculture.*
S. B. DETWILER, B. S. in Agr., *Assistant in Forestry.*
A. D. WILHOIT, M. A., *Assistant in Soils.*
A. R. KOHLER, B. S. A., *Assistant in Vegetable Gardening.*

PURPOSE OF THE SCHOOL.

The short summer course for teachers, principals, and superintendents, is established to meet the demand for agricultural instruction by educators who wish to teach the elements of agriculture, or who wish to be able to supervise the teaching of the subject intelligently in the public schools. It is intended to be especially helpful to teachers who desire to be more efficient in teaching the elements of agriculture in rural schools, or in small village schools having an attendance largely from the country.

High school teachers who wish to get more complete information on agricultural subjects and technical work so as to make more practical

their teaching of botany, physics, chemistry and other natural sciences, may find here the opportunity they have long been seeking.

Principals of high schools who wish to introduce carpentry, blacksmithing, the elements of agriculture, sewing, cooking, may here get such an insight into the subjects that they may go about their introduction and supervision with some degree of confidence.

County superintendents having to do with country conditions more than others should seek to become familiar with modern agricultural problems and their solution. It is hoped that this short course may appeal to all the special classes mentioned as well as to some who are interested merely in the form of industrial education presented as a means of general information and culture.

LOCATION.

The school is located at the Experiment Station midway between Minneapolis and St. Paul. It is about a 15-minute walk from the street car line. To reach the school from either city, take a Como-Harriet or Como-Hopkins car, and get off Commonwealth Avenue.

Although the school is located in the country, and has all the advantages of the quiet and fresh air of the country, yet it is close enough to the Twin Cities to get all the benefits of these large centers. No more beautiful spot between the two cities could have been selected for such a school. Situated on picturesque hills, overlooking the midway and the two cities, the buildings are grouped conveniently about the undulating campus. Nature has done much to make this a beauty spot and the landscape artist has added to the beauty in the arrangement of paths and the replacing of trees and shrubs with many varieties suited to the climate.

PLAN OF THE COURSE.

The course is planned for three weeks commencing Monday, June 8th and closing Saturday June 27th. This will give those having regular summer school work the opportunity to attend this course and then take with them to the summer schools the knowledge and inspiration obtained.

It is expected that those entering this course will take all the work outlined in the program. This is not a requirement but the program is so arranged as to make it possible. The work given in the several subjects will be made as practical as possible and will combine lecture work, laboratory work, and field exercises.

The dormitories and dining hall on the grounds will be open for the use of those attending the summer course. The close association of a body of educators for three weeks cannot but be helpful in many ways.

EXPENSE.

The registration fee for the entire course or for any part of it, is \$3.00. This small fee is made possible only by the generous donation of services by the heads of departments of the School of Agriculture and by the cooperation of State Superintendent J. W. Olsen.

Good board will be furnished at the large dining hall for \$3.50 per week. Dormitory rooms may be used free of charge. These rooms have all necessary furniture, except pillows, pillow cases, sheets, quilts and towels. Those expecting to occupy the dormitories should bring such articles with them. If desired, the articles named may be rented at the school for 60 cts. per week. It will aid greatly in making arrangements for the proper accommodations, if those who expect to attend will write of their intention before June 1st.

THE CONFERENCE HOUR.

A conference hour is arranged for each day before dinner. At this time subjects of special interest to school men and women will be considered. Round table discussions of pedagogical problems especially related to the introduction of vocational subjects into the public school curriculum will be held.

Short talks and lectures by State Superintendent Olsen, Dean James and other men prominent in educational work will be given. All subjects presented will be open for question and debate.

A number of evening lectures and entertainments will also be provided during the course.

During the course Dr. Reynolds will give two illustrated lectures on ventilation and animal diseases. Mr. Vye will also lecture on farm accounts and Mrs. Boutelle on domestic economics.

AGRICULTURE.

The lectures in Agriculture will cover the principles of soil formation and classification; soil water, its movements, and effect on plant growth; the relation of tillage to plant growth and the effect of tillage upon the mechanical condition of soils. Field crops, their cultivation, growth and care, will be presented from the standpoint of economic relation to farming. A series of discussions of the arrangement of crops and of farm plans will form a distinctive feature of this subject, thus giving the principles of soil preparation, crop growth and farm management.

all necessary furniture except pillows, pillow cases sheets, quilts and

AGRICULTURAL CHEMISTRY.

The composition and comparative value of food materials, the changes which take place during their production, and the application of the principles of chemistry to plant and animal life form the basis of this work.

ANIMAL HUSBANDRY.

In animal husbandry, the work will consist of sketches of the history, development and classification of the various classes of live stock and their relation to farming; of comparisons of the types of each class and a study of the breeds of horses, cattle, sheep and swine. Good specimens will be used for illustrating the characteristics of each breed and for demonstrating the principle of selecting for specific purposes.

BLACKSMITHING.

A course of lessons in iron work will be offered to those who desire to prepare for teaching this subject in the common schools. This course will cover the essential principles of forging iron and steel and tempering the tools in common use.

DAIRY HUSBANDRY AND ANIMAL NUTRITION.

The lectures will cover the characteristics of the various breeds of dairy cattle, their adaptability for the various phases of dairying, and the style or type of cow that has demonstrated her ability as a large and economical producer. Instruction will be given in the scientific principles and practical phases of feeding, and training will be given in calculating and formulating rations.

DAIRY STOCK.

The instruction given in dairy stock will be based upon the actual performance of animals bred and reared in the dairy division: the records covering a period of five years, giving the annual yield of milk and butter fat and the cost of production and profits.

DOMESTIC ART.

This course will consist of lectures and exercises on models and plans for graded work in the public schools, including basting, the seam, the hem, the gusset, the placket, patching, darning, buttonholes and other hand sewing, also garment drafting, including the shirt waist, and making. Lectures will be given upon production and use of textiles, the judging of fabrics, the harmony of color and the beautifying of the useful in the school-room.

DOMESTIC SCIENCE.

This work will consist of lectures, class room demonstrations and of such library research as will enable students to make bibliography which will aid in securing reliable data for use in teaching this subject. The principles set forth in the lectures and discussions will be illustrated in either demonstration lectures or in individual practice, as the majority of the class may elect. The various methods of teaching this subject, now in general use, will be discussed and exemplified. In connection with this, a list showing utensils needed for a laboratory kitchen, with tentative cost will be compiled and considered. Results of experiments to ascertain the best means for introducing some work along domestic science lines into the rural schools will be studied.

ENTOMOLOGY.

Lectures will be given on the important features represented by this department. Such subjects as scale insects, plant lice, bee keeping, friendly insects, etc., will be dealt with in an effort to make the course as comprehensive as time permits and suited to the needs of teachers.

HORTICULTURE AND FORESTRY.

The course in horticulture and forestry will include lectures and laboratory periods, aimed to illustrate the fundamental principles underlying these subjects, and to show the best way in which they can be taught.

PLANT DISEASES.

Lectures will be given on important plant diseases of farm and garden crops, their economic importance, botanical features and methods of prevention and cure. Demonstrations and exhibitions of material will also be given.

POULTRY.

A course of lectures and demonstrations in the care and management of poultry will be given covering the subjects of poultry buildings the breeds of poultry, incubation, breeding, feeding and marketing. This course will be given at the season when the incubator and brooders will be in use thus affording a chance for practical work in this line to those who desire it.

SOILS.

Formation, physical properties, chemical composition and the judging, rating and scaling of soils are studied in the laboratory. Lectures are given upon the principles of soil fertility and the composition and uses of farm and commercial manures.

TENTATIVE PROGRAM.

Monday, June 8th, Registration.

	8:15	9:05	9:55	10:45	11:35	1:15	2:05	2:55	2:45
Tuesday, 9th.....	Agriculture	Fruit Gr.	Household Art Lec.	An. Hus. Cattle	C O N F E R E N C E	Chem. Lec.	Chemical Laboratory		
Wednesday, 10th	"	"	"	"		Soils Lec.	Soils Lab.	Field Practicums	
Thursday, 11th..	"	"	"	"		Blacksmith Lec.	Blacksmith Shop Work		
Friday, 12th	"	"	Dom. Sc. Lec.	"		Carp. Lec.	Carpentry Shop Work		
Saturday, 13th...	"	"	"	Sheep		Dairy Lec.	Dairy Practicums		
Tuesday, 16th...	"	Veg. Gard.	"	"		Chem. Lec.	Chemical Laboratory		
Wednesday, 17th	"	"	Entomology	Swine		Soils Lec.	Soils Lab.	Field Practicums	
Thursday, 18th..	"	"	"	"		Blacksmith Lec.	Blacksmithing Shop Work		
Friday, 19th	"	"	"	Poultry		Carp. Lec.	Carpentry Shop Work		
Saturday, 20th...	"	"	"	"		Dairy Lec.	Dairy Practicums		
Tuesday, 23rd....	"	Forestry	Plant Diseases	Horses		Chem. Lec.	Chemical Laboratory		
Wednesday, 24th	"	"	"	"		Soils Lec.	Soils Lab.	Field Practicums	
Thursday, 25th..	"	"	"	"		Blacksmith Lec.	Blacksmithing Shop Work		
Friday, 26th.....	"	"	"	"		Carp. Lec.	Carpentry Shop Work		
Saturday, 27th...	"	"	"	"	Dairy Lec.	Dairy Practicums			

The School of Agriculture

COPY OF LETTER FROM STATE SUPERINTENDENT OLSEN.

State of Minnesota,

DEPARTMENT OF PUBLIC INSTRUCTION,

St. Paul, January 24, 1908.

To Superintendents and Teachers of Minnesota:

The child needs that fundamental education that will aid him to find his individual place in life and teach him how to get the best out of living. He needs the special education that will thoroughly equip him for earning a livelihood when his school days are over.

In all our schools the tendency has been to make education too bookish. The country school has trained away from rather than toward the life of the farm. Of recent years practical science has been moving forward by leaps and bounds, but the knowledge acquired by it on its march has not reached the rural school to an extent adequate to the situation. Now, within the reach of every farmer's child there ought to be a school giving as good instruction and as much instruction in the general branches as is given by the city school, "but, instead of being colored with the activities of the city, it should have the equally useful and more delicious flavor of the soil."

County superintendents and others realize the imperative need for teachers who can with intelligence and real sympathy relate the instruction of the school to the natural interests and experience that environ the country boy and girl.

Through the generous enthusiasm of Dean Randall of the state college of agriculture and his staff, nearly all of whom offer their services free, it has been made possible to afford educators the opportunities outlined in this bulletin. While the primary object of the courses is to meet the present day needs of the rural schools, they are so suggestive and so comprehensive that they cannot but prove invaluable to the city teachers, principals and superintendents.

It is to be hoped that county superintendents, conductors and instructors of summer training schools and teachers generally will still further fit themselves for service at this unique training school. More delightful surroundings for a summer school than University Farm it would be hard to imagine. The situation of the school, midway between the business portions of St. Paul and Minneapolis, makes it readily accessible from either city, and no college in the country is better equipped as to modern conveniences and facilities for extensive observation and study.

Upon recommendation of the faculty those perfect in attendance will receive a credit in agriculture toward a first grade state certificate that will exempt them from examination in plane geometry or in physical geography as they prefer.

Please take notice that the instruction is not to be given by tutors or assistants, but almost wholly by the professors of the school, men and women of national reputation, whose service we can recompense only by accepting what they so generously contribute—knowledge that we may apply to good purpose, inspiration by which we may inspire others.

(Signed) J. W. OLSEN,

Superintendent.

The Agricultural Experiment Station

STATION OFFICERS.

J. A. VYE, *Secretary.*

EXPERIMENT CORPS.

E. W. RANDALL, *Director.*

SAMUEL B. GREEN, B. S., *Horticulturist.*

HARRY SNYDER, B. S., *Agricultural Chemistry and Soils.*

T. L. HAECKER, *Dairy Husbandry and Animal Nutrition.*

M. H. REYNOLDS, M. D., V. M., *Veterinarian.*

ANDREW BOSS, *Agriculturist and Animal Husbandry*

FREDERICK L. WASHBURN, M. A., *Entomologist.*

J. A. HUMMEL, B. Agr., *Assistant Chemist.*

COATES P. BULL., B. Agr., *Assistant in Agriculture.*

A. G. RUGGLES, M. A., *Assistant Entomologist.*

A. J. MCGUIRE, B. Agr., *Superintendent, Grand Rapids.*

D. A. GAUMNITZ, M. Agr., *Assistant in Animal Husbandry.*

A. D. WILSON, B. S. in Agr., *Assistant in Agriculture.*

E. C. PARKER, B. S. in Agr., *Assistant in Agriculture.*

WM. ROBERTSON, B. S., *Superintendent, Crookston.*

C. C. LIPP, D. V. M., *Assistant in Veterinary Science.*

A. D. WILHOIT, M. A., *Assistant in Soils.*

The bulletins of this Station are mailed free to all residents of this state who make application for them.

The Agricultural Experiment Station of the University of Minnesota was established by National and State legislation in 1887. The function of the Experiment Station as set forth in the Hatch Act is "to aid in acquiring and diffusing among the people useful and practical information on the subjects connected with agriculture, and to promote scientific investigation and experiment respecting the principles and applications of agricultural science." The funds provided by the National Government have been supplemented recently by the Adams Act which will ultimately provide \$15,000 annually, and appropriations for special lines of experimental work have also been made by the State Legislature.

The Experiment Station is located at University Farm, St. Anthony Park, and is one of the Divisions of the Department of Agriculture of the University of Minnesota, and the officers of the station are also profes-

sors and instructors in the School and College of Agriculture. The chief executive officer of the station is the Director who is also Dean of the College of Agriculture. Affiliated with the main station are a score or more of trial stations maintained by the State Horticultural Society. The Experiment Station also carries on co-operative tests and investigations with the U. S. Department of Agriculture and with farmers in various parts of the State. The Station has published since its organization in 1887, one hundred five regular, twenty-nine press and fifteen class bulletins.

The principal lines of work conducted at the station are as follows: Chemistry of soils and farm crops; field experiments—rotations, tests of varieties of cereals and forage crops, time and depth of seeding grains and amount of seed, methods of seeding grasses; horticultural—tests of varieties of fruits and vegetables, use of wind-breaks, testing hardy stocks for apple trees, improvement of native fruits; forestry; diseases of plants; food and nutrition of man; plant and animal breeding; feeding experiments; diseases of animals; entomology; dairying; farm management and farm statistics.

NORTHWEST EXPERIMENT FARM.

To give special consideration to local conditions in the northwestern part of the state an experiment farm was established at Crookston in 1895. The farm contains 450 acres and is one mile north of the city. It has a well-equipped poultry plant from which much good breeding stock is being distributed among the farmers. With aid from the U. S. Office of Experiment Stations the farm is taking an active part in testing surface and tile drainage for the Red River Valley region. It is also encouraging a more extensive growing of clover. The Crookston School of Agriculture is operated in connection with the farm. (See page 25.)

EXPERIMENT FARM AT GRAND RAPIDS.

The legislature of 1895 also provided for a second experiment farm to make possible a more thorough study of the agricultural conditions of the northeastern portions of the state. This farm was located at Grand Rapids April 16, 1896, and lies two miles east of the village. It contains approximately 375 acres of land, with the necessary farm equipment consisting of dwelling house, barns, machinery, live stock, etc.

Bulletins of the Experiment Station for 1907

GENERAL BULLETINS:

- No. 101 Forage Crops of High, Medium and Low Protein Content.
- No. 102. Soil Investigations.
 - 1. Fertilizer Tests with Wheat and Corn.
 - 2. Influence of Fertilizers upon the Composition and Quality of Wheat.
 - 3. Comparison of Chemical Methods and Field Tests for Determining the Fertilizer Requirements of Soils.
- No. 103 Dissemination of Tuberculosis by the Manure of Infected Cattle.
- No. 104 Pork Production.
 - 1. Hogging-off Corn vs. Yard Feeding.
 - 2. Field Management of Swine.
 - 3. Observations.
- No. 105 Importance of the Study of Entomology; Directions for Collecting and Studying Insects.

PRESS BULLETINS:

- No. 27 A Hint to Flax Growers.
- No. 28 The Fall Web Worm a Menace in Minnesota.
 - Autumn Remedies for the Stalk Borer in Flower Gardens.
- No. 29 Seed Corn Shortage.

Students

STUDENTS 1907-8.

Intermediate year.....	8
A Class	102
B Class	185
C Class	285
	580
Farmers' Short Course	141
Dairy School	93
	116
College course	116
Total in Department of Agriculture	930
Less six duplicates	6
TOTAL	924

"INTERMEDIATE CLASS," 8.

Bredvold, August J., Belview
 Carlton, Jay S., Owatonna
 Haw, John W., St. Anthony Park
 Heywood, Ralph M., Minneapolis

Lewis, Pauline L., Long Lake
 Meisch, Henry A., Minnesota City
 Quam, Oscar A., New London
 Swedberg, Jasper I., White Bear

"A" CLASS—102.

Anderson, Agnes E., Alexandria.
 Minn.
 Anderson, Elmer O., Alexandria.
 Anderson, Frederic A., Minneapolis.
 Austin, Florence Marion, Winnebago.
 Bacheller, Herbert S., Forest Lake.
 R. 26.
 Baker, Matt Hartford, Wood Lake.
 Beard, Lee Alexander, Kasson.
 Berg, Alma B., Minneapolis.
 Berry, J. Bert, St. Paul.
 Bush, Harvey M., Minneapolis.
 Butterfield, Elsie Mary, Faribault.
 Calkins, John E., Imogen, R. 1.
 Cantwell, William F., White Bear.
 Carpenter, Fred B., Sleepy Eye, R. 5.
 Charles, Ernest Havil, Hancock.
 Chase, Elizabeth Myrtle, Farmington.
 Christopherson, Edna Henrietta,
 Sioux Falls, S. D.
 Church, George H., St. Paul.
 Cleland, Edgar J., Waseca.
 Cole, Mary E., New York Mills.
 Colombe, Robert D., Little Falls.
 Cooper, Percy E. R., Minneapolis.
 Cross, Harrison J., Childs.
 Crysler, Flossie Winifred,
 Sioux Falls, S. D.
 DeMann, Frank A., Lonsdale, R. 2.
 Denison, Ena Leona, Faribault, R. 7.
 Denzer, Frank John, West St. Paul.
 Dorn, Ivan C., Robbinsdale.
 Dow, Charles F., Worthington.
 Eklund, Karl O. J., Brookston.
 Engstrand, Adolph G., Dawson.
 Enright, John P., Rose Creek.
 Erickson, Richard E., Stillwater.
 Flaten, Mabel R., Granite Falls.
 Follingstad, Henry A., Zumbrota, R. 6.

Gee, Merrill H., Minneapolis.
 Gillingham, Emilie J., St. Paul.
 Hall, Fay E., Morris.
 Harrison, Earl D., Osseo, R. 1.
 Hart, Iva Pearl, Farmington.
 Hazelton, Lyman W., Cutler.
 Herum, Haldor C., River Falls, Wis.
 Hovde, Fred T., Hanska.
 Howard, Burt B., Madelia.
 Hunt, Florence A., St. Cloud.
 Huseby, Bennie J., Adams.
 Jacobson, Norman G., Port Washing-
 ton, Wis.
 Johnson, J. Arthur, Center City.
 Jones, Clarence A., Duluth.
 Jones, Myrtle M., LeSueur, R. 6.
 King, Edwin H., Spring Valley, R. 4.
 Kottke, Edward A., Hutchinson.
 Lane, George E., Minnetonka, R. 2.
 Larson, Henrietta A., Ulen, R. 1.
 Lathrop, Alden B., Hugo, R. 29.
 Lewis, Roy W., Lewisville.
 Loegering, Aloysius J., Long Prairie.
 Lundgren, William A., Excelsior, R. 3.
 McCurry, Myrtle V., Osakis, R. 3.
 McKinney, Jesse A., Indianapolis, Ind.
 Mather, William E., Faribault.
 Maylott, Eugene A., Hancock, R. 2.
 Miller, LaVerne A., St. Paul.
 Monson, Clara I., Kenyon, R. 4.
 Monson, Grace V., Elbow Lake, R. 2.
 Nash, Floyd E., Robbinsdale.
 Oleson, M. Victor, Perley.
 Orton, Herbert, O., Elk River.
 Page, Clarence P., St. Paul.
 Pattee, Ralph E., Minneapolis.
 Paulson, Emiel, Windom.
 Peck, Francis Winfred, St. Anthony
 Park.

- Peterson, Alice B., New Ulm, R. 2.
 Peterson, Fred O., Olivia.
 Potter, Reuben M., Springfield.
 Reasoner, Margaretta A., New Brighton.
 Ricks, Nelson D., Minneapolis.
 Riley, Ellen H., Hammond.
 Robertson, Johan E., Appleton.
 Rollefson, Thea Serine, Clarkfield.
 Sagness, Lena H., Sacred Heart, R. 2.
 Sargent, Ray L., Red Wing, R. 2.
 Schmidt, William A., Osseo, R. 1.
 Selbig, Florence M., St. Paul.
 Sheaff, Philip L., Stillwater.
 Shumway, Frank E., Minneapolis.
 Spence, Alice Vandervort, Hamilton, Ill.
 Spence, John C., Hamilton, Ill.
- Staples, Alice M., West Side Sta., St. Paul.
 Staples, Myrtle C., West Side Sta., St. Paul.
 Strand, Elmor A., Ada, R. 2.
 Swain, Lawrence B., St. Paul.
 Thoe, Bertha S., Hayfield.
 Tornquist, Isidro, Buenos Ayres, Argentine.
 Trieloff, Harriet L., Carver.
 Trow, Clinton F., Glenville.
 Underwood, William, Hutchinson.
 Valleau, W. Dorney, St. Anthony Park.
 VanDoren, Amy L., Farmington.
 Watkins, Walter O., Carlton.
 White, Sherman L., Marshall.
 Wolfe, Sydney J., Morristown.

"B" CLASS—185.

- Aakre, Clara, Hayfield.
 Adley, C. Louis, Northome.
 Ainsworth, Walter S., Minneapolis.
 Albee, Charles B., Caledonia.
 Albers, Mary W., Northfield.
 Allen, Percy R., Winona.
 Anderson, Esther J., Minneapolis.
 Anderson, George M., Minneapolis.
 Anderson, Philip A. W., Forest Lake.
 Anderson, Raymond E., Maple Plain.
 Anderson, Sophus H., St. Anthony Park.
 Anderson, Walter R., Belgrade.
 Ashbach, Otto B., Ada.
 Backer, Roy F., New Ulm.
 Barsness, Alfred, Brandon.
 Barsness, Thilda B., Glenwood.
 Bartlett, Irving J., Mound.
 Beckstrand, Andrew C., Brookfield, R. 1.
 Benson, Edwin B., Jackson, R. 4.
 Berg, Edgar F., Dundas.
 Blackburn, R. Arthur, Royal, Neb.
 Blackburn, Ralph G., Royal, Neb.
 Bouman, Ado, Minneapolis.
 Bredvold, Jacob S., Belview.
 Brekken, Ole, Sacred Heart.
 Briggs, George M., St. Anthony Park.
 Briggs, Mary O., Houston.
 Brownell, Max C., Minneapolis.
 Burfeind, Arthur H., Minneapolis.
 Busse, Florence A., Merriam Park, R. 8.
 Busse, Rose O., Merriam Park, R. 8.
 Butterfield, James, Long Lake.
 Cantine, Sarah A., Walnut Grove.
 Carlson, Elvera S., Minneapolis.
 Carlson, Mabel H., Minneapolis.
 Chase, Vere E., Minneapolis.
 Churchill, C. Parkes, Fort Dodge, Iowa.
 Clark, Miles D., St. Paul.
 Connick, Bertha J., Westbrook.
 Corser, John, Minneapolis.
 Cowin, Alton B., Minneapolis.
- Crippen, Lee A., Langdon, R. 16.
 Croxen, John B., Monticello.
 Doten, Grace E., Minneapolis.
 Dubbles, Joseph, Viola.
 Ehlers, Frederick L., Marshall.
 *Ekelund, Herman A., Minneapolis.
 Ericson, Dwight S. E., Goodhue R. 6.
 Ferraby, Ethel S., Minneapolis.
 Fleming, Albert, St. Paul.
 Forbes, Charles S., West Side Sta., St. Paul.
 Francis, Merritt, Minneapolis.
 Gammon, Lee M., Excelsior, R. 3.
 Giere, Constance B., Sacred Heart.
 Hagen, Nellie C., Hagan.
 Hall, Jennie F., Buffalo Lake.
 Hall, Jessie M., Minneapolis.
 Hallan, Henry A., Spring Grove.
 Halvorson, Mabel A., Norway Lake.
 Hamilton, Vida L., Brooklyn Center.
 Hammerberg, Arvid, Shafer.
 Hancock, Morris W., Mankato.
 Hanscome, C. Pierce, Brooklyn Center.
 Hanson, Clarence J., Hutchinson.
 Hardesty, Frank J., Minneapolis.
 Harvey, Charles L., St. Paul.
 Helgenoe, Julia E., Canby.
 Hendrickson, Wm., Northfield.
 Herum, Norman S., River Falls, Wis., R. 1.
 High, Herman, New Ulm, R. 3.
 Hinshaw, Guy M., St. Paul.
 Hodorff, Gustave, Dixville.
 Hoffman, Ernest D., Marshall.
 Holbrook, David W., Markesan, Wis.
 Holmberg, Mabel O., Minneapolis.
 Holmquist, Oscar W., Dawson.
 Holt, Harry G., Delhi.
 Hordum, Florence A., Merriam Park, R. 8.
 Hunt, N. K., St. Cloud.
 Huntley, Herbert C., Hancock.
 Jacobson, Cecile L., Madison.
 Jacobson, Henry, Marshall.
 Jaquith, Harold H., Minnetonka, R. 1.

*Died March 2, 1908.

- Johnson, Clara V., New Richmond, Wis.
 Johnson, Ernestine M., St. Paul.
 Johnson, Henry A., Taylors Falls.
 Johnson, Myron H., Goodhue.
 Johnson, Stella A., Cannon Falls.
 Keller, John W., Dundas, R. 1.
 Kelley, Lloyd S., Markville.
 Kern, Frederick D., Minneapolis.
 Kern, Roy S., Hazel Park, St. Paul.
 Knoll, Gustave C., Minneapolis.
 Knuteson, E. George, St. Cloud.
 Kreffting, Carl L., Minneapolis.
 Kuschel, Herman F., Dixville.
 Lamb, Harvey H., Mazeppa.
 Lambert, Lenora M., Withrow.
 Larson, Sallie M., North Branch.
 LaRue, Mary E., St. Paul.
 Lawrence, Frank E., Litchfield, R. 4.
 Lemke, William A., Albert Lea, R. 4.
 Lenz, Valentine L., Albert Lea.
 Lien, Harry A., Montevideo.
 Lindall, Carl O. R., Parkers Prairie.
 Lundeen, J. Edward, White Bear Lake
 R. 1.
 McCarty, Raymond U., Good Thunder.
 McCurry, Margaret E., Osakis, R. 3.
 McNee, William, Spring Valley.
 McNelly, Charles E., Caledonia.
 McNelly, Mary E., Caledonia.
 Mallery, Erna, Lakeville.
 Manahan, M. Dorothy, Chatfield.
 Manning, Nydia A., St. Paul.
 Mark, Levi E., Goodhue, R. 5.
 Martensen, Elvina M., Martensen, Wis.
 Mattson, Elizabeth, St. Anthony Park.
 Melwold, Dina, Fairfax, R. 1.
 Meyst, Bessie L., Minneapolis.
 Minton, Harry S., Francis, Canada.
 Moak, Inez M., St. Paul.
 Montgomery, Tracy W., Minneapolis.
 Nelson, Arthur O., Stillwater, R. 7.
 Nelson, Arthur S., Afton.
 Nelson, Ellen L., Hector.
 Nelson, Emil R., Canby, Box 113.
 Nelson, Hilma F., Litchfield.
 Nelson, Helmer, Wood Lake.
 Nelson, Ida C., Alexandria.
 Noltmier, Warren H., St. Paul.
 Noltmier, Roy A., St. Paul.
 Norman, Edwin C., Traverse.
 O'Bryan, Allen P., Little Falls.
 Ostendorf, Alford, Somerset, Wis.,
 R. 2.
 Ott, John C., Albert Lea, R. 4.
- Padden, Roscoe L., Stewart.
 Palmer, Karl V., Harris.
 Patten, Norman B., Minneapolis.
 Pederson, Inga M., Irwin, Ia.
 Pedrick, William H., Minneapolis.
 Pemberton, Ada M., Eden Prairie.
 Pengilly, Alice L., Shakopee.
 Pentz, B. Elizabeth, Faribault.
 Pentz, Kenneth W., Faribault.
 Peterson, Ellen W., Lafayette.
 Peterson, Herbert C., White Bear.
 Peterson, Thorwald, Excelsior, R. 3.
 Phillips, D. Sarah, LeSueur.
 Poore, Iantha E., Bird Island.
 Rignell, Agnes D., Winthrop.
 Robertson, Charles J., Merriam Park,
 R. F. D.
 Sargent, Clara A., Red Wing, R. 2.
 Schrepel, Leo C., LeSueur.
 Schwab, Francesca L., Bennettville.
 Schwantes, Anna M., New Ulm.
 Smith, Ralph V., Parkers Prairie.
 Southmayd, Winthrop S., Braham.
 Squire Homer H., Hanley Falls.
 Stauffer, Clarence L., Winnebago.
 Stewart, Clarence E., Forest Lake.
 Stone, Allen W., Park Rapids.
 Sullivan, Jessie A., Minneapolis.
 Thordsen, Clara, Hanska.
 Thornton, Henry A., Appleton, R. 1.
 Torgrimson, Theofred, Hanska.
 Torne, Henry, Rich Valley.
 Tripp, Harry P., Beardsley.
 Turner, Amelia H., St. Peter.
 Turner, Evelyn M., St. Louis Park,
 R. 1.
 Turner Winfield H., St. Peter, R. 1.
 Upham, Thomas M., Monticello.
 Utter, Gustaf W., Ceylon.
 Victor, Emmy M., Lindstrom.
 Viets, J. Jay, Minneapolis.
 Voxland, Olaf L., Kenyon.
 Wakeman, W. Earl, Marshall.
 Warwick, James T., Goodhue, R. 5.
 Washburn, Etta R., Minneapolis.
 Watson, Irene, Merriam Park.
 Wessel, Anthony A., White Bear.
 Westmark, H. Arthur A., Minnetonka
 Mills, R.
 Wilcox, Richard S., White Bear Lake.
 Wilson, Walter A., Granite Falls.
 Workman, George, Villard.
 Wright, Albert D., St. Cloud.

"C" CLASS.

- Aamodt, Clara P., Cannon Falls.
 Alrich, Lawrence, Perley.
 Anderson, Arthur F., Hutchinson, R. 1.
 Anderson, Carl L., Aldrich.
 Anderson, Irene M., Aldrich.
 Arneson, Millard E., Shelly.
 Ash, Julia A., Wendell.
 Auld, Marian, Havre, Mont.
 Bahis, Benjamin J., St. Paul Park.
 Balstad, Henry O., Fosston.
 Balstad, Amanda C., Fosston.
- Barclay, Madge, Stillwater.
 Bartlett, Howard, Ellsworth.
 Bauermeister, Menjamin H., Fairfax.
 Bauermeister, Louis W., Fairfax.
 Baumann, Editha C., Springfield, Mo.
 Baumann, Edward C., Springfield, Mo.
 Bede, Russel, Pine City.
 Behnke, Gretchen, New Ulm.
 Benjamin, George W., Hutchinson.
 Bennett, William P., Austin.
 Bentdahl, John J., Hanska.

- Biscoe, Julius W., St. Paul Park.
 Bjorka, Knute, Fergus Falls, R. 7.
 Boe, George R., Lanesboro.
 Bondeson, Calectus C., Lafayette.
 Borlaug, Frederick W., Kenyon.
 Boyum, George, Rushford, R. 3.
 Brann, Alonzo, Minneapolis.
 Braxtan, Robert S., Paoli, Ind.
 Brendsel, Knut L., Humboldt, S. D.
 Brevig, Tina, Sacred Heart.
 Brink, Abel A., Askov, Denmark.
 Broberg, Leigh E., Robbinsdale.
 Brown, Jessie, Merriam Park.
 Bruce, Fred C., Ivanhoe.
 Brush, William H., Amboy.
 Budde, Theodore G., Kellogg.
 Byrne, Fred, Hart.
 Cantine, Hester E., Walnut Grove.
 Carlberg, Martha, Pennock, R. 1.
 Carlsted, Alfred, Dassel, R. 5.
 Carr, Elmer B., Excelsior, R. 3.
 Carson, James, Pipestone.
 Case, Frank T., St. Paul.
 Chase, Vera E., Farmington.
 Chase, Willis H., Farmington.
 Christensen, Frank, Porter.
 Cleator, Ralph A., Minneapolis.
 Conaughy, Laura C., Minneaoplis.
 Cooper, Edgar, Adrian.
 Corbett, Alice A., Minneapolis.
 Cornwell, Earl S., Ellsworth, Wis.
 Croxen, Roy, Monticello.
 Cunningham, Leon C., Pipestone.
 Curran, Clay C., Cannon Falls.
 Dahlquist, Anna V., North Branch.
 Davidson, Louis, Emmons.
 Dempsey, Ethel, Chatfield.
 Dodds, Ralph F., Wheaton.
 Dodds, Warren, Wheaton.
 Dorn, Earl O., Brooklyn Center.
 Doten, Allan L., Osseo, R. 1.
 Dugstad, Carl, Ostrander.
 Dunning, John W., Osseo, R. 6.
 Durfey, Phineas D., Chatfield.
 Duxbury, Pierre S., St. Paul.
 Ellefsrud, Elsie, Spring Grove.
 Ellingson, Clara S., Kenyon.
 Ellsworth, Mildred, St. Paul.
 Elsberg, Ellen, Minneapolis.
 Enger, Albert L., Big Lake.
 Erickson, Elmer F., Lindstrom.
 Ericson, Elmer, Hector.
 Fellows, George C., Worthington.
 Feustel, Nettie C., Fairmont.
 Flaten, Peter M., Granite Falls.
 Forsyth, Robert J., Franklin.
 Fowler, Audrey M., Bethel.
 Frentz, Frederic H., Waseca.
 Gaynor, Fred A., Milbank, S. D.
 Gilles, Arthur P., Minneapolis.
 Gluth, Edwin A., New Ulm.
 Gordhamer, Victor, Norway Lake.
 Gray, Helen L., Sparta, Wis.
 Groger, Bruce W., St. Charles.
 Haertel, Adolph, Minneapolis.
 Haertel, Wm. J., Milwaukee, Wis.
 Halvorson, Hannah H., Hancock.
 Hansen, Martin, Eyota.
 Hanson, Elben, Stillwater.
 Hart, Charles C., Farmington.
 Hartkopf, Baldwin, Osseo.
 Hatch, Ernest G., Hewitt, R. 2.
 Hauge, Effie M., Minneapolis.
 Hector, Emery E., Worthington.
 Helgeson, Emma S., Sacred Heart.
 Hellie, Clara, Hanley Falls.
 Hellzen, Wilhem, Carkfield.
 Hendrix, Myrtle H., River Falls, Wis.
 Hennessy, Claudia S., West St. Paul.
 Herzfeld, Elsie, Lake Elmo.
 Herzfeld, Emma, Lake Elmo.
 Hewett, Clyde W., Edson.
 Hewitt, Wyman H., Nassau.
 Higgins, Eva M., Minneapolis.
 Highberg, Victor M., Gaylord.
 Hoag, Henry J., Minneapolis.
 Hoel, Frank, Minneapolis.
 Holman, Peter A., Minneapolis.
 Holte, Mary, Appleton.
 Holte, Stanley, Shelly.
 Homme, Gunder, Porter.
 Homme, Thora, Granite Falls.
 Howard, Raymond W., St. Paul Park.
 Howe, Frank E., Brooklyn Center.
 Hoyt, Corinne R., Fridley.
 Hugo, Clara, Dennison.
 Hursh, Perry C., Henning.
 Ingberg, Joseph, Hendrum.
 Jackson, Hjalmer M., Minneapolis.
 Jackson, Joel F., Minneapolis.
 Jacobson, Alma S., Stacy.
 Jacobson, Nettie M., Port Washington, Wis.
 Joerns, Emelyn R., St. Anthony Park.
 Johanson, Algott B., Wheaton.
 Johnson, Elida S., St. Paul.
 Johnson, Ella J., Cambridge.
 Johnson, Mabel C., Milan.
 Johnson, Mabel G., Minneapolis.
 Johnson, Myrtle, E., Minneapolis.
 Jordan, Philip S., Minneapolis.
 Jurgensen, Adella R., St. Paul.
 Kain, Raymond, Benson.
 Keefe, George P., Chatfield.
 Keenholts, Raymond J., Minneapolis.
 Kelly, Severt, Franklin.
 Kernkamp, Howard C. H., St. Paul.
 Koehler, George W., Mound.
 Kouba, James, Hutchinson.
 Krueger, Elsie S., Bellingham.
 Kueffner, Frederick, St. Paul.
 Kuehn, Gretchen, St. Paul.
 Kuehn, Karl S., St. Paul.
 Lambrecht, Carl F., St. Paul Park.
 Landey, Jens, Cohasset.
 Lang, Henry W., Appleton.
 Langness, Carl, Kenyon.
 Larson, Ella M., St. Anthony Park.
 Lathrop, Byron G., Hugo.
 Lauer, Raymond T., Richfield.
 Law, Helen A., St. Anthony Park.
 Leveroos, Gertrude, St. Paul.
 Liberg, Benjamin A., Haug.
 Lindeman, Otto, North Redwood.
 Locke, Elmer B., Osseo.
 Loegering, Balbina, Long Prairie.

- Ludlow, H. Dwight, Worthington.
 Lueck, Elmer E., Spirtwood, N. Dak.
 Lunde, Anna C., Kenyon.
 Lunde, Carl, Hayward.
 Lunde, Lena, Kenyon.
 Lundgren, Herbert T., Minneapolis.
 Lynch, Robert S., St. Paul.
 McCurdy, Norma, Minneapolis.
 McDuffee, Herbert S., Minneapolis.
 McKenney, Richard E., Minneapolis.
 McMahon, Harold F., St. Paul.
 Madden, William C., Wascca, R. 6.
 Mason, Grafton Jr., St. Paul.
 Mattice, E. Burrell, Minneapolis, R. 1.
 Meck, Ethel B., St. Paul.
 Melhouse, Ingeborg M., Dennison.
 Miller, Carl A., Fawndale.
 Miller, Charles E., St. Paul.
 Moberg, Gus, St. Charles, Ill.
 Moeller, Lewis J., Kanaranzi.
 Monson, Amanda A., Minneapolis.
 Moore, Fred F., Stewart.
 Morrison, Earl B., Fergus Falls.
 Myrah, Olga G., Spring Grove.
 Neal, Winifred E., St. Paul.
 Nelson, Adolph E., Litchfield.
 Nelson, Edith R., Stillwater, R. 7.
 Nelson, Lloyd F., Goodhue.
 Nelson, Walter, St. Paul.
 Ness, Albert, Lanesboro.
 Newby, Ripley G., Plover, Wis., R. 1.
 Newgard, Clarence, Hartland.
 Newhouse, Carl O., Brandon.
 Nibbe, Harry H., Goodhue, R. 4.
 Nicholson, Marie A., Minneapolis.
 Nisius, William, New Rockford, N. D.
 Noltmier, Victor B., St. Paul Park.
 Norcross, Everett W., Minneapolis.
 Norris, Bessie M., Minneapolis.
 Nygaard, Hartvick, Hartland.
 O'Connell, John V., Goodhue, R. 5.
 Ogren, Rose J., Center City.
 Ohland, Frederick H., Gibbon.
 Oliver, Chauncey R., Granada.
 Olson, Clarence A., St. Paul.
 Olson, Frederick H., Anoka.
 Olson, Henry A., Grove City, R. 4.
 Olson, Otto, Emmons.
 Ostrem, Lewis, Lanesboro, R. 1.
 Palmer, Claude E., Minneapolis.
 Palmer, Leone, Red Wing.
 Parten, Blanda R., Minneapolis.
 Partridge, Francis E., Minneapolis.
 Paterson, Andrew, Wayzata.
 Pemberton, Ada M., Eden Prairie.
 Pemberton, Joseph D., Minneapolis.
 Peterson, Alget M., Minneapolis.
 Peterson, Axel E., Butterfield.
 Peterson, Olaf O., Hanska.
 Peterson, Mancel, Waubay, R. 3, S.
 Pfeil, Edward F., St. Charles.
 Phinney, Herbert L., Woodlake.
 Pratt, Hiram E., St. Charles, Ill.
 Precourt, Claude W., Plover, Wis., R. 1.
 Pye, Robert B., Faribault.
 Qualle, Gunder, Kenyon.
 Qualley, Martin, Hendrum.
 Randall, James H., Hinckley.
 Randolph, George H., LeSueur.
 Raymond, Ernest A., Little Falls.
 Regan, Mabel E., St. Paul.
 Rice, Maude B., Windom.
 Robb, Clarence P., Superior.
 Roble, Lueda M., Caledonia, R. 1.
 Rollefson, Hannah O., Clarkfield.
 Rosenwald, Benjamin F., Palto.
 Routhe, Oscar V., Redwood Falls, R. 4.
 Rudser, Lorenz O., Rudser, N. Dak.
 Rustad, Elmer F., Hendrum.
 Sandager, Peter N., Tyler.
 Sanders, Amy I., Houston.
 Sandlie, Hjalmar E., Rushford, R. 3.
 Sarver, Grant O., Excelsior.
 Sauer, Peter, LeSueur.
 Schmidt, Paul, Hugo, R. 1.
 Schramm, Lillian, Cottage Grove.
 Shaw, Bertha J., Minneapolis.
 Shellum, Joseph, St. James.
 Shipton, Roy L., Spring Valley.
 Smith, Esther L., New Duluth.
 Smith, George G., Chicago, Ill.
 Snow, Howard R., LeSueur.
 Sorensen, John A., Clinton.
 Spencer, Smith W., West Duluth.
 Stensrud, Hans G., Watson.
 Stephi, Otto E., LaCrosse, Wis.
 Stewart, A. Ross, St. Paul.
 Sules, Charles H., Minneapolis.
 Strong, Hazel G., Bethel.
 Stutzman, Harry J., Newport, R. 19.
 Swenson, Albert T., Nicollet, R. 2.
 Swenson, Caroline A., Minneapolis.
 Terry, Elsie R., Lamberton.
 Theilmann, Edward, Hancock.
 Theilmann, Hattie C., Theilman.
 Theilmann, Ivy A., Excelsior.
 Thompson, Milton C., Franklin.
 Thorson, Neil, Minneapolis.
 Thulien, Axel, St. James.
 Tollefson, Cora, Madison.
 Torgerson, Clifford M., Dalton.
 Ulrich, Ellen M., Biscay.
 Upham, Charles M., Monticello.
 VanDoren, Arthur L., Farmington.
 VanTassel, Theodore, Stillwater, R. 4.
 Weum, Ola M., Mabel.
 Wells, Mrs. Edith, Wibaux, Mont.
 Wheeler, Ralph, Minneapolis.
 White, Clifford K., Monticello, R. 2.
 White, Glenn B., Minneapolis.
 Whittet, Byron R., Redwood Falls.
 Wiberg, Phoebe, Lindstrom.
 Wickstrom, Hattie, Anoka, R. 1.
 Wolf, Norma E., St. Paul.
 Wood, Harold W., Granada.
 Woodman, Raymond H., Brooklyn Center.
 Woodward, Arthur I., Langdon.
 Young, John C., Montrose.

DAIRY SCHOOL, 93.

- Bjerking, J. L., Beldenville, Wis.
 Blattner, John, St. Cloud.
 Borgert, J. B., Browersville.
 Bowen, Roy, Easton.
 Broman, Aug. L., Atwater, R. 2.
 Butler, Horace W., Sedan.
 Carlson, P. B., Lake Benton.
 Cesak, Jos., Biscay.
 Christianson, Henry, Hanska.
 Danielson, Ed., Maple Plain.
 Dankmeier, Freeman W., Chill, Wis.
 Degolier, H. Manley, Amery, Wis.
 Donicht, Fred, Brownton.
 Dotseth, Alfred, Clarkfield.
 Denzel, E. A., Montrose.
 Eagan, Geo. N., Iska, Ill.
 Elliott, Lloyd, Round Prairie.
 Elofson, Wm. N., Thief River Falls.
 Erickson, F. E., Hutchinson.
 Engstrom, John E., Buffalo.
 Emans, Chas. L., Litchfield, R. 4.
 Fay, Clemens, M., Glencoe.
 Feners, Jos., Holdingford.
 Finstad, Alvin, New Ulm.
 Freeman, Herbert L., Cokato.
 Fruechte, Franklin H., Eitzen.
 Gerson, W. A., Rice Lake, Wis.
 Greethurst, Thos. M., Lewiston.
 Gustafson, S. G., Watertown.
 Gutzler, Jesse A., Faribault.
 Hagberg, Geo. W., Cokato.
 Hansen, Geo. Evan.
 Hansen, Henry A., Mora.
 Haslerud, Lars, Minneapolis.
 Hedtke, Fred W., Norwood.
 Hodorff, E. C., Royalton.
 Humphrey, Geo. G., Ixonia, Wis.
 Hovland, Gilbert A., Fertile.
 Jacobson, O. C., Wilson, Wis.
 Johnson, Peter, Bird Island.
 Johnson, Algot W., Clear Lake, Wis.
 Johnson, Aug. C., Taylors Falls.
 Johnson, Alex., Minneapolis.
 Johnson, Gust A., Fawndale.
 Johnson, W. C., Maynard, Ia.
 Jones, Peter, Watkins.
 Keller, Fred, Wabasso, R. 1.
 Koll, Chas. A., Eau Claire, Wis.
 Kristenson, Peder R., Fargo, N. D.
 Krueger, John C., Perham.
 Kuennen, Ben M., St. Lucas, Ia.
 Larson, Wm., Annandale.
 Lundberg, John, St. Paul.
 Magnuson, F. E., St. Croix Falls, Wis.
 Miller, Chas. W., Pine Island.
 Mooers, Florine J., Monticello.
 Mossing, Marcus N., Beldenville, Wis.,
 R. 1.
 Moy, J. G., Fosston.
 Mueller, Arthur, Stockton.
 Newman, Otto, Villard.
 Olson, Clarence, Fertile.
 Osterberg, O. W., Carlos.
 Otner, Alfred, Fairfax.
 Palmer, E. A., Clear Lake, Wis.
 Paulson, Gust A., St. James, Minn.,
 R. 3.
 Peterson, Lawrence, Atwater.
 Peterson, Theo., Maple Plain.
 Pflueger, Albert, Ortonville.
 Radke, Arthur L., Hamburg.
 Rautenkranz, Herman, Welcome.
 Refling, John, Fertile.
 Reese, Thos. F., Canton.
 Rindahl, Alexander, Fertile.
 Roch, John J., Pierz.
 Sandergaard, Jens J., Northwood, Ia.
 Schilling, Jacob, Plainview.
 Sell, Bruno, Brownton.
 Sorenson, Morris, Barnum.
 Starz, Edward, Zumbro Falls.
 Stolpe, Walter, Howard Lake.
 Stamsvik, Anton, Badger.
 Swee, Gustaf A., Wanamingo.
 Smith, Will H., Alden.
 Thielke, Edward, Rockford.
 Thielmann, N. F., Avon.
 Thompson, Harlow, Hutchinson.
 Wis. Truleen, Harry, Vasa.
 Tuttle, Alton P., Medford.
 Wegner, Emil W., Springfield.
 Werness, John, Cokato.
 Wolff, Ernest J., Bird Island.
 Winter, Loyd H., Eau Claire, Wis.
 Young, Conrad, Avon.

SHORT COURSE, 141.

- Aamodt, A. W., St. Paul.
 Alm, John, Page, N. Dak.
 Anderson, Henry, Lake Wilson.
 Anderson, Joseph K., Hazel Run.
 Anderson, Victor G., Litchfield.
 Avery, Wilbur, Austin.
 Bahls, Geo., St. Paul Park, R. 18.
 Bakken, O. W., Albert Lea.
 Berg, Oscar, Red Wing, R. 3.
 Bergstrom, K., New Ulm, R. 3.
 Bergum, Walter L., Kenyon.
 Besemer, Emil, New Ulm.
 Blackmer, Daniel, Albert Lea.
 Brakke, Lawrence, Kasson.
 Brakke, Wm., Byron.
 Broberg, Carl, Dassel.
 Broecker, Emil, Otisville.
 Broughton, Ray W., St. Paul.
 Bursch, O. H., Otisville.
 Carey, David, Minnesota Lake.
 Carlsted, Martin, Dassel.
 Case, Oren, Sleepy Eye.
 Cupp, Henry, Russell.
 Dahlgren, M. W., Minneapolis.
 Deters, W. F., Caldonia.
 Diepolder, Henry, New Ulm.
 Doughty, Richard, Milaca.
 Douglas, H. B., St. Anthony Park.
 Drew, P. A., Plainview, R. 1.
 Efshen, Oluf, Roscau.
 Erickson, P. W., Minneapolis.
 Erpestad, Joseph, Windom.

Fjestad, Theodore, Carlisle.
 Fjoslien, Ole, Elbow Lake.
 Fluggel, John, Minneiska.
 Fridman, Arthur, Bristol.
 Gabrielson, Chas., Maple Plain.
 Galles, George, Slayton.
 Garvey, Michael P., Milbank, S. Dak.
 Glaeser, Albert, Gibbon.
 Grue, John L., Willmar, R. 5.
 Haagenson, Nicolai, Fergus Falls.
 Hagen, Oscar, Montevideo, R. 5.
 Hagna, O. N., Blooming Prairie.
 Hallan, J. O., Fergus Falls.
 Halvorson, Ole O., Elbow Lake.
 Hamre, Albert, Nerstrand.
 Hare, John, Anoka, R. 2.
 Hart, Harold W., Dover.
 Harvey, D. E., Brewster.
 Heller, Max, Wood Lake.
 Helling, Sidney J., Hanska.
 Henry, John, Dover.
 Heuring, Joseph, Elk River.
 Hisdahl, Hans, Nerstrand.
 Hoberg, Andrew, Lake Benton.
 Horihan, E. L., Spring Grove, R. 6.
 Howard, Arthur B., Highwood.
 Hulbert, S. B., Richardson, Wis.
 Jardine, J. A., Sauk Center.
 Jaus, Otto, Gibbon.
 Jirik, Thomas A., Webster.
 Johannng, Chas., Elk River.
 Johnson, Ambrose, Rushford.
 Johnson, Arthur W., Dassel.
 Johnson, Bennie M., Atwater.
 Johnson, David, Warren.
 Johnson, Reuben A., Hallock.
 Johnson, Walter, Lafayette.
 Knutson, Christ O., Belview.
 Koester, Henry W., Hanska.
 Lanes, Arthur, Montevideo, R. 5.
 Lapham, H. L., Caledonia, R. 1.
 Larson, Bennie, Wegdahl.
 Larson, Conrad, Sacred Heart.
 Larson, Gust W., Sherburn.
 Larson, Winfred, Dassel.
 Lawson, Adams M., St. Paul.
 Letmolee, H. N., Sacred Heart.
 Lidberg, Rudolf, Hector.
 Lidstrom, Edward, Hastings.
 Lien, John E., Garvin.
 Lien, L. E., Renville.
 Lindgren, Swan, Kennedy.
 Lingen, Carl, Starbuck.
 Lundborg, John, St. Paul.
 Lundborg, Theodore, Belle Plaine.
 Lundgren, Edward, Ortonville.
 Lundquist, Eimon, Graceville.
 Lyndgaard, Jorgen, Lake Benton.
 McCulley, Preston, Maple Plain.
 McLean, H. H., Rockford.
 Maass, W. H., Waconia.
 Mandell, Harry, Faribault.
 Nelson, Ole E., Herman.
 Niemann, Fred, Afton.
 Oberg, Ole, Hanley Falls.
 Olson, George, Lonsdale.
 Olson, Rudolph, Watson.
 Orton, Chas, Elk River.
 Peterson, Albert, Balaton.
 Peterson, C. F., Otisville.
 Peterson, Ivan E., Brewster.
 Peterson, Marie, St. Paul.
 Peterson, P. H., Delhi.
 Redland, Wm. T., Shelly.
 Rhodin, John, Cokato.
 Pietz, J. H., Waconia.
 Ritchell, Willis, St Anthony Sta., Mpls.
 Roberts, G. M., New Ulm, R. 5.
 Sawinske, August, Rochester.
 Schrantz, Arthur.
 Schroeder, Arthur, Grand Meadow.
 Sethre, Peter, Carlisle.
 Shattuck, G. W., Whalan.
 Siehl, Henry, Lake Park, R. 2.
 Simons, L. C., Red Lake Falls.
 Skabo, Halfdan, St. Paul.
 Sletvold, John, Rothsay.
 Smith, Ole, Rothsay.
 Sondergard, H. T., Litchfield.
 Speckman, August C., Sleepy Eye.
 Spjut, Eron, Herb.
 Spong, Oscar M., Marshall.
 Stocker, H. G., Dover.
 Synhorst, Wm., Woodstock.
 Synnes, Martin, Sacred Heart.
 Thompson, Andrew G., Lansing.
 Thompson, A. H., Minneapolis.
 Uptagrafft, Urias, Spirit Lake, Ia.
 VanVleet, Harry O., Minneapolis.
 Wellhausen, Ernest, Lake Park, R. 2.
 Weeks, William, Wood Lake.
 West, Lowry, Dodge Center.
 Wetter, Oscar, Princeton.
 Wickstrom, Carl, Anoka, R. 1.
 Wilson, M. G., New York Mills.
 Wonzor, Theo. A., Bemidji.
 Worden, D. A., Pipestone.
 Yapp, H. E., St Paul.
 Zuercher, Albert, Excelsior.



The
University of Minnesota
Bulletin

The College of Dentistry

1908-1909

Volume XI

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THE REGISTRAR,

The University of Minnesota,

Minneapolis, Minnesota

CALENDAR FOR 1908-1909

1908

1909

MAY

S.	M.	T.	W.	T.	F.	S.
..	1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
31

JUNE

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SEPTEMBER

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OCTOBER

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NOVEMBER

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JANUARY

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FEBRUARY

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MARCH

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APRIL

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MAY

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JUNE

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20	21	22	23	24	25	26
27	28	29	30

University Calendar

1907-1908

THE UNIVERSITY YEAR

The University year covers a period of thirty-eight weeks beginning on the second Tuesday in September. Commencement day is always the second Thursday in June.

FEBRUARY	4 T	Second semester begins—classes called for regular work
	12 W	Lincoln's birthday—legal holiday
	22 S	Washington's birthday—legal holiday
APRIL	17 F	Good Friday. Recess two days
MAY	2 Th	Regular meeting Board of Regents
	25 M	Senior examinations begin
	30 S	Decoration Day—legal holiday
JUNE	1 M	Semester examinations begin
	6 S	Semester examinations close

COMMENCEMENT WEEK, 1908

SUNDAY	June 7	Baccalaureate service
MONDAY	June 8	Senior class exercises
TUESDAY	June 9	Phi Beta Kappa address. Senior promenade
WEDNESDAY	June 10	Alumni Day. Regular meeting Board of Regents
THURSDAY	June 11	Commencement Day. The thirty-sixth annual commencement
FRIDAY	June 12	Summer vacation begins

1908-1909

SEPTEMBER	7-14	Entrance examinations, condition examinations and registration
	15 T	Classes called for regular work. Seventeenth annual session
OCTOBER	1 Th	Regular meeting Board of Regents
	5 M	Regular meeting University Council. Opening day, School of Agriculture
NOVEMBER	26 Th	Thanksgiving Day. Recess three days
DECEMBER	7 M	Regular meeting University Council
	8 T	Annual meeting Board of Regents
	19 S	Holiday recess begins (no classes)
JANUARY	5 T	Work resumed in all departments
	23 S	Semester examinations begin
	30 S	Semester examinations close
FEBRUARY	2 T	Second semester begins—classes called for regular work
	12 F	Lincoln's birthday—legal holiday
	22 M	Washington's birthday—legal holiday
APRIL	5 M	Regular meeting University Council
	9 F	Good Friday. Recess two days

MAY	6 Th	Regular meeting Board of Regents
	24 M	Senior examinations begin
	31 M	Decoration Day—legal holiday
JUNE	1 T	Semester examinations begin
	5 S	Semester examinations close
	7 M	Regular meeting University Council

COMMENCEMENT WEEK, 1909

SUNDAY	June 6	Baccalaureate service
MONDAY	June 7	Senior class exercises
TUESDAY	June 8	Sigma Xi address. Senior promenade
WEDNESDAY	June 9	Alumni Day. Regular meeting Board of Regents
THURSDAY	June 10	Commencement Day. The thirty-seventh annual commencement
FRIDAY	June 11	Summer vacation begins

PROGRAM—ENTRANCE EXAMINATIONS

MONDAY,	September 7, 9	A. M.	3 Botany
			3 Zoology
			1 Astronomy
			3 Geology
		2 P. M.	2 American Government
			2 Political Economy
TUESDAY,	September 8, 9	A. M.	2 History
			5 Physics
		2 P. M.	4 Chemistry
			3 Physiography
WEDNESDAY,	September 9, 9	A. M.	1 English
		2 P. M.	1 German
			1 French
			1 Latin
			1 Scandinavian
THURSDAY,	September 10, 9	A. M.	1 Elementary Algebra
			2 Commercial Geography
		2 P. M.	1 Higher Algebra
FRIDAY,	September 11, 9	A. M.	1 Plane Geometry
		2 P. M.	1 Solid Geometry

1 Folwell Hall, 2 Library Building, 3 Pillsbury Hall, 4 Chemical Laboratory, 5 Physics Building, 6 Mechanic Arts Building.

The University

THE UNIVERSITY OF MINNESOTA comprises the following named schools, colleges and departments:

THE COLLEGE OF SCIENCE, LITERATURE AND THE ARTS

THE COLLEGE OF ENGINEERING AND THE MECHANIC ARTS

THE DEPARTMENT OF AGRICULTURE, including—

The College of Agriculture

The School of Agriculture

Short Course for Farmers

The Dairy School

The Crookston School of Agriculture

THE COLLEGE OF LAW

THE COLLEGE OF MEDICINE AND SURGERY

THE COLLEGE OF HOMEOPATHIC MEDICINE AND SURGERY

THE COLLEGE OF DENTISTRY

THE COLLEGE OF PHARMACY

THE SCHOOL OF MINES

THE SCHOOL OF ANALYTICAL AND APPLIED CHEMISTRY

THE COLLEGE OF EDUCATION

THE GRADUATE SCHOOL

The Regents of the University have entrusted to their charge:

THE EXPERIMENT STATIONS, including—

The Main Station at St. Anthony Park

The Sub-Station at Crookston

The Sub-Station at Grand Rapids

THE GEOLOGICAL AND NATURAL HISTORY SURVEY

Bulletins of these schools, colleges and departments may be obtained upon application to the University Registrar.

The Board of Regents

CYRUS NORTHROP, LL. D., MINNEAPOLIS	<i>Ex-Officio</i>
The President of the University	
The HON. JOHN LIND, MINNEAPOLIS	1914
The President of the Board	
The HON. JOHN A. JOHNSON, ST. PETER	<i>Ex-Officio</i>
The Governor of the State	
The HON. JOHN W. OLSEN, ALBERT LEA	<i>Ex-Officio</i>
The State Superintendent of Public Instruction	
The HON. THOMAS WILSON, ST. PAUL	1909
The HON. A. E. RICE, WILLMAR	1909
The HON. B. F. NELSON, MINNEAPOLIS	1910
The HON. PIERCE BUTLER, ST. PAUL	1910
The HON. CHARLES A. SMITH, MINNEAPOLIS	1910
The HON. S. M. OWEN, MINNEAPOLIS	1913
The HON. W. J. MAYO, ROCHESTER	1913
The HON. HENRY B. HOVLAND, DULUTH	1914

C. D. DECKER, MINNEAPOLIS
Secretary of the Board.

Executive Officers

THE UNIVERSITY

CYRUS NORTHROP, LL. D., *President*

ERNEST B. PIERCE, B. A., *Registrar*

JAMES T. GEROULD, B. A., *Librarian*

C. D. DECKER, *Purchasing Agent*

J. D. BREN, *Cashier*

THE COLLEGES

JOHN F. DOWNEY, M. A., C. E., *Dean of the College of Science, Literature,
and the Arts*

FREDERICK S. JONES, M. A., *Dean of the College of Engineering and the
Mechanic Arts*

EUGENE W. RANDALL, *Dean and Director of the Department of Agriculture*

WILLIAM S. PATTEE, LL. D., *Dean of the College of Law*

FRANK FAIRCHILD WESBROOK, M. A., M. D., C. M., *Dean of the College of
Medicine and Surgery*

EUGENE L. MANN, B. A., M. D., *Dean of the College of Homeopathic
Medicine and Surgery*

ALFRED OWRE, D. M. D., M. D., *Dean of the College of Dentistry*

FREDERICK J. WULLING, Phm.D., LL.M., *Dean of the College of Pharmacy*

WILLIAM R. APPELBY, M. A., *Dean of the School of Mines*

GEORGE B. FRANKFORTER, Ph. D., *Dean of the School of Chemistry*

GEORGE F. JAMES, Ph. D., *Dean of the School of Education*

HENRY T. EDDY, C.E., Ph. D., LL. D., *Dean of the Graduate School*

ADA L. COMSTOCK, M. A., *Dean of Women*

The University Council

At the regular meeting of the Board of Regents of the University, May 31st, 1905, a University Council was established according to the following plan:

I. The name of the body shall be The University Council. It shall consist of the President of the University, the deans of the various colleges and schools, one elected representative from each college or school for each 400 students or major fraction thereof, and one representative of the general alumni association.

II. The elected members shall serve for a period of one year. They shall be chosen from the various faculties at the time of the selection of standing committees. The representative of the general alumni association shall be chosen by that body at its annual meeting from among the alumni who are not members of the University.

III. The Council shall be authorized to—

a) Appoint the following committees or the faculty representation thereon:

The University auditing committee

The University press committee

The committee on athletics

The committee on University relations to other institutions of higher learning

The committee on health and sanitation

The committee on commencement and other University functions

The committee on catalogue, programs and courses of study

The committee on student entertainments and social affairs

And such other committees as the general University interests may require

b) Receive reports from such committees and to make such recommendations as may be required.

c) Consider and act upon any matter of general University interest beyond the province of a single faculty which may be referred to it by the President of the University or any faculty.

IV. The Council shall hold stated meetings upon the first Monday of October, December, April and June, and such other meetings as the President of the University may call

Representatives to the Council

The University

PRESIDENT CYRUS NORTHROP

The College of Science, Literature and the Arts

DEAN JOHN F. DOWNEY

PROFESSOR JOHN H. GRAY

PROFESSOR J. C. HUTCHINSON

PROFESSOR H. F. NACHTRIEB

PROFESSOR NORMAN WILDE

The College of Engineering and the Mechanic Arts

DEAN FREDERICK S. JONES

PROFESSOR GEORGE D. SHEPARDSON

The College and School of Agriculture

DEAN EUGENE W. RANDALL

PROFESSOR HARRY SNYDER

PROFESSOR SAMUEL B. GREEN

The College of Law

DEAN WILLIAM S. PATTEE

PROFESSOR HENRY J. FLETCHER

The College of Medicine and Surgery

DEAN F. F. WESBROOK

PROFESSOR THOMAS G. LEE

The College of Homeopathic Medicine and Surgery

DEAN EUGENE L. MANN

The College of Dentistry

DEAN ALFRED OWRE

The College of Pharmacy

DEAN FREDERICK JOHN WULLING

The School of Mines

DEAN WILLIAM R. APPLEBY

The School of Chemistry

DEAN GEORGE B. FRANKFORTER

The College of Education

DEAN GEORGE F. JAMES

The Graduate School

DEAN HENRY T. EDDY

General Alumni Association

DAVID P. JONES

The Dean of Women

ADA L. COMSTOCK

University Council Committees

The University Auditing Committee

PROFESSORS ANDERSON, FLETCHER, OWRE, SIGERFOOS, SPRINGER

The Committee on Athletics

PROFESSORS PAIGE, BROOKE, HARDING, D. P. JONES, LITZENBERG

The Committee on Grounds and Sanitation

PROFESSORS FLATHER, BASS, BRACKEN, HICKMAN, RANDALL, SIDENER,
WESBROOK

The Committee on Catalogue, Programs and Course of Study

DEANS APPLEBY, EDDY, FRANKFORTER, JAMES, JONES, MANN, OWRE,
WULLING; PROFESSORS FLETCHER, JOHNSTON, SCHLENKER, SNYDER,
E. B. PIERCE

The Press Committee

PROFESSORS SCHAFER, BAUER, CONSTANT, ERDMANN, JAMES

The Committee on Commencement and other University Functions

PROFESSORS NACHTRIEB, JENKS, OWRE, PATTEE, RANDALL, SCHLENKER,
WASHBURN

The Committee on Student Entertainments and Social Affairs

PROFESSORS FRANKFORTER, BASS, COMSTOCK, COOKE, MULLEN, PIKE

The Committee on University Relations to other Institutions of Higher Learning

PROFESSORS DOWNEY, BOTHNE, EDDY, GRAY, GREEN, JAMES, LEE

The Committee on University Extension and University Lectures

PROFESSORS WEST, HAECKER, RANKIN, SCHLENKER, SHEPARDSON

The Committee on the Library

PROFESSORS EDDY, FLETCHER, F. S. JONES, LEE, REYNOLDS,
VAN BARNEVELD, WEST

The Department of Medicine

The Department of Medicine includes the following colleges:

The College of Medicine and Surgery

FRANK F. WESBROOK, M.A., M.D., C.M., *Dean*

THOMAS G. LEE, B.S., M.D., C.M., *Librarian Department of Medicine*

The College of Homeopathic Medicine and Surgery

EUGENE L. MANN, B.S., M.D., *Dean*

The College of Dentistry.

ALFRED OWRE, D.M.D., M.D., *Dean*

The College of Pharmacy

FREDERICK J. WULLING, Phm.D., LL.M., *Dean*

Each college is self-governed as to its internal affairs, having its own faculty and an independent curriculum. The laboratories and staff of the College of Medicine and Surgery provide instruction for all students in each of the four colleges as required in the following branches:

Gross and microscopic anatomy and embryology, physiology, chemistry, physiological chemistry, pathology and bacteriology, pharmacology, principles of surgery and clinical microscopy.

BUILDINGS AND EQUIPMENT

The department occupies six buildings, five of which are situated upon the university campus, viz.: Millard Hall, the medical science building, the laboratory of chemistry, the laboratory of anatomy and the institute of Public Health and Pathology. In addition, two more buildings, a university hospital and a building for operative surgery, are provided for and will be erected.

Millard Hall contains the offices of the deans of the college of homeopathic medicine and surgery and of the college of dentistry; a large amphitheatre and lecture rooms for the several colleges, the library and read-

ing room of the department, the laboratory of materia medica, the operating rooms and laboratories of dentistry and the dental infirmary.

LIBRARY OF MEDICAL DEPARTMENT

Thomas G. Lee, B.S., M.D., Librarian.

The Medical Library consists of the following collections: The general clinical library, the libraries of the Colleges of Dentistry and Pharmacy, the department libraries of pathology and bacteriology, histology and embryology, anatomy, and physiology. These contain nearly 10,000 bound volumes, 14,000 unbound volumes, monographs, reprints, dissertations, etc., and about 175 current periodicals. In addition to the above, the libraries of the State Board of Health, of Hennepin County Medical Society, containing 4,000 volumes and 50 journals, and of the Ramsey County Medical Society with some 5,000 volumes and 150 journals, give the student additional opportunity to consult all the more important medical publications.

The College of Dentistry

FACULTY.

- CYRUS NORTHROP, LL.D., *President*
ALFRED OWRE, D.M.D., M.D., C.M., *Dean, Professor of Operative Dentistry and Dental Metallurgy*
RICHARD O. BEARD, M.D., *Professor of Physiology*
CHARLES A. ERDMANN, M.D., *Professor of Anatomy*
GEORGE B. FRANKFORTER, M.A., Ph.D., *Professor of Chemistry*
THOMAS B. HARTZELL, M.D., D.M.D., *Professor of Clinical Pathology, Therapeutics and Oral Surgery*
THOMAS G. LEE, B.S., M.D., *Professor of Histology and Embryology*
F. W. SPRINGER, E.E., *Professor of Electrical Engineering*
JAMES M. WALLS, D.M.D., *Professor of Clinical Operative Dentistry*
OSCAR A. WEISS, D.M.D., *Professor of Prosthetic Dentistry and Orthodontia*
JAMES O. WELLS, A.M., D.M.D., *Professor of Crown and Bridge-Work*
FRANK F. WESBROOK, M.A., M.D., *Professor of Pathology and Bacteriology*
IRA HARRIS DERBY, B.S., *Assistant Professor of Chemistry*
ARTHUR W. MEYER, A.B., M.D., *Assistant Professor of Anatomy*
WINFIELD S. NICKERSON, Sc.D., M.D., *Assistant Professor of Histology and Embryology*
M. R. WILCOX, M.D., *Assistant Professor of Physiology*
NORMAN J. COX B.S., D.M.D., *Instructor in Operative Dentistry*
G. M. DAMON, D. D. S., *Instructor in Prosthetic Dentistry and Dental Anatomy*
H. S. GODFREY, D.M.D., *Instructor in Operative Dentistry*
R. L. GREEN, D.D.S., *Instructor in Operative Dentistry*
J. A. HANDY, Ph.C., *Instructor in Chemistry.*
EARLE R. HARE, B.S., M.D., *Instructor in Anatomy*
MARY V. HARTZELL, D.M.D., *Instructor in Comparative Dental Anatomy*
U. E. HEDDY, D.D.S., *Instructor in Operative Technics*
E. E. HEMINGWAY, Ph.D., *Assistant in Anatomy*
W. F. LASBY, B.S., D.D.S., *Instructor in Technics*

- J. F. LEMSTROM, M.D., *Instructor in Histology and Embryology*
HERMAN A. MAVES, D.D.S., *Instructor in Operative Dentistry*
R. H. MULLIN, B. A., M.B., *Senior Demonstrator in Pathology and Bacteriology*
OSCAR OWRE, M.D., *Instructor in Oral Surgery*
JAY N. PIKE, D.D.S., *Instructor in Prosthetic Dentistry Orthodontia and Dental Anatomy*
C. C. PRATT, M.D., *Demonstrator in Pathology and Bacteriology*
H. M. REID, D.D.S., *Instructor in Prosthetic Dentistry*
H. E. ROBERTSON, A. B., M.D., *Demonstrator in Pathology*
J. F. SCHEFCIK, B.S., Ph.G., M.D., C.M., *Instructor in Materia Medica*
J. P. SEDGWICK, B.S., M.D., *Instructor in Physiological Chemistry*
C. C. TYRELL, B.A., M.D., *Prosector of Anatomy*
ANDREW J. WEISS, *Instructor in Technics*
AMOS S. WELLS, B.A., D.D.S., *Instructor in Crown and Bridge-Work*
FRANK R. WRIGHT, D.D.S., M.D., *Instructor in Anæsthesia and Oral Surgery*
FRED S. YAEGER, D.D.S., *Instructor in Crown and Bridge-Work*
MRS. M. C. CLYDE, *Professional Nurse*
MISS H. E. COOKE, *Professional Nurse*
A. L. MOORE, *Infirmiry Clerk*

General Information, Rules and Regulations

The College of Dentistry of the University of Minnesota is a member of the National Association of Dental Faculties, and its diplomas are recognized by the Dental Examining Boards of every state.

The regular course covers a period of three years of collegiate study, each year representing nine months in actual attendance.

The University now offers an optional six year course of study. The first three years of the course are given in the College of Science, Literature and the Arts. The last three years are given in the College of Dentistry. It leads to the bachelor's degree at end of the first four years and to the degree of doctor of dental surgery at the end of the six year course.

For schedule of lectures, announcements, changes in college rules, etc., see bulletin board.

Rules and regulations of the infirmary and laboratories are posted in their respective places.

MATRICULATION AND REGISTRATION

After matriculating with the registrar of the University and paying the regular fees, students will be assigned seats, benches and lockers in the order of their registration with the dean of the college.

Students shall have their registration completed not later than the day previous to the day set for regular work to begin.

No one is recognized as a student of the school or admitted to classes, until his receipts are presented to and countersigned by the dean; this applies to both semesters.

Students shall have their registration completed not later than the day previous to the day set for regular work to begin.

REQUIREMENTS FOR ADMISSION

Graduates of the following courses, provided they present credits for four years of English, one year each of elementary algebra and plane geometry, one year of Latin, and one year of manual training, are admitted to the College of Dentistry without conditions.

- (a) Any four-year course of a Minnesota state high school
- (b) A four-year course of other accredited schools in the state
- (c) A four-year course of schools in any other state accredited to the state university of that state
- (d) The advanced Latin or English course of the Minnesota State normal schools.

Students having no credit in manual training will be required to demonstrate, by test, the possession of mechanical ability.

Certificates of graduation must be presented on the regular University admission blanks, which may be obtained from the registrar.

Students not having credentials as indicated in either (a), (b), (c), or (d), are required to take the regular entrance examination. See program page 3.

State High School Board certificates are accepted in lieu of examinations in the subjects they represent.

Examinations are held only in the English language.

ADVANCED STANDING

Applicants for advanced standing must present satisfactory evidence of possessing the preliminary educational qualifications required of the class they desire to enter.

They must also satisfy the professors of the branches from which they wish to be exempt, that the work pursued by them in other institutions was equal in scope and amount to that passed by the class they propose to enter.

No credits are accepted unconditionally, the faculty reserving the privilege of examining any applicant when deemed necessary.

All certificates pertaining to advanced standing must be presented to the dean who will send them to the respective professors for acceptance or report of further requirements for acceptance.

Students coming from other schools must make up their technic conditions under supervision of the instructors of this school, at the convenience of the instructor.

One-year credit will be allowed graduates in medicine, but the dental technic branches of the first year must be taken and completed before advanced work in these branches can be entered upon, and the courses in dental pathology, dental histology and bacteriology taken as they occur in the curriculum.

When a student, for any cause, transfers from one college to another of the National Association of Dental Faculties, his certificate of attendance and standing must be verified by the dean of the school he withdraws from. This is done by correspondence between the executive officers of the two schools.

EXAMINATIONS, STANDINGS AND CONDITIONS

No student with an entrance condition will be allowed to register for any second-year subject, nor will any student with any first-year condition or failure be allowed to register for a third-year subject.

No student will be allowed to omit any freshman work in order to make up entrance conditions, except by special permission of the department affected.

Students will not be permitted to substitute private work in any branch for the regular college courses.

Final examination in every required subject is held at the close of the work at the end of the semester or quarter, according to the extent of the course given. Opportunity is offered to remove conditions at the opening of the school year in September. The examinations at the end of semester or quarter are only for those who are taking the courses, while the September examinations are only for those who are attempting to remove conditions or are applicants for advanced standing.

The final standing of any student in a given subject shall be determined as the result of his (a) practical work (laboratory or clinical), (b) recitations, and (c) oral or (d) written examinations.

All of these factors shall be taken into consideration in making up the final grading in any subject.

Students' standings shall be determined at the end of the year by a conference of the heads of the departments in which the work is pursued during that year.

All standings shall be reported officially to and from the registrar's office at the end of the year.

Students shall be reported as Passed, Incomplete, Conditioned or Failed.

No student will be registered for any examination to remove a condition until he presents a receipt from the cashier for the fee of said examination.

Conditions must be removed at the beginning of the school year in September. No student who has any conditions unremoved at the close of this examination is allowed to continue with his class without the express permission of the dean upon the recommendation of the department concerned.

A condition not removed at the first opportunity becomes a failure subject to the rule governing failures.

Failures necessitate the taking of the work again in class.

A student repeating work (by reason of having "failed") must pay the fees connected with that course.

A student who is conditioned in the majority of the subjects given in any year will become a "failed" student and must repeat the entire work of that year.

Students who carry "failures" into a succeeding year may find a resultant conflict of study hours; in that event they will give preference to the unfinished studies of the lower conflicting course.

Practical work in the infirmary is not allowed to students having conditions, or incompletes in any technic work.

ATTENDANCE AND DISCIPLINE

Attendance upon all lectures, and infirmary and laboratory hours, as scheduled, is obligatory. A complete record of each student's attendance is kept, and all absences and tardinesses are noted.

Students to be eligible for final examinations, must have a record of not less than eighty per cent in attendance.

Habitual absence, continued indifference to study, or persistently poor scholarship, may subject the student to temporary or permanent suspension.

All laboratory courses must be taken in full and must invariably be entered upon during the first week in which they begin.

The connection of any student with this college may be terminated at any time, without a return of fees, whenever such action may be advisable on the ground of immorality or disorderly conduct, or a failure to conform to any of the established rules.

Students detected in the use of outside help, as notes, etc., in quizzes or examinations, or of rendering assistance to other students during examinations, will be suspended or expelled. The possession of any secret aids while under examination, will be deemed presumptive evidence of guilt, and will subject the student to the same penalty as if detected in using them.

Any student detected in stealing will be permanently expelled from the college, and be handed over to the civil authorities to be dealt with according to the law.

The practice of dentistry by students, except under the direct supervision of a preceptor, is prohibited by law in the state of Minnesota, and a rule of the National Association of Dental Faculties, to which this college belongs, reads as follows: "Students in attendance at colleges of this Association are required to obey the laws regulating the practice of dentistry in the various States, and, failing to do this, shall not be again received into any college of this Association." Any student detected in violating this rule will be suspended or expelled.

DEGREES

The degree of doctor of dental surgery is conferred by the Board of Regents upon the students who are recommended, by vote of the faculty,

for graduation. Candidates for the degree must possess the following essential qualifications:

- (1) Twenty-one years of age.
- (2) Good moral character.
- (3) Three full college years spent in the study of dentistry; the third year, at least, in this university, and the remainder in this or other recognized schools of dentistry.
- (4) Satisfactory examinations passed in all branches of the curriculum.

FEEES

The annual fee is one hundred and fifty dollars (\$150.00). It includes all charges for matriculation, lectures, laboratory courses, dissections, technic materials, microscopes and graduation.

One-half of this fee will be payable when the student matriculates. The accountant's receipts for the portion will entitle the holder to take entrance examinations and to classify. The second half will be payable at the opening of the second semester. These receipts must be presented to and countersigned by the dean before entering upon the work of each semester.

A deposit of five dollars (\$5.00) will be required in addition to the first semester fee, to cover loss of and breakage or damage to college property. This will be returned at the end of the year, providing there is no charge against the student. This fee is to be deposited with the University accountant each year when the student matriculates.

If the applicant fails to pass the entrance examinations, his fee will be returned by the accountant.

After having entered upon the course of study, fees are not returnable, and no rebate will be recommended should a student discontinue work, but the faculty may recommend the application of a part to the succeeding year.

The fee for condition examinations is one dollar (\$1.00).

The fee for advanced standing examinations is one dollar (\$1.00).

The fee for special examinations is five dollars (\$5.00).

Senior students failing to graduate, will be required to pay a fee of fifteen dollars (\$15.00) for each branch examined in or taken subsequent to the close of the session in which the failure occurred. A fee of fifteen dollars (\$15.00) will also be charged for the completion of each branch of unfinished laboratory or practical work.

Special and graduate students will pay to the accountant a fee of thirty dollars per year for each study they pursue, and additional fees, varying from ten to thirty dollars, for each laboratory course they may elect.

INSTRUMENTS, BOOKS, TOOLS AND MATERIALS

All students are required to provide themselves with instruments, books, tools and materials as prescribed by the college.

BREAKAGE AND LOSS

In each laboratory course the student will be assigned a certain amount of apparatus and material, for which he will give a receipt.

For apparatus and material attaching to his laboratory desk he will also be held responsible. At the end of each course, if such apparatus and material are restored in good condition, this receipt will be returned to him.

SUMMARY EXPENSES

	1st yr.	2d yr.	3d yr.
Tuition, Instruments, Tools and Books	\$200.00	\$350.00	\$175.00
Room, Board and Incidentals	200.00	200.00	200.00

This is a general average and few use more than \$1,500.00 for the entire three years.

SPECIAL LECTURES

Occasional lectures are given during the senior year on subjects having a general bearing upon the practice of dentistry, such as: Ethics, Jurisprudence, Public Educational measures, etc.

ALUMNI ASSOCIATION

An association of the graduates of the college has its annual meeting during commencement week.

President, E. F. Wanous, Syndicate Block, Minneapolis.

Secretary, B. A. Sandy, Andrus Building, Minneapolis.

Course in Dentistry

FRESHMAN YEAR

FIRST SEMESTER

Anatomy 1, six hours, Professor Erdmann and Assistants
Chemistry 1 and 3, sixteen hours, Professor Frankforter and Assistants
Comparative Dental Anatomy 1, two hours, Dr. Hartzell
Dental Anatomy 1, three hours, Drs. Pike and Damon
Prosthetic Dentistry 1, fourteen hours, Drs. Pike and Damon

SECOND SEMESTER

Anatomy 2, twelve hours, Professor Erdmann and Assistants
Dental Anatomy 2, three hours, Drs. Pike and Damon
Histology and Embryology 5, eight hours, Professor Lee and Assistants
Physiology 1, six hours, Professor Beard and Assistants
Prosthetic Dentistry 2, eight hours, Drs. Pike and Damon

JUNIOR YEAR

FIRST SEMESTER

Crown and Bridge-Work 1, eight hours, Professor Wells and Assistants
Materia Medica 1, two hours, Dr. Schefcik
Operative Dentistry 1, fifteen hours, Professors Owre, Walls and Assistants
Orthodontia 1, six hours, Professor Weiss and Assistants
Pathology and Therapeutics 1, two hours, Professor Hartzell and Assistants
Prosthetic Dentistry 3, eleven hours, Professor Weiss and Assistants

SECOND SEMESTER

Crown and Bridge-Work 2, eight hours, Professor Wells and Assistants
Materia Medica 2, two hours, Dr. Schefcik

Operative Dentistry 2, fifteen hours, Professors Owre, Walls and Assistants

Orthodontia 2, four hours, Professor Weiss and Assistants

Pathology and Bacteriology 1, two hours, Professor Wesbrook and Assistants

Pathology and Therapeutics 2, two hours, Professor Hartzell and Assistants

Prosthetic Dentistry 4, eleven hours, Professor Weiss and Assistants

SENIOR YEAR

FIRST SEMESTER

Crown and Bridge-Work 3, six hours, Professor Wells and Assistants

Dental Electricity 3, one hour, Professor Springer

Operative Dentistry 3, twenty hours, Professors Owre, Walls and Assistants

Oral Surgery 1, three hours, Professor Hartzell and Assistants

Orthodontia 3, five hours, Professor Weiss and Assistants

Physical Diagnosis and Anæsthesia 1, one hour, Drs. Wright and Owre

Prosthetic Dentistry 5, eight hours, Professor Weiss and Assistants

SECOND SEMESTER

Crown and Bridge-Work 4, six hours, Professor Wells and Assistants

Dental Metallurgy 1, two hours, Professor Owre

Operative Dentistry 4, twenty hours, Professors Owre, Walls and Assistants

Oral Surgery 2, three hours, Professor Hartzell and Assistants

Orthodontia 4, five hours, Professor Weiss and Assistants

Physical Diagnosis and Anæsthesia 2, one hour, Drs. Wright and Owre

Prosthetic Dentistry 4, eight hours, Professor Weiss and Assistants

Course of Instruction

ANATOMY

CHARLES A. ERDMANN, M.D., *Professor of Anatomy*
ARTHUR W. MEYER, B. S., M. D., *Assistant Professor of Anatomy*
EARLE R. HARE, B. S., M. D., *Instructor in Anatomy*
E. E. HEMINGWAY, Ph. D., *Assistant in Anatomy*
C. C. TYRRELL, Ph.B., M.D., *Prosector in Anatomy*

1. OSTEOLOGY PROFESSOR ERDMANN, DRs. HARE AND TYRRELL
Four credits (twelve hours of each week, for six weeks) First quarter
Required of freshmen.
Lectures and recitations upon the human skeleton and supplementary work on the osteology of domestic mammals. Practical study of the bones of the human body, and recitations from the specimen.
2. SYNDESMOLGY PROFESSOR ERDMANN, DRs. HARE AND TYRRELL
Two credits (twelve hours of each week, for three weeks) First quarter
Open to students having completed course 1. Required of freshmen.
Lectures and recitations covering the articulations, including the structure and movements of joints. Demonstrations from the specimen and preparation.
3. DISSECTION ASSISTANT PROFESSOR MEYER, DRs. HARE AND TYRRELL
Six credits (twenty-four laboratory hours each week, for nine weeks) Fourth quarter
Open to students having completed course 2. Required of freshmen.
Dissection of a complete lateral half of the human body, with special reference to the head and neck. Dissection of the human and comparative brain.

CHEMISTRY

G. B. FRANKFORTER, M.A., Ph.D., *Professor of Chemistry*
I. H. DERBY, B.S., *Assistant Professor of Chemistry*
J. A. HANDY, Ph.C., *Instructor in Chemistry*

1. GENERAL CHEMISTRY ASSISTANT PROFESSOR DERBY AND MR. HANDY
Five credits (four recitation hours and twelve laboratory hours for nine weeks) First quarter
Required of freshmen.
Lectures and laboratory work. The course includes a detailed study of chemical and physical properties of the non-metals and their more important compounds.

3. **QUALITATIVE CHEMISTRY** ASSISTANT PROFESSOR DERBY AND MR. HANDY
 Five credits (four recitation hours and twelve laboratory hours
 for nine weeks) Second quarter
 Open to students completing course 1. Required of freshmen.
 Lectures, recitations and laboratory work. The course includes
 the general functions of the metals and acids with their quali-
 tative separation and identification.
 For work in other special or technical lines of chemistry, numer-
 ous courses are offered (see Bulletin of the School of Chem-
 istry in the department of physiology, in the pathology of the
 large number of lines.
 The analysis of the urine is dealt with under physiological chem-
 istry in the department of physiology, in the pathology of the
 urinary system in the department of pathology and in the
 clinical laboratories in connection with the microscopy of the
 urine.

COMPARATIVE DENTAL ANATOMY

M. V. HARTZELL, D.M.D., *Instructor in Comparative Dental Anatomy.*

1. **COMPARATIVE DENTAL ANATOMY** DR. HARTZELL
 Two credits (four recitation hours per week for nine weeks)
 Second quarter
 Open to students completing anatomy 1 and 2. Required of
 freshmen.

The instruction in this subject embraces a comparative study of animal
 life, giving special attention to number, form and arrangement of teeth, and
 their adaptation to food habits, ranging from the horny teeth of the inverte-
 brates, to the complex tooth-forms of the most highly specialized animals of
 the present time. The lectures will be illustrated with the stereopticon, casts,
 models and skulls.

CROWN AND BRIDGE-WORK

J. O. WELLS, A.M., D.M.D., *Professor of Crown and Bridge-Work*

F. S. YEAGER, D.D.S., *Instructor in Crown and Bridge-Work*

A. S. WELLS, B.A., D.D.S., *Instructor in Crown and Bridge-Work*

1. **CROWN AND BRIDGE-WORK** PROFESSOR WELLS AND ASSISTANTS
 Five credits (two recitation and six laboratory hours per week)
 First semester
 Required of juniors.
 Lectures, recitations, demonstrations and laboratory work. The
 latter includes all the more important forms of crowns and
 bridges.
2. **CROWN AND BRIDGE-WORK** PROFESSOR WELLS AND ASSISTANTS
 Five credits (two recitation and six laboratory hours per week)
 Second semester
 Open to students completing 1. Required of juniors.
 Continuation of course 1 as outlined above.
3. **CROWN AND BRIDGE-WORK** PROFESSOR WELLS AND ASSISTANTS
 Three credits (six laboratory hours per week) First semester
 Open to students completing 1 and 2. Required of seniors.
 Clinical lectures dealing with questions arising in the infirmary
 and clinical practice covering the entire field of crown and
 bridge-work.

4. CROWN AND BRIDGE-WORK
Continuation of 3 as outlined.

DENTAL ANATOMY

- J. N. PIKE, D.D.S., *Instructor in Prosthetic Dentistry, Orthodontia and Dental Anatomy.*
G. M. DAMON, D.D.S., *Instructor in Prosthetic Dentistry and Dental Anatomy.*

1. DENTAL ANATOMY DR. PIKE, DR. DAMON
Two credits (one recitation and two laboratory hours per week) First semester
Required of freshmen.
This course will consist of lectures, recitations and such laboratory work as drawing, dissection, modelling and carving of teeth.
2. DENTAL ANATOMY DR. PIKE, DR. DAMON
Two credits (one recitation hour and two laboratory hours per week) Second semester
Open to students completing course 1. Required of freshmen.
Continuation of course 1 as outlined above.

DENTAL ELECTRICITY

- F. W. SPRINGER, E.E., *Professor of Electrical Engineering*

3. DENTAL ELECTRICITY PROFESSOR SPRINGER
One credit (two recitation hours per week for nine weeks) First quarter
Required of seniors.
A course of instruction will be given upon the different forms of batteries, dynamos and motors in use in dental practice. Their construction, use, care and operation. Electricity as used in surgery and for therapeutic purposes, including application of x-rays, will be made clear by laboratory demonstrations and practical application.

DENTAL METALLURGY

- A. OWRE, D.M.D., M.D., C.M., *Professor of Operative Dentistry and Dental Metallurgy*

1. DENTAL METALLURGY PROFESSOR OWRE
Two credits (two recitation hours per week) Second semester
Required of seniors.
Lectures, recitations and demonstrations, taking up the most important metals with special reference to those used in dentistry.

HISTOLOGY AND EMBRYOLOGY

T. G. LEE, B.S., M.D., *Professor of Histology and Embryology*W. S. NICKERSON, Sc.D., M.D., *Assistant Professor of Histology and Embryology*J. F. LEMSTROM, M.D., *Instructor in Histology and Embryology*

5. HISTOLOGY AND EMBRYOLOGY PROFESSOR LEE AND ASSISTANTS
Six credits (eight recitation and eight laboratory hours per week) Fourth quarter

Required of freshmen.

This course will consist of lectures, recitations, laboratory work and demonstrations, including the preparation of specimens illustrating important points in the structure and development of the teeth and jaws. The instruction will include a general consideration of the structure and properties of protoplasm, the cell, cell division, the ovum, reproduction and formation of the blastoderm, the differentiation of tissues and organs, a detailed study of the various tissues, epithelium, connective tissue, cartilage, bone, muscle, nerve, blood and lymph, the vascular and lymphatic system, the respiratory system, the excretory system, the nervous system. A special emphasis is laid upon the structure and development of the digestive system from a human and comparative standpoint.

MATERIA MEDICA

J. F. SCHEFCIK, B.S., Ph.G., M.D., C.M., *Instructor in Materia Medica*

1. MATERIA MEDICA DR. SCHEFCIK
Two credits (two recitation hours per week) First semester
Required of juniors.

This subject is covered as thoroughly as its importance demands.

The writing and correct composition of prescriptions is an important feature. Particular attention is devoted to all therapeutic measures pertaining to dentistry. Practical work consists of the study of crude drugs and preparations, with demonstrations of all the pharmaceutical processes of importance.

2. MATERIA MEDICA DR. SCHEFCIK
Two credits (two recitation hours per week) Second semester
Open to students completing 1. Required of juniors.
Continuation of course 1 as outlined above.

OPERATIVE DENTISTRY

A. OWRE, D.M.D., M.D., C.M., *Professor of Operative Dentistry and Dental Metallurgy*J. M. WALLS, D.M.D., *Professor of Clinical Operative Dentistry*H. S. GODFREY, D.M.D., *Instructor in Operative Dentistry*N. J. COX, B.S., D.M.D., *Instructor in Operative Dentistry*H. A. MAVES, D.D.S., *Instructor in Operative Dentistry*U. E. HEDDY, D.D.S., *Instructor in Operative Technics*W. F. LASBY, B.S., D.D.S., *Instructor in Technics*R. L. GREEN, D.D.S., *Instructor in Operative Dentistry*

1. OPERATIVE DENTISTRY PROFESSORS OWRE, WALLS AND ASSISTANTS
Eight credits (three recitation and ten laboratory hours per week) First semester

Required of juniors.

Lectures, recitations, demonstrations and laboratory work. The object of the latter is to teach technical procedure as much as possible before clinical practice is begun.

2. OPERATIVE DENTISTRY PROFESSORS OWRE, WALLS AND ASSISTANTS
Eight credits (three recitation and ten laboratory hours per week) Second semester
Open to students completing 1. Required of juniors.
Lectures, recitations and clinical practice.
3. OPERATIVE DENTISTRY PROFESSORS OWRE, WALLS AND ASSISTANTS
Eleven credits (two recitation and eighteen laboratory hours per week) First semester
Required of seniors.
Lectures, recitations, conference work, demonstrations and clinical practice covering the entire field of operative dentistry.
4. OPERATIVE DENTISTRY PROFESSORS OWRE, WALLS AND ASSISTANTS
Eleven credits (two recitation and eighteen laboratory hours per week) Second semester
Open to students completing 3. Required of seniors.
Continuation of course 3 as outlined above.

ORAL SURGERY.

- T. B. HARTZELL, D.M.D., M.D., *Professor of Clinical Pathology, Therapeutics and Oral Surgery*
 F. R. WRIGHT, D.D.S., M.D., *Instructor in Anæsthesia and Oral Surgery*
 O. OWRE, M.D., *Instructor in Oral Surgery*

1. ORAL SURGERY PROFESSOR HARTZELL AND ASSISTANTS
Two credits (one recitation and two laboratory hours per week) First semester
Open to students completing courses 1 and 2, pathology and therapeutics.
Required of seniors.
The subject is taught by lectures, recitations and practical demonstrations upon the abundant clinical material available in the infirmary.
2. ORAL SURGERY PROFESSOR HARTZELL AND ASSISTANTS
Two credits (one recitation and two laboratory hours per week) Second semester
Open to students completing 1. Required of seniors.
Continuation of course 1 as outlined above.

ORTHODONTIA

- O. A. WEISS, D.M.D., *Professor of Prosthetic Dentistry and Orthodontia*
 J. N. PIKE, D.D.S., *Instructor in Prosthetic Dentistry, Orthodontia and Dental Anatomy*
 W. F. LASBY, B.S., D.D.S., *Instructor in Technics*
 A. J. WEISS, *Instructor in Technics*

1. ORTHODONTIA PROFESSOR WEISS AND ASSISTANTS
Three credits (six laboratory hours per week) First semester
Required of juniors.

This course consists entirely of technic work in the laboratory, comprising a brief course in the technique of steel which is followed by a comprehensive course in making regulating appliances, and the preparation of materials for the same.

2. ORTHODONTIA PROFESSOR WEISS AND ASSISTANTS
 Three credits (three laboratory hours per week) Second semester
 Open to students completing 1. Required of juniors.
 Continuation of course 1 as outlined above.

3. ORTHODONTIA PROFESSOR WEISS AND ASSISTANTS
 Three credits (one recitation and four laboratory hours per week) First semester
 Required of seniors.
 This course consists of lectures and recitations in which the theory and practice of orthodontia is fully considered.
 An ample clinic is provided which affords a comprehensive training in the practice of orthodontia. Every student is required to treat at least one case of irregularity of the teeth but may treat two or three cases.

4. ORTHODONTIA PROFESSOR WEISS AND ASSISTANTS
 Three credits (one recitation and four laboratory hours per week) Second semester
 Open to students completing 3. Required of seniors.
 Continuation of course 3 as outlined above.

PATHOLOGY AND BACTERIOLOGY

- F. F. WESBROOK, M.A., M.D., C.M., *Professor of Pathology and Bacteriology*
 R. H. MULLIN, B.A., M.B., *Senior Demonstrator in Pathology and Bacteriology*
 C. C. PRATT, M.D., *Demonstrator of Pathology and Bacteriology*
 H. E. ROBERTSON, A.B., M.D., *Demonstrator in Pathology*

1. BACTERIOLOGY AND PATHOLOGY PROFESSOR WESBROOK AND ASSISTANTS
 Two credits (four recitation hours per week for nine weeks) Second semester
 Required of juniors. A course of lectures, recitations and demonstrations of the general principles underlying pathology and bacteriology.

PATHOLOGY AND THERAPEUTICS

- T. B. HARTZELL, D.M.D., M.D., *Professor of Clinical Pathology, Therapeutics and Oral Surgery*

1. PATHOLOGY AND THERAPEUTICS PROFESSOR HARTZELL
 One and one half credits (one recitation and one laboratory hour per week) First semester
 Required of juniors.
 These subjects are taught by lectures and recitations involving general pathology as a foundation for the special pathology of the oral cavity; paying particular attention to the therapeutic requirements of the lesions of the mouth and teeth.

The work in pathology is supplemented by laboratory work under the care of the chair of pathology, department of medicine.

2. PATHOLOGY AND THERAPEUTICS PROFESSOR HARTZELL
One and one half credits (one recitation and one laboratory hour per week) Second semester
Open to students completing 1. Required of juniors.
Continuation of course 1 as outlined above.

PHYSICAL DIAGNOSIS AND ANÆSTHESIA

- T. B. HARTZELL, D.M.D., M.D., *Professor of Clinical Pathology, Therapeutics and Oral Surgery*
F. R. WRIGHT, D.D.S., M.D., *Instructor in Anæsthesia and Oral Surgery*
O. OWRE, M.D., *Instructor in Oral Surgery*

1. PHYSICAL DIAGNOSIS AND ANAESTHESIA PROFESSOR HARTZELL,
DR. WRIGHT AND DR. OWRE
One half credit (one laboratory hour per week) First semester
Required of seniors.
The subject of physical diagnosis will be taught didactically and practically, and will have direct bearing upon the subject of anæsthesia and will be as complete as its importance demands. A course in urinalysis will be given in connection with this course. The technics of anæsthetics, both general and local, receive full consideration. All anæsthetics are administered in the clinic, and full instruction concerning their use is given. The members of the senior class are required, under direction, to administer them and extract teeth under these agents.
2. PHYSICAL DIAGNOSIS AND ANAESTHESIA PROFESSOR HARTZELL,
DR. WRIGHT AND DR. OWRE
One half credit (one laboratory hour per week) Second semester
Open to students completing 1. Required of seniors.
Continuation of course 1 as outlined above.

PHYSIOLOGY

- R. O. BEARD, M.D., *Professor of Physiology*
M. R. WILCOX, M.D., *Assistant Professor of Physiology*
J. P. SEDGWICK, B.S., M.D., *Instructor in Physiological Chemistry*

1. PHYSIOLOGY PROFESSOR BEARD AND ASSISTANTS
Six credits (twelve recitation hours per week for nine weeks) Third quarter
Required of freshmen.
This subject is taught by recitations and lectures, illustrated by practical demonstrations. These embrace the discussion and, so far as possible, the observation of the physiological ingredients of the animal body; of the physiology of cell life or the fundamental properties of the cell; of the nutritive media, blood lymph and chyle; of the elementary functions of the nervous system; the muscular tissues; the vascular mechanism; the alimentary canal; the organs of secretion, excretion and respiration, and of the function of metabolism.

PROSTHETIC DENTISTRY

O. A. WEISS, D.M.D., *Professor of Prosthetic Dentistry and Orthodontia*

H. M. REID, D.D.S., *Instructor in Prosthetic Dentistry*

J. N. PIKE, D.D.S., *Instructor in Prosthetic Dentistry, Orthodontia and Dental Anatomy*

G. M. DAMON, D.D.S., *Instructor in Prosthetic Dentistry, Orthodontia and Dental Anatomy*

W. F. LASBY, B.S., D.D.S., *Instructor in Technics*

A. J. WEISS, *Instructor in Technics*

1. PROSTHETIC TECHNICIS DRS. PIKE AND DAMON
 Seven credits (fourteen laboratory hours per week) First semester
 Required of freshmen.
 This course consists entirely of technic work in the laboratory, comprising impression materials and their uses and the simpler processes of plate-work.
2. PROSTHETIC TECHNICIS DRS. PIKE AND DAMON
 Four credits (eight laboratory hours per week) Second semester
 Open to students completing 1. Required of freshmen.
 Continuation of course 1 as outlined above.
3. PROSTHETIC DENTISTRY PROFESSOR WEISS AND ASSISTANTS
 Six credits (one recitation and ten laboratory hours per week) First semester
 Open to students completing 1 and 2. Required of juniors.
 This course consists of lectures and recitations in which the principles and practice of plate-work are fully considered.
 The technic work in this course is a continuation of that begun in the freshmen year, and consists of the more difficult plate-work. This work is graded and consists only of practical processes; obsolete processes and unnecessary repetition are avoided.
4. PROSTHETIC DENTISTRY PROFESSOR WEISS AND ASSISTANTS
 Six credits (one recitation and ten laboratory hours per week) Second semester
 Open to students completing 3. Required of juniors.
 Continuation of course 3 as outlined above.
5. PROSTHETIC DENTISTRY PROFESSOR WEISS AND ASSISTANTS
 Four credits (eight laboratory hours per week) First semester
 Open to students completing 4. Required of seniors.
 Lectures and recitations cover the treatment of cleft palate cases and other special forms of prosthesis.
 An excellent clinic for general prosthetic dentistry affords ample opportunity for the student to treat a variety of cases by various methods of practice.
6. PROSTHETIC DENTISTRY PROFESSOR WEISS AND ASSISTANTS
 Four credits (eight laboratory hours per week) Second semester
 Open to students completing 5. Required of seniors.
 Continuation of course 5 as outlined above.

Students

Graduates 1907—30.

Aarness, Walter Stene, Montevideo.
 Alrick, Owen Kinnie, Minneapolis.
 Barnitz, Robert Andrew, Austin.
 Bauer, Theo. Phillip, Minneapolis.
 Birnberg, Ansel, St. Paul.
 Borgwardt, George, Peterson, Ia.
 Butter, Archibald B., Moline, Ill.
 Carlaw, Allen Chester, Northfield.
 Damon, Geo. Myron, Worthington.
 Doely, Owen Eugene, Spring Grove.
 Fitzgerald, Francis Gerald, Lake City.
 Froelich, George Henry, Winnebago City.
 Glimme, Knute Arthur, Kenyon.
 Griffith, Chas. Arthur, Hector.
 Helele, Orlen, St. Paul.
 Hollern, Edward John, Sauk Rapids.
 Jones, Rolland Ralph, Minneapolis.
 May, Clyde Luther, Young America.

Niemi, William, Superior, Wis.
 Page, Wright Benton, Minneapolis.
 Pinney, Egbert Ralph, Mankato.
 Purdon, Cleveland A., Wahpeton, N. D.
 Ramstead, Henry Geo., Eau Claire, Wis.
 Rauch, Charles, Minneapolis.
 Rosendahl, Peter Oscar, Spring Grove.
 Seebach, Oscar Christian, Red Wing.
 Smith, Nat Cyrus, Fair Haven.
 Thomas, Thos. Heathcote, Spencer, Ia.
 Weaver, Homer Abraham, Lancaster, Pa.
 Zierold, Arthur Adeburt, Granite Falls.

Third Year—45.

Bandelin, William John, Arlington.
 Bergh, Charles John, St. Paul.
 Broderson, Clarence, Fountain City, Wis.
 Bunce, Elmer Wayland, Minneapolis.
 Capron, Harry, Minneapolis.
 Coleman, Lauren M., Ellendale, N. D.
 Conway, Jesse Francis, Lake City.
 Countryman, Ralph Williams, Minneapolis.
 Donald, Raymond Bristol, Minneapolis.
 Franta, Valentine Adolph, Montgomery.
 Grafslund, Edwin, Lake Park.
 Hagberg, Gust Adolph, Brainerd.
 Harrison, Francis Randall, St. Cloud.
 James, Meredith Jay, Lake Crystal.
 James, William Henry, Lake Crystal.
 Johnson, Joseph, Edina Mills.
 Kaiser, Frederick John, Wells.
 Kjelland, Joseph Almon, Rushford.
 Knoche, Karl George, St. Paul.
 *Kohagen, John Benjamin, Duluth.
 Lawton, Harry Comegys, St. Paul.
 Leary, Daniel James, Portage, Wis.
 Lier, Edorf Menton, Ashby.

Madden, Fred M., Watertown.
 Miesen, Peter James, St. Peter.
 Mittwer, Arthur Edward, Minneapolis.
 Moore, Thomas John, Chatfield.
 Munns, Herbert Allen, Minneapolis.
 Olson, Charles John, Hastings.
 Radermacher, Harley Adolph, Barron, Wis.
 Rayman, Frederick Luverne, Austin.
 Remele, Herman Charles, Minneapolis.
 Ringnell, Ernest Berrhart, Minneapolis.
 Sandstrom, Carl L., Cloquet.
 Schapler, John Earl, Pipestone.
 Schmitz, Leroy Christian, Jamestown, N. D.
 Simon, Edwin James, Faribault.
 Snyder, Lynn, Lake City.
 Spurbeck, Lee, Two Harbors.
 Tanner, William Paul, Cannon Falls.
 Trench, William, Dennison.
 Van Dyke, Arthur Alexander, Alexandria.
 Whitson, Abram Page, Packwaukee, Wis.
 Will, Mellville Bruce, Mapleton.
 Williams, Louis, Ashland, Wis.
 *In attendance part of semester.

Saunders, Benjamin Harrison, Parkers Prairie.	Thomson, Erwin Emmerson, Minneapolis.
Smetana, Edward E., Hopkins.	Washburn, Dwight Wells, Plainview.
Smith, Harvey Willard, Verndale.	Wells, Harry Asa, Minneapolis.
Stangeby, Torlief Ludwig, Minneapolis.	Whitney, Harry Carroll, Wessington Springs, S. D.

*In attendance part of semester.

Specials—28.

Benjamin, Harley George, Minneapolis.	Hull, Isaac Stephenson, St. Paul
Brady, Charles Patrick, Red Lake Falls.	*Johnson, Renel Warren, Cannon Falls.
Britzus, Harry Adam, Minneapolis.	Key, John Lewis, Huron, S. D.
*Carpenter Dwight Jefferson, Minneapolis.	Larson, Arnold John, Minneapolis.
Conway, Steven Vincent, Minneapolis.	Lawrence, Edward, Winthrop.
Davis, Oscar Detorest, Detroit.	Lommen, John Sigurd, Caledonia.
Ertl, Rudolph William, Minneapolis.	Moorhouse, Raymond Richard, Minneapolis.
Froelich, George Henry, Winnebago City.	Roth, Albert Casper, Norwood
Gustafson, Richard Elmer, Winthrop.	Samuels, Harvey Charles, Minneapolis.
Haarlow, Arnold William, Baldwin, Wis.	Schmid, Adolph Robert, Springfield.
Harmon, Harry Weston, Faribault.	Scott, Louis William, Waseca.
Haynes, Manley Hewitt, Minneapolis.	Solberg, Chris Bernard, Montevideo.
Higgins, Clifford Crumbaugh, Kirkwood, Ohio.	Solem, Paul Oscar, Minneapolis.
	Stockwell, John Dudley, Hudson, Wis.
	Vaughan, William Henry, Minneapolis.

*In attendance part of semester.



The
University of Minnesota
Bulletin

The College of

Engineering and the Mechanic Arts

1908-1909

Volume XI

March 24, 1908

No. 4

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CALENDAR FOR 1908-1909

1908

1909

MAY

S.	M.	T.	W.	T.	F.	S.
..	1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
31

JUNE

..	1	2	3	4	5	6
7	8	9	10	11	12	13
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SEPTEMBER

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OCTOBER

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..

NOVEMBER

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DECEMBER

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JANUARY

S.	M.	T.	W.	T.	F.	S.
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31

FEBRUARY

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MARCH

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APRIL

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MAY

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30	31

JUNE

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20	21	22	23	24	25	26
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University Calendar

1907-1908

THE UNIVERSITY YEAR

The University year covers a period of thirty-eight weeks beginning on the second Tuesday in September. Commencement day is always the second Thursday in June.

FEBRUARY	4 T	Second semester begins—classes called for regular work
	12 W	Lincoln's birthday—legal holiday
	22 S	Washington's birthday—legal holiday
APRIL	17 F	Good Friday. Recess two days
MAY	2 Th	Regular meeting Board of Regents
	25 M	Senior examinations begin
	30 S	Decoration Day—legal holiday
JUNE	1 M	Semester examinations begin
	6 S	Semester examinations close

COMMENCEMENT WEEK, 1908

SUNDAY	June 7	Baccalaureate service
MONDAY	June 8	Senior class exercises
TUESDAY	June 9	Phi Beta Kappa address. Senior promenade
WEDNESDAY	June 10	Alumni Day. Regular meeting Board of Regents
THURSDAY	June 11	Commencement Day. The thirty-sixth annual commencement
FRIDAY	June 12	Summer vacation begins

1908-1909

SEPTEMBER	7-14	Entrance examinations, condition examinations and registration
	15 T	Classes called for regular work. Seventeenth annual session
OCTOBER	1 Th	Regular meeting Board of Regents
	5 M	Regular meeting University Council
NOVEMBER	26 Th	Thanksgiving Day. Recess three days
DECEMBER	7 M	Regular meeting University Council
	8 T	Annual meeting Board of Regents
	19 S	Holiday recess begins (no classes)
JANUARY	5 T	Work resumed in all departments
	23 S	Semester examinations begin
	30 S	Semester examinations close
FEBRUARY	2 T	Second semester begins—classes called for regular work
	12 F	Lincoln's birthday—legal holiday
	22 M	Washington's birthday—legal holiday
APRIL	5 M	Regular meeting University Council
	9 F	Good Friday. Recess two days

MAY	6 Th	Regular meeting Board of Regents
	24 M	Senior examinations begin
	31 M	Decoration Day—legal holiday
JUNE	1 T	Semester examinations begin
	5 S	Semester examinations close
	7 M	Regular meeting University Council

COMMENCEMENT WEEK, 1909

SUNDAY	June 6	Baccalaureate service
MONDAY	June 7	Senior class exercises
TUESDAY	June 8	Sigma Xi address. Senior promenade
WEDNESDAY	June 9	Alumni Day. Regular meeting Board of Regents
THURSDAY	June 10	Commencement Day. The thirty-seventh annual commencement
FRIDAY	June 11	Summer vacation begins

PROGRAM—ENTRANCE EXAMINATIONS

MONDAY,	September	7, 9	A. M.	3	Botany	
				3	Zoology	
				1	Astronomy	
				3	Geology	
				2	American Government	
				2	Political Economy	
TUESDAY,	September	8, 9	A. M.	2	History	
				5	Physics	
				4	Chemistry	
				3	Physiography	
WEDNESDAY,	September	9,	9	A. M.	1	English
					2	German
					1	French
					1	Latin
THURSDAY,	September	10,	9	A. M.	1	Scandinavian
					1	Elementary Algebra
					2	Commercial Geography
					2	Higher Algebra
FRIDAY,	September	11,	9	A. M.	1	Plane Geometry
					2	Solid Geometry

1 Folwell Hall, 2 Library Building, 3 Pillsbury Hall, 4 Chemical Laboratory, 5 Physics Building, 6 Mechanic Arts Building.

PROGRAM—CONDITION EXAMINATIONS.

TUESDAY,	September 8,	9:00-12:00	Mathematics and Mechanics.
		2:00-5:00	Civil Engineering Subjects.
WEDNESDAY,	September 9,	9:00-12:00	Chemistry and Astronomy.
		2:00-5:00	Drawing and Descriptive Geometry.
THURSDAY,	September 10,	9:00-12:00	Mechanical Engineering Subjects.
		2:00-5:00	Physics and Experimental Engineering Subjects.
FRIDAY,	September 11,	9:00-12:00	Electrical Engineering Subjects.
		2:00-5:00	English.
THURSDAY,	January 14,	2:00-5:00	English, Physics and Experimental Engineering Subjects.
FRIDAY,	January 15,	4:00-5:35	Chemistry.
SATURDAY,	January 16,	2:00-5:00	Mechanical Engineering Subjects.
			Civil Engineering Subjects.
			Electrical Engineering Subjects.
			Drawing Subjects and Astronomy.
MONDAY,	January 18,	2:00-5:00	Mathematics, Mechanics, Steam Turbines, and Stresses.

The University

THE UNIVERSITY OF MINNESOTA comprises the following named schools, colleges and departments:

THE COLLEGE OF SCIENCE, LITERATURE AND THE ARTS

THE COLLEGE OF ENGINEERING AND THE MECHANIC ARTS

THE DEPARTMENT OF AGRICULTURE, including—

The College of Agriculture

The School of Agriculture

Short Course for Farmers

The Dairy School

The Crookston School of Agriculture

THE COLLEGE OF LAW

THE COLLEGE OF MEDICINE AND SURGERY

THE COLLEGE OF HOMEOPATHIC MEDICINE AND SURGERY

THE COLLEGE OF DENTISTRY

THE COLLEGE OF PHARMACY

THE SCHOOL OF MINES

THE SCHOOL OF ANALYTICAL AND APPLIED CHEMISTRY

THE COLLEGE OF EDUCATION

THE GRADUATE SCHOOL

The Regents of the University have entrusted to their charge:

THE EXPERIMENT STATIONS, including—

The Main Station at St. Anthony Park

The Sub-Station at Crookston

The Sub-Station at Grand Rapids

THE GEOLOGICAL AND NATURAL HISTORY SURVEY

Bulletins of these schools, colleges and departments may be obtained upon application to the University Registrar.

The Board of Regents

CYRUS NORTHROP, LL. D., MINNEAPOLIS	<i>Ex-Officio</i>
The President of the University	
The HON. JOHN LIND, MINNEAPOLIS	1914
The President of the Board	
The HON. JOHN A. JOHNSON, ST. PETER	<i>Ex-Officio</i>
The Governor of the State	
The HON. JOHN W. OLSEN, ALBERT LEA	<i>Ex-Officio</i>
The State Superintendent of Public Instruction	
The HON. THOMAS WILSON, ST. PAUL	1909
The HON. A. E. RICE, WILLMAR	1909
The HON. B. F. NELSON, MINNEAPOLIS	1910
The HON. PIERCE BUTLER, ST. PAUL	1910
The HON. CHARLES A. SMITH, MINNEAPOLIS	1910
The HON. S. M. OWEN, MINNEAPOLIS	1913
The HON. W. J. MAYO, ROCHESTER	1913
The HON. HENRY B. HOVLAND, DULUTH	1914
<hr/>	
C. D. DECKER, MINNEAPOLIS	
Secretary of the Board.	

Executive Officers

THE UNIVERSITY

CYRUS NORTHROP, LL. D., *President*

ERNEST B. PIERCE, B. A., *Registrar*

JAMES T. GEROULD, B. A., *Librarian*

C. D. DECKER, *Purchasing Agent*

J. D. BREN, *Cashier*

THE COLLEGES

JOHN F. DOWNEY, M. A., C. E., *Dean of the College of Science, Literature
and the Arts*

FREDERICK S. JONES, M. A., *Dean of the College of Engineering and the
Mechanic Arts*

EUGENE W. RANDALL, *Dean and Director of the Department of Agriculture*

WILLIAM S. PATTEE, LL. D., *Dean of the College of Law*

FRANK FAIRCHILD WESBROOK, M. A., M. D., C. M., *Dean of the College of
Medicine and Surgery*

EUGENE L. MANN, B. A., M. D., *Dean of the College of Homeopathic
Medicine and Surgery*

ALFRED OWRE, D. M. D., M. D., *Dean of the College of Dentistry*

FREDERICK J. WULLING, Phm.D., LL.M., *Dean of the College of Pharmacy*

WILLIAM R. APPLEBY, M. A., *Dean of the School of Mines*

GEORGE B. FRANKFORTER, Ph. D., *Dean of the School of Chemistry*

GEORGE F. JAMES, Ph. D., *Dean of the School of Education*

HENRY T. EDDY, C.E., Ph. D., LL. D., *Dean of the Graduate School*

ADA L. COMSTOCK, M. A., *Dean of Women*

The University Council

At the regular meeting of the Board of Regents of the University, May 31st, 1905, a University Council was established according to the following plan:

I. The name of the body shall be The University Council. It shall consist of the President of the University, the deans of the various colleges and schools, one elected representative from each college or school for each 400 students or major fraction thereof, and one representative of the general alumni association.

II. The elected members shall serve for a period of one year. They shall be chosen from the various faculties at the time of the selection of standing committees. The representative of the general alumni association shall be chosen by that body at its annual meeting from among the alumni who are not members of the University.

III. The Council shall be authorized to—

a) Appoint the following committees or the faculty representation thereon:

The University auditing committee

The University press committee

The committee on athletics

The committee on University relations to other institutions of higher learning

The committee on health and sanitation

The committee on commencement and other University functions

The committee on catalogue, programs and courses of study

The committee on student entertainments and social affairs

And such other committees as the general University interests may require

b) Receive reports from such committees and to make such recommendations as may be required.

c) Consider and act upon any matter of general University interest beyond the province of a single faculty which may be referred to it by the President of the University or any faculty.

IV. The Council shall hold stated meetings upon the first Monday of October, December, April and June, and such other meetings as the President of the University may call

Representatives to the Council

The University

PRESIDENT CYRUS NORTHROP

The College of Science, Literature and the Arts

DEAN JOHN F. DOWNEY

PROFESSOR JOHN H. GRAY

PROFESSOR J. C. HUTCHINSON

PROFESSOR H. F. NACHTRIEB

PROFESSOR NORMAN WILDE

The College of Engineering and the Mechanic Arts

DEAN FREDERICK S. JONES

PROFESSOR GEORGE D. SHEPARDSON

The College and School of Agriculture

DEAN EUGENE W. RANDALL

PROFESSOR HARRY SNYDER

PROFESSOR SAMUEL B. GREEN

The College of Law

DEAN WILLIAM S. PATTEE

PROFESSOR HENRY J. FLETCHER

The College of Medicine and Surgery

DEAN F. F. WESBROOK

PROFESSOR THOMAS G. LEE

The College of Homeopathic Medicine and Surgery

DEAN EUGENE L. MANN

The College of Dentistry

DEAN ALFRED OWRE

The College of Pharmacy

DEAN FREDERICK JOHN WULLING

The School of Mines

DEAN WILLIAM R. APPELBY

The School of Chemistry

DEAN GEORGE B. FRANKFORTER

The College of Education

DEAN GEORGE F. JAMES

The Graduate School

DEAN HENRY T. EDDY

General Alumni Association

DAVID P. JONES

The Dean of Women

ADA L. COMSTOCK

University Council Committees

The University Auditing Committee

PROFESSORS ANDERSON, FLETCHER, OWRE, SIGERFOOS, SPRINGER

The Committee on Athletics

PROFESSORS PAIGE, BROOKE, HARDING, D. P. JONES, LITZENBERG

The Committee on Grounds and Sanitation

PROFESSORS FLATHER, BASS, BRACKEN, HICKMAN, RANDALL, SIDENER,
WESBROOK

The Committee on Catalogue, Programs and Course of Study

DEANS APPLEBY, EDDY, FRANKFORTER, JAMES, JONES, MANN, OWRE,
WULLING; PROFESSORS FLETCHER, JOHNSTON, SCHLENKER, SNYDER
E. B. PIERCE

The Press Committee

PROFESSORS SCHAPER, BAUER, CONSTANT, ERDMANN, JAMES

The Committee on Commencement and other University Functions

PROFESSORS NACHTRIEB, JENKS, OWRE, PATTEE, RANDALL, SCHLENKER,
WASHBURN

The Committee on Student Entertainments and Social Affairs

PROFESSORS FRANKFORTER, BASS, COMSTOCK, COOKE, MULLEN, PIKE

The Committee on University Relations to other Institutions of Higher Learning

PROFESSORS DOWNEY, BOTHNE, EDDY, GRAY, GREEN, JAMES, LEE

The Committee on University Extension and University Lectures

PROFESSORS WEST, HAECKER, RANKIN, SCHLENKER, SHEPARDSON

The Committee on the Library

PROFESSORS EDDY, FLETCHER, F. S. JONES, LEE, REYNOLDS,
VAN BARNEVELD, WEST

The Purposes of the College

The College of Engineering and the Mechanic Arts was founded in accordance with the Laws of the State of Minnesota and of the Federal Government, its object being "to promote the liberal and practical education of the industrial classes in the several pursuits and professions in life." It offers courses of study, of five years each, in civil, mechanical, electrical and municipal engineering, leading to the degrees of civil, mechanical or electrical engineer, the degree of Bachelor of Science being conferred at the end of the fourth year. This college also offers work in the graduate school leading to the degree of Master of Science.

The College of Engineering and the Mechanic Arts

FACULTY

CYRUS NORTHROP, LL.D., *President*

FREDERICK S. JONES, M.A., *Dean*

FREDERICK H. BASS, B.S., *Assistant Professor of Municipal and Sanitary Engineering*

WILLIAM E. BROOKE, B.C.E., M.A., *Professor of Mathematics and Mechanics*

CHARLES W. BENTON, M.A., Litt.D., *Professor of French*

FREDERICK E. CLEMENTS, Ph.D., *Professor of Botany*

FRANK H. CONSTANT, C.E., *Professor of Structural Engineering*

HENRY T. EDDY, C.E., Ph.D., LL.D., *Professor of Mathematics and Mechanics*

HENRY A. ERIKSON, E.E., *Assistant Professor of Physics*

JOHN J. FLATHER, Ph.B., M.M.E., *Professor of Mechanical Engineering*

GEORGE B. FRANKFORTER, M.A., Ph.D., *Professor of Chemistry*

EVERHART P. HARDING, M.S., Ph.D., *Assistant Professor of Chemistry*

ARTHUR EDWIN HAYNES, M.S., M.Ph., Sc.D., *Professor of Engineering Mathematics*

FREDERICK S. JONES, M.A., *Professor of Physics*

WILLIAM H. KAVANAUGH, M.E., *Professor of Experimental Engineering*

WILLIAM H. KIRCHNER, B.S., *Professor of Drawing and Descriptive Geometry*

FRANCIS P. LEAVENWORTH, M.A., *Professor of Astronomy*

JOHN G. MOORE, B.A., *Professor of German*

HENRY F. NACHTRIEB, B.S., *Professor of Animal Biology*

BURT L. NEWKIRK, Ph.D., *Assistant Professor of Mathematics and Mechanics*

EDWARD E. NICHOLSON, M.A., *Assistant Professor of Chemistry*

EDWARD VAN DYKE ROBINSON, Ph.D., *Professor of Economics*

MARIA L. SANFORD, *Professor of Rhetoric and Elocution*

FREDERICK W. SARDESON, Ph.D., *Assistant Professor of Geology*

WILLIAM A. SCHAPER, M.A., Ph.D., *Professor of Political Science*

GEORGE D. SHEPARDSON, M.A., M.E., *Professor of Electrical Engineering*

CHARLES F. SIDENER, B.S., *Professor of Chemistry*

EDWARD SIGERFOOS, Captain U. S. A., *Professor of Military Science*

FRANK W. SPRINGER, E.E., *Professor of Electrical Engineering*

FRANK F. WESBROOK, M.A., M.D., C.M., *Professor of Pathology and Bacteriology*

ANTHONY ZELENY, M.S., Ph.D., *Assistant Professor of Physics*

JOHN ZELENY, B.A., Ph.D., *Professor of Physics*

INSTRUCTORS

ALVIN S. CUTLER, C.E., *Instructor in Railway Engineering*
 T. L. HINCKLEY, B.S., *Instructor in Civil Engineering*
 OLAF HOVDA, B.S., *Instructor in Engineering Mathematics*
 HENRY J. KESNER, B.A., *Instructor in Structural Engineering*
 ALOIS F. KOVARIK, B.A., *Instructor in Physics*
 JOHN V. MARTENIS, M.E., *Instructor in Machine Design*
 PETER PETERSON, *Instructor in Foundry Practice*
 EDWARD QUIGLEY, *Instructor in Forge Work*
 WILLIAM H. RICHARDS, *Instructor in Carpentry and Pattern Work*
 NORMAN W. ROSE, M.E., *Instructor in Drawing*
 FRANK B. ROWLEY, B.S., M.E., *Instructor in Drawing*
 WILLIAM T. RYAN, E.E., *Instructor in Electrical Engineering*
 S. CARL SHIPLEY, B.S., *Instructor in Machine Work*
 C. F. SHOOP, B.S., *Instructor in Mechanical Engineering*
 HENRY UBRICH, *Instructor in Carpentry*

ASSISTANTS

HARRY W. DIXON, *Engineer*
 CARL L. HERRICK, M.E., *Assistant in Mechanical Engineering*
 L. W. MCKEEHAN, *Assistant in Drawing and Descriptive Geometry*
 FRANK L. NEMEC, *Assistant in Drawing*
 LEONARD B. SPERRY, M.E., *Assistant in Electrical Engineering*

STANDING COMMITTEES

Enrollment—PROFESSORS CONSTANT, HAYNES, SPRINGER
Curriculum—PROFESSORS EDDY, FLATHER, CONSTANT, BASS, JONES
 SHEPARDSON
Degrees—PROFESSORS JONES, FLATHER, SHEPARDSON, BASS
Library—PROFESSORS EDDY, FLATHER, JONES, SHEPARDSON
Catalogue—PROFESSOR KIRCHNER
Military Affairs and Athletics—PROFESSORS BROOKE, HAYNES, SIGERFOOS
Students' Work—PROFESSORS JONES, NEWKIRK, CUTLER, SHEPARDSON,
 KAVANAUGH, BROOKE
Graduate Studies and Degrees—PROFESSOR EDDY
Program—PROFESSORS KIRCHNER AND BASS

Non-Resident Lecturers

CIVIL ENGINEERING

- Geo. L. Wilson, Engineer, T. C. R. T. Co., Minneapolis.
L. T. Blanchard, Statistician, U. S. Reclamation Service, Washington.
Frank Nay, General Auditor, C. R. I. & P. R. R., Chicago.
J. A. L. Waddell, Consulting Engineer, Kansas City.
J. T. Fanning, Consulting Engineer, Minneapolis.
D. C. Morgan, Engineer, State Railroad and Warehouse Commission,
St. Paul.
L. R. Clausen, Superintendent, C. M. & St. P. Ry., Milwaukee.

ELECTRICAL ENGINEERING

- F. A. Sager, Engineer, The Arnold Company, Chicago. "What is an Engineer-Constructor?"
C. H. Harris, Engineer, Stone & Webster Company, Minneapolis.
"The Taylors Falls Hydro-Electric Development."
W. S. Hart, Erecting Engineer, Electric Storage Battery Company, Chicago. "The Installation of a Storage Battery."
Truman Hibbard, Designing Engineer, Electric Machinery Company, Minneapolis. "The Design of Electric Machinery." "The Design of a 300 Kilowatt Direct Current Generator."
A. G. Wessling, Assistant Engineer, Bullock Electric Mfg. Company, Cincinnati. "The Works and Factory Methods of the Allis-Chalmers and the Bullock Companies."
C. E. Downton, Foreman of Apprentices, Westinghouse Electric and Manufacturing Company, Pittsburg. "The Factory Post-Graduate Course."

Admission

Students proposing to enter this college must be prepared to pass examinations in *fifteen* high-school year-credits or their equivalent chosen from the following list of subjects. The first six subjects, amounting to eight year-credits, are required of all students and substitutes cannot be accepted. Of the remaining seven year-credits at least *two* year-credits must be chosen from one of the language groups. Two half year-credits are equivalent to one year-credit. The ground to be covered for each credit is given in the syllabus on page 18.

EIGHT YEAR-CREDITS REQUIRED:

- Elementary Algebra, one year
- Higher Algebra, one half year
- Plane Geometry, one year
- Solid Geometry, one half year
- English, four years
- Chemistry, one year

SEVEN YEAR-CREDITS REQUIRED FROM THIS GROUP, OF WHICH AT LEAST TWO YEAR-CREDITS SHALL BE CHOSEN FROM ONE OF THE LANGUAGE GROUPS:

Latin

- Grammar, one year
- Caesar, four books, one year
- Cicero, six orations, one year
- Vergil, six books, one year

Greek

- Grammar, one year
- Anabasis, one year

German

- Grammar, one year
- Literature, one year

French

- Grammar, one year
- Literature, one year

Spanish

- Grammar, one year
- Literature, one year

History

Ancient, to Charlemagne, one year

Modern, from Charlemagne, one year

English, one half year

Senior American, one half year

Civics, one half year

Political Economy, one half year

Physics, one year

Botany, one half or one year

Zoology, one half or one year

Astronomy, one half year

Geology, one half year

Physiography, one half year

Commercial Geography, one half or one year

Drawing, one half or one year

Shop Work, one half or one year

ENTRANCE EXAMINATIONS

I. Every applicant for admission to the freshman class, whether a graduate of a high school or not, must either,

(a) present State High School Board certificates for each of the mathematical subjects required for admission, or

(b) take the entrance examinations in said subjects at the University.

No applicant will be admitted who fails to obtain credit in one of these two ways in all of the mathematical subjects required for admission.

Students proposing to enter this college should be thoroughly prepared in mathematics, since the prosecution of the work depends so largely upon the preliminary training in this subject.

II. Graduates of Minnesota State high schools; of advanced courses of Minnesota normal schools; or of Minnesota high schools or academies not under the supervision of the State High School Board, but which are accredited by the faculty of the University, will be admitted without examination in the remaining subjects presented for entrance, provided

(a) that the school maintain a full four year course.

(b) that the applicant present to the registrar the principal's certificate on the blank form provided by the University (see note below) showing the satisfactory completion of at least fourteen of the required fifteen year credits. Such deficiency, when not a mathematical subject, is charged against the student as an entrance condition which must be removed before he enters the sophomore class.

III. Graduates of such schools, whose principal's certificate shows them to be deficient in not more than one and one half year credits and who have made such additional preparation in one or more of these subjects as they deem necessary, may take the regular entrance examinations in such subjects to reduce their deficiency to one year credit or less. But graduates whose principal's certificate shows them to be deficient in more than one and one half year credits, even though they have made such additional preparation as they deem necessary, must take the regular entrance examinations in all subjects.

IV. Graduates from schools in any other state, accredited to the state university of that state, will be admitted on the same terms as graduates of Minnesota State high schools.

V. Applicants from schools not coming within any of the above classes must take the regular entrance examinations or present State High School Board certificates, which will be accepted in lieu of an examination in the subjects which they represent.

N. B.—Students bringing records from accredited schools are required to present them on the blank form provided for the purpose by the University. Blank forms may be obtained from the registrar. No other form of certificate will be accepted. Students who do not bring their certificates on the proper form of blank will not be allowed to register until they have secured the certificate on the required form.

N. B.—Any Minnesota high school or academy not under supervision of the State High School Board, but requiring for graduation a four years' course, exclusive of the common school branches, conforming essentially in distribution of time to the entrance requirements of at least one of the University courses, will, upon application, be inspected by a committee, and after favorable recommendation, may be accredited by the faculty in all respects as are the State high schools, provided,

(1) that the school be open to inspection at any time by the University;

(2) that it take such supplementary examinations as may be prescribed from time to time.

TIME AND PLACE OF EXAMINATIONS

Entrance examinations are held only at the beginning of the college year (Tuesday, Sept. 8th). Applicants should present themselves to the registrar who will furnish them with application blanks and directions how to proceed with these examinations and registration. Students prevented from entering at the beginning of the year may be admitted at a subsequent date when circumstances are such as to justify the action. Such students are at a great disadvantage and all students expecting to

enter the University are urged to be present at the beginning of the year.

ENTRANCE CONDITIONS

No applicant will be admitted who is deficient in more than one year credit. The deficiency becomes an entrance condition and must be made up before the student passes into the sophomore class. But no applicant will be admitted to the college with an entrance condition in mathematics.

Students are strongly advised to enter without entrance conditions if possible, since the work of the freshman year is arduous, requiring the full time and energy of students to get the greatest benefit from it. It is very important that the candidate be fully prepared in the entrance requirement in chemistry.

ADVANCED CREDIT

Advanced credit for work done in manual training in the high schools is allowed under the following conditions:

(a) The courses in drawing and shop work in the high schools must be approved by the corresponding departments in the College;

(b) Students presenting two or three year credits in wood-work from such courses will receive an advanced credit in the first semester freshman shop.

(c) Students presenting three year credits from such courses in drawing will receive an advanced credit of the second semester freshman drawing.

(d) Students presenting four year credits from such courses in shop will receive an advanced credit of the first semester freshman and one-half semester sophomore shop.

(e) Students presenting four year credits from such courses in drawing will receive an advanced credit of the first and second semester freshman drawing, not including descriptive geometry.

Syllabi

The following statements indicate, in a general way, the ground expected to be covered in the study of the various subjects accepted for admission:

English (four years)

In order to secure a definite plan of study and unity of method on the part of preparatory schools, the entrance requirement in English is outlined below somewhat in detail. Where texts are mentioned they are merely suggestive and not arbitrary. Equivalents will be accepted in lieu of any of the texts mentioned. The entrance requirement in English covers four years of the high school course, and not less than four hours a week should be devoted to the subject. The headings under which instruction will naturally fall are:

- (a) English classics
 - (b) The principles of rhetoric
 - (c) Practice in written expression
- (a) English classics should include a critical reading, in class, of English masterpieces. The following are suggested as well adapted for such study: Shakespeare's "Macbeth," Milton's "Paradise Lost," books one and two, Burke's "Conciliation with America," Carlyle's essay on "Burns." In the study of these works the student should come to know leading facts connected with the author and his time; he should become familiar with the subject matter of the work; thoroughly at home with the story and have a clear idea of the form and structure of the work as a whole.
- A less critical knowledge of other standard or classic works, which may perhaps be read by the student at home, with written reports and brief oral discussions in class. The following works are noted as indicative of the minimum amount of work expected: At least two of Shakespeare's plays, beside the one read in class, one of Irving's works, one of Hawthorne's novels, one of Stevenson's novels, one of Webster's orations.
- (b) The work in the principles of composition should include the principles and technical terms of ordinary texts upon the subject, whether acquired by the direct study of such texts or mainly by the study of selected English masterpieces. It should not be forgotten that this is not an end in itself, but simply a means of teaching the student the correct use of English.
- (c) Not less than one hour each week throughout the four years of the high school course should be devoted to practice in written expression. The instructor may choose such topics as local conditions may require or make most profitable, but whatever line of work is pursued, the student should be taught to use language correctly and forcibly and learn to express himself clearly and logically in writing.

Elementary Algebra (one year)

Addition, subtraction, multiplication, division, factoring, highest common divisor, lowest common multiple, fractions, simple equations (with one, two, and several unknown quantities) followed by problems, theory of exponents, involution (including the binomial theorem for positive integral exponents), evolution, radicals, inequalities, ratio, proportion, progression, and quadratic equations with problems.

Higher Algebra, First Part (one half year)

While this subject does not include any topics not named under elementary algebra, a much fuller treatment of those topics is expected in this work. Principles as well as processes should be learned, theorems and rules should be rigorously demonstrated, the exercises and problems should be more difficult, and students should be drilled in short methods and rapid work. Unless candidates have a good knowledge of the fundamental topics named below, they are not prepared to pursue successfully at the University the second part of higher algebra.

The topics are addition, subtraction, multiplication, division, factoring, highest common divisor, lowest common multiple, fractions, theory of

exponents, involution, evolution, surds, imaginaries and simple equations with problems.

Plane Geometry (one year)

Any of the standard texts on this subject will furnish the necessary preparation. Isoperimetry, symmetry and maxima and minima of figures are not required. The exercises requiring solutions and demonstrations should not be omitted.

Solid Geometry (one half year)

Any of the standard texts on this subject will furnish the necessary preparation. The exercises requiring solutions and demonstrations should not be omitted.

Latin Grammar (one year)

This will include the subjects of orthography, etymology and syntax. Proficiency is particularly desired in the following subjects: the analysis of the verb forms, the rules of syntax, and the principal parts of the irregular verbs.

Caesar (one year)

First four books, or selections from the seven books equivalent to four; or three books, with thirty pages of Cornelius Nepos, or two books with sixty pages of Cornelius Nepos. Special attention should be paid to the translation of passages of the text into correct and idiomatic English; grammatical questions connected with the text; more especially on the subjunctive mood, indirect discourse and sequence of tenses. The pupil should be able to rewrite in oratio recta all the passages of oratio obliqua that occur in the text. The student is expected to be familiar with the life of Caesar and an account of his wars.

Cicero (one year)

Six orations: four against Catiline and any two of the following: "Poet Archias," "Ligarius," "Marcellus," "Manilian Law" (to count as two orations), the Fourteenth Philippic. The student should be familiar with the life of Cicero and the history of his times.

Vergil (one year)

Six books of Aeneid, or five of Aeneid and one of the Metamorphoses of Ovid, or the Eclogues. The student should be familiar with the life of Vergil, and an account of his times and writings. A correct rhythmical reading of the text is to be encouraged.

Greek Grammar (one year)

Xenophon's Anabasis (one year) Four books

German (two years)

First year—the pupil should acquire:

- (1) A correct pronunciation, training of the ear, eye and organs of speech.
- (2) A vocabulary of a thousand words of every day use; facility in combining these words into simple sentences. As a means to this, 100 to 150 pages of easy narrative prose and poetry should be read, from which questions and answers may be formed. To test the student's memory and knowledge of the word-order he should relate or write out the story anew in his own words.
- (3) From two to three hundred German idioms.
- (4) The essentials of German grammar, to be taught by means of oral and written exercises based upon the reading lessons

Second year

- (1) Read 150 to 200 pages of prose and poetry.
- (2) Practice in reading smoothly and with expression.
- (3) Carefully translate selected passages of the text into idiomatic English. To translate easy sentences which the student already understands is a waste of time.
- (4) Translate sentences from English into German, using words and idioms of the text read.
- (5) Study topically German grammar, chief rules of orthography, etymology and syntax; illustrate these by words, phrases and sentences selected or composed by the student.

French (two years)

The principles of French grammar, including acquaintance with the verb, regular and irregular; an ability to translate easy English sentences into French and simple French prose into English.

Spanish (two years)

First year—Grammar and reader.

Second year—Grammar and reviewed; reading of some modern writer; composition and conversation.

Ancient History (one year).

- (a) This study should begin with from five to seven weeks upon the oriental peoples who have most influenced European development, noting the early civilizations in the valleys of the Nile and Euphrates, the spreading and meeting of these civilizations in the intermediate region, with notice of the more important states in that district, and the union of the East under Persia. This survey should aim to give an idea of the reach of recorded history, of the distinguishing features of the successive oriental nations, and of their more important influence upon later European development.
- (b) In the Greek and Roman age emphasis should be put upon the evolution of institutions, and considerable attention should be paid to the later Hellenistic period, after the rise of Macedon, and to the Roman Empire, with its bearing upon subsequent history. Some of the work should be illustrated by the use of sources, and maps should be used constantly.
- (c) The subject should be carried down to the establishment of Charlemagne's Empire. This will bring together all the chief lines of influence which were afterwards to make our modern world, will show the meaning of the preceding eras as can not be done if the study stops at an earlier date, and will leave the subject at a period of comparative order and simplicity.

Modern History (one year)

From Charlemagne to the present. The topics to which special attention are called are the period of disorder after Charlemagne and the consequent rise of feudalism, the Holy Roman Empire and the papacy, the medieval church, the crusades, the free cities, the rise of national monarchies, the intellectual renaissance and the Protestant reformation, the French revolution and the subsequent democratic movements in politics and industry.

It is desirable to give at least half of the year to this last period from 1789.

English History (one half year)

The Saxon period should be passed over rapidly. In the remainder of the work, besides the narrative, constitutional points should receive attention and easily accessible documents like Magna Charta, should receive careful study.

Senior American History (one half year)

No attempt should be made to cover the whole field in this time. Either the colonial history or the period from 1783 to 1832 offers quite enough material. In any case considerable use should be made of collections of documents and sources.

Civics (one half year)

The subject should be approached from the historical side. The best arrangement is to combine the study with the senior American History and to give a year to the two.

Political Economy (one half year)

Some good elementary text-book should be mastered. It is desirable that students be encouraged to study local and general economic phenomena and conditions. The time should be wholly devoted to the elements of

the science of political economy. The beginner should not be confused with problems of applied economics such as tariff, trusts, bimetallism.

Physics (one year)

It is suggested that the year's work be confined to four of the seven subjects mentioned below:

- 1, Mechanics of solids; 2, liquids and gases; 3, sound; 4, heat; 5, light; 6 and 7, electricity and magnetism (to count as two subjects but not to be divided).

Chemistry (one year)

The work should include a study of both the non-metals and metals with laboratory experiments illustrating the common chemical laws and the commoner chemical reactions.

Botany (one or one half year)

Schools which give one-half year of botany should devote particular attention to plant relations, making the course largely ecologic in bearing. When a whole year is given to the subject, additional work upon plant structures should be offered, and together with fundamental conceptions of ecology, a general idea of morphology and taxonomy should be the aim of the course.

Zoology (one or one half year)

The course of zoology, whether a half year or a year, should be a natural history rather than a modern morphological course. Collecting and classifying (as a means) should be encouraged as much as possible. Animals should be studied as living units, in their relations to one another and their environments. The general and special structural feature in relation to the habits, the food and manner of obtaining it, the enemies and means of protection against them, hibernation, migration, and differences in habits, form and structure between the old or mature animal and the young, the relation of parents to their offspring, etc.—in short, all about the life of the animal under consideration should be the prominent feature, and as much as possible of this should be made out by direct observation of the animal in its natural home and in confinement.

The course, on the whole, should aim to foster and develop a love for nature, train the power of observation toward accuracy and give a healthful stimulation to the imagination. The pupil should be guarded against the habit of confounding the facts of observation with his interpretation, his judgments.

The animals for direct observation should be selected from as many branches of the animal kingdom as possible, and the changes during the year in the character of the faunae of the locality in general as well as some particular region should be noted. In some localities the work will of necessity be largely restricted to land and air animals, but no locality in Minnesota is so poor in animal life that very profitable work cannot be laid out along the line indicated above.

It will be noticed that such a course of necessity includes so-called laboratory work. The amount and extent of the laboratory work will depend upon conditions, but even under the best conditions it is hardly advisable to go into detailed dissections and embryology. Continued, repeated and close observation, aided now and then by a simple hand lens or a compound microscope, will reveal an abundance of material and opportunity for disciplining the mind.

Astronomy (one half year)

An elementary course in general astronomy as presented in any good modern text-book.

Geology (one half year)

These subdivisions should receive special attention: physiographic geology, which treats of the building of the land and the evolution of its existing contours; geo-dynamics, the study of the forces, atmosphere, water, terrestrial heat, plants, and animals, modifying the earth; and a brief survey of historical geology.

Physiology (one half year)

The following topics should be emphasized: meteorology, to an orderly arrangement of the leading facts relating to the atmosphere, and its phe-

nomens, including some acquaintance with the work of the U. S. Bureau and sculpture, as it treats of the origin, development and decadence of land forms and the influence of these processes on the physical environment of man.

Commercial Geography (one half year)

The work usually provided in larger schools will cover this requirement.

Drawing (one or one half year)

One full year of the work usually provided in the manual training course of high schools will satisfy the requirement for a half-year entrance credit. Two years or more of high school work will be accepted for a one-year entrance credit.

Shop Work (one or one half year)

One full year of the work usually provided in the manual training course of high schools will satisfy the requirement for a half-year entrance credit. Two years or more of high school work will be accepted for a one-year entrance credit.

ADVANCED STANDING

The University accepts records from other colleges for credit to advanced standing. Such records are accepted as far as they are equivalent to the work done in this University, subject to the approval of the department concerned. In bringing records from other institutions, the certificates must be on the official blanks of the institution granting the certificate, and should show:

1. The subject studied and ground covered
2. The time spent upon each subject
3. In case of laboratory subjects a concise statement of work done.
4. The result. It is sufficient to state that the subject was creditably completed.

Students who desire to obtain advanced standing must present their applications and certificates to the enrollment committee who will consult departments concerned in determining the credit to be given.

UNCLASSIFIED STUDENTS

Unclassified students are permitted to pursue, under the direction of the faculty, one or two lines of study, selected from some regular course. Such students must be persons of mature years and present preparation sufficient to admit them to the freshman class. Persons of mature years who shall give satisfactory evidence of ability to do with credit the work applied for, may be admitted by vote of the faculty.

GRADUATION

Students completing the course of study to the satisfaction of the faculty of the college are entitled to receive the professional degree. Any

person may undergo, at suitable times, examination in any subject, and if such person pass in all the studies and exercises of the course, he is entitled to the appropriate degree: provided, however, that at least one full year must be spent at the University before such degree shall be granted: and provided the examination in every case be held before a committee of the faculty appointed for that purpose.

THESES

Every candidate for the degree of engineer is required to prepare a thesis on some subject particularly relating to his course. The thesis must embody the results of original research made by the student himself and be creditable from a literary as well as from a technical point of view.

Theses are to be written in a clear hand, or typewritten. The subject of the thesis is required to be reported to the head of the department in which the student is a candidate for a degree, and the work of preparation must be formally begun early in the year. During the second semester the student is expected to devote at least ten hours a week to the preparation of his thesis.

The subject of the thesis and character of the work to be done will be suggested in a large measure by the course of study pursued by the student. Great emphasis is laid upon the careful and accurate preparation of the thesis; because, more than any other work the undergraduate does, this certifies to his ability to undertake the difficult and responsible duties involved in the direction of engineering and industrial interests. The thesis must be completed and put into the hands of the faculty not later than Friday, June 5th, upon a good quality of paper, 8½ by 11 inches, leaving a margin 1½ inches wide at the left for binding and a margin about 1¼ inches wide on the other sides.

The original drawings, tracings, negatives, etc., are to be placed in the department files. Clear prints therefrom are to accompany the manuscript. The thesis shall be bound in black cloth and leather and shall be deposited in the department library.

FACULTY REGULATIONS

Registration for work. Students will not receive credit for work done in classes for which they have not been registered.

Examination for credit. Students who make up work out of class and wish to take examinations to gain credit in their University course, shall apply to the faculty for permission to take the examinations.

Reports. At the end of each semester each student shall receive a mark in each subject for which he is registered. The several marks shall be as follows: A—pass with honor; B—pass with credit; P—pass; C—conditioned; F—failed.

In determining the standing of any student in any subject, the result of his daily work in that subject shall be combined with the result of the final examination in the ratio of two to one.

Subjects to be repeated. Any student in the College of Engineering whose average for the year is below passing grade will be required on reëntering the University to pursue again all the subjects of the year in which he has not passed with credit.

Students who receive a condition or failure in work of either semester so as to make it impossible for them to continue the same line of work in the following semester, will not be allowed to elect an advanced subject in place of the one omitted, but shall be required to devote their full time to the remaining subjects of the course.

However, those students who attain an average grade of B in the remaining subjects pursued may elect an advanced subject in the place of the one omitted.

Conditions and Failures. No student will be allowed to omit any freshman work in order to make up entrance conditions.

No student with an entrance condition will be allowed to register for any sophomore subject, nor will any student with a freshman condition or failure be allowed to register for a junior subject, nor will any student with a sophomore condition or failure be allowed to register for any senior subject.

A condition not made up before the subject is offered again becomes a failure subject to rules governing failures.

Students conditioned in the work of the first semester are given an opportunity to remove their conditions at the beginning of the first semester of the following year. Students conditioned in the work of the second semester are given an opportunity to remove their conditions at the beginning or end of the first semester of the following year, at the date regularly set by the program for such examinations, but can take no subjects which require this work as a prerequisite, until the condition has been removed. It is provided that if a student attempts to remove a condition at the first examination he will not be allowed to try the following examination, but shall be required to take the work over in class. Failures must be taken over again in class.

Dropped from Rolls. Any student receiving conditions or failures in more than fifty per cent of his work in the first semester shall be dropped from the rolls, and will not be allowed to re enter the University until the opening of the following year.

General Information

THE UNIVERSITY YEAR

The University year covers a period of thirty-eight weeks beginning on the second Tuesday in September, Commencement day being always the second Thursday in June.

STUDENT ORGANIZATIONS

The Society of Engineers meets once in two weeks to listen to addresses by prominent engineers and for the discussion of various engineering topics. The Year Book of this society is published annually. It is devoted to the publication of articles upon engineering subjects by professors and students.

The Minnesota Section of the American Institute of Electrical Engineers meets monthly in St. Paul and Minneapolis alternately. Students of the College of Engineering are welcome at these meetings.

SCHOLARSHIPS

It is the policy of the University to establish scholarships in the different departments, where extra help is needed, under regulations somewhat as follows:

1. The appointments are made by the executive committee of the Board of Regents, upon the recommendation of the department in which the appointment is desired after approval by the faculty.
2. Recipients of scholarships may be either graduate or undergraduate students.
3. The scholarships are not intended as gifts or benefactions from the state to the recipients, but as provisions under which services may be rendered the University.
4. It is understood that these services are of a nature which shall assist the holder of a scholarship to attain the mastery of some line of work in the department to which he is appointed.

THE BRIGGS PRIZE IN FOUNDRY PRACTICE

For the encouragement of studies in foundry practice, Mr. O. P. Briggs, commissioner of the National Foundrymen's Association, Detroit, Mich., offers \$75 annually, in two prizes, which are to be accompanied by gold medals. The competition is open to sophomores in the

College of Engineering, and the prize will be awarded for the best essay relative to the above subject. No prize will be awarded if less than five essays are submitted in competition. Essays should contain about 3,000 words, and must be submitted to the professor of rhetoric on or before May 1st.

THE GEORGE C. ANDREWS PRIZE

Mr. George C. Andrews, M. E. '87, has offered an annual prize to the Senior Mechanical Engineers for the best essay on any subject connected with heating and ventilation. The first prize in this contest will consist of \$50.00 in cash accompanied by a suitable medal; a second prize will also be given which will consist of \$25.00 in cash accompanied by a medal. The winner of the first prize will be offered a position with the George C. Andrews Heating Company.

Fees and Expenses

A registration fee of fifteen dollars per semester, payable in advance, is required of all residents of the state who register in this college. Non-residents are charged double this fee, or thirty dollars per semester. No reduction is made for late entrance or for leaving before the end of the semester. In addition to this fee students who take laboratory work are charged a sum sufficient to cover the cost of material and breakage. The fees are as follows:

FRESHMAN YEAR.

<i>First Semester.</i>	
Shop work	\$ 4.50
<i>Second Semester.</i>	
Shop work	\$ 4.50

FOR CLASSES GRADUATING IN 1909-1910-1911

SOPHOMORE YEAR.

<i>First Semester.</i>	
Shop work	\$ 7.00
Physics	3.00
Chemistry	3.00
<i>Second Semester.</i>	
Shop work	\$ 7.00
Physics	3.00

JUNIOR YEAR

<i>First Semester.</i>	
Shop work	\$ 4.50
Materials Testing Laboratory	6.00
Electrical Laboratory	1.50
Physics	3.00
<i>Second Semester.</i>	
Shop work	\$4.50
Steam Laboratory	3.00
Hydraulic Laboratory	3.00
Fuel and Gas analysis	5.00
Electrical Laboratory	6.00

SENIOR YEAR

<i>First Semester.</i>	
Electrical Laboratory	\$3.00
Electric Power	3.00
Experimental Laboratory	6.00
<i>Second Semester.</i>	
Electrical Laboratory	\$4.50
Electric Power	3.00
Gas Engine Laboratory	4.50

A fee of 25 cents per day is charged for each day of delayed registration.

LIVING EXPENSES

Several years ago a number of young men kept careful account of their expenses for the University year. The result was that the expenses of the young men ranged from \$217.00 to \$397.00. The same students earned sums varying from \$237.00 to \$272.00. These figures do not include fees, and, as the cost of living has increased decidedly, probably 25 per cent should be added to make them safe.

Board can be had at prices ranging from \$2.10 to as high as the student can afford to pay. In private families board ranges from \$3.00 to \$5.00. Furnished rooms vary in price from \$8 to \$20 per month

Buildings and Equipment

As an integral part of the University of Minnesota, the College of Engineering and the Mechanic Arts enjoys the advantages of the resources of the institution to the fullest extent. In addition to the University libraries and laboratories in which engineering students receive instruction, three buildings are devoted exclusively to the work of this college. The Mechanic Arts Building is occupied by the Departments of Mathematics and Drawing and also affords temporary quarters for the Departments of Civil, Municipal and Experimental Engineering. The Mechanical Engineering Department has an entire building devoted to its special work and the Electrical Engineering Department together with the Electric Light and Power Plant occupies a third building.

At the last session of the Legislature a bill was passed appropriating \$700,000 for special University purposes. Of this, \$450,000 was designated as purchase money for additional land and \$250,000 for the erection of a main engineering building and laboratory. It is hoped that these buildings will be completed during the coming year.

For information concerning methods of work and the equipment of the various departments the following condensed statements are offered.

HYDRAULIC AND MUNICIPAL ENGINEERING

The department is provided with the usual equipment for giving instruction in class-room, laboratory, and field, including a collection of drawings, photographs and models. The Engineering Department of the State Board of Health is in a position to furnish records of existing practice in Minnesota, thus providing a means of comparing progress in Minnesota and elsewhere; facilities are also offered for the prosecution of experimental work in sanitary lines under the direction of this board. Arrangements have been made with the Engineering Department of the State Highway Commission for co-operative work.

RAILWAY ENGINEERING

The aim of this department is to give the student a thorough working knowledge of railroad work, especial emphasis being laid upon the execu-

tion of practical problems, both in the field and drafting room. The department is fully equipped with the instruments necessary for carrying on an extended railroad survey.

STRUCTURAL ENGINEERING

This department has a collection of drawings of representative structures; photographs of prominent bridges, buildings and roofs, in this country and abroad; a well selected library of the best books and specifications upon structural engineering; slide rules and calculating instruments for rapid and accurate computations; and such other instruments as will facilitate the work of design.

Laboratories. Students in civil engineering have access to the laboratories and shops of the several departments in which their work lies. The Experimental Engineering laboratory offers excellent facilities for experimental work with cement and its products. In this connection there is a large Olsen testing machine of two hundred thousand pounds capacity, with automatic and autographic attachments, extension head for columns ten feet long, and transverse arms for twenty foot beams. Additional space and equipment are provided for experimental and research work.

Library. The civil engineering library is located on the first floor of the Mechanic Arts building. It contains all of the more important books and American and foreign periodicals relating to civil engineering. There are complete sets of the leading technical journals, proceedings, and reports of state and engineering societies.

Inspection Tours. The professional work in the several departments in civil engineering is illustrated in a practical manner by frequent class visits to the many engineering works and plants in the vicinity of Minneapolis and St. Paul.

MECHANICAL ENGINEERING

The plan of instruction in this course is intended to give the student a thorough training in mathematics and the physical sciences; and in the fundamental principles of engineering.

The work is planned to make him familiar with the various applications of these principles, and with the practical details of machine construction and design.

A new building especially designed to meet the requirements of instruction in the various lines of shop work, has recently been erected and the increased facilities thus afforded for the prosecution of this work are unexcelled.

This building consists of a two-story portion, containing the ma-

chine shop on the first floor and the wood shop on the second; beyond the machine shop and at a different level is the forge shop and foundry, both one story in height.

Slow burning mill construction is used throughout. This consists of brick walls and heavy timbers which, in case of fire, burn slowly and are safer than the ordinary iron and timber combination for this class of buildings.

A two-story extension has recently been added in which are located the mechanical engineering lecture and recitation rooms, drawing rooms, library and offices.

In the machine shops a three-ton crane covers a clear span of twelve feet, the entire length of the shop, thus giving ample space for erecting. This crane also serves some of the larger machine tools.

The foundry has been the subject of especial study and possesses many features of interest and value. In accordance with the best modern practice for light work the floor is of concrete, and the gangways, leading from the cupola and extending lengthwise of the room, are of heavy iron plates set in cement.

A light traveling crane is also provided for the foundry. This has a span of eighteen feet, and runs the entire length of the room.

The lighting, heating and ventilation of the building have received careful consideration. In the machine and pattern shops sixty per cent of the wall space above the benches is in glass. In the foundry and forge shop less light is allowed, since an abundant supply of overhead light is obtained from windows placed in the lantern or ventilator which extends over the roof. Pipe coils are employed in heating the building and these are placed partly on the side walls under the windows and partly overhead. Electric power is used for driving the machinery. The group system has been selected as the best adapted to the conditions, and a number of small motors are placed in the several departments; 220-volt continuous current motors are employed in connection with a three wire system of distribution, which is also used in the lighting circuit.

The machine shop contains representatives of the ordinary machine tools, gauges, and small tools usually found in a well-equipped modern plant.

The shop for pattern making and general wood work contains benches with vises and tools, lathes and lathe tools, an improved universal sawing machine, band saw, planer, and other power tools, and all hand tools used in carpentry and pattern making.

The forge shop is equipped with stationary and portable forges, a blower and exhaust fan, a one-hundred pound drop hammer, and the necessary small tools used in blacksmithing.

The foundry contains a thirty-inch Whiting cupola, and two brass furnaces, which embody some novel features. There are two core ovens: one for ordinary work $3\frac{1}{2} \times 3\frac{1}{2} \times 5$ feet, and one $3\frac{1}{2} \times 7 \times 6$ feet for special cores which may be required. The feature of these core ovens is that the gases and products of combustion are caused to traverse suitable conduits under a plate floor and do not come into direct contact with the cores. The usual moulding tools, ladles, crucibles, and all of the tools and materials needed in moulding and casting iron, brass or white metal, are provided.

The shop work is intended, not so much to give the student skill in the manual operations of the respective crafts, as a knowledge of the methods and processes of practical construction.

The new engineering power plant is admirably equipped with apparatus which constitutes a valuable part of the laboratory equipment.

The boiler plant contains a 130-h.p. Cahall (B. & W. type) water tube boiler designed to carry a working pressure of 250 pounds; a 60x16 foot multitubular boiler which carries 175 pounds pressure; a Sorge-Cochrane purifier of 300-h.p. capacity; and a large Sturtevant fan and direct-connected engine, to be used for experiments with mechanical draft.

In the engine room there is an Allfree automatic expansion 75-h.p. engine, connected by belting to a jack shaft equipped with roller bearings. A 150-h.p. cross-compound Corliss engine especially designed for the mechanical engineering department has recently been erected and is available for experimental work.

This engine is provided with a condenser, and is arranged so that it may be run simple or compound, condensing or non-condensing, as desired. It thus constitutes a valuable part of the equipment of the experimental laboratory.

The library of the department contains a collection of historic and recent works, the best standard books being purchased as soon as issued. There are a number of complete files of the transactions of engineering societies and of the leading technical publications. The reading room is amply supplied with both the general mechanical and railway press.

Railway mechanical engineering. Courses have been arranged for students wishing to specialize in this subject. The various courses may be elected separately, subject to the requirements for previous preparation, to fill out the electives, or options in the regular senior year of any department.

Students planning to elect these courses are encouraged to work, under special arrangements, in railway shops during the summer vacations. This has proved its value as preparatory to the special work of the senior year. In every possible way the methods of the department

are intended to place the students in touch with the best railway work, keeping always in sight the limitations which railway experience has found financially and practically to exist.

The location of the University is particularly favorable, being between the cities of St. Paul and Minneapolis in proximity to the shops, yards and headquarters of the extensive railway systems of the Northwest, which offer exceptional facilities for the prosecution of this work. The Northwest Railway Club, meeting monthly for papers and discussions, is open for the attendance of students.

Visits of inspection. During the year numerous visits are made to the manufacturing plants of St. Paul and Minneapolis, which have proven to be of great value in supplementing the class room work.

ELECTRICAL ENGINEERING

The electrical engineering department and the University electric light and power plant are housed in a brick building of slow-burning mill construction. The part of the building devoted exclusively to the work of the electrical engineering department of instruction is eighty feet long by sixty feet wide with two stories and full basement. In the basement are electro-chemical laboratory, shop, battery room, toilet and stock rooms. On the first floor are the dynamo laboratory, high tension laboratory, research laboratories, instrument rooms and offices. On the second floor are laboratories for photometry, photography, meter and lamp testing; and rooms for recitations, draughting, library and office.

The laboratory equipment includes about forty dynamo electric machines of various types and sizes for direct and alternating currents, such as constant current and constant potential direct current generators and motors, single phase and polyphase alternators, commutating, induction and synchronous motors and rotary converters, each furnished with suitable regulating devices. A number of these machines have been equipped with special devices for experimental purposes. Lamps, rheostats, batteries, fans and brakes afford convenient and ample means for taking up the energy of dynamos and motors. To facilitate testing, there are a number of pairs of similar machines. A three-ton traveling crane facilitates handling the machines. Power is obtainable from a main shaft driven by the engines of the lighting plant, or by motors connected with the University power circuits, with a storage battery or with the circuits of The Minneapolis General Electric Company, which supplies direct current at 500 volts and alternating current at 220 volts. An excellent assortment of instruments of well known American and foreign makers is available for laboratory use. A well equipped standardizing laboratory furnished with certified standards for current,

electromotive force and resistance, allows the frequent checking of instruments, so that students may work to any desired degree of refinement. The meter and lamp testing laboratories are furnished with a wide variety of arc and incandescent lamps and meters with all necessary standards and other accessories. The electro-chemical laboratory provides facilities for the construction and testing of various cells, for electro-plating and other electrolytic processes. Alternators, rotary converters, transformers, lamps, condensers, oscillographs, special apparatus and suitable instruments afford facilities for the experimental study of alternating currents. Telephone transmitters, receivers and accessories provide for practice in assembling and testing the ordinary telephonic apparatus and circuits and for investigation. There is a variety of apparatus for special investigations.

The department library contains an excellent collection of electrical and allied works, including a full set of United States Patent Office Gazettes. New books and trade publications are being added continually. Files of twenty-two journals are nearly complete and others are being collected and bound. These, with the files in the general and other department libraries of the University, offer excellent facilities for research work. Free access is given to the private libraries and collections of the professors.

The reading room receives regularly the leading American and foreign periodicals devoted to electrical engineering and allied interests. A journal club meets for the discussion of current literature in mechanical and electrical engineering, keeping the students in touch with current progress and best modern practice, and teaching them the value of the technical press.

The collection of samples furnished by various manufacturers and dealers is a great help in exhibiting best modern practice and in teaching young engineers to appreciate the merits of different products. Samples from repair shops and elsewhere are of special value in illustrating the treatment received by apparatus in commercial use and necessity of careful design and construction.

Instruction. The course aims to give the students a knowledge of phenomena and principles and the various applications of electricity, the methods and instruments used in measuring and transforming it, and practice in the design and operation of electrical apparatus. Practice and theory are taken together as far as possible. During the junior and senior years, students have daily work with electrical instruments and apparatus, and with commercial problems. Occasional inspection tours among the extensive and varied electrical interests in Minneapolis and St. Paul furnish excellent illustration. The University electric light and

power plant, which is in the same building, affords opportunity to observe commercial conditions at close range.

All engineering students are strongly advised to spend their vacations in factories, repair shops, electric light and railway stations, etc., in order to obtain commercial experience, and appreciate the relations of their technical training and actual work.

It is the aim to train the students to be independent and efficient workers, and to adopt the methods of professional engineers. Students are required to verify the formulas used in various calculations, and are encouraged to derive their own formulas for simplifying work in special cases. At the same time they are expected to use logarithms, slide rules, tables, curves, charts, and all legitimate means for obtaining accurate results with least amount of drudgery.

The regular instructing force is supplemented by competent non-resident lecturers.

Laboratory work. In the more advanced work students are encouraged to determine for themselves as independent workers the best methods and conditions for accurate results. While the laboratory work is classified, the students are treated individually and are advanced as rapidly as their attainments warrant.

In fitting up the laboratory, care is taken to secure representative types of apparatus of commercial style and size, in order to acquaint the students with actual practice. In putting up new lines and in setting up apparatus, the students are required to work in accordance with standard practice. Each student is given a certain amount of practice in the construction of electrical apparatus.

Design. The electrical engineers have drawing and design in common with the mechanical engineers in the first three years. A large number of numerical problems are given during the course. During the junior and senior years, electro-magnets and mechanism, dynamos and motors, lines, switches, switchboards and plants are designed. Complete working drawings and specifications for some special problems are elaborated. A file of about six hundred blueprints and drawings in the department library in addition to those in other departments is available to the students.

EXPERIMENTAL ENGINEERING

The laboratory, in which the experimental research of the college is conducted, has been considerably enlarged and its equipment greatly increased. Three universal testing machines of 50,000 pounds, 100,000 pounds and 200,000 pounds capacity, and five transverse and torsion testing machines are provided for determining strength, ductility, resilience and

other characteristics of the various materials used in engineering work under the various stresses. Several forms of absorption and transmission dynamometers are available for determining the power generated by engines or other motors, or absorbed by shafting or machinery; coal and gas calorimeters for determining the heating value of fuels, and apparatus for the analysis of flue gases.

The laboratory is also provided with machines for determining the lubricating qualities of oils and the relative values of metals used for journals and bearings. In addition to the boilers in the university heating plant, there is in the laboratory a 35 horse-power boiler and a high pressure boiler capable of carrying a working pressure of 300 pounds, with the necessary gages, calorimeters, tanks and pyrometers for making complete duty trials; several automatic steam engines equipped with condensers, indicators, brakes, scales and thermometers, which are employed to determine the efficiency in the use of steam under various conditions assumed or found in actual practice, and for valve setting and indicator work.

The operation and economy of other heat engines are illustrated by an Otto gas engine of five horse-power, a White gasoline engine of eight horse-power, Rider and Ericsson hot air engines, a pulsometer, and several steam and power pumps. The laboratory also contains Pelton and Tuerk water motors, a water ram, injectors, weirs, nozzles, meters and other pieces of apparatus and instruments which an engineer is called upon to use in the course of his professional work.

A constantly increasing quantity of commercial testing is being done in connection with the regular work which brings the student into actual contact with the engineering world and affords him valuable experience and data for his future work.

LIBRARIES AND READING ROOMS

The reference libraries of the several departments are well supplied with technical literature. The civil engineering library comprises over one thousand volumes; the library of the department of mathematics and mechanics numbers eighteen hundred volumes of choice mathematical and scientific works; the departments of mechanical engineering, electrical engineering and of physics have excellent collections of standard works which number over fourteen hundred volumes; the chemistry library contains over five hundred technical works; the drawing department has a collection of two hundred volumes relating to drawing, architecture and design. The above number, upwards of four thousand

volumes, comprising many works which are the private property of professors, is accessible to the students.

In addition to the above are the libraries of the University, the City of Minneapolis, the City of St. Paul and others, containing many works of value to the engineering profession. Standard works bearing on special subjects are secured as they appear and the more important scientific and technical periodicals are secured and placed in the reading rooms maintained in connection with the several departments of the college.

Journal clubs are organized, in most of the departments, for the discussion of current technical literature, relating to the best modern practice. The students are kept in touch with the developments along engineering lines and are taught how to use the technical press.

In addition to the foregoing, the college has many periodicals donated by the societies publishing them, and others loaned by members of the faculty, who place their periodicals and professional libraries at the disposition of the students.

Courses of Study

Figures at the left indicate credit hours; figures at the right indicate the course number. Letters at the right are abbreviations for the various courses, as follows:

Animal Biology	A. B.
Astronomy	A.
Botany	B.
Chemistry	C.
Civil Engineering	C.E.
Drawing and Descriptive Geometry.....	D.
Economics	Ec.
Electrical Engineering	E.E.
English	E.
Experimental Engineering	Ex. E.
French and Spanish	F.
Geology and Mineralogy	G. M.
German Language and Literature.....	G
Mathematics and Mechanics.....	M.
Mechanical Engineering	M.E.
Military Science	M. S.
Pathology and Bacteriology.....	P. B.
Physics	P.
Political Science	P.S.

CIVIL, MECHANICAL AND ELECTRICAL ENGINEERING

FRESHMAN YEAR

5	Mathematics, M. 1, 2.	Professor Haynes, Assistant Professor Newkirk, Mr. Hovda
4	English, E. 1.	Professor Sanford, Mr. Gislason
4	Drawing, D. 1, 3, 2, 4.	Professor Kirchner, Mr. Rowley, Mr. Rose, Mr. McKeehan
3	Shop M. E. 1, 2.	Mr. Shipley, Mr. Richards, Mr. Quigley
3	Modern Language, G. 1 or 4 or F. 1, 3 or 11.	Professor Moore, Professor Benton
3	Drill, M. S. 1.	Captain Sigerfoos

CIVIL ENGINEERING

SOPHOMORE YEAR

4	Mathematics, M. 3, 4.	Professor Haynes, Professor Brooke
4	Physics, P. 5, 6.	Professor Jones, Professor J. Zeleny, Assistant Professor A. Zeleny, Assistant Professor Erikson, Mr. Kovarik
3	Chemistry, C. 2.	Assistant Professor Nicholson, Mr. Frary
3	Drawing, D. 5.	Professor Kirchner, Mr. Rowley, Mr. Rose
3	Modern Language,* G. 3 or 7; or F. 2, 5 or 12.	Professor Moore, Professor Benton.
3	Geology, G. M. 1, (First semester)	Assistant Professor Sardeson
3	Astronomy, A. 1, (Second semester)	Professor Leavenworth
3	Drill, M. S. 1.	Captain Sigerfoos

JUNIOR YEAR

First Semester

3	Mathematics, M. 5.	Professor Haynes, Professor Brooke, Assistant Professor Newkirk
4	Physics, P. 7.	Professor Jones, Professor J. Zeleny, Assistant Professor A. Zeleny, Assistant Professor Erikson, Mr. Kovarik
3	Chemistry, C. 3.	Professor Sidener
3	Animal Biology or Botany, A. B. 1 or B. 1.	Professor Nachtrieb, Professor Clements
3	Economics, Ec. 1.	Professor Robinson, Mr. Phelan
3	Architecture, D. 6.	Professor Kirchner

Second Semester

3	Mathematics, M. 6.	Professor Haynes, Professor Brooke, Assistant Professor Newkirk
4	Physics, P. 8.	Professor Jones, Professor J. Zeleny, Assistant Professor A. Zeleny, Assistant Professor Erikson, Mr. Kovarik
3	Surveying, C. E. 1.	Assistant Professor Bass, Mr. Cutler
3	Animal Biology or Botany, A. B. 1 or B. 1.	Professor Nachtrieb, Professor Clements
3	Transportation, Ec. 9 A.	Professor Robinson
3	Highways, C. E. 7.	Assistant Professor Bass

SENIOR YEAR

First Semester

4	Mechanics, M. 7.	Professor Eddy, Professor Brooke, Assistant Professor Newkirk
3	Stresses, C. E. 12.	Professor Constant, Mr. Kesner
4	Surveying, C. E. 2.	Assistant Professor Bass, Mr. Cutler, Mr. Hinckley
2	American Government, P. S. 16.	Professor Schaper, Mr. Allin
2	Experimental Laboratory Ex. E. 1.	Professor Kavanaugh, Mr. Shoop
3	Elective.	

Second Semester

4	Mechanics, M. 8.	Professor Eddy, Professor Brooke, Assistant Professor Newkirk
3	Stresses, C. E. 13.	Professor Constant, Mr. Kesner
4	Surveying, C. E. 3.	Assistant Professor Bass, Mr. Hinck- ley
2	Engineering Law, P. S. 6.	Mr. Allin
2	Hydraulic Laboratory, Ex. E. 3.	Professor Kavanaugh, Mr. Shoop
3	Electric Power, E. E. 4.	Mr. Ryan

POST SENIOR YEAR

First Semester

5	Structural Design, C. E. 14.	Professor Constant, Mr. Kesner
4	Hydraulic Engineering, C. E. 5.	Assistant Professor Bass Mr. Hinckley
5	Masonry, C. E. 17.	Professor Constant
6	Railway Engineering, C. E. 9.	Mr. Cutler
3	Experimental Laboratory, Ex. E. 8.	Professor Kavanaugh
	OR	
3	Water Analysis, C. 5.	Professor Frankforter
	OR	
3	Railway Engineering, C. E. 10	Mr. Cutler

*Option allowed by the Committee on Students' Work, in cases of students who have completed the modern language requirement.

Second Semester

5	Structural Design, C. E. 15.	Professor Constant, Mr. Kesner
4	Municipal Engineering, C. E. 6.	Assistant Professor Bass
3	Reinforced Concrete, C. E. 18.	Professor Constant
5	Thesis.	
4	Swing Bridges, C. E. 16.	Professor Constant
	or	
4	Bacteriology, P. B. 1.	Professor Wesbrook
	or	
4	Railway Economics, C. E. 11.	Mr. Cutler

MECHANICAL ENGINEERING

SOPHOMORE YEAR

4	Mathematics, M. 3, 4.	Professor Haynes, Professor Brooke
4	Physics, P. 5, 6.	Professor Jones, Professor J. Zeleny, Assistant Professor A. Zeleny, Assistant Professor Erikson, Mr. Kovarik
3	Chemistry, C. 2.	Assistant Professor Nicholson, Mr. Frary
3	Drawing, D. 5.	Professor Kirchner, Mr. Rowley, Mr. Rose
3	Modern Language* G. 3 or 7; or F. 2, 5 or 12.	Professor Moore, Professor Benton
3	Shop, M. E. 3, 4.	Mr. Shipley, Mr. Peterson
3	Drill, M. S. 1.	Captain Sigerfoos

JUNIOR YEAR

3	Mathematics, M. 5, 6.	Professor Haynes, Professor Brooke, Assistant Professor Newkirk
4	Physics, P. 7, 8.	Professor Jones, Professor J. Zeleny, Assistant Professor A. Zeleny, Assistant Professor Erikson, Mr. Kovarik
3	Chemistry, C. 3, 6.	Professor Sidener, Assistant Pro- fessor Harding
3	Economics, Ec. 1, 9A.	Professor Robinson, Mr. Phelan
3	Mechanism and Kinematics, M. E. 11, 12.	Mr. Martenis
4	Shop, M. E. 5, 6.	Mr. Shipley

SENIOR YEAR

First Semester

4	Mechanics, M. 7.	Professor Eddy, Professor Brooke, Assistant Professor Newkirk
2	Experimental Laboratory, Ex. E. 1.	Professor Kavanaugh, Mr. Shoop
2	American Government, P. S. 16.	Professor Schaper, Mr. Allin
3	Stresses, C. E. 12.	Professor Constant, Mr. Kesner
3	Machine Design, M. E. 13.	Professor Flather, Mr. Martenis.
1	Boilers, M. E. 19.	Mr. Shoop
3	Electric Power, E. E. 5.	Mr. Ryan

Second Semester

4	Mechanics, M. 8.	Professor Eddy, Professor Brooke, Assistant Professor Newkirk
3	Experimental Laboratory, Ex. E. 4.	Professor Kavanaugh, Mr. Shoop
2	Engineering Law, P. S. 6.	Mr. Allin
3	Steam Engines, M. E. 20.	Professor Flather
3	Machine Design, M. E. 14.	Professor Flather, Mr. Martenis
2	Gas Engines, M. E. 21.	Mr. Shoop
3	Electric Power, E. E. 5.	Mr. Ryan

POST SENIOR YEAR

First semester.

3	Thermodynamics, M. 9.	Professor Eddy
3	Experimental Laboratory, Ex. E. 6.	Professor Kavanaugh
2	Mechanical Engineering, M. E. 22.	Professor Flather
4	Machine Design, M. E. 15.	Professor Flather
	or	
4	Railway Design, M. E. 25.	Professor Flather
3	Heating and Ventilation, M. E. 23.	Mr. Martenis
	or	
2	Railway Technology, M. E. 24.	Mr. Martenis
2	Thesis	
	or	
2	Electrical Engineering, E. E. 10.	Professor Springer
3	Elective.	

Second Semester.

5	{ 4 Turbines, M. 10, 11.	Professor Eddy
	{ 1 Specifications, M. E. 28.	Professor Flather
	or	
5	{ 3 Railway Administration, Ec. 9B.	Professor Robinson
	{ 2 Railway Mech. Eng. M. E. 26.	Professor Flather
4	Machine Design, M. E. 16.	Professor Flather
	or	
4	Railway Design, M. E. 25.	Professor Flather, Mr. Martenis
2	Mechanical Engineering, M. E. 22.	Professor Flather.
	or	
2	Locomotive Testing, M. E. 27.	Professor Flather
3	Gas Engine Laboratory, Ex. E. 9.	Professor Kavanaugh
3	Elective.	
3	Thesis.	

ELECTRICAL ENGINEERING

SOPHOMORE YEAR

4	Mathematics, M. 3, 4.	Professor Haynes, Professor Brooke
4	Physics, P. 5, 6.	Professor Jones, Professor J. Zeleny, Assistant Professor A. Zeleny, Assistant Professor Erikson, Mr. Kovarik
3	Chemistry, C. 2.	Assistant Professor Nicholson, Mr. Frary
3	Drawing, D. 5.	Professor Kirchner, Mr. Rowley, Mr. Rose
3	Modern Language* G. 3 or 7; or F. 2, 5 or 12.	Professor Moore, Professor Benton.
3	Shop, M. E. 3, 4.	Mr. Shipley, Mr. Peterson
3	Drill, M. S. 1.	Captain Sigerfoos

JUNIOR YEAR

First Semester

3	Mathematics, M. 5.	Professor Haynes, Professor Brooke, Assistant Professor Newkirk
4	Physics, P. 7.	Professor Jones, Professor J. Zeleny, Assistant Professor A. Zeleny, Assistant Professor Erikson, Mr. Kovarik
3	Kinematics and Mechanism, M. E. 11.	Mr. Martenis
3	Economics, Ec. 1.	Professor Robinson, Mr. Phelan
3	Chemistry, C. 3.	Professor Sidener
4	Shop, M. E. 5.	Mr. Shipley

*Option allowed by Committee on Students' Work in cases of students who have completed the modern language requirement.

Second Semester

3	Mathematics, M. 6.	Professor Haynes, Professor Brooke, Assistant Professor Newkirk
5	Physics, P. 8, 9.	Professor Jones, Professor J. Zeleny, Assistant Professor A. Zeleny, Assistant Professor Erikson, Mr. Kovarik
3	Kinematics and Mechanism, M. E. 12.	Mr. Martenis
3	Economics, Ec. 9A.	Professor Robinson, Mr. Phelan
3	Applied Electricity, E. E. 1.	Professor Shepardson
3	Shop, M. E. 6.	Mr. Shipley

SENIOR YEAR

First Semester

4	Mechanics, M. 7.	Professor Eddy, Professor Brooke, Assistant Professor Newkirk
2	American Government, P. S. 16.	Professor Schaper, Mr. Allin
3	Electrical Machinery, E. E. 2.	Professor Springer
3	Electrical Laboratory, E. E. 17.	Professor Springer
2	Experimental Laboratory, Ex. E. 1.	Professor Kavanaugh, Mr. Shoop
5	Machine Design, M. E. 13.	Professor Flather, Mr. Martenis
1	Steam Boilers, M. E. 19.	Mr. Shoop

Second Semester

4	Mechanics, M. 8.	Professor Eddy, Professor Brooke, Assistant Professor Newkirk
2	Engineering Law, P. S. 6.	Mr. Allin
3	Stresses, C. E. 12.	Professor Constant, Mr. Kesner
3	Steam Engines, M. E. 20.	Professor Flather
3	Electrical Machinery, E. E. 2.	Professor Springer
3	Electrical Laboratory, E. E. 17.	Professor Springer
2	Experimental Laboratory, Ex. E. 2.	Professor Kavanaugh, Mr. Shoop

POST SENIOR YEAR

First Semester

2	Alternating currents, E. E. 6.	Professor Shepardson
3	Thermodynamics, M. 9.	Professor Eddy
2	Electrical Engineering Practice, 7, 8 or 9, E. E.	Professor Shepardson, Mr. Ryan
3	Electrical Laboratory, E. E. 18.	Professor Springer
3	Electrical Design, E. E. 14.	Mr. Ryan
2	Experimental Laboratory, Ex. E. 7.	Professor Kavanaugh, Mr. Shoop
2	Thesis.	Professor Shepardson
3	Elective.	

Second Semester

3	Alternating Currents, E. E. 6.	Professor Shepardson
3	Electrical Engineering Practice, 8, 10, 11, 12, E. E.	Professor Shepardson, Professor Springer, Mr. Ryan
3	Electrical Laboratory, E. E. 18.	Professor Springer
3	Electrical Design, E. E. 15.	Mr. Ryan
2	Telephony, E. E. 12.	Professor Shepardson
	or	
2	Water Turbines, M. 10.	Professor Eddy
3	Thesis.	Professor Shepardson
3	Elective.	

ORDER OF STUDIES FOR CLASSES GRADUATING 1909-1910-1911

CIVIL ENGINEERING

SOPHOMORE YEAR

First Semester

5	Mathematics, M. 3'.	Professor Haynes, Professor Brooke
6	Physics, P. 1a.	Professor Jones
3	Technological Chemistry, C. 3.	Professor Sidener
3	Drawing, D. 5.	Professor Kirchner, Mr. Rose
4½	Topography, C. E. 2.	Assistant Professor Bass, Mr. Hinckley
3	Drill, M. S. 1.	Captain Sigerfoos

Second Semester

5	Mathematics, M. 4'.	Professor Haynes, Professor Brooke
6	Physics, P. 1b.	Professor Jones and Assistants
2	Drawing, D. 5.	Professor Kirchner, Mr. Rowley
2	Astronomy, A. 1.	Professor Leavenworth
4½	Topography, C. E. 3.	Assistant Professor Bass, Mr. Hinckley
2	Highways, C. E. 7.	Assistant Professor Bass
3	Drill, M. S. 1.	Captain Sigerfoos

JUNIOR YEAR

First Semester

5	Mechanics, M. 7'.	Professor Eddy
3	Physics P. 2 or Elective.	Assistant Professor A. Zeleny
2	Experimental Laboratory, Ex. E. 1.	Professor Kavanaugh, Mr. Shoop
4½	Curves and Earthworks, C. E. 9.	Mr. Cutler
3	Field Work, C. E. 10.	Mr. Cutler
3	Stresses, C. E. 12.	Professor Constant, Mr. Kesner

Second Semester

5	Mechanics, M. 8'.	Professor Eddy
3	Structural Details, C. E. 13.	Mr. Kesner
3	Stresses, C. E. 12, 13.	Professor Constant, Mr. Kesner
5	Railway Engineering, C. E. 9, 10.	Mr. Cutler
3	Geology, G. M. 1.	Assistant Professor Sardeson
2	Hydraulic Laboratory, Ex. E. 3.	Professor Kavanaugh, Mr. Shoop

SENIOR YEAR

First Semester

5	Masonry, C. E. 17.	Professor Constant
2	Experimental Laboratory, Ex. E. 8.	Professor Kavanaugh
	or	
2	Railway Economics, C. E. 11.	Mr. Cutler
3	Electric Power, E. E. 4.	Mr. Ryan
5	Structural Design, C. E. 14.	Professor Constant
2	Political Science, P. S. 16.	Professor Schaper
4	Hydraulic Engineering, C. E. 5.	Assistant Professor Bass
	Thesis.	

Second Semester

5	Structural Design, C. E. 15.	Professor Constant
3	Reinforced Concrete, C. E. 18.	Professor Constant
2	Transportation, Ec. 9A.	Professor Robinson
3	Sanitary Engineering, C. E. 6.	Assistant Professor Bass, Mr. Hinckley
2	Contracts and Specifications, M. E. 28.	Professor Flather
5	Thesis.	

ORDER OF STUDIES FOR CLASSES GRADUATING 1909-1910-1911
MECHANICAL ENGINEERING

SOPHOMORE YEAR

First Semester

5	Mathematics, M. 3'.	Professor Haynes, Professor Brooke
6	Physics, P. 1a.	Professor Jones and Assistants
3	Technological Chem., C. 3.	Professor Sidener
3	Drawing, D. 5.	Professor Kirchner, Mr. Rose
4½	Shop, M. E. 2, 4.	Mr. Shipley, Mr. Quigley
3	Drill, M. S. 1.	Captain Sigerfoos

Second Semester

5	Mathematics, M. 4'.	Professor Haynes
6	Physics, P. 1b.	Professor Jones and Assistants
2	Drawing, D. 5.	Professor Kirchner, Mr. Rowley
2	Kinematic Drawing, M. E. 12.	Mr. Martenis
3	Mechanism, M. E. 11.	Mr. Martenis
4½	Shop, M. E. 2, 4.	Mr. Shipley, Mr. Quigley
3	Drill, M. S. 1.	Captain Sigerfoos

JUNIOR YEAR

First Semester

5	Mechanics, M. 7a'.	Professor Eddy, Assistant Professor Newkirk
3	Physics, P. 2.	Assistant Professor A. Zeleny
3	Stresses, C. E. 12.	Professor Constant
4	Machine Design, M. E. 13.	Professor Flather, Mr. Martenis
2	Experimental Lab. Ex. E. 1.	Professor Kavanaugh, Mr. Shoop
2½	Shop, M. E. 5.	Mr. Shipley
3	Electric Power, E. E. 5.	Mr. Ryan

Second Semester

5	Mechanics, M. 8'.	Professor Eddy, Assistant Professor Newkirk
3	Steam Engines, M. E. 20.	Professor Flather
4	Machine Design, M. E. 14.	Professor Flather, Mr. Martenis
2	Gas Engines and Producers, M. E. 21.	Mr. Shoop
3	Experimental Lab. Ex. E. 2, 3.	Professor Kavanaugh, Mr. Shoop
1	Steam Boilers, M. E. 19.	Mr. Shoop
3	Electric Power, E. E. 5.	Mr. Ryan

SENIOR YEAR

First Semester

3	Thermodynamics, M. 9'.	Professor Eddy
2	Water Turbines, M. 10'.	Professor Eddy
	or	
2	Railway Mech. Eng., M. E. 24.	Mr. Martenis
2	Mechanical Engineering, M. E. 22.	Professor Flather
4	Steam Engine Design, M. E. 15.	Professor Flather
	or	
4	Gas Engine Design, M. E. 15.	Professor Flather
3	Fuel and Gas Analysis, C. 6.	Assistant Professor Harding.
2	Political Science, P. S. 16.	Professor Schaper
3	Experimental Lab., Ex. E. 6.	Professor Kavanaugh
	0 to 2 Elective. Subject to ap- proval of department. Thesis.	

Second Semester

2	Steam Turbines, M. 11'. or	Professor Eddy
2	Railway Engineering, M. E. 25.	Professor Flather
2	Contracts and Spec., M. E. 28.	Professor Flather
2	Transportation, Ec. 9A.	Professor Robinson
4	Machine Design, M. E. 16. or	Professor Flather
4	Railway Design, M. E. 25.	Professor Flather
4	Gas Engine Lab., Ex. E. 9.	Professor Kavanaugh
	2 to 4 Elective.	(As approved by Department)
3	Thesis.	

ORDER OF STUDIES FOR CLASSES GRADUATING 1909-1910-1911

ELECTRICAL ENGINEERING

SOPHOMORE YEAR.

First Semester

5	Mathematics, M. 3'.	Professor Haynes, Professor Brooke
6	Physics, P. 1a.	Professor Jones and Assistants
3	Technological Chemistry, C. 3.	Professor Sidener
3	Drawing, D. 5.	Professor Kirchner, Mr. Rose
4 ½	Shop, M. E. 2, 4.	Mr. Shipley, Mr. Quigley
3	Drill, M. S. 1.	Captain Sigerfoos

Second Semester

5	Mathematics, M. 4'.	Professor Haynes, Professor Brooke
6	Physics, P. 1b.	Professor Jones and Assistants
2	Applied Electricity, E. E. 1.	Professor Shepardson
4	Kinematics and Mechanism, M. E. 11, 12.	Mr. Martenis
2	Drawing, D. 5.	Professor Kirchner, Mr. Rowley
3 ½	Shop, M. E. 2, 4.	Mr. Shipley, Mr. Quigley
3	Drill, M. S. 1.	Captain Sigerfoos

JUNIOR YEAR

First Semester

5	Mechanics, M. 7a'.	Professor Brooke
3	Physics, P. 2.	Assistant Professor A. Zeleny
3	Stresses, C. E. 12.	Professor Constant
2	Electrical Machinery, E. E. 2.	Professor Springer
1	Electrical Laboratory, E. E. 17.	Professor Springer.
1	Steam Boilers, M. E. 19.	Mr. Shoop
4	Machine Design, M. E. 13.	Professor Flather, Mr. Martenis
2	Experimental Laboratory, Ex. E. 1.	Professor Kavanaugh, Mr. Shoop

Second Semester

5	Mechanics, M. 8'.	Professor Brooke
3	Electrical Machinery, E. E. 2.	Professor Springer
3	Steam Engines, M. E. 20.	Professor Flather
2	Machine Design, M. E. 13.	Professor Flather, Mr. Martenis
2	Electrical Design, E. E. 14.	Mr. Ryan.
4	Electrical Laboratory, E. E. 17.	Professor Springer
2	Experimental Laboratory, Ex. E. 2.	Professor Kavanaugh, Mr. Shoop

SENIOR YEAR

First Semester

3	Thermodynamics, M. 9'.	Professor Eddy
3	Alternating currents, E. E. 6.	Professor Shepardson
2	Electrical engineering practice, E. E. 7 to 12.	Professor Shepardson, Mr. Ryan
2	Water turbines, ** M. 10'.	Professor Eddy
2	Political science, P. S. 16.	Professor Schaper
2	Electrical laboratory, E. E. 18.	Professor Springer
3	Elective. Thesis.	

Second Semester

3	Alternating currents, E. E. 5.	Professor Shepardson
2	Electrical engineering practice, E. E. 9 to 12.	Professor Shepardson Professor Springer, Mr. Ryan
2	Contracts and spec., M. E. 28.	Professor Flather
2	Transportation, Ec. 9A.	Professor Robinson
3	Electrical design, E. E. 15.	Mr. Ryan
3	Electrical laboratory, E. E. 18.	Professor Springer
3	Elective.	
3	Thesis.	

MUNICIPAL ENGINEERING

SOPHOMORE YEAR

First Semester

5	Mathematics, M. 3'.	Professor Haynes, Professor Brooke
6	Physics, P. 1a.	Professor Jones
3	Quantitative Anal., C. 4.	Professor Sidener
3	Drawing, D. 5.	Professor Kirchner, Mr. Rose
4½	Topography, C. E. 2.	Assistant Professor Bass
3	Drill, M. S. 1.	Captain Sigerfoos

Second Semester

5	Mathematics, M. 4'.	Professor Haynes, Professor Brooke
6	Physics, P. 1b.	Professor Jones
2	Drawing, D. 5.	Professor Kirchner, Mr. Rowley
2	Astronomy, A. 1.	Professor Leavenworth
4½	Topography, C. E. 3.	Assistant Professor Bass, Mr. Hinckley
2	Highways, C. E. 7.	Assistant Professor Bass
3	Drill, M. S. 1.	Captain Sigerfoos

JUNIOR YEAR

First Semester

5	Mechanics, M. 7'.	Professor Eddy
3	Physics, P. 2 or Elective.	Assistant Professor A. Zeleny
2½	Curves and earthwork, C. E. 9.	Mr. Cutler
2½	Water analysis, C. 5.	Professor Frankforter
2	Experimental lab., Ex. E. 1.	Professor Kavanaugh, Mr. Shoop
3	Field work, C. E. 10.	Mr. Cutler
3	Stresses, C. E. 12.	Professor Constant, Mr. Kesner

** This course in Water Turbines is a prerequisite to the course in Steam Turbines in the second semester, and all students desiring to take the latter course should not omit Water Turbines in the first semester. Senior Mechanical Engineers wishing to take Railway Mechanical Engineering may be allowed to substitute Railway Technology for Water Turbines but may, nevertheless, elect Water Turbines in preparation for Steam Turbines as an elective in the second semester. Senior Electrical Engineers wishing to specialize in Telephone Engineering will be allowed to elect an optional course in Telephony instead of Water Turbines, but they may, nevertheless, elect Water Turbines as preparation for Steam Turbines of the second semester if they desire to take Steam Turbines as an elective.

Second Semester

5	Mechanics, M. 8'.	Professor Eddy
3	Structural Details, C. E. 12, 13.	Professor Constant, Mr. Kesner
3	Stresses, C. E. 13.	Professor Constant, Mr. Kesner
5	Railway engineering, C. E. 9, 10.	Mr. Cutler
3	Geology, G. M. 1.	Professor Sardeson
2	Hydraulic lab., Ex. E. 3.	Professor Kavanaugh, Mr. Shoop

SENIOR YEAR

First Semester

5	Masonry, C. E. 17.	Professor Constant
2	Experimental lab., Ex. E. 8.	Professor Kavanaugh
3	Electric power, E. E. 4.	Mr. Ryan.
5	Structural design, C. E. 14.	Professor Constant
2	Political science, P. S. 16.	Professor Schaper
4	Hydraulic engineering, C. E. 5.	Assistant Professor Bass

Second Semester

3	Biology, B. 2.	Assistant Professor Tilden
4	Bacteriology, P. B. 1.	Professor Wesbrook
5	Sanitary engineering, C. E. 6.	Assistant Professor Bass
2	Transportation, Ec. 9A.	Professor Robinson
2	Contracts and spec., M. E. 28.	Professor Flather
3	Thesis.	

COURSE IN SCIENCE AND TECHNOLOGY

SOPHOMORE YEAR

5	Mathematics, M. 3', 4'.	Professor Haynes, Professor Brooke
3	History or Chemistry, or French or English.	
6	Physics, P. 1.	Professor Jones and assistants
4	Drawing, D. 1, 3, 2, 4.	Professor Kirchner
1	Rhetoric, E. 1.	Professor Sanford, Mr. Gislason
3	Military Drill, M. S. 1.	Captain Sigerfoos

JUNIOR YEAR

First Semester

5	Mechanics, M. 7'.	Professor Eddy
3	Physics, P. 2.	Assistant Professor Zeleny
3	Drawing, D. 5.	Professor Kirchner
4	Technical work.	
4	Elective work.	

Second Semester

5	Mechanics, M. 8'.	Professor Eddy
2	Drawing, D. 5.	Professor Kirchner
5	Technical work.	
7	Elective work.	

SENIOR YEAR

12	Elective.
8	Technical work.

Courses of Instruction

ANIMAL BIOLOGY

PROFESSOR NACHTRIEB, PROFESSOR SIGERFOOS, ASSISTANT PROFESSOR
BROWN, ASSISTANT PROFESSOR DOWNEY

1. GENERAL ZOOLOGY PROFESSOR SIGERFOOS, ASSISTANT PROFESSOR
BROWN, ASSISTANT PROFESSOR DOWNEY
Three credits (four hours laboratory, two lectures per week) First and second semesters

Open to juniors, C. E. course.

This course is a comprehensive study of the principles of structure, physiology and development in animals. In the laboratory a brief study of insects and the dissection of the frog are used as a practical introduction to the course. Then follows a study of cell structure and cell division; a systematic study of representatives of the chief phyla or branches of the animal kingdom; and a study of the elements of embryology as illustrated by the development of the starfish and chick. Lectures, quizzes and laboratory work. Text-book required,—Hertwig's Manual of Zoology.

ASTRONOMY

PROFESSOR LEAVENWORTH, MR. BURNS

1. PRACTICAL ASTRONOMY PROFESSOR LEAVENWORTH
Three credits (three hours per week) Second semester
Sophomore C. E. course. Preparation: course M. 3.
Spherical co-ordinates; time; latitude; longitude, and other astronomical problems. Lectures.

BOTANY

PROFESSOR CLEMENTS, ASSISTANT PROFESSOR TILDEN, ASSISTANT PROFESSOR
ROSENDAHL

1. GENERAL BOTANY PROFESSOR CLEMENTS, ASSISTANT PROFESSOR TILDEN
Three credits (four hours laboratory, two lectures per week) First semester

Open to juniors, C. E. course.

A general survey of the subject, comprising laboratory study of the evolution and relationships of plants, greenhouse study of their behavior and structure, and field work in the identification and distribution of flowering plants. Lectures and quizzes, laboratory, greenhouse and field work.

2. BIOLOGY ASSISTANT PROFESSOR TILDEN
Three credits (six hours per week).
Required of seniors, municipal engineering course.
Brief course in general biology. Microscopical examination of samples of water for small plants and animals of frequent occurrence in public water supplies. Sedgwick-Rafter method.

CHEMISTRY

PROFESSOR FRANKFORTER, PROFESSOR SIDENER, ASSISTANT PROFESSOR
NICHOLSON, ASSISTANT PROFESSOR HARDING, MR. FRARY

2. **QUALITATIVE ANALYSIS** ASSISTANT PROFESSOR NICHOLSON, MR. FRARY
Three credits (six hours per week) First and second semesters
Required of all sophomores.
The course includes general reactions of the metals and their qualitative separation; reaction and identification of acids, followed by practical problems in qualitative analysis. Lectures and laboratory work.
3. **CHEMISTRY OF MATERIALS OF ENGINEERING** PROFESSOR SIDENER
Three credits (one lecture or recitation and four hours laboratory per week) First semester
Required of all juniors. Preparation: course 2.
Includes technical analysis of materials of engineering, with special references to iron and steel. Lectures and laboratory work.
4. **VOLUMETRIC ANALYSIS** PROFESSOR SIDENER
Three credits First semester
Required of sophomores, municipal engineering course. Preparation: course 2.
5. **WATER ANALYSIS** PROFESSOR FRANKFORTER
Three credits First semester
Optional, post-senior year C. E. course.
Sanitary chemical analysis of water. Samples collected by the students tested for nitrogen in its several conditions, chlorine, color, turbidity, hardness.
6. **FUEL AND GAS ANALYSIS** ASSISTANT PROFESSOR HARDING
The work includes an exhaustive chemical examination of fuels and the common gases, with a determination of their light and heat efficiencies. Lectures and laboratory work.

CIVIL ENGINEERING

HYDRAULIC AND MUNICIPAL ENGINEERING; SURVEYING

ASSISTANT PROFESSOR BASS, MR. HINCKLEY; MR. CUTLER

1. **SURVEYING** ASSISTANT PROFESSOR BASS, MR. CUTLER
Three credits, (five hours per week) Second semester
Required of juniors, C. E. course.
Recitations, lectures and illustrative problems relating to chaining, field problems employing chain; methods of keeping field notes; determination of area—D. M. D. and rectangular coordinate method. Methods of laying out and dividing land, including the public land surveys of the United States. The care, proper use and adjustment of all instruments used are treated in field exercises. Chain, compass and transit surveys are made and circuits of level-lines run by each party. All surveys made in the field are platted and areas computed. Solution of problems and usual office reduction of all field notes.
2. **SURVEYING AND TOPOGRAPHY** ASSISTANT PROFESSOR BASS, MR. HINCKLEY
Four credits, (eight hours) First semester
Senior C. E. course. Preparation: course 1.
A complete topographical survey is made and platted. The survey consists of a triangulation, followed by stadia and sketching.
3. **SURVEYING AND TOPOGRAPHY** MR. HINCKLEY
Four credits, (six hours per week) Second semester
Required of seniors, C. E. course.
Hydrographic, mining and municipal surveying. Use of plane-table, barometers: aneroid and mercurial. Determination of meridian by solar observation. Computation of earthwork.

4. SURVEYING MR. HINCKLEY
One credit, (one to two hours per week)
Elective, open to students in mechanical and electrical engineering courses.
A short course in the use, care and adjustment of surveying instruments.
5. HYDRAULIC ENGINEERING ASSISTANT PROFESSOR BASS
Four credits, (six hours per week) First semester
Post senior C. E. course.
Lectures and recitations followed by field problems in municipal water supply. Water power, irrigation, land drainage and river and harbor improvements.
6. MUNICIPAL ENGINEERING ASSISTANT PROFESSOR BASS
Four credits, (six hours per week) Second semester
Post senior C. E. course.
A continuation of course 5 in municipal water supply and sewerage. Adaptation of various structures to the solution of problems of hydraulics and public hygiene. Maintenance and operation by municipal governments. House drainage, garbage disposal, heating and ventilating of public buildings, are also reviewed.
7. HIGHWAYS AND PAVEMENTS ASSISTANT PROFESSOR BASS
Three credits, (four to five hours per week) Second semester
Required of juniors, C. E. course.
Lectures, recitations and field work relating to the economics, location, construction and maintenance of public highways and pavements
- THESIS ASSISTANT PROFESSOR BASS
Five credits (ten hours per week) Second semester
Post senior year
Excellent opportunities are offered for experimental work through the connection of the department with the State Board of Health.

RAILWAY ENGINEERING

MR. CUTLER, MR. HINCKLEY

9. RAILWAY ENGINEERING MR. CUTLER, MR. HINCKLEY
Six credits (ten hours per week) First semester
Post senior, C. E. course.
Study of the mathematics of curves and earthwork, with application to practical problems in location and construction. Preliminary and final location survey is made of about four miles of relocation, "profiles," "mass diagrams," description of right of way, complete estimate of cost. Text books: "Railroad Curves and Earthwork," Allen; "The Railroad Spiral," Searles.
10. RAILWAY ENGINEERING MR. CUTLER
Three credits, (six hours per week) First semester
Post senior C. E. course. Optional.
Recitations and drawing room work relating to the design and construction of railroad buildings and structures, such as wooden trestles, coaling stations, water stations, engine houses, etc. The object is to make the student familiar with all the principal structures which come under the supervision of the maintenance-of-way department of a modern railroad. Text book, "Track and Track Work," Tratman.
11. RAILWAY ENGINEERING MR. CUTLER
Three credits, (three hours per week) Second semester
Post senior, C. E. course. Optional.
Recitation and lectures covering the following subjects: economics of railroad location with a critical study of train resistance, influence of grade, curvature, distance, rise and fall, signaling, yards and stations, valuation of railroad property. Textbook: "Economics of Railroad Construction," Webb.

STRUCTURAL ENGINEERING

PROFESSOR CONSTANT, MR. KESNER

12. **STRESSES IN FRAMED STRUCTURES** PROFESSOR CONSTANT, MR. KESNER
 Three credits (three hours per week) First or second semester
 Open to senior students pursuing the course in mechanics of materials.
 Stresses in simple structures by graphic and algebraic methods. Mill building specifications and proportioning of parts. Design of roof trusses, simple beams and girders and roof truss bents. Recitations, problems and plates. Ketchum's Steel Mill Buildings. Handbooks of Steel Manufacturers.
13. **STRESSES IN FRAMED STRUCTURES** PROFESSOR CONSTANT, MR. KESNER
 Three credits, (three hours per week) Second semester
 Continuation of course 12, with special reference to stresses in bridge trusses under moving loads. Recitations, problems and plates. Burr and Falk's "Design and Construction of Metallic Bridges"; Burr and Falk's "Influence Lines."
14. **STRUCTURAL DESIGN** PROFESSOR CONSTANT, MR. KESNER
 Five credits (ten hours per week) First semester
 Post-senior. Open to students who have completed courses 12 and 13.
 Theory and design of steel structures, including mill buildings, railway and highway bridges, standpipes and towers and other problems of structural interest. Lectures, problems and design. Merriman and Jacoby's Roofs and Bridges, Part III. Standard Specifications.
15. **STRUCTURAL DESIGN** PROFESSOR CONSTANT, MR. KESNER
 Five credits, (ten hours per week) Second semester
 Post senior continuation of course 14.
 With special reference to the design of a steel railway bridge and the theory and design of steel arch bridges. Lectures, problems and designs. Merriman and Jacoby's Roofs and Bridges, Part IV.
16. **SWING BRIDGES** PROFESSOR CONSTANT
 Four credits, (eight hours per week) Second semester
 Post senior, C. E. course. Optional.
 Theory and design of swing and bascule bridges, with special attention to the design of the operating machinery. Moving structures. Lectures, problems and design. Merriman and Jacoby's Roofs and Bridges, Part IV. Reference works on machine design. Students intending to take this course are advised to elect machine design, M. E. 13, first semester, senior year.
17. **MASONRY CONSTRUCTION** PROFESSOR CONSTANT
 Five credits (seven hours per week) First semester
 Post senior, preparation: course 12.
 Foundations, design and use of cribs, cofferdams and pneumatic caissons, pressure of earth, design of retaining walls, piers, abutments, dams and chimneys. Properties of stones, bricks, cement and concrete. Recitations and lectures, three hours per week; drawing room work, four hours per week. Fowler's Deep Foundations; Taylor and Thompson's Concrete and Reinforced Concrete; Howe's Retaining Walls for Earth; and current periodical engineering literature.
18. **REINFORCED CONCRETE** PROFESSOR CONSTANT
 Three credits, (six hours per week) Second semester
 Post senior. Preparation: course 17.
 Theory and design of reinforced concrete beams, slabs and columns; application of reinforced concrete to buildings, dams, retaining walls and arches. Lectures, problems and design. Turneaure and Maurer's Principles of Reinforced Concrete.

DRAWING AND DESCRIPTIVE GEOMETRY

PROFESSOR KIRCHNER, MR. ROWLEY, MR. ROSE, MR. MCKEEHAN, MR. NEMEC

1. DRAWING MR. ROSE, MR. MCKEEHAN, MR. ROWLEY
Three credits (six hours per week) First semester
Required of all freshmen, in conjunction with course 3.
The elements of general drafting. Mechanical drawing as a language. Lines, views, dimensions, standards, signs, abbreviations and explanatory notes.
Sketching, lettering, tracing and blue printing. Representation of details of machines and structures, and the interpretation of working-drawings.
2. DRAWING MR. ROSE, MR. MCKEEHAN, MR. ROWLEY
Two credits (four hours per week) Second semester
Required of all freshmen. Preparation: courses 1, 3.
Continuation of course 1.
3. DESCRIPTIVE GEOMETRY PROFESSOR KIRCHNER, MR. ROWLEY,
MR. ROSE, MR. MCKEEHAN
One credit (one hour per week) First semester
Required of all freshmen. Open to students pursuing course 1.
Central projection and special cases; principles and applications. Representation of lines, planes, and solids, and of their relations; tangencies, intersections and developments.
Recitations, lectures and the solution of problems.
4. DESCRIPTIVE GEOMETRY PROFESSOR KIRCHNER, MR. ROWLEY,
MR. ROSE, MR. MCKEEHAN
Two credits (two hours per week) Second semester
Required of all freshmen.
Preparation: courses 1, 3.
Continuation of course 3.
5. DRAFTING PROFESSOR KIRCHNER, MR. ROWLEY, MR. ROSE
Three credits each semester (six hours per week) First and second semesters
Required of all sophomores. Preparation: courses 2, 4.
Graphics, machine drafting, structural drafting, and topography. Instruction in drafting room methods.
6. ELEMENTS OF ARCHITECTURE PROFESSOR KIRCHNER
Three credits First semester
Required of juniors, C. E. course. Preparation: course 5.
The orders and other fundamental forms; principles of design, the analysis of the characteristics of style, application of the elements in design.
7. TECHNICAL DRAWING PROFESSOR KIRCHNER, MR. ROWLEY, MR. ROSE
Three credits each semester (six hours per week) First and second semesters
Required of freshmen, analytical chemistry course.
Theoretical and practical graphics, the reading and making of working plans. Projection, sketching, lettering, conventions, renderings and translations.

FOR GRADUATES

8. DESCRIPTIVE GEOMETRY AND APPLICATIONS
9. PROJECTIVE GEOMETRY

ECONOMICS

PROFESSOR GRAY, PROFESSOR ROBINSON, MR. PHELAN

1. ELEMENTS OF ECONOMICS PROFESSOR ROBINSON, MR. PHELAN
Three credits (three hours per week) First or second semester
Required of juniors

A thorough course in the elements of economic theory, with special reference to present day economic and social problems.

McVey's Outline and a text book, supplemented by lectures and problems, with a weekly quiz.

9. A. ECONOMICS OF TRANSPORTATION AND COMMUNICATION

PROFESSOR ROBINSON
Second semester

Three credits (three hours per week)

Required of juniors. Preparation: course 1.

A general course on the history and theory of transportation and communication, with special reference to the United States. Early routes and methods of migration and commerce. Causes determining the location of railways. Effect of steam and electricity in the consolidation of industries and of nations.

Signal systems, the post, telegraph and telephone. Parcels post and express service. Economic functions and relations of highways, interurban electric lines, steam railways, inland waterways and ocean transportation. The organization of ocean commerce.

Lectures, assigned readings and discussions.

9. B. RAILWAY ECONOMICS

PROFESSOR ROBINSON
Second semester

Three credits (three hours per week)

Required, post senior year, railway M. E. course, preparation: course 9 A.

An advanced course devoted to the study of railway problems and administration, including: (1), conditions affecting economy of operation; (2), passenger and goods traffic; (3), underlying economic principles.

ELECTRICAL ENGINEERING

PROFESSOR SHEPARDSON, PROFESSOR SPRINGER, MR. RYAN, MR. SPERRY

1. APPLIED ELECTRICITY

PROFESSOR SHEPARDSON
Second semester

Three credits (three hours per week)

Required of juniors E. E. course.

Preparation: course P. 5.

Outline of industrial uses of electricity; applications of Ohm's law; methods and calculation of wiring.

2. ELECTRICAL MACHINERY

PROFESSOR SPRINGER

Three credits (six hours per week)

First and second semesters

Preparation: courses E. E. 1, P. 5, 6, and M. 5, 6.

Electrical engineering measuring instruments and their use; units; theory of dynamo electric machinery; methods of regulation, construction and operation of generators and motors; methods of testing.

4. ELECTRIC POWER

MR. RYAN

Three credits (four hours per week)

First or second semester

Required of seniors. C. E. course and School of Mines. Preparation: courses P. 5, 6.

Elements of theory and practice of electrical measurements, wiring, dynamos, motors and electric lighting. Twenty-four lectures and recitations and forty-eight hours laboratory. Textbook: Norris, Introduction to the Study of Electrical Engineering.

5. ELECTRIC POWER

MR RYAN

Three credits (four hours per week)

First and second semesters

Required of seniors. M. E. and Chemical courses. Preparation: courses P. 5, 6.

An elementary study of the electrical problems involved in the generation, distribution, measurement and utilization of power. Lectures, recitations and laboratory work, supplemented by numerous practical problems. Textbook: Franklin and Esty, Elements of Electrical Engineering Practice.

6. ALTERNATING CURRENTS PROFESSOR SHEPARDSON
Two and three credits (two or three hours per week)
First and second semesters
Post senior year. Preparation: courses 1, 2.
Phenomena, measurement and use of alternating currents; theory of line, transformer, generator and motor; types of apparatus.
Textbook: Steinmetz, Alternating Current Phenomena.
7. ELECTRICAL ENGINEERING PRACTICE. Batteries. MR. RYAN
One credit (one hour per week) First semester
Post senior year. Preparation: course 2.
General theory of primary and secondary cells; types and methods of construction; commercial applications; operation of battery plants; construction and test of cells by students; test of a commercial plant. Textbook: Lyndon, Storage Battery Engineering.
8. ELECTRICAL ENGINEERING PRACTICE. Lighting PROFESSOR SHEPARDSON
One credit (one hour per week) First semester
Post senior year. Preparation: course 2.
Comparison of different sources of light; photometry; physics of the arc; history, design and regulation of arc lamps; adaptation to constant current, constant potential and A. C. circuits; carbons; history, manufacture and economy of incandescent lamps; distribution of light.
9. ELECTRICAL ENGINEERING PRACTICE. Central stations MR. RYAN
Two credits (two hours per week) First or second semester
Post senior year. Preparation: courses 2, 6.
Preliminary surveys; choice of electrical systems; load diagrams; best units of power; comparison of steam, gas and water power; location, design and erection of station buildings; boilers, engines, dynamos, storage batteries, switch board and lines; operation and regulation; maintenance of plant; emergencies; examination of stations in Minneapolis and St. Paul.
10. ELECTRICAL ENGINEERING PRACTICE. Railways PROFESSOR SPRINGER
One credit (one hour per week) Second semester
Post senior year. Preparation: course 2 or 4.
History and development; different systems of distribution; location and calculation of feeders; line and track construction; choice of motors, trucks, generators and engines; operation and repairs. Text book: Gotshall, Electric Railway Economics.
11. ELECTRICAL ENGINEERING PRACTICE. Transmission PROFESSOR SHEPARDSON
One credit (one hour per week) Second semester
Post senior year. Preparation: courses 1, 2, 5.
Utilization of natural forces; various methods of transmission; theory of electric motor; power distribution with constant current, constant potential and alternating systems; design of line; study of particular plants.
12. ELECTRICAL ENGINEERING PRACTICE. Telegraph and telephone PROFESSOR SHEPARDSON
One or two credits (one or two hours per week) Second semester
Post senior year. Preparation: courses 1, 5.
Various systems and instruments used in local and long distance telegraphy and telephony; design and construction of switchboards and lines; protection from inductive and other disturbances; police, fire alarm and district messenger systems.
13. ELECTROCHEMISTRY PROFESSOR SHEPARDSON
One or two credits (one or two hours per week) First or second semester
Post senior year.
Theoretical and experimental study of electrolytic and electrothermal processes.

14. **ELECTRICAL DESIGN** MR. RYAN
 Three credits (six hours per week) First semester
 Post senior year. Preparation: courses P. 1, 2, E. E. 1, 2, and
 M. E. 13.
 Problems in designing circuits, electro-magnets and dynamos;
 complete working drawings and specifications to accompany
 each design.
15. **ELECTRICAL DESIGN** MR. RYAN
 Three credits (six hours per week) Second semester
 Post senior year. Preparation: courses 6, 14.
 Design of a transformer, switchboard and other problems.
16. **ELECTRICAL DESIGN** MR. RYAN
 Two credits (four hours per week) Second semester
 Post senior year. Preparation: courses 8, 14.
 Designs, specifications and estimates for an electric light or pow-
 er plant
17. **ELECTRICAL LABORATORY** PROFESSOR SPRINGER
 Three credits (six hours per week) First and second semester
 Senior year. Preparation: courses P. 5, 6, and E. E. 1, 2.
 Tracing circuits and locating faults; electrical engineering
 measurements; calibration of instruments; operation and char-
 acteristic curves of generators and motors.
18. **ELECTRICAL LABORATORY** PROFESSOR SPRINGER
 Three credits (six hours per week) First and second semesters
 Post senior year.
 Experimental study of alternating currents; regulation and effi-
 ciency tests of alternators, transformers, motors and rotaries;
 photometric tests of incandescent and arc lamps.
19. **ELECTRICAL LABORATORY** PROFESSOR SHEPARDSON, PROFESSOR SPRINGER
 One or two credits (two or four hours per week) First or second semester
 Post senior year. Efficiency tests and special problems.
20. **ELECTRICAL ENGINEERING MEASUREMENTS** PROFESSOR SPRINGER
 Application of measurements to electrical engineering practice.
 Lectures and laboratory.
21. **PLANT OPERATION** MR. RYAN, MR. DIXON
 One credit (equivalent to two hours per week) First or second semester
 Practice in operation and care of boilers, engines, motors,
 dynamos, battery and circuits of the University lighting plant.
22. **JOURNAL READING** PROFESSOR SHEPARDSON
 One credit First and second semester
 Post senior year.
 Weekly discussion of current electrical periodicals. The class
 meets monthly with the Minnesota Section of the American
 Institute of Electrical Engineers.
23. **PRECISE ELECTRICAL ENGINEERING MEASUREMENTS** PROFESSOR SPRINGER
 Preparation: course 19.
 Lectures and laboratory work. Precise measurements of re-
 sistance, voltage, current, self-induction and capacity; stand-
 ardization of measuring instruments. Open to a limited num-
 ber subject to approval.
24. **ILLUMINATING ENGINEERING** PROFESSOR SHEPARDSON
 Lectures and laboratory work. Investigation of performance of
 electric and gas lamps, reflectors and diffusers; luminous effi-
 ciency, distribution, color characteristics, physiological phenom-
 ena, methods of determining location, kind and quantity of
 lights for obtaining desired illumination.
25. **TELEPHONE ENGINEERING** PROFESSOR SHEPARDSON, PROFESSOR EDDY
 Lectures and laboratory work. Theoretical and experimental
 study of telephonic apparatus; lines and line phenomena, in-
 cluding induction, transpositions, loading coils, etc.

26. ALTERNATING CURRENT PHENOMENA PROFESSOR SHEPARDSON

Lectures and laboratory work. Study of wave forms, transient phenomena; oscillographic investigations; tests of apparatus.

Candidates for the degree of electrical engineer are required to take courses 1, 2, 6, 14, 15, 17, 18, also 68 hours class room work selected from courses 7 to 13.

NOTE.—Electives may be chosen from any courses given in the academic or engineering colleges for which the student has sufficient preparation. Attention is called to the following as desirable for electrical engineers.

Botany—Timber and timber diseases.

Chemistry—Quantitative analysis, fuel and gas analysis, electro-chemical analysis.

Civil engineering—Short course in surveying for seniors; masonry and construction, structural details; hydraulic engineering; railway economics.

Drawing—Advanced work.

Electrical engineering—Any courses not taken as required work (except 3, 4, and 5).

Geology—Mineralogy.

Language—English, French, German, Spanish.

Mathematics—Theory of turbines, hydraulic motors and wind engines; circular, hyperbolic and elliptic functions; wave theories of light, heat and electricity; directional calculus, vector analysis, differential equations, least squares.

Mechanical engineering—Measurement of power, air compressors and motors, shop work, heating and ventilation, machine design, railway technology, experimental laboratory, gas engines and producers.

Military science.

Physics—Advanced work on special problems.

Political science and economics—Money and banking, corporation finance, public finance, accounting, industrial problems.

ENGLISH

PROFESSOR SANFORD, MR. GISLASON

I. ENGLISH

Four credits (four hours per week) First and second semesters
Required of all freshmen.

This course is planned with special reference to the needs of engineering students. Two hours a week will be given to the study of English composition, and two hours to the study of a general survey of English literature. Essays will be required every week.

While in the study of literature one object will be the general broadening of the mind by an acquaintance with the masterpieces of English prose and poetry, especial attention will be given to the work of those writers who have handled scientific subjects with clearness and power.

EXPERIMENTAL ENGINEERING

PROFESSOR KAVANAUGH, MR. SHOOP

I. MATERIALS TESTING LABORATORY PROFESSOR KAVANAUGH, MR. SHOOP

Two credits (lecture and laboratory) First semester
Required of seniors. Open to those pursuing course M. 7.

Investigation of the strength and physical qualities of iron, steel, brass, copper, wood, belting, ropes, chains and cement. Supplemented by lectures on the various materials of construction and standard methods of testing.

2. STEAM LABORATORY PROFESSOR KAVANAUGH, MR. SHOOP
Two credits (lecture and laboratory) Second semester
Required of senior E. E. Open to those pursuing course M. E. 20.
Valve setting, indicator practice, calibration of gages, calorimetry, efficiency of screws, hoists and other machines.
3. HYDRAULIC LABORATORY PROFESSOR KAVANAUGH, MR. SHOOP
Two credits (lecture and laboratory) Second semester
Required of senior C. E. Open to those pursuing course M. 8
Hydraulic measurements, calibration of weirs, nozzles, orifices and meters. Tests of water motors, rams, pulsometers, steam and power pumps and other hydraulic apparatus.
4. EXPERIMENTAL LABORATORY PROFESSOR KAVANAUGH, MR. SHOOP
Three credits
Required of senior M. E. Open to those pursuing courses M. 8 and M. E. 20.
Special modification of courses 2 and 3.
5. EXPERIMENTAL LABORATORY PROFESSOR KAVANAUGH
Two credits Second semester
Required of senior miners.
Special modification of courses covering work in hydraulic measurements, gas and steam engine and boiler testing.
6. EXPERIMENTAL LABORATORY PROFESSOR KAVANAUGH
Three credits First semester
Required of post senior M. E.; preparation: course 4.
Calibration of dynamometers and measurement of power.
Testing lubricating value of oils. Tests of injectors and ejectors. Tests of steam-turbines, steam-engines and boilers, and complete power and lighting plants.
7. EXPERIMENTAL LABORATORY PROFESSOR KAVANAUGH
Two credits First semester
Required of post senior E. E. Preparation: courses, M. 8 and M. E. 20.
Hydraulic measurements. Tests of water motors, rams, steam and power pumps. Measurement of power. Tests of gas and steam engines, boilers and complete power and lighting plants.
8. EXPERIMENTAL LABORATORY PROFESSOR KAVANAUGH
Three credits First semester
Elective for post seniors. Preparation: course 1. Tests of the properties of cements, concrete and reinforced concrete. Strength of beams, columns, joints and framed structures.
9. GAS ENGINE LABORATORY PROFESSOR KAVANAUGH
Three credits Second semester
Required of post senior M. E. Preparation: courses M. E. 21 and Ex. E. 6. A continuation of course 6, also tests of gas, gasoline and hot-air engines; gas producers, air compressors, automobile and locomotive testing and special work.
10. EXPERIMENTAL LABORATORY PROFESSOR KAVANAUGH
Two or four credits Second semester
Elective for post seniors. Special research work and commercial tests.
- FOR CLASSES GRADUATING IN 1909, 1910 and 1911.
1. MATERIALS TESTING LABORATORY; two credits required of juniors
First semester
2. STEAM LABORATORY; two credits, required of juniors, M. E. and E. E. Second semester
3. HYDRAULIC LABORATORY; two credits, required of juniors M. E. and C. E. Second semester
5. EXPERIMENTAL LABORATORY; two credits, required of senior miners. Second semester
6. EXPERIMENTAL LABORATORY; three credits, required of senior M. E. First semester

7. EXPERIMENTAL LABORATORY; three credits required of senior E. E. First semester
 8. EXPERIMENTAL LABORATORY; two credits (elective), First semester
 9. GAS ENGINE LABORATORY; four credits required of senior M. E. Second semester
 10. EXPERIMENTAL LABORATORY; two or four credits (elective) Second semester
- Description and prerequisites of the above courses as previously stated.

FRENCH AND SPANISH

PROFESSOR BENTON, ASSISTANT PROFESSOR ANDRIST, ASSISTANT PROFESSOR
FRELIN, MR. MELOM

1. BEGINNING ASSISTANT PROFESSOR ANDRIST,
ASSISTANT PROFESSOR FRELIN
Three credits (three hours per week) First and second semesters
Open to freshmen.
Fraser and Squair's *French Grammar and Reader*; modern texts.
2. INTERMEDIATE FRENCH ASSISTANT PROFESSOR FRELIN
Three credits (three hours per week) First and second semesters
Open to sophomores who have completed course 1.
Francois, *Advanced French Prose Composition*; modern texts
will be read, including some of the works of Merimee, Daudet,
Scribe, etc.
3. ADVANCED FRENCH GRAMMAR AND COMPOSITION ASSISTANT PROFESSOR ANDRIST
Three credits (three hours per week) First and second semesters
Open to all who enter the university with two years of French.
Francois' *Introduction to French Composition*; readings from
modern authors, including selections from Copee, Feuillet,
and Sandeau.
5. THE CLASSICAL PERIOD OF FRENCH LITERATURE PROFESSOR BENTON
Three credits (three hours per week) First and second semesters
Open to those who have completed course 2 or 3.
The reading of works and selections produced during the
classical period of French literature, and conversations in
French concerning the same. The works of Corneille, Ra-
cine, Moliere, La Fontaine, etc. Compositions.
11. BEGINNING SPANISH MR. MELOM
Three credits (three hours per week) First and second semesters
Monsanto and Languellier *Spanish Course-Josselyn*. Worman,
First Spanish Book. Bransby's Spanish Reader.
12. INTERMEDIATE SPANISH MR. MELOM
Three credits (three hours per week) First and second semesters
Open to those who have completed F. 11.
First Semester; Loiseaux, Spanish Composition. Brownell, *El
Pizarro Verde*.
Second Semester: Gray's *Fortuna*; Alarco's *El Capitan Veneno*.

GEOLOGY AND MINERALOGY

PROFESSOR HALL, ASSISTANT PROFESSOR SARDESON

1. GEOLOGY ASSISTANT PROFESSOR SARDESON
Three credits (three hours per week) First semester
Required of sophomores C. E. course.
A condensed course in physical and historic geology, for civil
engineers. Geodynamics, structural geology, physiography,
stratigraphic and historical geology are treated of successively.
Excursions to typical localities will supplement work done in
the class room. Lectures and references.

GERMAN LANGUAGE AND LITERATURE

PROFESSOR MOORE, ASSISTANT PROFESSOR JUERGENSEN, MR. BURKHARD

1. BEGINNING ASSISTANT PROFESSOR JUERGENSEN, MR. BURKHARD
Three credits (three hours per week) First and second semesters
Open to all.
Pronunciation, grammar, conversation and composition; selected reading in easy prose and verse.
3. SCIENTIFIC INTERMEDIATE ASSISTANT PROFESSOR JUERGENSEN
Three credits (three hours per week) First and second semesters
Open to all who have completed course 1. First semester:
Hodge's German Science Reader (or equivalent). Second
semester: Brandt and Day's German Scientific Reading. This
course aims to give the student a reading knowledge of German
for use in scientific studies.
4. PROSE AND POETRY PROFESSOR MOORE, ASSISTANT PROFESSOR
JUERGENSEN, MR. BURKHARD
Three credits (three hours per week) First and second semesters
Open to all who enter the university with two years of German.
First semester: Meissner's *Aus Deutschen Landen*; Goethe's
Gedichte. Second semester: Schrakamp's *Berühmte Deutsche*;
Heine's *Buch der Lieder*. Geography, history and legend. Re-
view of German grammar throughout the year. This course
may be supplemented.
7. ADVANCED SCIENTIFIC READING ASSISTANT PROFESSOR JUERGENSEN
Three credits (three hours per week) First and second semesters
Open to those who have taken course two, three or four. Read-
ing of monographs and periodicals.

MATHEMATICS AND MECHANICS

PROFESSOR EDDY, PROFESSOR HAYNES, PROFESSOR BROOKE, ASSISTANT
PROFESSOR NEWKIRK, MR. HOVDA

The ability to understand and apply mathematical processes read-
ily is regarded as essential to the engineer. The aim of these
courses is to cultivate this ability so far as possible. To
this end special emphasis is laid upon two things: elucida-
tion of principles and drill upon their applications, as furnish-
ing the only sure basis for a thorough technical and profes-
sional training. Courses 1 to 8 inclusive must be taken in the
order indicated, and in order to enter upon the work of any
year the student must have attained a passing mark on all
the required courses in preceding years.

1. HIGHER ALGEBRA AND ANALYTICAL TRIGONOMETRY PROFESSOR HAYNES,
ASSISTANT PROFESSOR NEWKIRK, MR. HOVDA
Five credits (five hours per week) First semester
Required of all freshmen. Theory of exponents, series, unde-
termined coefficients, determinants, theory of equations, graphs,
logarithms, trigonometric transformations.
2. PLANE AND SPHERICAL TRIGONOMETRY AND ANALYTICAL GEOMETRY
TO CONIC SECTIONS PROFESSOR HAYNES, ASSISTANT PROFESSOR
NEWKIRK, MR. HOVDA
Five credits (five hours per week) Second semester
Required of all freshmen. Properties of plane triangles and
their solution by logarithmic tables and the slide rule; general
properties and solution of spherical triangles; introduction to
analytical geometry, transformation of co-ordinates, the right
line and circle.
3. ANALYTICAL GEOMETRY OF TWO AND THREE DIMENSIONS
PROFESSOR HAYNES, PROFESSOR BROOKE
Four credits (four hours per week) First semester
Required of all sophomores. Conic sections and other loci; the
point, line, plane and quadric.

4. DIFFERENTIAL AND INTEGRAL CALCULLUS PROFESSOR HAYNES,
PROFESSOR BROOKE
 Four credits (four hours per week) Second semester
 Required of all sophomores. Differentiation and integration, expansion in series, maxima and minima, differential properties of curves and surfaces, indeterminate forms, evolutes and envelopes, curve tracing.
5. CALCULUS AND MECHANICS PROFESSOR HAYNES, PROFESSOR BROOKE,
ASSISTANT PROFESSOR NEWKIRK
 Three credits (three hours per week) First semester
 Required of all juniors. Integration; rectification, quadrature, cubature, mean value, center of pressure, center of gravity, moments of inertia, differential equations of motion, linear differential equations.
6. ANALYTICAL MECHANICS PROFESSOR HAYNES, PROFESSOR BROOKE,
ASSISTANT PROFESSOR NEWKIRK
 Three credits (three hours per week) Second semester
 Required of all juniors. Before registration for this course the student must pass the required physics of sophomore year in addition to the required mathematics, courses 1 to 5 inclusive. Statics and dynamics, rectilinear, circular and harmonic motion, and curvilinear motion in general, dynamics of rigid bodies, impact, work and energy.
7. STRENGTH AND RESISTANCE OF MATERIALS PROFESSOR EDDY,
PROFESSOR BROOKE, ASSISTANT PROFESSOR NEWKIRK
 Prerequisite, course 6. First semester
 Four credits (four times per week)
 Required of all seniors. Mechanical and elastic properties of materials of construction; beams, shafts, columns, reinforced concrete, hollow cylinders and spheres, rollers, plates; theory of internal stress.
8. HYDRAULICS AND PUMPING MACHINERY PROFESSOR EDDY,
PROFESSOR BROOKE, ASSISTANT PROFESSOR NEWKIRK
 Prerequisite, course 6. Second semester
 Four credits (four times per week)
 Required of all seniors. Laws of equilibrium, pressure and flow of liquids; theory of the action of pumps.
9. THERMODYNAMICS OF STEAM AND GAS ENGINES PROFESSOR EDDY
 Three credits (three times per week) First semester
 Required of all candidates for degrees in mechanical and electrical engineering. Prerequisite, course 8. The mechanical theory of heat as applied to steam, oil, gas and hot air engines and to compressors including use of steam tables, entropy diagrams, etc.
10. WATER TURBINES PROFESSOR EDDY
 Two credits (two times per week) Second semester
 Required of all candidates for degrees in mechanical and electrical engineering except those who elect either railway engineering or telephony. Theory of the operation, construction and regulation of turbine wheels.
11. STEAM TURBINES PROFESSOR EDDY
 Two credits (two times per week) Second semester
 Open to all who have had course 9 and are pursuing course 10. Various types of turbines, velocity, impulse, and reaction; nozzles, vanes, discs, bearings, governors, thermodynamic analysis and efficiency.
12. REFRIGERATING MACHINERY PROFESSOR EDDY
 Two credits (two hours per week) Second semester
 Open to those who have had course 10. The course will be given when a sufficient number apply.
 Ammonia compression and absorption machines, compressed air, carbonic acid, etc.

FOR GRADUATES

Courses in the following related subjects in mathematics, mathematical physics and theoretical mechanics are open to those who have had sufficient preparation, but they are primarily intended for graduates.

13. Differential Equations
14. Analytical Statics and Potential Functions
15. Spherical Harmonics
16. Theory of Electricity and Magnetism
17. Analytical Theory of the Conduction of Heat
18. Theory of Elasticity and Sound
19. Electro-magnetic Theory of Light
20. Hydrodynamics and Fluid Motion
21. Dynamics of Rigid Bodies
22. Elliptic Functions
23. Theory of Functions of the Complex Variable
24. Directional Calculus, Vector Analysis, Determinants
25. Kinetic Theory of Gases

FOR CLASSES GRADUATING 1909, 1910, 1911

- 3'. ANALYTICAL GEOMETRY AND ELEMENTARY CALCULUS PROFESSOR
HAYNES, PROFESSOR BROOKE
Five credits, (five hours per week) First semester
Required of all sophomores. Conic sections and other loci; analytical geometry of three dimensions, including the point, straight line and plane and the quadric; differentiation and integration.
- 4'. CALCULUS PROFESSOR HAYNES, PROFESSOR BROOKE
Five credits (five hours per week) Second semester
Required of all sophomores. Differential coefficients, expansions in series, maxima and minima, differential properties of curves and surfaces, indeterminate forms, evolutes and envelopes, curve tracing, rectification, quadrature, cubature, center of gravity, center of pressure, moment of inertia.
- 7'. STRENGTH AND RESISTANCE OF MATERIALS PROFESSOR EDDY
Five credits, (five hours per week) First semester
Required of all juniors in the civil engineering course. Before registration for this course the student must pass the required physics of sophomore year in addition to the required mathematics of the two preceding years. Bars, beams, shafts, columns, reinforced concrete, hollow cylinders and spheres, rollers and plates and the general theory of internal stress.
- 7a'. APPLIED MECHANICS PROFESSOR BROOKE, ASSISTANT PROFESSOR
NEWKIRK
Five credits, (five hours per week) First semester
Required of all juniors in the mechanical and electrical engineering courses. Prerequisites the same as course 7'. The principles of statics and dynamics, and the mechanics of the materials of construction.
- 8'. HYDRAULICS AND PUMPING MACHINERY PROFESSOR EDDY, PROFESSOR
BROOKE, ASSISTANT PROFESSOR NEWKIRK
Five credits (five hours per week) Second semester
Required of all juniors. Prerequisite course 7' or 7a'. Laws of the equilibrium, pressure and flow of liquids; theory of the action of pumps, compression and flow of gases.
- 9'. THERMODYNAMICS OF STEAM AND GAS ENGINES PROFESSOR EDDY
Three credits (three hours per week) First semester
Required of all candidates for degrees in mechanical and electrical engineering. Prerequisite, course 8'. The mechanical theory of heat as applied to steam, oil, gas and hot air engines and to compressors, including the use of steam tables, entropy diagrams, etc.

- 10'. WATER TURBINES PROFESSOR EDDY
 Two credits, (two hours per week) First semester
 Required of all candidates for degrees in mechanical and electrical engineering, except those who elect either railway engineering or telephony. Theory of the operation, construction and regulation of turbine wheels.
- 11'. STEAM TURBINES PROFESSOR EDDY
 Two credits (two hours per week) First semester
 Open to all who have had courses 9' and 10'. Various types of turbines, velocity, impulse and reaction; nozzles, vanes, discs, bearings, governors, thermodynamic analysis and efficiency.
- 12'. REFRIGERATING MACHINERY PROFESSOR EDDY
 Two credits (two hours per week) Second semester
 As previously stated.

MECHANICAL ENGINEERING

PROFESSOR FLATHER, MR. MARTENIS, MR. SHOOP, MR. SHIPLEY,
 MR. RICHARDS, MR. PETERSON, MR. QUIGLEY, MR. HERRICK

SHOP WORK

1. CARPENTRY AND PATTERN MAKING MR. RICHARDS
 Four credits (six hours per week, twenty-four weeks) First and second semester
 Required of all freshmen.
 Wood working, use of tools; lathe and bench work. Patterns for moulding, core boxes, flasks. Lectures and practice.
2. BLACKSMITHING MR. SHIPLEY AND MR. QUIGLEY
 Two credits (six hours per week, twelve weeks) First or second semester
 Required of all freshmen.
 Use of tools, forging, welding, tool dressing, tempering. Lectures and practice.
3. FOUNDRY PRACTICE MR. PETERSON
 Three credits (six hours per week) First or second semester
 Required of all M. E. and E. E. sophomores.
 Moulding, casting, mixing metals, brass work and core making. Shop practice, recitations and lectures.
4. MACHINE AND BENCH WORK MR. SHIPLEY
 Three credits (six hours per week) First or second semester
 Required of all M. E. and E. E. sophomores.
 Chipping, filing, machine work. Lectures and practice.
5. TOOL CONSTRUCTION MR. SHIPLEY
 Four credits (eight hours per week) First semester
 Required of juniors, M. E. course. Preparation: course 5.
 Tools, taps, reamers, cutters and other special work. Lectures and practice.
6. MACHINE CONSTRUCTION MR. SHIPLEY
 Four credits (eight hours per week) Second semester
 Required of juniors, M. E. course. Preparation: course 5.
 Gear cutting, finishing, machine construction. Lectures and practice.
7. CARPENTRY, JOINERY AND WOOD CARVING MR. RICHARDS
 Four credits (eight hours per week) First or second semester
 Open to all students.
 A course in wood working designed with special reference to the needs of teachers of manual training.
8. MACHINE CONSTRUCTION MR. SHIPLEY
 Four credits (eight hours per week) First or second semester
 Elective. Open to seniors.
 Construction of patterns and machine work for special apparatus or machinery designed by the students.

9. **SHOP ECONOMICS** PROFESSOR FLATHER
Two credits (two hours per week) Second semester
Senior elective.
Shop and factory organization and management; cost systems.
10. **ENGINE ROOM PRACTICE** MR. MARTENIS, MR. DIXON
One credit (equivalent to two hours per week) First or second semester
Elective, post senior year.
Operation and maintenance of gas producers, gas engines, boilers, engines, steam turbines and accessory apparatus. Smoke prevention.

MACHINE DESIGN

11. **PRINCIPLES OF MECHANISM** MR. MARTENIS
Three credits (three hours per week, lectures and recitations) First semester
Required of juniors, M. E. and E. E. courses. Preparation: course M. 4.
The transmission of motion without consideration of the strength of parts. Gear wheels, linkages, belts, screws, epicyclic trains, parallel motions, quick-return movements.
12. **KINEMATICS AND ELEMENTARY MACHINE DESIGN** MR. MARTENIS
Three credits (six hours per week) Second semester
Required of juniors, M. E. and E. E. courses. Preparation: course M. 4.
Graphical diagrams of the paths, speeds and accelerations of important mechanisms; centroids, analysis of mechanisms; construction of cams; roulettes, tooth profiles; kinematic pairs; machine parts.
13. **MACHINE DESIGN** PROFESSOR FLATHER AND MR. MARTENIS
Five credits (ten hours per week) First semester
Required of seniors, M. E. and E. E. courses. Open only to students pursuing course M. 7.
Calculation and design of such machine parts as fastenings, bearings, rotating pieces, pulleys and spur gearing. Recitations, lectures and drawing-room practice.
14. **MACHINE DESIGN** PROFESSOR FLATHER, MR. MARTENIS
Three credits (six hours per week) Second semester
Required of seniors, M. E. course. Open only to those pursuing course 20.
Continuation of course 13. Rope driving; bevel gears, spiral gears. Also application of graphical methods to the design of valve gears and link motions. Zeuner diagrams, indicator cards. Lectures and drawing-room practice.
15. **MACHINE DESIGN** PROFESSOR FLATHER
Four credits (eight hours per week) First semester
Required, post senior year, M. E. course. Preparation: courses 14, 19.
Steam engine. Calculations and working drawings for a high speed automatic steam engine. Theoretical diagrams and determination of details.
Gas engine. An alternative course in gas engine design is offered those who have completed course 21.
16. **MACHINE DESIGN** PROFESSOR FLATHER
Four credits (eight hours per week) Second semester
Required, post senior year, M. E. course. Preparation: course 13.
Original designing, including machinery for changing size and form. Boiler design, cranes, pumping and transmission machinery and engineering appliances. Lectures, problems and drawing-room practice.

17. **TOOL DESIGN**
Two to four credits (four or eight hours per week) PROFESSOR FLATHER
First or second semester
Post senior year, elective.
Preparation: courses 6, 13.
Design of special tools for manufacturing interchangeable parts;
jigs and milling fixtures
18. **ENGINEERING DESIGN**
Two or four credits (four or eight hours per week) PROFESSOR FLATHER
First or second semester
Elective. Preparation: courses 19, 20.
Problems, designs and estimates for power plants, central stations and factory equipment. Selection of motive powers, relative advantages of steam and producer gas plants; choice of engines and boilers; water powers; power distribution, dynamos and motors; pumps, shafting, piping and accessory plant.
- STEAM ENGINEERING AND PRIME MOVERS**
19. **STEAM BOILERS**
One credit (one hour per week) MR. SHOOP
First semester
Senior year. Open only to students pursuing course M. 7.
Application of theory and practice in the design and construction of steam boilers, chimneys, boiler settings, and accessories, smoke prevention, mechanical stokers; methods of operating boilers with safety and economy.
20. **STEAM ENGINE**
Three credits, (three hours per week) PROFESSOR FLATHER
Second semester
Senior year, preparation: course M. 7.
Mechanics of the steam engine. Work in the cylinder; effect of reciprocating parts; steam distribution. Mechanism of the steam engine. A study of the details of modern steam engines. Valves and valve gears. A study of the slide valve, link motions, and other reversing gear; automatic cut-off gears and the Zeuner diagram. The steam engine indicator. Principles and operation of the instrument, indicator rigging; indicator cards; compounding.
21. **GAS ENGINES AND PRODUCERS**
Two credits, (two hours per week) MR. SHOOP
Second semester
Senior year. Open only to students pursuing course C. 6.
Principles of operation of two cycle and four cycle engines; cylinder construction and arrangement; valve gears and starting mechanisms; system of speed control, ignition and cooling. Application of the indicator and consideration of indicator diagrams.
A study of the power gas producer including suction and pressure types for various fuels; construction and operation of the generator and accessory apparatus. Application to various industrial purposes. Recitations and lectures.
22. **MECHANICAL ENGINEERING**
Two credits (two hours per week) PROFESSOR FLATHER
First semester
Post senior. Preparation: course M. 8.
Measurement of power. A study of the methods employed in measuring power. Dynamometers. Prony brakes; measurement of water power; water meters; weir measurement, flow of water in pipes; measurement of electric power, efficiency of motors, power required to drive machine tools and shafting. Recitations and lectures.
Two credits (two hours per week) Second semester
Elective, post-senior. Preparation: course M. 8.
Air compressors and motors, and the transmission of power by compressed air. Recitations and lectures.

23. **MECHANICAL ENGINEERING** MR. MARTENIS
 Three credits (six hours per week)
 Elective. Post senior year.
 Heating and ventilation. Principles of heating and ventilation.
 Construction and operation of heating apparatus. Steam,
 hot water, exhaust, vacuum and fan systems. Lectures, reci-
 tations and design.
 Seminar. Open to seniors and post seniors once a week.

RAILWAY MECHANICAL ENGINEERING

The following courses are available to students desiring to prepare them-
 selves for special work in railway engineering.

24. **RAILWAY TECHNOLOGY** MR. MARTENIS
 Two credits (four hours per week)
 Post senior. Railway M. E. course.
 The object of this course is to familiarize the student with the
 principal details of construction of locomotives, and consists in
 part of a systematic course of visits to the various railroad
 shops in the vicinity; lectures and recitations.
25. **RAILWAY DESIGN** PROFESSOR FLATHER
 Four credits (eight hours per week) First and second semesters
 Post senior. Preparation: course 24.
 (a) Of link and valve motions. Continuation of course 12
 with special applications of the Stephenson link.
 (b) Of locomotive and car details.
 (c) Of the locomotive boiler.
 (d) Of assembled parts.
26. **LOCOMOTIVE CONSTRUCTION** PROFESSOR FLATHER
 Two credits (two hours per week) Second semester
 Post senior. Preparation: course 24.
 Lectures, reading and recitations on design and construction of
 locomotives, supplementing course 24. This treats
 (a) Of parts not involving the boiler and the use of steam;
 but including the carriage, as frames, springs and equaliz-
 ing arrangements, running gear, brakes, trucks, lubrication.
 (b) Of locomotive boilers and connected parts. Types, propor-
 tions, grates, flues, smoke-box arrangements and stacks,
 riveted joints, bracing and staying. Lagging, smoke pre-
 vention.
 (c) Of the locomotive engine. Details, heat insulation, cylinder
 proportion for various types, weight on drivers, special
 service; crank effort diagrams with inertia of reciprocating
 parts, cylinder and receiver ratios for compound engines,
 starting valves for compounds.
27. **LOCOMOTIVE ROAD TESTING** PROFESSOR FLATHER
Second semester
 Post senior.
28. **SPECIFICATIONS** PROFESSOR FLATHER
Second semester
 One credit (one hour per week)
 Post senior year, M. E. course.
 A study of engineering specifications. Classes of specifications;
 essential features; clauses; details. Examples. Lectures, reci-
 tations and practice in writing specifications.

FOR GRADUATES

Courses are offered in:
 Engineering design.
 Experimental investigation.
 Railway engineering.

MILITARY SCIENCE AND TACTICS

1. MILITARY DRILL CAPTAIN SIGERFOOS
(Three hours per week) First and second semesters

Drill is required of all men in the freshman and sophomore classes.

Freshman—Practical instruction in schools of the soldier, company and battalion; signals, ceremonies; schools of the cannoneer and battery.

Sophomore—Practical and theoretical instruction in schools of the company and battalion; advance and rear guard drill; practical and theoretical instruction in guard duty. Gallery practice. Ceremonies.

For the instruction in military drill and administration the students are organized into a corps of cadets, consisting of four battalions of infantry, a band and a platoon of artillery.

A uniform of prescribed pattern is worn by all cadets during drill.

The uniform consists of blouse, trousers and cap, modelled after the U. S. Military Academy cadet uniform, and costs in Minneapolis about \$15.

Military drill may be taken voluntarily by others outside of the freshman and sophomore classes; and to encourage this, as it is considered beneficial, not only to the individual student, but to the State generally, the extra work is encouraged by allowing a year's drill to count as a two-hour credit for one semester, but no credit will be allowed for such drill for less than one year.

2. MILITARY SCIENCE CAPTAIN SIGERFOOS
(Two hours per week) Second semester
Optional with seniors and juniors.

Junior, senior—Theoretical instruction—Advance and rear guards, outposts, reconnaissance, camping, duties of company commander, articles of war, records.

This work when satisfactorily completed taken in connection with the year's drill will give a four-hour credit for the semester.

Military instruction is intended to be so conducted as to develop a soldier-like bearing and foster a spirit of gentlemanly courtesy, soldierly honor and obedience to lawful authority, as well as to familiarize students with company and battalion manoeuvres, guards and the theoretical and practical use of firearms.

On graduation of each class the Commandant will report to the Adjutant General of the Army the names of the graduates who have shown special aptitude for the military service and furnish a copy thereof to the Adjutant General of the State.

The officers and non-commissioned officers are required to be good students in the other departments, soldier-like in the performance of their duties, exemplary in their general deportment and able to pass a creditable examination in drill regulations. In general, the officers are selected from the senior class; the sergeants from the junior class; and the corporals from the sophomore class.

PATHOLOGY AND BACTERIOLOGY

PROFESSOR WESBROOK, ASSISTANT PROFESSOR HILL, DR. PRATT

1. BACTERIOLOGY PROFESSOR WESBROOK
(Four credits) Second semester
Post senior C. E. course, optional.
Brief course in general bacteriology. Preparation of media and study of cultures, especially those of pathogenic bacteria found in water and sewage

PHYSICS

PROFESSOR JONES, PROFESSOR J. ZELENY, ASSISTANT PROFESSOR A. ZELENY,
ASSISTANT PROFESSOR ERIKSON, MR. KOVARIK

5. MECHANICS OF SOLIDS AND FLUIDS PROFESSOR JONES, PROFESSOR
J. ZELENY, ASSISTANT PROFESSOR A. ZELENY,
ASSISTANT PROFESSOR ERIKSON, MR. KOVARIK
Four credits, (three recitations, one lecture or two hours laboratory)
First semester
Open to those who have completed courses M. 1, 2.
Required of sophomores.
The course consists of a thorough drill in the elementary principles of mechanics. Numerous simple problems are taken up to illustrate the principles. Laboratory work will continue through the first part of the semester and will then be replaced by experimental lectures
6. HEAT, MAGNETISM AND ELECTROSTATICS PROFESSOR JONES, PROFESSOR
J. ZELENY, ASSISTANT PROFESSOR A. ZELENY,
ASSISTANT PROFESSOR ERIKSON, MR. KOVARIK
Four credits (one lecture, two recitations and two hours laboratory)
Second semester
Open to those who have completed course 5.
Required of sophomores.
The fundamental principles of the subjects are studied, mainly from the experimental side. The laboratory work consists of the measurement of the most important quantities involved, and the lectures aim to illustrate the various phenomena which are studied.
7. ELECTROKINETICS PROFESSOR JONES, PROFESSOR J. ZELENY, ASSISTANT
PROFESSOR A. ZELENY, ASSISTANT
PROFESSOR ERIKSON, MR. KOVARIK
Four credits, (one lecture, two recitations and two hours laboratory)
First semester
Open to those who have completed course 6. Required of juniors.
A study is made of the phenomena accompanying the passage of electricity through solids, liquids and gases, and of the various laws which govern such discharges. Not only are the basic principles of electrical engineering taken up, but a brief study is made of ionization, the X-rays, radioactivity, electric waves and wireless telegraphy. Measurements of the various electrical quantities are made in the laboratory.
8. SOUND AND LIGHT PROFESSOR JONES, PROFESSOR J. ZELENY, ASSISTANT
PROFESSOR ERIKSON, MR. KOVARIK
Four credits, (one lecture, two recitations and two hours laboratory)
Second semester
Open to those who have completed course 5. Required of juniors.
The course consists of a study of wave motion and the various phenomena of sound and light. The lectures are profusely illustrated with experiments showing the various effects studied. The laboratory work is aimed to aid the student to a better insight of some of the relations which obtain in the subjects.
9. ADVANCED ELECTRICAL MEASUREMENTS ASSISTANT PROFESSOR A. ZELENY
One credit (two hours laboratory work)
Second semester
Open to those who have completed course 7.
Required of juniors, E. E. course.
This course is devoted mainly to the study and measurements of capacity, inductance and magnetic induction, and gives a thorough knowledge of the accurate determination of these quantities.

FOR CLASSES GRADUATING IN 1909-1910-1911

The mathematics of the freshman year is required as preparation for all courses in this department.

1. PHYSICS PROFESSOR JONES AND ASSISTANTS
Six credits, (two lectures, three recitations and two hours laboratory per week) First and second semesters
(a) Mechanics, heat, and sound.
(b) Electricity, magnetism, and light.
2. ELECTRICAL MEASUREMENTS ASSISTANT PROFESSOR A. ZELENY
Three credits (one lecture or recitation and four hours laboratory per week) First semester
3. ADVANCED LABORATORY WORK PROFESSOR JOHN ZELENY
Open to those who have completed course 2.

POLITICAL SCIENCE

PROFESSOR SCHAPER, MR. ALLIN

16. AMERICAN GOVERNMENT PROFESSOR SCHAPER, MR. ALLIN
Two credits, (two hours per week) First semester
Required of all seniors.
An introductory course in political science. It includes a study of the organization and present workings of our national, state and local government, and serves as an introduction to course 6.
6. ENGINEERING LAW MR. ALLIN
Two credits (two hours per week) Second semester
Required of all seniors. Preparation: course 16.
A course in the elements of law especially designed for engineering students. It includes a study of the system of federal and state courts, the jury system, the law of contracts, corporations, partnerships and limited partnerships, administrative law, the rights and duties of citizenship and some leading features of the law of real and personal property and the law of riparian rights.

Students

SENIOR CLASS

CIVIL ENGINEERS—26

Ash, J. Wesley, Wendell.
Borrowman, Le Roy, Stillwater.
Brenchley, Harry E., Minneapolis.
Comstock, John Walter, Minneapolis.
Dallimore, Arthur N., St. Paul.
Doeltz, William F., Minneapolis.
Dougan, Henry K., Minneapolis.
Fiske, F. William, St. Paul.
Fleming, Douglas R., St. Paul.
Furber, Pierce P., Northfield.
Gage, Hugh Newton, Winona.
Houston, Cecil C., Minneapolis.
Hustad, Andrew P., Minneapolis.
Knowlton, Herbert H., Minneapolis.
Krauch, William L., St. Paul.
Lang, Fred, Spokane, Wash.
Longfellow, Dwight W., Minneapolis.
McCall, Harry J., Minneapolis.
McCree, A. A., St. Paul.
Mowery, Clarence W., Northfield.
Quinn, John, Minneapolis.
Robertson, Charles N., Sleepy Eye.
Schlattman, Edward Charles, Alberta.
Walker, George William, Minneapolis.
Widell, G. Fred, Mankato.
Willis, Roy, St. Paul.

ELECTRICAL ENGINEERS—28

Anderson, Frank Arthur, Welis.
Bachrach, Alfred, Faribault.
Brown, George J., Minneapolis.
Carter, Robert J. S., Minneapolis.
Casberg, James W., Minneapolis.
Currie, Neil Jr., Minneapolis.
Dijkers, Henry, St. Paul.
Frahm, Alfred R., Rochester.
Hoppin, Glenn H., Minneapolis.
Hovelson, Henry, Minneapolis.
Japs, Barney G., Hopkins.
Kauffman, Roy, Minneapolis.
King, Alfred B., Welcome.
McAfee, Allan L., St. Paul.
Miller, Addison, St. Paul.
Pancratz, Frank J., Perham.
Peterson, Clarence A., Minneapolis.
Prentice, Robert S., Minneapolis.
Schltdt, William F. H., Hastings.
Schoepf, Alfred Walter, Appleton.
Scobie, Frank G., Duluth.
Sperry, Leonard B., Milaca.
Sturtevant, Percy G., Detroit.
Svendsen, George P., Minneapolis.
Swanstrom, Frank, Lake Park.
Sweningsen, Oliver, Austin.
Weibeler, William M., Belle Plaine.
Zimmerman, Louis P., Waseca.

MECHANICAL ENGINEERS—16

Anderson, Ole A., Hawley.
Bingham, Stanley E., New Ulm.
Councilman, Hjalsted P., Minneapolis.
Cox, Richard F., Graceville.
Estep, Harvey Cole, Minneapolis.
Fleming, Frank R., St. Paul.
Frary, Hobart D., Minneapolis.
Harwood, Stanley G., Minneapolis.
Hetheron, Percival, Minot, N. D.
Morris, Thomas C., Minneapolis.
Norelius, Emil F., Luverne.
Norton, Clyde W., Minneapolis.
Peterson, George T., New Ulm, R. 3.
Priedeman, George W., St. Paul.
Walsh, James, Northfield.
Weber, Erwin, Minneapolis.

MUNICIPAL ENGINEERS—5

Bergoust, Oscar J., Minneapolis.
Norelius, Lewis M., Luverne.
Okes, Day I., Minneapolis.
Olsen Melvin S., Spring Valley, Wis.
Wodrich, Oscar F., Minneapolis.

SCIENCE AND TECHNOLOGY—4

Clarke, Charles P., Elysian.
Fruen, Arthur B., Minneapolis.
King, Robert N., Minneapolis.
McKeehan, Louis Williams, Minneapolis

JUNIOR CLASS

CIVIL ENGINEERS—20

Childs, James A., St. Paul.	Jaques, Robert, Duluth.
Ellison, Jay T., St Paul.	King, Lawrence W., Minneapolis.
Elsberg, William, Minneapolis.	Moyer, Malcolm B., Minneapolis.
Esser, Frank F., Elsworth.	Nelson, Edward Severy, St. Paul.
Frahm, Herbert C., Rochester.	Olsen, Arthur O., Muskegon, Mich.
Geraghty, Hubert A., St. Paul.	Paul, Fred T., Minneapolis.
Godward, Alfred C., Elbow Lake.	Sheffield, Fred W., Crookston.
Hubbard, Frederick A., Minneapolis.	Shepard, George M., Kenyon.
Hubbard, Henry A., Spencer.	Siverts, Samuel A., Morris.
Ingberg, Simon H., Hendrum.	Torrance, Ell Jr., Minneapolis.

ELECTRICAL ENGINEERS—31

Beckjord, Walter C., St. Paul.	Kreger, A. J., Le Sueur.
Brockway, Alvah E., Luverne.	Kruschke, George A., Duluth.
Chandler, Malcolm D., Minneapolis.	Larson, Phinney O., Fosston.
Cobban, Rollo J., Luverne.	Lindelef, Charles G., Rush City.
Davies, Ralph M., Minneapolis.	McKenzie, Lauren F., Glencoe.
Converse, Clovis M., St. Paul.	Murrish, Frederic E., Minneapolis.
Fitts, Joel A., Minneapolis.	Piper, Herman, Stillwater.
Harris, Clayton, Park River, N. D.	Poore, Orson B., Bird Island.
Gadsby, Lester H., Minneapolis.	Powles, James W., St. Paul.
Grant, Fred R., Windom.	Stillman, Marcus H., Austin.
Harris, Clayton, Minneapolis.	Stillman, Paul R., Riceville, Ia.
Hitzker, Albert J., Winona.	Turner, Leslie E., St. Paul.
Hopkins, Mark L., Minneapolis.	Vita, Theodore, New Prague.
Hornbrook, James Wm., Tower.	Walling, Benjamin B., Winona.
Johnson, Herman R., Minneapolis.	Williams, Fred M., Elk River, Minn.
Kaplan, Eugene, Owatonna.	

MECHANICAL ENGINEERS—22

Beery, Charles B., Minneapolis.	Lambert, Edwin M., Young America.
Bieri, John B., Wells.	Mark, Walter J., St. Paul.
Birnberg, Zingel, St. Paul.	Morris, John E., Minneapolis.
Buck, Frederick W., W Duluth.	Moyer, Malcolm B., Montevideo.
Buhl, John E., Graceville.	Nemec, Frank Louis, Montgomery.
Forfar, Donald M., Minneapolis.	Shippam, Willis, Minneapolis.
Holmgren, Charles E., Breckenridge.	Starrett, Howard M., Minneapolis.
Johnson, Frank, Willmar.	Thompson, Herbert Leslie, Minneapolis.
Kircher, Frank J., Hudson, Wis.	Udell, Carl D., Wells.
Kircher, George A., Hudson, Wis.	Williams, Wilbur S., Buffalo, N. Y.
Knopp, William R., St. Paul.	Wright, Harris H., Farmington.

MUNICIPAL ENGINEERS—3

Itnner, William F., Red Lake Falls.	Moe, Alfred H., Duluth.
Okes, Sidney R., Minneapolis.	

SCIENCE AND TECHNOLOGY—2

Boyum, Benj. O., Rushford.	Curtiss, Lindsley B.
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SOPHOMORE CLASS

CIVIL ENGINEERS—36

Asleson, Hans.	Davison, Dodo E., Granada.
Brownell, Otto E.	Effertz, Edward P., Norwood.
Adams, Ben. W., Pine Island.	Ekman, Claes T., St. Paul.
Bolme, Ole M., Sperry, N. D.	Ferguson, Walker, Mankato.
Chapman, Berton L., Westbrook.	Fields, Howard H., St. Paul.
Crockard, Geo. E., Britton, S. D.	Fossen, George, Fergus Falls.
Dahlquist, Philip L., Minneapolis.	Fox, Milo P., Mankato.

Fredin, Conrad G., Duluth.
 Hauser, Rupert V., St. Paul.
 Jevne, George W., Minneapolis.
 Jensen, Arthur H., Kasson.
 Johnson, Paul A., Minneapolis.
 McGinnis, William H., Staples.
 Mark, Reuben A., St. Paul.
 Merriell Walter H., Minneapolis.
 Merrill, Lewis H., Minneapolis.
 Methven, Clyde, Minneapolis.
 Meyer, C. Foerster, Minneapolis.

Motl, Charles L., Alpha.
 Nason, George L., St. Paul.
 Orbeck, Martin J., Eau Claire.
 Overholt, Harley G., Minneapolis.
 Sawyer, Emerson D., Minneapolis.
 Sommerfeld, Adolph A., Sleepy Eye.
 Swedberg, M. Roy, Luverne.
 Timperly, William D., Minneapolis.
 Wardell, John M. Jr., Tracy.
 Weld, Quade C., Minneapolis.
 Wolff, Henry Ernest, St. Paul.

ELECTRICAL ENGINEERS—48

Anderson, Oscar V., Hudson, Wis.
 Arvold, Henry M., Strong's Prairie.
 Ashworth, Roy H., Mankato.
 Beck, Vernon S., Minneapolis.
 Carpenter, Ernest F., Redwood Falls.
 Chapin, Sprague L., Luverne.
 Clarkson, Cyrus E., St. Charles.
 Conley, Wilfred E., Lake Mills.
 Cook, H. C., Red Wing.
 Cooper, Ray Lee, Britton, S. D.
 Cottingham, George, Minneapolis.
 Councilman, Walter L., Minneapolis.
 Dahlstrom, Raymond E., St. Paul.
 Drinkall, Leon R., Spring Valley.
 Duffy, Raymond V., Minneapolis.
 Grinols, Earl L., Fair Haven.
 Hagstrom, Herbert E., Minneapolis.
 Hansen, Christian, St. Paul.
 Healy, Ralph L., Red Lake Falls.
 Hicks, Emery A., Byron.
 Hush, Howard R., Minneapolis.
 Jepserson, Clarence M., Minnetonka.
 Johnson, Leonard I., Minneapolis.
 Jones, Watkin W., Windom.

Josephson, Eliot B., Red Wing.
 Krauser, Aloysius, Minneapolis.
 Landeen, Arvid G., Garfield.
 Larson, Edwin G., Fosston.
 Layman, Jesse O., Minneapolis.
 Lyford, Dartt H., Minneapolis.
 McClure, Howard W., Litchfield.
 McQuillin, Raymond E., Britton, S. D.
 Muir, John S., Hampton, Ia.
 Nelson, C. Hugo, Minneapolis.
 Nelson, Fred C., Chatfield.
 Olson, Clarence, Two Harbors.
 Packer, Alfred H., St. Paul.
 Phelps, Ray R., St. Paul.
 Purcell, Richard T., Minneapolis.
 Rasmussen, Carl R., Faribault.
 Reid, Harry A., Mankato.
 Reiff, Ernest R., No. St. Paul.
 Richley, Clyde A., Minneapolis.
 Shepard, Donald D., Waseca.
 Soulek, Joseph H., Montgomery.
 Stahlmann, Henry C. G., St. Paul.
 Stover, Lester A., Minneapolis.
 Swenson, Theodore M., St. Paul.

MECHANICAL ENGINEERS—27

Albrecht, Armin G., St. Paul.
 Best, H. L., Minneapolis.
 Brohaugh, George O., Shelby.
 Bush, John C., Duluth.
 Comb, Fred R., Minneapolis.
 Cone, Robert A., Minneapolis.
 Du Toit, George A., Chaska.
 Fleming, Lawrence T., Minneapolis.
 Frear, Jenness E., Excelsior.
 Gjerberg, Ole H., Red Lake Falls.
 Holden, E. G., Minneapolis.
 Larson, Martin S., Red Wing.
 Lutz, Robert A., Mantorville.
 Markoe, James C., St. Paul.

Martin, Wallace H., Willmar.
 Mencke, Paul A., St. Paul.
 Meixner, Bernard A., Owatonna.
 Moyer, Amos F., Montevideo.
 Nichols, Browning, Montevideo.
 Olstad, Oscar A., Minneapolis.
 Oram, Robert C., Willmar.
 Palmer, Porteus B., St. Paul.
 Pease, Maynard W., Minneapolis.
 Salisbury, Willis R., Minneapolis.
 Stone, Webster H., Alden.
 Tolstad, Martin, Starbuck.
 Westbrook, Donald M., Minneapolis.

MUNICIPAL ENGINEERS—2

Bazil, Joseph G., Montgomery.

Smith, George H., Spring Valley.

SCIENCE AND TECHNOLOGY—2

Barney, Hadwen C., Minneapolis.

Buffington, J. Raymond, Minneapolis.

FRESHMAN CLASS

CIVIL ENGINEERS—67

Adams, John W., St. Paul.
 Ainslie, Arthur F., Rochester.
 Allen, Edgar M., Minneapolis.
 Alwin, Sydney S., New Ulm.
 Arnesen, Herbert P., Benson.
 Bailey, William H., Minneapolis.
 Bernstein, Jacob, Stillwater.
 Blanchard, Cecil D., St. Paul.
 Boerner, Frank C., Duluth.
 Bowen, Clarence W.,
 South Pasadena, Cal.
 Bradley, Gaylord, Paynesville.
 Buhl, Thomas J., Graceville.
 Claybourn, John G., Albert Lea.
 Cottingham, Will, Helena, Mont.
 Coughlan, Edward D., Mankato.
 Counter, John R., Minneapolis.
 Croft, Ernest E., Minneapolis.
 Curtis, Thmas H., Fairmont.
 Cutter, Leeds H., Anoka.
 Cutter, William W., Anoka.
 Darby, George A., Minneapolis.
 Elfstrum, Axel E., Willmar.
 Enger, Edward H., Minneapolis.
 Fieldman, David, Duluth.
 Flygare, August L., Winthrop.
 Gilman, Chenoweth H., St. Paul.
 Goodnow, Marion H., Minneapolis.
 Hartnett, John G., Graceville.
 Hauser, Kenneth, St. Paul.
 Haven, Frank G., Minneapolis.
 Higbie, George, Grand Meadow.
 Hodnett, Ralph M., St. Paul.
 Hoffmann, Michael J., St. Paul.
 Hosfield, Raleigh Wm., Faribault.
 Hullsiek, Karl L., St. Paul.
 Hunt, Harold, Minneapolis.
 Ireland, Max A., Minneapolis.
 Johnson, C. Arthur, Minneapolis.
 Johnson, Lynn R., Minneapolis.
 Kvitrud, Ingwald, Minneapolis.
 Latham, Robert L., Minneapolis.
 Lepper, Orlando E., Minneapolis.
 McLeod, Jason A., Lake City.
 Maney, George, Minneapolis.
 Mattison, George C., Minneapolis.
 Miller, Harold A., Guthrie Centre, Ia.
 Nordstrom, Maurice H., Willmar.
 Peterson, Barney, Alvarado.
 Pidgeon, Vernon C., Minneapolis.
 Pratt, Benjamin A., Minneapolis.
 Ranney, Alfred G., St. Paul.
 Ravlin, J. H., Minneapolis.
 Record, George H., Minneapolis.
 Rich, George S., Minneapolis.
 Roth, Lewis M., Livingston, Mont.
 Russell, Irving H., Minneapolis.
 Sawyer, Eldreth L., Minneapolis.
 Scott, J. Allyn, Duluth.
 Siverson, Sigvel J., Minneapolis.
 Smith, R. Thorne, Superior, Wis.
 Smith, Sydney H., Mitchell, S. D.
 Stanton, Randall, St. Paul.
 Tuttle, William B., Minneapolis.
 Umbehecker, Grover, Princeton.
 Walby, Arthur C., Minneapolis.
 Warren, W. Albert, Minneapolis.
 Wold, Benjamin, Barron, Wis.

ELECTRICAL ENGINEERS—70

Anderson, Arthur R., Willmar.
 Andert, Fred A., Morris.
 Barden, Chauncey H., Minneapolis.
 Beal, William W., Minneapolis.
 Bennett, Eugene F., Preston.
 Bill, Earl M., Minneapolis.
 Bisek, Peter P., New Prague.
 Blair, Giles E., Wadena.
 Blossom, George W., Minneapolis.
 Bradley, Lemi F., Lake Benton.
 Brunkow, Herbert, Delano.
 Burrows, Robert, St. Paul.
 Butterworth, Allan C., Minneapolis.
 Camp, John W., Wayzata.
 Campbell, Robert E., Minneapolis.
 Carson, J. Philip, St. Paul.
 Chapman, C. S., Laneshoro.
 Demarest, Charles S., Minneapolis.
 Dorrance, Albert P., Minneapolis.
 Dow, Clarence A., Minneapolis.
 Emerson, Lynn A., Elmore.
 Ferriss, Benjamin C., St. Paul.
 Flaherty, John J., St. Paul.
 Forsberg, Peter W., Minneapolis.
 Frederickson, Harry B., Minneapolis.
 Giles, Aubrey L., Albert Lea.
 Gunderson, Walter B., Minneapolis.
 Hansen, Maurice J., Hopkins.
 Hjelm, Fred W., Minneapolis.
 Howard, Willard, Rice Lake, Wis.
 Huevelmann, Herbert H., New Ulm.
 Hyser, George W., Minneapolis.
 James, Henry C., St. Paul.
 Johnson, Chas. Walter, Minneapolis.
 Johnson, J. Ewald, Minneapolis.
 Kemmer, Judson, Fergus Falls.
 Kenyon, Ray H., Minneapolis.
 Kerr, Harry A., Park Rapids.
 Klopsteg, Paul E., Fairmont.
 Koch, William C., St. Paul.
 Lane, John P., Minneapolis.
 Lutz, Roy P., Minneapolis.
 McCoy, Ira C., Rochester.
 MacMullan, J. Elmer, Minneapolis.
 Magraw, C. Elliott, St. Paul.
 Markuson, Oscar, Fertile.
 Mireault, Henry J. E., Sandstone.
 Mittag, Albert H., Elizabeth.
 Mooney, Stanton G., Minneapolis.
 Murphy, John A., Anoka.
 Nagle, Clarence, Preston.
 Nebel, Harry, Braham.
 O'Brien, Raymond, St. Paul.
 Orme, Thomas, St. Paul.

Pengilly, Joseph H., Shakopee.
 Purves, Leland E., Viola.
 Riegel, Louis F., Rochester.
 Ringstrom, Ivan G., Wheaton.
 Rogers, Bertram H., Minneapolis.
 Schroeder, Carl W., Minneapolis.
 Shipman, William D., St. Paul.
 Stinson, Will V., Minneapolis.

Streich, Harry C., Winona.
 Swenson, Albert, Willmar.
 Van Alstein, Harold, Princeton.
 Vancura, Edward W., Lakefield.
 Walker, William A., Moorhead.
 Wilson, Glenn W., Dover.
 Woodcock, Fremont, Princeton.
 Young, Charles N., St. Paul.

MECHANICAL ENGINEERS—30

Abbott, Theodore S., St. Paul.
 Barnum, Marvin C., Minneapolis.
 Bishop, Ira L., Mapleton.
 Bronson, Harry S., St. Paul.
 Brown, Francis A., St. Paul.
 Brown, William P., Yankton, S. D.
 Campbell, Arthur, Park Rapids.
 Christensen, George, Robbinsdale.
 Cohen, Julius M., St. Paul.
 Crawford, Fred G., Faribault.
 Crosby, Frederic, St. Paul.
 Dickey, Vernon G., Princeton.
 Farnam, Julian P., Minneapolis.
 Hess, Arba L., Minneapolis.
 Hobbs, Fowler K., Minneapolis.

Hoffman, Ralph Mueller, Minneapolis.
 Kasper, Walter F., Owatonna.
 Owens, Leo E., Minneapolis.
 Rand, Lars, Minneapolis.
 Ray, Frank J., Minneapolis.
 Sears, Lester Merriam, Minneapolis.
 Smalley, Clarence E., Lakefield.
 Sneve, Jack Stickney, St. Paul.
 Sudor, Hugh William, St. Paul.
 Swenson, Adolph, Kasota.
 Tydeman, Frederick E., Montevideo.
 Watrous, Russell W., St. Paul.
 Willits, Guy L., Minneapolis.
 Woodman, Joseph C., Minneapolis.
 Worcester, Harold, Minneapolis.

SCIENCE AND TECHNOLOGY—6

Aldrich, Robert G., Osakis.
 Bookwalter, Joseph S., Minneapolis.
 Bryant, Stewart H., St. Paul.
 Lanphear, Howard, Minneapolis.

Robinson, Frank J., Sauk Centre.
 Thvedt, Christen Bernhard,
 Minneapolis.

UNCLASSED ENGINEERS—28

Arndt, William P., Pine Island.
 Atkinson, William B., Barnesville.
 Duncanson, Archie V., Stewartville.
 Foss, Elmer T., Minneapolis.
 Freel, Albert E., Duluth.
 Gilbertson, J. L., Atwater.
 Hawley, Robert C., Lanesboro.
 Hicks, Emery A., Byron.
 Huseby, John S., Cloquet.
 Kelty, Harland E., Minneapolis.
 Kruse, T. A., Minneapolis.
 McGonagle, Sargent, Duluth.
 McMillan, Edward C., Minneapolis.
 Merz, Edward H., Monticello.

Miner, Robert, Minneapolis.
 Nestaval, Stephen J., Montgomery.
 Nicholson, Percival H., Moorhead.
 Pettijohn, Lyle, St. Paul.
 Schmid, Robert J., Minneapolis.
 Shane, William G., Gladstone.
 Skytte, E. E., St. Paul.
 Stinchfield, Fred R., Robbinsdale.
 Todd, Milo E., Minneapolis.
 Trogner, Walter J., Minneapolis.
 Um, Lynne C., Red Wing.
 Walker, Herbert E., Minneapolis.
 Warren, Alvah H., St. Paul.
 Williams, Donald T., Minneapolis.

SUMMARY

Total enrollment 473

The University catalogues are published by authority of the Board of Regents, as a regular series of bulletins. One bulletin for each college is published every year, and in addition a bulletin of general information outlining the entrance requirements of all colleges of the University, and embodying such items as University equipment, organizations and publications, expenses of students, loan and trust funds, scholarships, prizes, etc. Bulletins will be sent gratuitously, postage paid, to all persons who apply for them. In calling for bulletins, please state the college or school of the University concerning which information is desired. Address,

THE REGISTRAR,

The University of Minnesota,

Minneapolis, Minnesota.





The
University of Minnesota
Bulletin

College of Pharmacy

1908-1909

Volume XI

March 31, 1908

No. 5

Entered at the Postoffice
in Minneapolis as second-class matter
MINNEAPOLIS, MINN

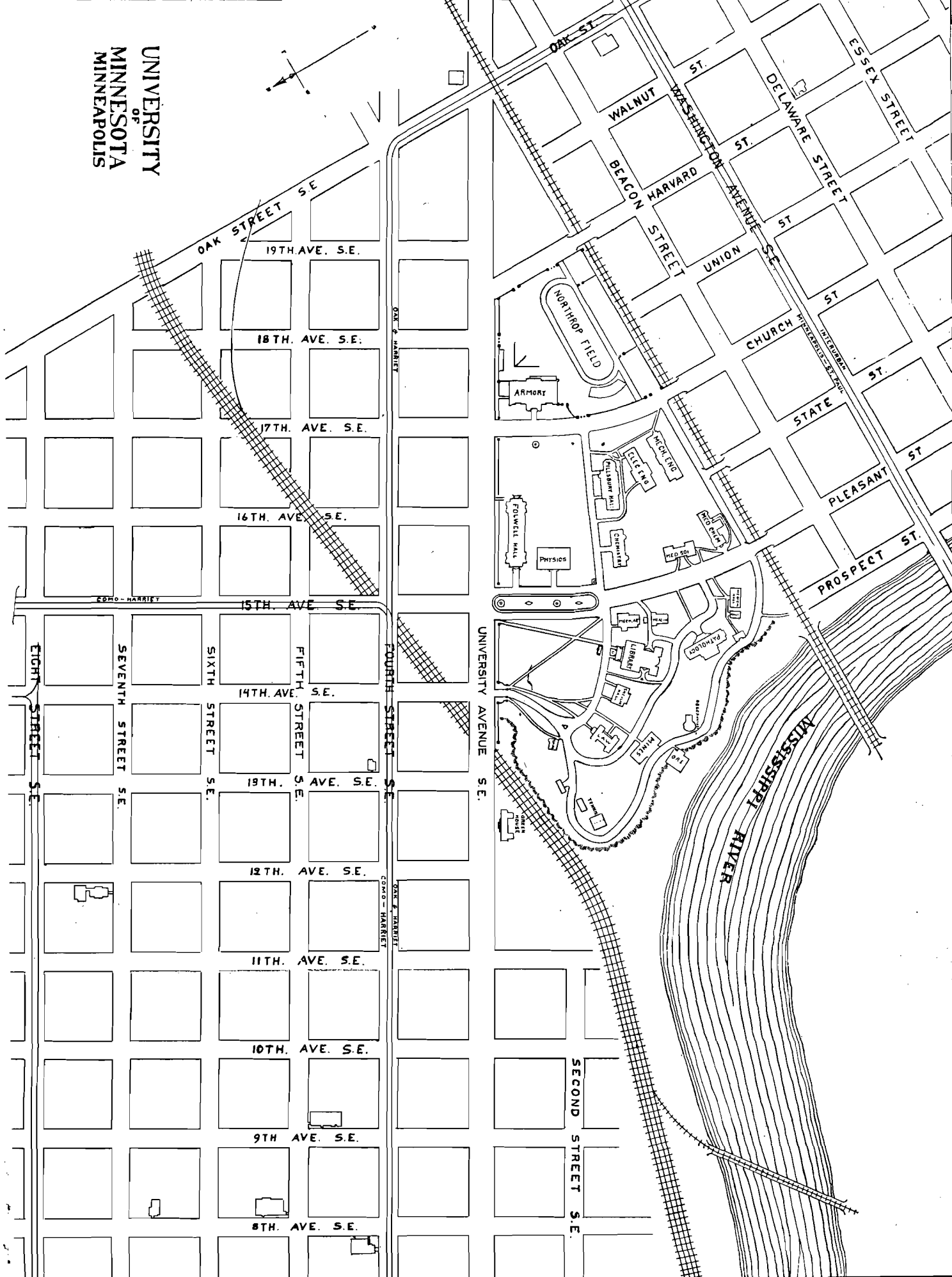
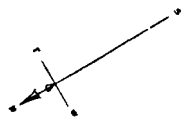
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THE REGISTRAR,

The University of Minnesota,

Minneapolis, Minnesota.

UNIVERSITY
OF
MINNESOTA
MINNEAPOLIS



CALENDAR FOR 1908-1909

1908

1909

MAY

S.	M.	T.	W.	T.	F.	S.
..	1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
31

JUNE

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7	8	9	10	11	12	13
14	15	16	17	18	19	20
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SEPTEMBER

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OCTOBER

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11	12	13	14	15	16	17
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NOVEMBER

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8	9	10	11	12	13	14
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DECEMBER

..	..	1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31

JANUARY

S.	M.	T.	W.	T.	F.	S.
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3	4	5	6	7	8	9
10	11	12	13	14	15	16
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24	25	26	27	28	29	30
31

FEBRUARY

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7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28
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MARCH

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7	8	9	10	11	12	13
14	15	16	17	18	19	20
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APRIL

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MAY

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16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31

JUNE

..	..	1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30

University Calendar

1907-1908

THE UNIVERSITY YEAR

The University year covers a period of thirty-eight weeks beginning on the second Tuesday in September. Commencement day is always the second Thursday in June.

FEBRUARY	4 T	Second semester begins—classes called for regular work
	12 W	Lincoln's birthday—legal holiday
	22 S	Washington's birthday—legal holiday
APRIL	17 F	Good Friday. Recess two days
MAY	2 Th	Regular meeting Board of Regents
	25 M	Senior examinations begin
	30 S	Decoration Day—legal holiday
JUNE	1 M	Semester examinations begin
	6 S	Semester examinations close

COMMENCEMENT WEEK, 1908

SUNDAY	June 7	Baccalaureate service
MONDAY	June 8	Senior class exercises
TUESDAY	June 9	Phi Beta Kappa address. Senior promenade
WEDNESDAY	June 10	Alumni Day. Regular meeting Board of Regents
THURSDAY	June 11	Commencement Day. The thirty-sixth annual commencement
FRIDAY	June 12	Summer vacation begins

1908-1909

SEPTEMBER	7-14	Entrance examinations, condition examinations and registration Classes called for regular work. Seventeenth annual session
OCTOBER	1 Th	Regular meeting Board of Regents
	5 M	Regular meeting University Council
NOVEMBER	26 Th	Thanksgiving Day. Recess three days
DECEMBER	7 M	Regular meeting University Council
	8 T	Annual meeting Board of Regents
	19 S	Holiday recess begins (no classes)
JANUARY	5 T	Work resumed in all departments
	23 S	Semester examinations begin
	30 S	Semester examinations close
FEBRUARY	2 T	Second semester begins—classes called for regular work
	12 F	Lincoln's birthday—legal holiday
	22 M	Washington's birthday—legal holiday
APRIL	5 M	Regular meeting University Council
	9 F	Good Friday—Recess two days

The College of Pharmacy

3

MAY	6 Th	Regular meeting Board of Regents
	24 M	Senior examinations begin
	31 M	Decoration Day—legal holiday
JUNE	1 T	Semester examinations begin
	5 S	Semester examinations close
	7 M	Regular meeting University Council

COMMENCEMENT WEEK, 1909

SUNDAY	June 6	Baccalaureate service
MONDAY	June 7	Senior class exercises
TUESDAY	June 8	Sigma Xi address. Senior promenade
WEDNESDAY	June 9	Alumni Day. Regular meeting Board of Regents
THURSDAY	June 10	Commencement Day. The thirty-seventh annual commencement
FRIDAY	June 11	Summer vacation begins

The University

THE UNIVERSITY OF MINNESOTA comprises the following named schools, colleges and departments:

THE COLLEGE OF SCIENCE, LITERATURE AND THE ARTS

THE COLLEGE OF ENGINEERING AND THE MECHANIC ARTS

THE DEPARTMENT OF AGRICULTURE, including—

The College of Agriculture

The School of Agriculture

Short Course for Farmers

The Dairy School

The Crookston School of Agriculture

THE COLLEGE OF LAW

THE COLLEGE OF MEDICINE AND SURGERY

THE COLLEGE OF HOMEOPATHIC MEDICINE AND SURGERY

THE COLLEGE OF DENTISTRY

THE COLLEGE OF PHARMACY

THE SCHOOL OF MINES

THE SCHOOL OF ANALYTICAL AND APPLIED CHEMISTRY

THE COLLEGE OF EDUCATION

THE GRADUATE SCHOOL

The Regents of the University have entrusted to their charge:

THE EXPERIMENT STATIONS, including—

The Main Station at St. Anthony Park

The Sub-Station at Crookston

The Sub-Station at Grand Rapids

THE GEOLOGICAL AND NATURAL HISTORY SURVEY

Bulletins of these schools, colleges and departments may be obtained upon application to the University Registrar.

The Board of Regents

CYRUS NORTHROP, LL.D., MINNEAPOLIS	<i>Ex-Officio</i>
The President of the University	
The HON. JOHN LIND, MINNEAPOLIS	1914
The President of the Board	
The HON. JOHN A. JOHNSON, ST. PETER	<i>Ex-Officio</i>
The Governor of the State	
The HON. JOHN W. OLSEN, ALBERT LEA	<i>Ex-Officio</i>
The State Superintendent of Public Instruction	
The HON. THOMAS WILSON, ST. PAUL	1909
The HON. A. E. RICE, WILLMAR	1909
The HON. B. F. NELSON, MINNEAPOLIS	1910
The HON. DANIEL R. NOYES, ST. PAUL	1910
The HON. PIERCE BUTLER, ST. PAUL	1910
The HON. S. M. OWEN, MINNEAPOLIS	1913
The HON. W. J. MAYO, ROCHESTER	1913
The HON. HENRY B. HOVLAND, DULUTH	1914

C. D. DECKER, MINNEAPOLIS,
Secretary of the Board

Executive Officers

THE UNIVERSITY

CYRUS NORTHROP, LL. D., *President*

ERNEST B. PIERCE, B. A., *Registrar*

JAMES T. GEROULD, B. A., *Librarian*

C. D. DECKER, *Purchasing Agent*

J. D. BREN, *Cashier*

THE COLLEGES

JOHN F. DOWNEY, M. A., C. E., *Dean of the College of Science, Literature,
and the Arts*

FREDERICK S. JONES, M. A., *Dean of the College of Engineering and the
Mechanic Arts*

EUGENE W. RANDALL, *Dean and Director of the Department of Agriculture*

WILLIAM S. PATTEE, LL. D., *Dean of the College of Law*

FRANK FAIRCHILD WESBROOK, M. A., M. D., C. M., *Dean of the College of
Medicine and Surgery*

EUGENE L. MANN, B. A., M. D., *Dean of the College of Homeopathic
Medicine and Surgery*

ALFRED OWRE, D. M. D., M. D., *Dean of the College of Dentistry*

FREDERICK J. WULLING, Phm.D., LL.M., *Dean of the College of Pharmacy*

WILLIAM R. APPLEBY, M. A., *Dean of the School of Mines*

GEORGE B. FRANKFORTER, Ph. D., *Dean of the School of Chemistry*

GEORGE F. JAMES, Ph. D., *Dean of the School of Education*

HENRY T. EDDY, C.E., Ph. D., LL. D., *Dean of the Graduate School*

ADA L. COMSTOCK, M. A., *Dean of Women*

The University Council

At the regular meeting of the Board of Regents of the University, May 31st, 1905, a University Council was established according to the following plan:

I. The name of the body shall be The University Council. It shall consist of the President of the University, the Deans of the various colleges and schools, one elected representative from each college or school for each 400 students or major fraction thereof, and one representative of the general alumni association.

II. The elected members shall serve for a period of one year. They shall be chosen from the various faculties at the time of the selection of standing committees. The representative of the general alumni association shall be chosen by that body at its annual meeting from among the alumni who are not members of the University.

III. The Council shall be authorized to—

a) Appoint the following committees or the faculty representation thereon:

The University auditing committee

The University press committee

The committee on athletics

The committee on University relations to other institutions of higher learning

The committee on health and sanitation

The committee on commencement and other University functions

The committee on catalogue, programs and courses of study

The committee on student entertainments and social affairs

And such other committees as the general University interests may require

b) Receive reports from such committees and to make such recommendations as may be required.

c) Consider and act upon any matter of general University interest beyond the province of a single faculty which may be referred to it by the President of the University or any faculty.

IV. The Council shall hold stated meetings upon the first Monday of October, December, April and June, and such other meetings as the President of the University may call.

Representatives to the Council

The University

PRESIDENT CYRUS NORTHROP

The College of Science, Literature and the Arts

DEAN JOHN F. DOWNEY

PROFESSOR JOHN H. GRAY

PROFESSOR J. C. HUTCHINSON

PROFESSOR H. F. NACHTRIEB

PROFESSOR NORMAN WILDE

The College of Engineering and the Mechanic Arts

DEAN FREDERICK S. JONES

PROFESSOR GEORGE D. SHEPARDSON

The College and School of Agriculture

DEAN EUGENE W. RANDALL

PROFESSOR HARRY SNYDER

PROFESSOR SAMUEL B. GREEN

The College of Law

DEAN WILLIAM S. PATTEE

PROFESSOR HENRY J. FLETCHER

The College of Medicine and Surgery

DEAN F. F. WESBROOK

PROFESSOR THOMAS G. LEE

The College of Homeopathic Medicine and Surgery

DEAN EUGENE L. MANN

The College of Dentistry

DEAN ALFRED OWRE

The College of Pharmacy

DEAN FREDERICK JOHN WULLING

The School of Mines

DEAN WILLIAM R. APPLEBY

The School of Chemistry

DEAN GEORGE B. FRANKFORTER

The College of Education

DEAN GEORGE F. JAMES

The Graduate School

DEAN HENRY T. EDDY

General Alumni Association

DAVID P. JONES

University Council Committees

The University Auditing Committee

PROFESSORS ANDERSON, FLETCHER, OWRE, SIGERFOOS, SPRINGER

The Committee on Athletics

PROFESSORS PAIGE, BROOKE, HARDING, D. P. JONES, LITZENBERG

The Committee on Grounds and Sanitation

PROFESSORS FLATHER, BASS, BRACKEN, HICKMAN, RANDALL, SIDENER,
WESBROOK

The Committee on Catalogue, Programs and Course of Study

DEANS APPLEBY, EDDY, FRANKFORTER, JAMES, JONES, MANN, OWRE,
WULLING; PROFESSORS FLETCHER, JOHNSTON, SCHLENKER, SNYDER,
E. B. PIERCE

The Press Committee

PROFESSORS SCHAPER, BAUER, CONSTANT, ERDMANN, JAMES

The Committee on Commencement and other University Functions

PROFESSORS NACHTRIEB, JENKS, OWRE, PATTEE, RANDALL, SCHLENKER,
WASHBURN

The Committee on Student Entertainments and Social Affairs

PROFESSORS FRANKFORTER, BASS, COMSTOCK, COOKE, MULLEN, PIKE

The Committee on University Relations to other Institutions of Higher Learning

PROFESSORS DOWNEY, BOTHNE, EDDY, GRAY, GREEN, JAMES, LEE

The Committee on University Extension and University Lectures

PROFESSORS WEST, HAECKER, RANKIN, SCHLENKER, SHEPARDSON

The Committee on the Library

PROFESSORS EDDY, FLETCHER, F. S. JONES, LEE, REYNOLDS,
VAN BARNEVELD, WEST

The College of Pharmacy

FACULTY

- CYRUS NORTHROP, LL.D., *President.*
FREDERICK J. WULLING, Phm.D., LL.M., etc., *Dean: Professor of Pharmacology*
RICHARD O. BEARD, M.D., *Professor of Physiology*
E. D. BROWN, Pharm.D., M.D., *Acting Professor of Materia Medica and Therapeutics*
FREDERIC E. CLEMENTS, Ph.D., *Professor of Botany*
IRA HARRIS DERBY, B.S., *Assistant Professor of Chemistry*
GEORGE B. FRANKFORTER, M.A., Ph.D., *Professor of Chemistry*
EVERHART P. HARDING, M.S., Ph.D., *Assistant Professor of Chemistry*
CHAS. F. SIDENER, B.S., *Professor of Quantitative Chemistry*
FRANK F. WESBROOK, M.A., M.D., C.M., *Professor of Bacteriology*
M. R. WILCOX, M.D., *Assistant Professor of Physiology*
.....*Professor of Pharmacognosy*

INSTRUCTORS AND ASSSTANTS

- GUSTAV BACHMAN, Ph.C., Ph.M., *Instructor in Pharmacy*
OSCAR BLOSMO, Ph.C., *Assistant in Pharmacy*
FREDERICK K. BUTTERS, M.S., *Instructor in Pharmaceutical Botany and Microscopy and Pharmacognosy*
FRANK F. GROUT, B.S., *Instructor in Mineralogy*
JOHN A. HANDY, Ph.C., *Instructor in Chemistry*
GEORGE D. HEAD, B.S., M.D., *Instructor in Clinical Microscopy*
JOHN ELDON HYNES, Ph.C., *Assistant in Clinical Microscopy*
E. P. JONES, Ph.B., *Pharmacy Laboratory Assistant*
C. N. MCCLOUD, Phm.D., M.D., *Lecturer on First Aids to the Injured*
J. P. SEDGWICK, B.S., M.D., *Instructor in Physiological Chemistry*
W. D. SHELDON, M.D., *Instructor in Therapeutics*
.....*Instructor in Pharmaceutical Latin*
.....*Assistant in Materia Medica*
.....*Assistant in Pharmacognosy*

THE REGULAR COURSE

The complete regular course extends over two years of nine months each. Students may arrange their work so as to complete the course in three years, without additional expense to them for tuition.

ENTRANCE REQUIREMENTS

A.—To the Two-Year Course

While nearly all students enrolled in this college are graduates of full four-year high school courses, such a training prior to entrance is not obligatory at the present time. The requirements, however, are being raised gradually in such a way that soon they shall be a full high school preparation or an equivalent.

Applicants may be admitted without examination if they bring certificates of graduation from, or standing in, institutions of the collegiate grade or present other credentials showing that they have successfully completed the branches of study embraced in a full four-year high school course, or an equivalent, provided that among the branches completed are:

English, two years, including the principles of composition and practice in written expression.

Algebra, one year, elementary, up to beginning of higher algebra.

Geometry, one year, elementary.

Physics, one year, elementary.

Latin, two years: grammar, one year; Caesar (four books), one year.

- II. Other applicants must pass examinations in the branches above specified, i. e., in English, algebra, geometry, physics and Latin, or present satisfactory evidence of having completed these branches, for which substitutes cannot be accepted.

Students will be allowed to carry not more than two conditions which, however, must be removed before the final examinations in the first year subjects.

In certain cases credit is given for drug store experience.

B.—To the Three-Year Course

The minimum requirements for admission to the three-year course are the same as those for admission to the two-year course II., with the exception that students may carry as conditions not more than three of the entrance subjects among which English cannot be. Students must pursue the branches in which they are conditioned during their first year and pass examinations in them or present evidence of having satisfactorily completed the branches. The subjects are not taught at the college, but may be taken at the Academy near by, or at the city high schools or with

private tutors. The University Y. M. C. A. usually establishes courses for the benefit of students conditioned in entrance branches.

Applicants whose preparatory course of study has not conformed precisely to the requirements above enumerated will be allowed to offer, in lieu of a portion of these requirements, equivalent preparation in similar branches of study; and if they show, by examination, or by other evidence, that their preparation has been substantially equivalent, such branches will be accepted as substitutes for those omitted.

The examinations for entrance are conducted by the faculty of the college of pharmacy, in the pharmacognosy rooms, beginning at 9:00 a. m., on Tuesday, September 15, 1908. Lecture work begins as soon as possible after the examinations, usually the following day.

Every applicant is required to furnish a certificate of good moral character.

Those who do not pass the entrance examinations, may enter and complete their course in three years, provided they pursue the subjects required for admission, in addition to the professional work that may be assigned to them, and pass their entrance examinations, before the end of the first year. There are a number of preparatory schools in the neighborhood of the University, where the subjects required for admission may be pursued.

GRADUATE COURSES

In addition to the regular course this college offers two graduate courses, the first continuing through one college year and leading to the degree "master of pharmacy," and the second continuing through an additional year or longer, and leading to the degree "doctor of pharmacy." The first graduate course, the one leading to the master's degree, is now in operation. The curriculum includes higher pharmaceutical chemistry, pharmaceutical assaying, higher organic chemistry, proximate and ultimate analysis, chemistry of food, spectroscopic work, therapeutics, and bacteriology, and a thesis of at least 3,000 words, embodying the results of original work, but this curriculum may be changed by the faculty if occasion or experience require.

The requirements for admission are a diploma from a Minnesota high school of the first grade, or an equivalent; a diploma from a college of pharmacy whose curriculum, extent and kind of work and length of under-graduate course are equal to those of the under-graduate work of this college; an acquaintance with either German or French sufficient to enable the student to read and understand the scientific literature of those languages, and a certificate of registration as pharmacist from any state board of pharmacy. The fees for this course are seventy-five dollars,

and, upon graduation, an additional fee of ten dollars for diploma. The rules relating to damage, waste and breakage in laboratories are the same as those applying to the undergraduate course.

The course leading to the doctor's degree will begin as soon as there are sufficient applicants.

PROPOSED NEW COURSES

Beginning with the school year 1909, two additional courses will be instituted: the one, a lower and shorter than the regular course to conform to the minimum requirements of the American Conference of Pharmaceutical Faculties; the other, a higher than the regular course to lead to the degree, Bachelor of Science in Pharmacy, and to include four years of work. The details have not yet been worked out but it is probable that the former will include about two-thirds of the work of the regular course and will cover two years of at least six months each. Possibly opportunity will be offered to complete the work in twelve consecutive months. The entrance requirements will include the first year in high school or equivalent training or whatever the entrance requirements of the Conference may be at the time.

The higher course will cover four years of nine months each and will include two years of academic and cultural work. The qualifications for entrance to this course will be the same as those required for entrance to the College of Literature, Science and Arts. Those presenting evidence of having completed the first two years of a collegiate course may complete the course in two years, providing the collegiate work completed includes certain subjects in the sciences and mathematics. Full announcement regarding these courses will be made in next year's bulletin.

REGISTRATION

All applicants for admission to the regular courses must present to the Dean not later than September 15, their school or high school certificates, diplomas or such other credentials as they may wish to offer toward meeting in whole or in part the entrance requirements. If these are found satisfactory the applicant will register in the office of the University registrar, who will issue a card to the University accountant to whom the applicant will pay the tuition and breakage fees and microscope rental and receive receipts therefor. Registration is completed by depositing these receipts in the office of the Dean. The student is then classified.

PROFESSIONAL EXAMINATIONS AND STANDINGS

Examinations are held at the end of the regular school year and during the last week of the first semester, and are supplementary to the written

recitations and quizzes that are held at frequent intervals during the year, and with them form the basis of final determination of fitness for promotion or graduation. Students are rated throughout the year, and all who have a standing of ninety per cent, or more, in certain of the branches, may not be required to take the final examination in those branches.

Students are not required to write graduating theses, but instead, they keep complete records of all their laboratory work. The records are to be kept in substantially bound books, to be approved by the faculty. The respective professors call for the records for inspection and rating once a month or oftener. Duplicates of records are to be furnished the college by the students. The college provides the paper.

The standing of students is determined by the results of recitations, written examinations, laboratory work and attendance. It is indicated by the terms "excellent," "passed," "conditioned," "incomplete," or "failed." Conditions may be removed as indicated below. Incomplete work must be made up before the final examinations of the following year.

ATTENDANCE

In order to become eligible for final examinations, students are required to attend at least four-fifths of the lectures in each course. This rule is not intended for the benefit of those who seek admission after the opening of the college year, but is designed to cover cases of sickness or unavoidable absence. It does not apply to laboratory courses which must be taken in full and must be entered during the first week in which they begin.

CONDITIONS

Students having conditions in more than two major or in more than three minor subjects of the first year, cannot enter upon the second year's work. All entrance conditions must be removed before the next spring examination. Candidates for graduation must have removed all conditions before entering upon the second semester of the graduating year.

Condition examinations are held during the first week of the course in September. The dates are usually posted in June. Conditioned students are required to inform themselves as to these dates as soon as they learn that they are conditioned, as no other notice is given.

All who carry a condition and fail to remove it within one year will be charged an extra examination fee.

Students who carry a condition into a succeeding year may find a conflict of lecture or laboratory hours. In such cases they are to give preference to the lower course.

ADVANCED STANDING

Applicants for advanced standing must pass the entrance examinations or present the usual equivalents. They must furnish satisfactory evidence of time spent and subjects covered in previous professional studies, and must present themselves at the above date and pass the examinations of all departments in which they wish to be exempt, if such examinations are deemed necessary by the professors in charge of the various departments. Students will not be permitted to substitute private work in any branch for the regular course work.

REQUIREMENTS FOR GRADUATION

Regular attendance at lectures, recitations and laboratory exercises is required. Students will not be permitted to present themselves for final examination unless they have been in attendance upon at least seven-eighths of the required number of exercises.

Every person upon whom the degree is conferred must be of good moral character, and must be at least twenty-one years old; must have attended two full lecture and laboratory courses, the last at this college, and must have passed a successful examination in the subjects required for graduation.

Drug store experience is not a requirement for graduation.

Those who fail to appear for examination after having paid their diploma fee, or those who do not pass satisfactorily, will be permitted to present themselves at any subsequent examination, upon payment of an additional fee of five dollars, and complying with all other requirements.

DEGREE

This college confers the degree of Bachelor of Pharmacy, (Ph.B.), upon the graduates of the regular course.

FEES

TWO YEAR COURSE

First year	\$75.00
Second year	90.00
	—————\$165.00

THREE YEAR COURSE

First year	\$45.00
Second year	55.00
Third year	65.00
	—————\$165.00

There are no other fees in the regular course. Fees are payable at the time of registration. Those desiring to take special work will be required to pay fifteen dollars a subject in the didactic courses and twenty-five dollars in the laboratory courses.

Students will be charged for laboratory material if used unreasonably. At the end of the laboratory courses students will be required to pay for breakage and damage to utensils in their care. If a student is careful this charge need not amount to more than two or three dollars. Students are to provide themselves with a designated set of metric weights, a set of apothecary's weights and steel spatulas. The expense of these is within three dollars. Students using platinum crucibles are charged for same. Upon the return of the crucible in the original condition the charge is cancelled; if the crucible is in any wise damaged the full value is collected from the student. A rental of two dollars per college year or fraction is collected for use of a microscope. All money is payable to the accountant of the University, who will give receipts which must be deposited in the Dean's office.

Fees will not be returned, except in case of discontinuance for sufficient reason before the student has been assigned to a place in the laboratory.

BREAKAGE AND LOSS

In each laboratory course the student will be assigned a certain amount of apparatus and material, for which he will give receipt. At the end of each course, if such apparatus and material are restored in good condition, this receipt will be returned to him.

All apparatus lost or damaged will be charged to him, and must be paid for before he can receive credits for his course, or take his annual examinations.

CAUTION FEE

A deposit of ten dollars will be made with the accountant each year, by every student, at the time of enrollment as a caution fee. This fee is intended to cover the cost of unnecessary damage to or in the college buildings and of breakage and loss of laboratory apparatus and material. It will be returned to the student at the close of each year, minus the cost of articles assigned to him, that are not returned in good condition, or of damage to college property for which he is individually responsible. If responsibility for such damage cannot be individually fixed, a pro rata charge upon all students will be made.

GENERAL STATEMENT

Students are permitted to use their own crude drugs for the making of preparations, provided such material is approved by the Dean of the

college as suitable to demonstrate the lesson in hand. Finished products from such material, if of satisfactory quality, are at the disposal of the student, unless made with the tax-free alcohol belonging to the college.

Absence will not be excused, unless satisfactory reasons are given to the professor in charge. Habitual absence without a satisfactory excuse, continued indifference to study, or persistently poor scholarship may subject the student to temporary or permanent suspension. Students are earnestly requested to be present at the beginning of the school year, but those who cannot enter in the fall may enter at the beginning of the second semester taking any of the subjects beginning then. Special students, however, may enter at any time; they will not be rated on their work, nor will they be examined unless they make special request therefor. Any of the facilities for work in the University are open to the students of this college, subject to the approval of the Dean. Opportunity is afforded to do advanced work in all branches. Text-books may be obtained after coming to the University.

Rooms and board convenient to the college can be obtained at prices ranging from \$3.00 to \$5.00 per week, according to accommodations and furnished rooms without board, from \$5.00 to \$10.00, and unfurnished rooms from \$4.00 to \$7.00 per month.

A list of rooms and boarding places is kept by the secretary of the University Y. M. C. A., to whom inquiries or applications may be addressed.

POSITIONS FOR GRADUATES

The demand for graduates of this College has always been greater than the supply and is continually growing. The rule is that practically all of the senior class are engaged before graduation. This College is recognized in every state, including those in which standards of efficiency have been established, and its graduates are everywhere admitted to Board examinations.

STATE BOARD OF PHARMACY

The Board meets at the college four times each year. For information concerning the Board address the Secretary, Mr. Chas. J. Moos, 502 Bank of Commerce Building, Minneapolis, Minn.

COLLEGE OF PHARMACY ALUMNI ASSOCIATION

The Alumni Association meets annually in the college building the day before commencement, at 3 p. m. Every member of the Association is urgently requested to report change of address to the secretary.

COMMUNICATIONS

Address communications to the Dean, Professor Frederick J. Wulling, University of Minnesota, Minneapolis, Minn.

THE AMERICAN CONFERENCE OF PHARMACEUTICAL FACULTIES

The College of Pharmacy of the University of Minnesota is one of the twenty-nine colleges constituting the membership of the American Conference of Pharmaceutical Faculties.

COLLEGE TRAINING FOR PHARMACISTS

The recognition of the need of substantial college training for pharmacists finds expression in many ways. In New York, Pennsylvania, Hawaii, Wisconsin and Ohio such training is obligatory either by law or by rule of the Boards of Pharmacy. In a number of other states credit is given for college work. In Minnesota graduates from recognized colleges need to have only two years of practical experience, while all others must have four years of drug store experience before they become eligible for examination by the State Board of Pharmacy for full license to practice in Minnesota. At the Joint Conference of the National Association of Boards of Pharmacy and the American Conference of Pharmaceutical Faculties, held at Indianapolis, Ind., in September, 1906, the following resolution was adopted:

"Special education for the practice of pharmacy is in this age a necessity and should as rapidly as possible be made compulsory. The rules of the Boards of Pharmacy are such as to promote and encourage it in all practicable ways. The special pharmaceutical education should include substantial laboratory courses."

The training advocated by these two most representative bodies and by the American Pharmaceutical Association can be obtained only at colleges or schools of pharmacy of recognized standing. It is admitted that the State of Minnesota through its University College of Pharmacy is affording instruction of the most approved kind.

In the organization of this college the Board of Regents and the faculty have had the co-operation of the pharmacists of the state. The character of instruction is of high order and every effort is made to comply with the demands of the profession in the Northwest, or elsewhere, in the maintenance of a course of instruction of the highest grade. The college is located on the university campus, in the Medical Science Laboratory building, and is one of the colleges comprising the department of medicine, but is distinct in the government of its affairs. The

building and laboratories are on a par with the best, and their equipment is complete.

The work of the college, as outlined in the following pages, is conducted by means of lectures, recitations and laboratory exercises. Students find their time fully occupied. Those who feel unable to complete the work in two years may divide it in a manner to complete it in three years. Practising pharmacists who desire to take certain branches of study may avail themselves of any of the college facilities.

Courses of Instruction

COURSES OF INSTRUCTION COMPRISING THE REGULAR PHARMACY COURSE

The complete regular course extends over two years of nine full months each. Students may arrange their work so as to take the course in three years. It is quite possible that three years attendance will be required of students in this college in the near future. The sixteenth annual course begins on September 15, 1908, on which day all students in pharmacy should register. The office of the Registrar is open for the purpose of registration as early as September 8th, but students must first report at the Dean's office in the pharmacy building.

FIRST YEAR

FIRST QUARTER

Botany 1, eleven hours, Mr. Butters and Assistant
Pharmacy 9, five hours, Professor Wulling
Chemistry 1, fifteen hours, Professor Derby and Mr. Handy

SECOND QUARTER

Botany 1, six hours, Mr. Butters and Assistant
Pharmacy 10, three hours, Professor Wulling
Pharmacy 1, 2 and 3, twelve hours, Professor Wulling, Mr. Bachman,
Mr. Blossmo and Assistant
Chemistry 2, fifteen hours, Professor Derby and Mr. Handy

THIRD QUARTER

Pharmacy 11, two hours, Professor Wulling
Pharmacy 4, four hours, Professor Wulling, Mr. Bachman, Mr. Blossmo
and Assistant
Pharmacy 7, one hour, Mr. Bachman
Materia Medica 1, five hours, Professor Brown and Assistant
Chemistry 5, fifteen hours, Professor Frankforter, Assistant Professor
Derby and Mr. Handy
Physiology 1, nine hours, Professors Beard and Wilcox

FOURTH QUARTER

- Pharmacy 11*, two hours, Professor Wulling
Materia Medica 2, five hours, Professor Brown and Assistant
Pharmacy 5 and 6, six hours, Professor Wulling, Mr. Bachman, Mr. Blosmo and Assistant
Pharmacy 7, two hours, Mr. Bachman
Pharmacy 8, one hour, Mr. Bachman
Botany 2 and 3, nine hours, Mr. Butters and Assistant
Chemistry 5, fifteen hours, Professor Frankforter, Assistant Professor Derby and Mr. Handy

SECOND YEAR

FIRST QUARTER

- Pharmacy 12*, one hour, Professor Wulling
Pharmacy 13, two hours, Professor Wulling
Pharmacy 14, sixteen hours, Professor Wulling, Mr. Bachman, Mr. Blosmo and Assistant
Mineralogy and Crystallography 1, one hour, Mr. Grout
Pharmacognosy 1, five hours, Mr. Butters and Assistant
Pharmacy 16 and 17, sixteen hours, Professor Wulling, Mr. Bachman and Assistants
Pharmacy 23, one hour, Mr. Bachman

SECOND QUARTER

- Pharmacy 13*, two hours, Professor Wulling
Mineralogy 2, one hour, Mr. Grout
Pharmacognosy 1, nine hours, Mr. Butters and Assistant
Pharmacy 18, sixteen hours, Professor Wulling, Mr. Bachman, Mr. Blosmo and Assistant
Chemistry 4, nine hours, Professor Frankforter, Assistant Professors Derby and Harding
Pharmacy 23, one hour, Mr. Bachman

THIRD QUARTER

- Pharmacognosy 1*, six hours, Mr. Butters and Assistant
Chemistry 3, sixteen hours, Professor Sidener and Assistant
Pharmacy 23, one hour, Mr. Bachman
Pharmacy 13, two hours, Professor Wulling
Pharmacy 19 and 15, twenty hours, Professor Wulling, Mr. Bachman, Mr. Blosmo and Assistant

FOURTH QUARTER

Pharmacy 13, one hour, Professor Wulling

Pharmacy 23, two hours, Mr. Bachman

Pharmacognosy 2, six hours, Mr. Butters

Pharmacy 20, 21, 22, 24, twenty hours, Professor Wulling, Mr. Bachman,
Mr. Blosmo and Assistant

Therapeutics 3, six hours, Professor Brown and Assistant

Pharmacy Law, one and one-half hour, Professor Wulling

First Aids, one and one-half hours, Dr. McCloud

THIRD YEAR

Students taking three years to do the work of the regular two-year course will divide the work in an equitable way subject to the approval of the Dean. Students are urged to devote three years to the completion of the course.

PHARMACY

FREDERICK J. WULLING, Ph.D., LL.M., etc., *Professor of Pharmacology*

GUSTAV BACHMAN, Ph.C., Ph.M., *Instructor in Pharmacy*

OSCAR BLOSMO, Ph.C., *Assistant in Pharmacy*

E. P. JONES, Ph.B., *Laboratory Assistant*

1. HISTORY OF PHARMACY PROFESSOR WULLING
One-third credit (six hours lecture) First quarter, first year
The history of the U. S. Pharmacopeia through all its revisions.
Dispensatories, text-books, and works of reference.
2. METROLOGY PROFESSOR WULLING, MR. BACHMAN AND ASSISTANT
Two-thirds credit (twelve hours lecture) First quarter, first year
Weights and measures, including metric system; balances—construction, varieties, methods of weighing; specific gravity in detail; specific volume, alligation, etc.
3. THE PHYSICS OF PHARMACY PROFESSOR WULLING, MR. BACHMAN
AND ASSISTANT
Two and one-half credits (eighteen hours lecture, fifty-four hours
laboratory) Second quarter, first year
Prerequisite, pharmacy 2.
Students are required to have had elementary physics before entering. This course covers a review and more extended elucidation of such divisions of physics as apply to pharmaceutical processes. Special attention is paid to heat. Specific heat; thermometers—the various scales, testing and comparing thermometers; combustion of solids, liquids and gases in various kinds of furnaces, stoves and burners; application of heat in drying ovens, steam, hot-air and water ovens; drying closets, desiccators, blow-pipes, crucibles; baths for controlling and equalizing heat; water-salt-oil-glycerine-paraffin-hot-air-baths; evaporation—spontaneous, rapid, slow, in vacuo; ebullition—boiling points, fusion; sublimation, calcination, dehydration, torrefaction, roasting, reduction, oxidation; carbonization, de-

flotation, ignition, etc.; solution—pharmaceutical, simple, chemical, saturated; circulatory displacement; dialysis—construction of dialyser, osmosis, endosmosis, exosmosis; crystalloids and colloids, etc.

4. PHARMACEUTICAL PROCESSES PROFESSOR WULLING, MR. BACHMAN
AND ASSISTANT

Three and one-half credits (twenty-four hours lecture, seventy-two hours laboratory) Second and third quarters, first year
Prerequisite, pharmacy 3.

The processes not taken up in 3, constitute the subjects of this course. In part they are: drug grinding and powdering; comminution; contusion; trituration; sifting; elutriation; levigation; lixiviation; filtration—filtering medii, filtration of solutions, oils, syrups, rapid filtration, filtration in vacuo, hot filtration, colation; washing—displacement, continuous; decantation—the syphon and its uses; precipitation—methods, vessels, separating, drying, weighing; granulation—granular effervescent salts; desiccation; exsiccation; crystallization—water of crystallization, deliquescence, efflorescence, methods of obtaining crystals, collecting, draining, washing, drying crystals, fractional crystallization; distillation—stills, simple, fractional, destructive; extraction; maceration; expression; percolation—history, theories, percolators, exhaustion, repercolation, continuous percolation, fractional percolation; clarification; decolorization

5. PHARMACOPOEIAL PREPARATIONS PROFESSOR WULLING, MR. BACHMAN
AND ASSISTANT

Five credits (thirty hours lecture, one hundred twenty hours laboratory) third and fourth quarters, first year.

This course includes the study and preparation of official bodies for which the U. S. P. gives formulae and processes, and includes waters, solutions, syrups, mucilages, spirits, infusions, decoctions, tinctures, fluid extracts, vinegars, wines, liniments, oleates, ointments, cerates, resins, oleo-resins, honeys; glycerites, mixtures, emulsions, elixirs, collodions, pills, capsules, powders, suppositories, bougies, plasters, papers, cachets, etc.

6. MATHEMATICS OF PHARMACY PROFESSOR WULLING AND MR. BACHMAN

While students are required to have a preparation in arithmetic and algebra before entering, they receive frequent drills at stated hours and as occasion requires or suggests throughout the entire course. Students are required to take a final examination in the subject at the end of the first year, at which examination they must attain a rating of at least eighty per cent.

7. PHARMACY QUIZ MR. BACHMAN

Three credits (fifty-four hours) Second, third and fourth quarters,
first year

Prerequisites, pharmacy 2, 3, 4, and 5.

A thorough review of the work covered in 2, 3, 4, and 5.

8. IDENTIFICATION OF INORGANIC OFFICIAL PREPARATIONS MR. BACHMAN
One credit (eighteen hours) Second and third quarters, first year

The study of the physical properties of official preparations.

9. CHEMICAL PHILOSOPHY PROFESSOR WULLING
One and one-half credits (twenty-seven hours lecture)
First quarter, first year

Treats of the principles underlying chemistry, and endeavors to elucidate chemical facts and phenomena. The subject is divided into—chemical statics, embracing the study of the theories of atoms and molecules, atomic weights, atomic and

molecular volume, quantivalence, molecular structure, ions, electric qualities, etc., and—chemical dynamics, the study of reactions and their equations, thermics, chemical properties in general, etc.

10. THE PHARMACEUTICAL CHEMISTRY OF THE NON-METALS AND THEIR PREPARATIONS
 PROFESSOR WULLING
 One and one-half credits (twenty-seven hours lecture)
 Second quarter, first year
 Prerequisite, pharmacy 9.
11. PHARMACOPOEIAL INORGANIC SALTS AND THEIR OFFICIAL PREPARATIONS
 PROFESSOR WULLING
 Three credits (fifty-four hours lecture)
 Third and fourth quarters, first year
 Prerequisites, pharmacy 10.
 Especial reference to description, properties and manufacture.
12. CLASSIFICATION OF PHARMACOPOEIAL ORGANIC COMPOUNDS
 PROFESSOR WULLING
 One credit (eighteen hours lecture)
 Third quarter, first year
 A preparation for pharmacy 13.
13. CHEMISTRY OF THE PHARMACOPOEIAL ORGANIC COMPOUNDS AND THEIR PREPARATIONS
 PROFESSOR WULLING
 Three credits (fifty-four hours lecture)
 First, second, and third quarters, second year
 Prerequisite, pharmacy 12.
 This course includes the critical study of cellulin and its derivatives, destructive distillation products, starches, sugars, fermentation products, organic acids, fixed oils and fats, volatile oils, waxes, and animal fats, alkaloids, glucosides, animal drugs and products, etc.
14. PHARMACOPOEIAL TESTING
 PROFESSOR WULLING, MR. BACHMAN
 AND ASSISTANTS
 Five credits (thirty-six hours lecture, one hundred eight hours laboratory)
 First quarter, second year
 A critical study of the identity, purity, limit and percentage tests of the Pharmacopœia and their application either wholly or in part to practically every official organic and inorganic salt and compound.
15. QUANTITATIVE ANALYSIS OF U. S. P. SALTS AND PREPARATIONS
 PROFESSOR WULLING AND MR. BACHMAN
 Two credits (eighteen hours lecture, thirty-six hours laboratory)
 Third quarter, second year
 Prerequisites, chemistry 3 and pharmacy 14.
 This course includes the gravimetric, volumetric and gasometric determinations of the U. S. Pharmacopœia, but not pharmaceutical assay work (20).
16. INCOMPATIBILITY
 PROFESSOR WULLING AND MR. BACHMAN
 One-half credit (nine hours lecture)
 Second and third quarter, second year
 Therapeutic, pharmaceutical and chemical incompatibility is taken up in lecture and recitation work preliminary to 17.
17. DISPENSING
 PROFESSOR WULLING AND MR. BACHMAN
 Five and one-half credits (twenty-seven hours lecture, one hundred forty-four hours laboratory)

- Third and fourth quarters, second year.
- Prerequisite, pharmacy 16.
The study of the prescription and practical work in dispensing upwards of one hundred typical prescriptions
18. MANUFACTURE OF OFFICIAL ORGANIC AND INORGANIC SALTS AND PREPARATIONS PROFESSOR WULLING, MR. BACHMAN AND ASSISTANT
Four and one-third credits (twenty-four hours lecture, one hundred eight hours laboratory) Second quarter, second year
The preparation of about forty official salts included in the course.
19. NATIONAL FORMULARY PROFESSOR WULLING AND MR. BACHMAN
One credit (six hours lecture, twenty-four hours laboratory) Second and third quarters, second year
This course includes the study of the National Formulary and the making of one or more members of each class of preparations.
20. PHARMACEUTICAL ASSAY PROFESSOR WULLING, MR. BACHMAN AND ASSISTANT
One and one-third credits (six hours lecture, thirty-six hours laboratory) Fourth quarter, second year
Prerequisites, pharmacy 14 and chemistry 3.
The quantitative determination of active constituents of a number of the potent organic drugs and preparations.
21. SYNTHETIC REMEDIES PROFESSOR WULLING
One-third credit (six hours lecture) Fourth quarter, second year
Prerequisites, pharmacy 12 and 13 and chemistry 4.
A study of the chemistry of synthetic remedies in medical use.
22. HOMEOPATHIC PHARMACY PROFESSOR WULLING AND MR. BACHMAN
Fourth quarter, second year.
A brief exposition of the principles underlying homeopathic medication with some laboratory work.
23. IDENTIFICATION OF SALTS MR. BACHMAN
One and one-half credits (fifty-four hours laboratory) Second semester, first year and entire second year
The study of the physical identity of the more important official inorganic and organic salts.
24. MICRO-CHEMISTRY PROFESSOR WULLING
Fourth quarter, second year. (Optional)
A brief course is provided for seniors if time permits.

CHEMISTRY

GEORGE B. FRANKFORTER, M.A., Ph.D., *Dean of the School of Chemistry*
Professor of Chemistry

CHAS. F. SIDENER, B.S., *Professor of Quantitative Chemistry*

EVERHART P. HARDING, M.S., Ph.D., *Assistant Professor of Chemistry*

IRA HARRIS DERBY, B.S., *Assistant Professor of Chemistry*

JOHN A. HANDY, Ph.C., *Instructor in Chemistry*

1. GENERAL CHEMISTRY PROFESSOR DERBY AND MR. HANDY
Five credits (forty-five hours lecture, ninety hours laboratory) First quarter, first year

This course includes a study of the chemical properties of the metallic and non-metallic elements.

2. **QUALITATIVE ANALYSIS** PROFESSOR DERBY AND MR. HANDY
 Five credits (forty-five hours lecture, ninety hours laboratory)
 Second quarter, first year

Prerequisites, chemistry 1.

This course covers the common reactions of the metals and acids and their qualitative separation. The ionic theory and the law of mass action are discussed with especial reference to qualitative reactions.

3. **QUANTITATIVE ANALYSIS** PROFESSOR SIDENER AND ASSISTANT
 Four and one-half credits (twenty-seven hours lecture, one hundred eight hours laboratory) Second quarter, second year

Prerequisites, chemistry 1 and 2.

A study of the principles of quantitative estimation; gravimetric, volumetric and gasometric.

4. **TOXICOLOGY, WATER AND FOOD ANALYSIS** PROFESSORS FRANKFORTER, DERBY AND HARDING

Three and one-half credits (twenty-seven hours lecture, seventy-two hours laboratory) Second quarter, second year

The chemistry of the atmosphere, water, soil, etc.; the sanitary examination of air and water.

5. **ORGANIC CHEMISTRY** PROFESSORS FRANKFORTER, DERBY AND MR. HANDY

Nine and one-half credits (seventy-two hours lecture, one hundred ninety-eight hours laboratory)

Third and fourth quarters, first year

This course includes work in both the aliphatic and aromatic series and the preparation of the more important compounds.

BOTANY AND MICROSCOPY

FREDERICK E. CLEMENTS, Ph.D., *Professor of Botany*

FREDERICK K. BUTTERS, M.S., *Instructor in Pharmaceutical Botany and Microscopy*

.....Assistant

1. **COMPARATIVE MORPHOLOGY OF THE CRYPTOGAMS** PROFESSOR CLEMENTS, MR. BUTTERS

Four credits (thirty-six hours lecture, seventy-two hours laboratory) First year

The course embraces the comparative morphology of the cryptogams. Especial attention is paid to the green algae, the foundation of the vegetable kingdom. The other groups of algae and the fungi are briefly treated, particular stress being laid on their economic relations to other plants, to animals and to man. About one-half of the semester is devoted to the study of the archegoniate series of plants. Numerous examples of liverworts, mosses, ferns, and their allies are studied in the laboratory, and the line of development which leads from the algae through the archegoniate series to the seed plants is emphasized.

2. THE MORPHOLOGY AND ANATOMY OF THE HIGHER SEED PLANTS

PROFESSOR CLEMENTS AND MR. BUTTERS

Four credits (thirty-six hours lecture, seventy-two hours laboratory)

Prerequisite, botany 1.

In this course especial attention is paid to vegetable histology. The characteristic plant tissues are examined, and their arrangement is noted in roots, stems, leaves, fruits and seeds. The formation and occurrence of carbo-hydrates, glucosides, alkaloids, organic acids, resins, gums, gum-resins and oleo-resins are carefully studied.

3. MICRO-BOTANY

MR. BUTTERS

Designed to furnish practical training in the use of the microscope, in the preparation of material for microscopic examination, including the use of micro-chemical reagents, and in the representation by drawings of all structures observed.

The work of this course is co-incident with that of 2 and 3.

These courses occupy the equivalent of six and one-half hours a week throughout the junior year. They aim to give a comprehensive and scientific view of the vegetable kingdom, to lay a broad foundation for the study of pharmacognosy. Throughout the course attention is frequently directed in the lectures to the wider relations of plants to one another and to animals, and to the discussion of the plant as a living unit, thus bringing before the class the fundamental problems of plant physiology and ecology.

The successful completion of the course in botany is prerequisite to the study of pharmacognosy.

PHARMACOGNOSY

.....*Professor of Pharmacognosy*
 FREDERICK K. BUTTERS, M.S., *Instructor in Pharmacognosy*

.....*Assistant*

1. CRUDE VEGETABLE DRUGS

MR. BUTTERS

Seven credits (fifty-four hours lecture, one hundred forty-four hours laboratory) Second, third, and fourth quarters, second year

Prerequisites, Botany 1, 2, and 3.

The vegetable drugs of the United States Pharmacopoeia are taken up in the following order: Roots, rhizomes, tubers and bulbs, woods, barks, leaves, herbs and flowers, fruits, seeds, plant exudations, resins, gum-resins, waxes and starches. Each drug is carefully examined, both macroscopically and microscopically. Students are also provided with specimens for home study. The lectures give, in compact form, the history and important features of each drug, with consideration of its importance to the pharmacist. The quizzes include careful drill on the constituents, action and dose and official preparation of each drug considered. Identification receives careful attention and there are weekly tests of the student's ability. A short course is given in the microscopic examination of some of the more important alkaloids and glucosides, and of certain emulsions and inorganic salts, if time permits.

The drugs are considered in the following order:

Roots—Sarsaparilla (Mexican, Para and Honduras), senega, gentian, taraxacum, pyrethrum, inula, lappa, apocynum, stillingia, sumbul, asclepias, phytolacca, althaea, belladonna, bryonia, calumba, rheum, glycyrrhiza, (Spanish and Russian), ipecacuanha, pareira, krameria, rumex.

Rhizomes—Aspidium, zingiber (Jamaican, East Indian and African), calamus, veratum viride, iris, cypridium, convallaria, triticum, sanguinaria, geranium, podophyllum, valeriana, arnica, serpentaria, spigelia,

hydrastis, caulophyllum, cimicifuga, leptandra, gelsemium, menispermum.

Tubers and Bulbs—Jalapa, aconitum, colchicum, scilla, allium.

Twigs and Woods—Quassia, hæmatoxyton, santalum rubrum, gualacum, dulcamara.

Barks—Cinchona (Rubra et Flava), prunus virginiana, viburnum prunifolium, viburnum opulus, rubus, quercus alba, granatum, aspidosperma, frangula, rhamnus purshiana, juglans, xanthoxylum, mezereum, gossypii radix, euonymus, quillaja, ulmus, sassafras, cascariilla, cinnamomum (Ceylon, Saigon and cassia).

Leaves and Leaflets—Pilocarpus, eucalyptus, uva ursi, senna (Alexandria and India), coca (Bolivian and Truxilla), belladonna, stramonium, hyoscyamus, tabacum, digitalis, matico, salvia, hamamelis, castanea, eriodictyon, chimaphila, buchu (long and short), rhus toxicodendron.

Herbs and Flowers—Santonica, caryophyllus, sambucus, calendula, cusso, arnica, matricaria, anthemis, rosa gallica, rosa centifolia, crocus, zea, chondrus, cetraria, cannabis indica, pulsatilla, scoparius, eupatorium, grindelia, tanacetum, artemisia, absinthium, lobelia, mentha piperita, mentha viridis, melissa, hedeoma, marrubium, scutellaria, chlrata, sabina, chelidonium.

Fruits—Humulus, piper (longum, nigrum et album), cubeba, pimenta, rhus glabra, capsicum, colocynthis, cassia fistula, chenopodium, illicium, cardamomum, vanilla, coriandrum, conium, anisum, carum, feniculum (Roman and German), macis, aurantii amari cortex, aurantii dulcis cortex, limonis cortex, prunum, tamarindus (East and West Indian), phytolacca, ficus, rubus.

Seeds—Physostigma, amygdala (dulcis et amara), pepo, myristica, sinapis (alba et nigra), nux vomica, staphisagria, ricinus, tiglium, stramonium.

Miscellaneous—Guarana, lactucarium, aloe (Socotrina, Barbadosensis, et Capensis), catechu, kino (Malabar et Pallas), opium, elastica, manna, saccharum, saccharum lactis, mel, acacia, tragacantha, mastiche, gualacum, benzoinum, cambogia, asafoetida, ammoniacum, scammonium, myrrha, copaiba, terebinthina, terebinthina canadensis, resina, pix (Burgundica et liquida), styrax, balsamum peruvianum, balsamum toltanum, camphora, thymol, menthol, ergota (Spanish and German), sassafras medulla, galla (Aleppo et Chinensis), gossypium purificatum, kamala, lupulinum, lycopodium, amylium, cetaceum, cera, cantharis, coccus, ichthyocolia, moschus, carbo animalis.

Besides the foregoing, a number of the more important unofficial drugs will also be discussed.

2. POWDERED DRUGS

MR. BUTTERS AND ASSISTANT

One credit (nine hours lecture, twenty-seven hours laboratory)

Fourth quarter, second year

Prerequisite, pharmacognosy 1.

This course consists of laboratory work and occasional lectures.

The more important vegetable drugs are examined microscopically, in powdered form. Especial attention is paid to the identification of unknown powders, and to the detection of the various forms of sophistication to which powdered drugs are subject.

MATERIA MEDICA AND THERAPEUTICS

E. D. BROWN, Pharm.D., M.D., *Acting Professor of Materia Medica and Therapeutics*

W. D. SHELDON, M.D., *Instructor in Therapeutics*

..... *Assistant in Materia Medica*

1. INORGANIC MATERIA MEDICA

PROFESSOR BROWN AND ASSISTANT

2. **ORGANIC MATERIA MEDICA** PROFESSOR BROWN AND ASSISTANT
Five credits (ninety hours lecture and recitation)
Third and fourth quarters, first year
The work in inorganic and organic materia medica is based principally on the U. S. P., but unofficial and synthetic drugs are also studied. The course includes the study of the general characteristics of drugs and of physiological action. Pharmacodynamics, including the study of the identity and quality of drugs, shares attention in the course of pharmacognosy.
3. **THERAPEUTICS** PROFESSOR BROWN AND DOCTOR SHELDON
One credit (eighteen hours lecture and recitation)
Third quarter, second year
Prerequisites, materia medica 1 and 2.
In this course drugs are studied in groups, as governed by their physiologic action, and the therapeutic features of such groups are described. Remedial measures other than those depending upon drugs, are fully considered.

PHYSIOLOGY

RICHARD O. BEARD, M.D., *Professor of Physiology*

M. R. WILCOX, M.D., *Professor of Physiology*

JULIUS PARKER SEDGWICK, B.S., M.D., *Instructor in Physiological Chemistry*

1. **PHYSIOLOGY, ANATOMY AND HISTOLOGY . . .** PROFESSORS BEARD AND WILCOX
Four and one-half credits (eighty-one hours lecture and recitation)
Third quarter, first year
1. The work covers the study of the physiological properties of the cell, the nutritive media, the nervous mechanisms in general, muscular tissues, connective tissues and epithelial tissues. The subjects of anatomy and histology are touched upon sufficiently to lay the foundation for the proper understanding of physiological functions.
Special demonstrations are given upon animals and the living subject, illustrating the physiological functions in the muscular, nervous, vascular, respiratory and glandular systems, special attention being directed to the action of drugs and their effects upon the various systems.
2. **QUALITATIVE AND QUANTITATIVE URANALYSIS (Post-Graduate)**
PROFESSOR BEARD AND DR. SEDGWICK
One credit (nine hours lecture, eighteen hours laboratory)
Second semester
Prerequisite, Physiology 1.
Lectures, recitations and laboratory work. The laboratory work includes the qualitative analysis of representative specimens of urine as regards their physical properties, inorganic and organic constituents, as well as the quantitative determination of chlorides, urea, ammonia, total nitrogen, sugar and albumin, together with the preparation of reagents.
3. **EXPERIMENTAL PHYSIOLOGY (Post-Graduate)** PROFESSORS BEARD AND WILCOX
Four credits (thirty-six hours lecture, seventy-two hours laboratory)
Second semester
Prerequisite, physiology 2.
Laboratory work and demonstrations. A study of physiologic apparatus, electric stimuli and methods of experimentation;

the demonstration and performance of experiments which illustrate physiologic function in the muscular, nervous, vascular, respiratory and glandular systems; and the study of the cardiac areas, the heart and respiratory sounds, and of pulse tracings including training in the use of sphygmograph, the stethoscope, phonendoscope, etc.

4. **PHYSIOLOGICAL CHEMISTRY AND MICROSCOPY (Post-Graduate)**

PROFESSORS BEARD AND WILCOX AND DR. SEDGWICK

Eight credits (seventy-two hours lecture, one hundred forty-four hours laboratory)

First semester

Prerequisite, physiology 3.

Laboratory work and demonstrations. A practical study of the several classes of proteids; of carbohydrates, fats, muscle and bone; of gastric juice, saliva, pancreatic juice and bile in their respective digestions; of glycogen, and of blood lymph, chyle and milk. Microscopic study of the carbohydrates in vegetable and animal forms; of the physiologic emulsions of fat; of the crystalline waste products, and of the physiologic conditions of the blood cells and of blood crystals. Practical instruction is given during this course in the enumerations of the blood cells, in the estimation of hæmoglobin and of the corpuscles in mass, in the spectroscopic examination of the blood in the determination of blood tests, and in the use of the polariscope.

PHARMACEUTICAL MINERALOGY AND CRYSTALLOGRAPHY

1. **MINERALOGY**

MR. GROUT

One credit (eighteen hours lecture)

First quarter, second year

Prerequisite.

A study of the occurrence and properties of minerals of pharmaceutical importance; ores of metals used in pharmacy; non-metallic minerals and mineral waters in their mineralogic and geologic relations.

2. **CRYSTALLOGRAPHY**

MR. GROUT

One credit (eighteen hours lecture)

Second quarter, second year

Prerequisite, mineralogy 1.

A survey of form and more evident physical characters as a basis for practice in sight recognition of economic minerals and their distinction from common rocks.

PHARMACEUTICAL JURISPRUDENCE

1. **LAW FOR PHARMACISTS**

PROFESSOR WULLING

Two-thirds credit (twelve hours lecture)

Fourth quarter, second year

The lectures introduce the subjects of contracts, agency, commercial paper, insurance, and discuss the liability of retail and manufacturing pharmacists, etc.

FIRST AIDS TO THE INJURED

1. **EMERGENCY CASES**

DR. MCCLOUD

Two-thirds credit (twelve hours lecture)

Third quarter, second year

A series of lectures designed to qualify the pharmacist to administer upon emergency cases before the arrival of the physician.

BACTERIOLOGY

Lectures and demonstrations. The general scope of bacteriology, the history of its development and the biological and chemical problems involved in the life history of bacteria will be dealt with. The classification of the various bacterial forms, the methods of isolation and culture and

the composition and manufacture of culture media will be studied until a thorough knowledge of technique is acquired. General and special study of the various antiseptics, disinfectants and bactericidal substances and conditions will be undertaken.

Laboratory work, involving the making of their own culture media by the students, the study of bacteria in cultures and under the microscope, technique of staining and other methods, including observations of chemical and biological peculiarities, will be thoroughly carried out. Testing of various germicides—chemical and physical—and the use of bacteriological methods in the examination of drinking water will form an important part of the work. Eighteen hours per week during the last eight weeks of the second semester, second year.

PROFESSOR WESBROOK, DR. CHOWNING.

This course is optional with students of pharmacy at present, but may be made obligatory.

CLINICAL MICROSCOPY

Instruction includes (a) the macroscopical study of urine, its colors, sediments, and finer chemical tests; (b) the microscopical study of urinary sediments, including blood, pus, epithelial cells, casts, etc.; (c) the macroscopical and microscopical study of sputum, including the study of sputa from cases of pneumonia, pulmonary tuberculosis, asthma, chronic bronchitis, etc.

Lectures and laboratory work. Eight hours weekly; last third, second semester, second year.

(Post-Graduate.)

DR. GEORGE DOUGLAS HEAD.

MINNESOTA PHARMACY LAW

Several lectures elucidating the rights, duties, privileges and liabilities of pharmacists under the state law regulating the practice of pharmacy, are given by special lectures near the close of the second year.

SPECIAL LECTURES

From eight to twelve special lectures on subjects related to the practice of pharmacy are delivered by well-known pharmacists of the state at intervals during the college year.

DISPENSARY PRESCRIPTION PRACTICE

The dispensing department of the University Free Dispensary at 1810 Washington Avenue South has lately been placed in charge of the College of Pharmacy, Mr. G. Bachman having supervision. The senior students are sectioned into classes of three for the purpose of doing practical prescription work at the dispensary under the direction of Mr. Bachman or Mr. Blosmo. The dispensary practice continues throughout the college year.

LECTURE AND LABORATORY SCHEDULES

The work of the regular course for 1908-'09 will be somewhat augmented, but the herewith schedule of the past year will be adhered to as far as possible. The necessary changes will be posted on the college bulletin in September.

The college year is divided into four quarters, the first and second constituting the first semester and the third and fourth, the second semester. The college year covers nine full months or thirty-eight weeks. Each quarter consists of nine working weeks.

FIRST SEMESTER—JUNIOR AND SENIOR SCHEDULE.

		FIRST QUARTER, 9 WEEKS. SEPT. 15 TO NOV. 14.						SECOND QUARTER, 9 WEEKS. NOV. 16 TO JAN. 30.											
		8:30	9:30	10:30	11:30	1:30	2:30	3:30	4:30	8:30	9:30	10:30	11:30	1:30	2:30	3:30	4:30		
FIRST YEAR	1908																		
	MON.	Botany Laboratory			Pharmaceutical Chemistry	General Chemistry				Pharmaceutical Laboratory				Qualitative Chemistry					
	TUES.	Botany Lecture	Pharm. Chemistry			General Chemistry				Botany Laboratory		Pharm. Chemistry	Qualitative Chemistry						
	WED.	Botany Laboratory			Pharm. Chemistry	Chem. Recitation				Pharmaceutical Laboratory				Recitation					
	THUR.	Botany Lecture	Pharm. Chemistry			General Chemistry				Botany Laboratory		Pharm. Chemistry	Qualitative Chemistry						
	FRI.	Botany Laboratory			Pharm. Chemistry	General Chemistry				Pharmaceutical Laboratory				Qualitative Chemistry					
SAT.	Make up Laboratory																		
SECOND YEAR	MON.	U. S. P. Testing						Dispensing				Pharmacognosy Laboratory				Toxicology, Food & Water			
	TUES.	U. S. P. Testing						Dispensing				Operative Pharmacy				Operative Pharmacy			
	WED.	Organic Pharm.	Identification	Mineral and Crystall.	Pharmacognosy Lecture	Pharma. Labor.				Organic Pharm.	Identification	Mineral and Crystall.	Pharmacognosy Lecture	Toxicology, Food & Water					
	THUR.	U. S. P. Testing						Dispensing				Operative Pharmacy				Operative Pharmacy			
	FRI.	U. S. P. Testing						Dispensing				Pharmacognosy Laboratory				Toxicology, Food & Water			
	SAT.	Make up Laboratory																	

On Saturday mornings the pharmaceutical laboratory is open for the benefit of students who for sufficient reason may be behind in their laboratory work.

SECOND SEMESTER—JUNIOR AND SENIOR SCHEDULE.

		THIRD QUARTER. Feb. 2 to April 3.								FOURTH QUARTER. April 5 to June 5.									
1909		8:30	9:30	10:30	11:30	1:30	2:30	3:30	4:30	8:30	9:30	10:30	11:30	1:30	2:30	3:30	4:30		
FIRST YEAR.	MON.	Materia Medica	Physiology		Organic Chemistry				Materia Medica	Botany Laboratory				Organic Chemistry					
	TUES.	Pharm. Chemistry	Materia Medica	Pharmaceutical Laboratory		Organic Chemistry				Pharm. Chemistry	Materia Medica	Pharmaceutical Laboratory				Organic Chemistry			
	WED.	Materia Medica	Physiology		Organic Chemistry				Materia Medica	Botany Laboratory				Organic Chemistry					
	THUR.	Pharm. Chemistry	Materia Medica	Pharmaceutical Laboratory		Organic Chemistry				Pharm. Chemistry	Materia Medica	Pharmaceutical Laboratory				Organic Chemistry			
	FRI.	Materia Medica	Physiology		Organic Chemistry				Materia Medica	Botany Laboratory				Organic Chemistry					
	SAT.	Make up Laboratory								Make up Laboratory									
SECOND YEAR.	MON.	Quantitative Chemistry			Pharm. Labor.				First Aids	Law	Therapeutics				Pharmaceutical Laboratory				
	TUES.	Pharmacognosy Laboratory		Organic Pharmacy	Pharm. Labor.				Pharmacognosy Laboratory			Identification			Pharmaceutical Laboratory				
	WED.	Quantitative Chemistry			Pharm. Labor.				Organic Pharmacy	New Remedies	Therapeutics				Pharmaceutical Laboratory				
	THUR.	Pharmacognosy Laboratory		Organic Pharmacy	Pharm. Labor.				Pharmacognosy Laboratory			Identification			Pharmaceutical Laboratory				
	FRI.	Quantitative Chemistry			Pharm. Labor.				First Aids	Law	Therapeutics				Pharmaceutical Laboratory				
	SAT.	Make up Laboratory								Make up Laboratory									

Pharmaceutical laboratory work includes U. S. P. and N. F. preparations, the manufacture of some U. S. P. salts, assay, and homeopathic pharmacy. Quantitative analysis includes gravimetric, volumetric, and gasometric determinations.

Students

JUNIOR PHARMACISTS

- Bradley, Gaylord F., Paynesville.
Budde, Emil M., Rochester.
Bugbee, Guy C., Paynesville
—Cochrane, Edith C., St. Paul.
Colby, Hans C., Jackson.
—Constance M. Ryan, Sister,
St. Josephs Hospital, St. Paul.
Courtney, John F., Belle Plaine.
Doerr, Harry, Minneapolis.
—Elizabeth M. McGolrick, Sister,
St. Josephs Hospital, St. Paul.
Emmans, Floyd H., Minneapolis.
Erickson, William A., Cashton, Ws.
Fratzke, Theodore W., Eyota.
Glass, Philip A., River Falls, Wis.
—Gjerdingen, Nathalia L., Halstad.
Hamilton, Horace L., St. Louis Park.
Hanson, Harry, Rochester.
Hanson, William C., Sleepy Eye.
Hare, Joseph Jr., Bismarck, N. D.
Hawlish, Joseph E., Hopktns.
Hohn, Walter G., St. Paul.
James, Chas. W., Rochester.
Kellam, Ansel B., Heron Lake.
Kelly, Chas. F., Webster, S. D.
Kleihuizen, Albert E., Raymond.
—Lyman, Emily L., Ia.
Leikvold, Albert, Waterville, Ia.
Levinson, Irving M., Seattle, Wash.
- Majerus, John, Helena, Mont.
—Mathewson, Vera Mae, Minneapolis.
—Maxwell, Hazel, St. Paul.
—Meadowcroft, Grace, Ruso, N. D.
Michael, Joseph C., Jordan.
Munroe, Will R., Cummings, N. D.
Nelson, Rex G., New Richland.
Orr, Merton J., Bismarck, N. D.
Parker, Claude H., Minneapolis.
Paulson, Carl M., Minneapolis.
Peterson, Hugo O., Minneapolis.
—Peyton, Agnes, Wheaton.
—Ponthan, Marie Wilhelmina,
St. Paul.
Reierson, Carl R., Spring Grove.
Root, Nelson W., Elysian.
Samuels, Harvey C., Minneapolis.
Shima, Ryujen, Otaro, Rokkaido,
Japan.
Sievvert, Arthur F., New Richland.
Slawson, Frank W., Graceville.
—Snyder, Bessie E., Hector.
Speidel, Harry W., Ladysmith, Wis.
Spellman, Clyde A., Montevideo.
Spengler, Wm. M., St. Paul.
Tyrholm, Harold A., New Richland.
Wolf, George E., Olivia.
Yamagishi, Kozo, Kobe, Japan.
—Zalesky, Pauline B., St. Paul.

SENIOR PHARMACISTS

- Alcott, Dolph C., Lakefield.
—Austin, Alberta J., Milbank, S. D.
Becker, Frank A., Montgomery.
Bowman, Fred M., Browns Valley.
Buckman, Mark M., Little Falls.
Breckenridge, John Y. Jr., Pine City.
Carlson, Arthur E., Willmar.
—Carlson, Helma A., Erskine.
Casey, John A., Aitkin.
—Caton, Mrs. Charlotte E.,
Minneapolis.
Cleveland, Zina, Northfield.
De Witz, Frank A., Rochester.
Diessner, Chas. O., Waconia.
Doty, Archie C., Eyota.
Dretchko, Guy L., Winthrop.
Earle, Fred W., Rochester.
Eckstein, Arthur W., New Ulm.
Eichstadt, John, Stewartville.
Erkenbrack, Earl S., Parkers Prairie.
Green, Everhard, Hankinson, N. D.
Gronvold, Bernt O., Kenyon.
Gunderson, Alfred J., Pelican Rapids.
- Heath, Marie J., Riga, N. D.
Holmgren, George A., Breckenridge.
Hooper, Archie J., Minneapolis.
Hotvedt, Elmer L., Eau Claire, Wis.
Jones, Edward P., Blue Earth.
Kelly, John V., St. Paul.
Klovstadt, Thomas, Milan.
Kurth, Asa F., Hendricks.
Kusterman, Frederick G., St. Cloud.
Lafans, Alfred F., Minneapolis.
Lambert, Ray R., Royaltton.
Lovdahl, Arthur E., Park Rapids.
McMiller, Paul R., Carrington, N. D.
—Nesse, Ella M., Mabel.
Olverson, Oscar A., Clark, S. D.
Pladson, Ingvald S., Glenwood.
Puhl, Richard H., Menomonie, Wis.
Schreiber, Norman C., Red Lake Falls.
Stoppel, Ernest, Rochester.
Van Campen, Harry, Alton.
Weber, George C., Rochester.
Welch, Leo S., Glencoe.
Zender, Chas. H., Henry, S. D.





The
University of Minnesota
Bulletin

School of Chemistry

1908-1909

Volume XI

April 7, 1908

No. 9

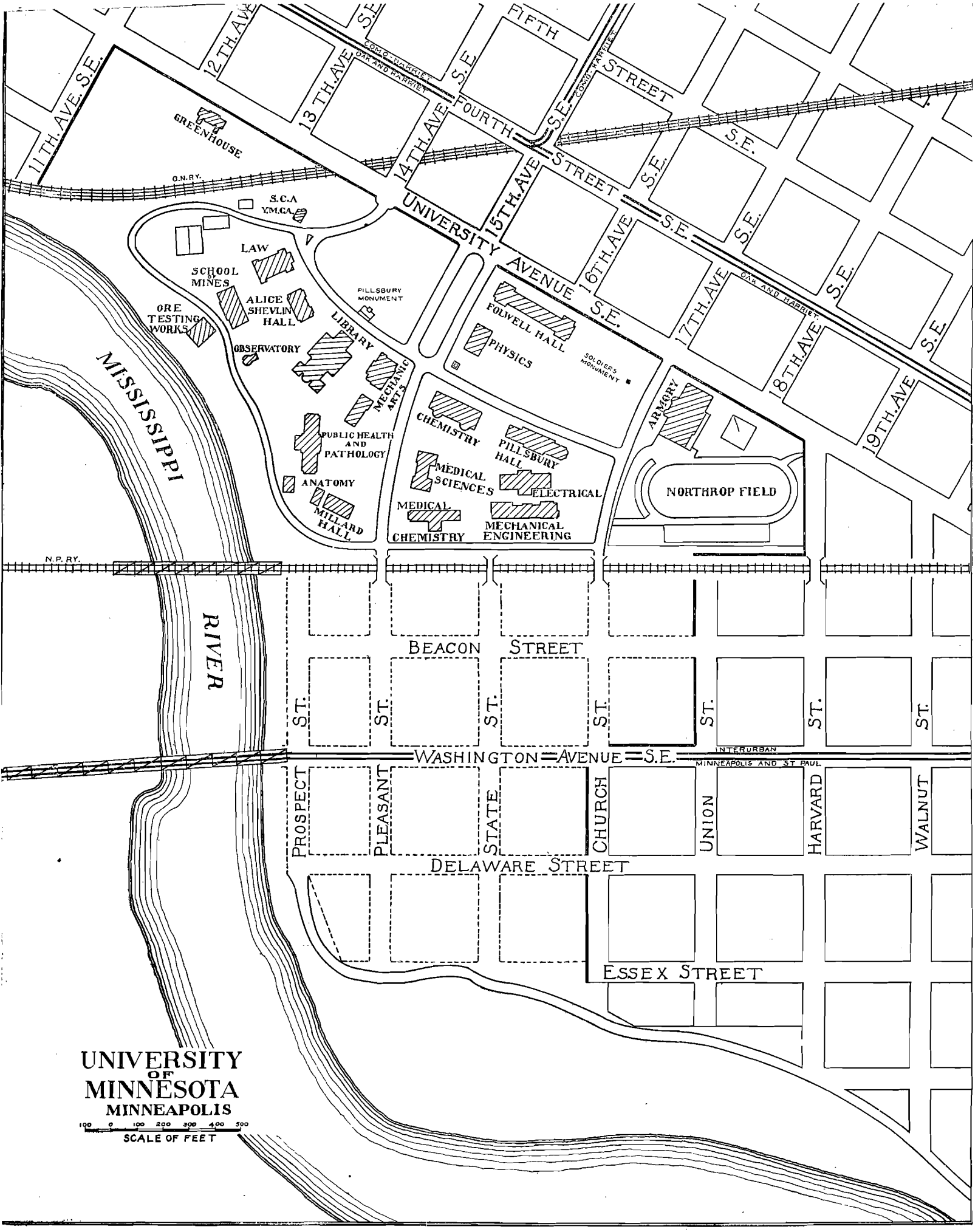
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The University catalogues are published by authority of the Board of Regents as a regular series of bulletins. One bulletin for each college is published every year, and in addition a bulletin of general information outlining the entrance requirements of all colleges of the University, and embodying such items as University equipment, organizations and publications, expenses of students, loan and trust funds, scholarships, prizes, etc. Bulletins will be sent gratuitously, postage paid, to all persons who apply for them. In calling for bulletins, please state the college or school of the University concerning which information is desired. Address,

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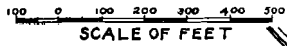
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**UNIVERSITY
OF
MINNESOTA
MINNEAPOLIS**



CALENDAR FOR 1908-1909

1908

1909

MAY

S.	M.	T.	W.	T.	F.	S.
..	1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
31

JUNE

..	1	2	3	4	5	6
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28	29	30
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SEPTEMBER

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OCTOBER

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..

NOVEMBER

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20	21	22	23	24	25	26
27	28	29	30	31

JANUARY

S.	M.	T.	W.	T.	F.	S.
..	1	2
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24	25	26	27	28	29	30
31

FEBRUARY

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28
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MARCH

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APRIL

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MAY

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30	31

JUNE

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6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30

University Calendar

1907-1908

THE UNIVERSITY YEAR

The University year covers a period of thirty-eight weeks beginning on the second Tuesday in September. Commencement day is always the second Thursday in June.

FEBRUARY	4 T	Second semester begins—classes called for regular work
	12 W	Lincoln's birthday—legal holiday
	22 S	Washington's birthday—legal holiday
APRIL	17 F	Good Friday. Recess two days
MAY	2 Th	Regular meeting Board of Regents
	25 M	Senior examinations begin
	30 S	Decoration Day—legal holiday
JUNE	1 M	Semester examinations begin
	6 S	Semester examinations close

COMMENCEMENT WEEK, 1908

SUNDAY	June 7	Baccalaureate service
MONDAY	June 8	Senior class exercises
TUESDAY	June 9	Phi Beta Kappa address. Senior promenade
WEDNESDAY	June 10	Alumni Day. Regular meeting Board of Regents
THURSDAY	June 11	Commencement Day. The thirty-sixth annual commencement
FRIDAY	June 12	Summer vacation begins

1908-1909

SEPTEMBER	7-14	Entrance examinations, condition examinations and registration
	15 T	Classes called for regular work. Seventeenth annual session
OCTOBER	1 Th	Regular meeting Board of Regents
	5 M	Regular meeting University Council. Opening day, School of Agriculture
NOVEMBER	26 Th	Thanksgiving Day. Recess three days
DECEMBER	7 M	Regular meeting University Council
	8 T	Annual meeting Board of Regents
	19 S	Holiday recess begins (no classes)
JANUARY	5 T	Work resumed in all departments
	23 S	Semester examinations begin
	30 S	Semester examinations close
FEBRUARY	2 T	Second semester begins—classes called for regular work
	12 F	Lincoln's birthday—legal holiday
	22 M	Washington's birthday—legal holiday
APRIL	5 M	Regular meeting University Council
	9 F	Good Friday. Recess two days

MAY	6 Th	Regular meeting Board of Regents
	24 M	Senior examinations begin
	31 M	Decoration Day—legal holiday
JUNE	1 T	Semester examinations begin
	5 S	Semester examinations close
	7 M	Regular meeting University Council

COMMENCEMENT WEEK, 1906

SUNDAY	June 6	Baccalaureate service
MONDAY	June 7	Senior class exercises
TUESDAY	June 8	Sigma Xi address. Senior promenade
WEDNESDAY	June 9	Alumni Day. Regular meeting Board of Regents
THURSDAY	June 10	Commencement Day. The thirty-seventh annual commencement
FRIDAY	June 11	Summer vacation begins

PROGRAM—ENTRANCE EXAMINATIONS

MONDAY,	September 7, 9	A. M.	3 Botany
			3 Zoology
			1 Astronomy
			3 Geology
		2 P. M.	2 American Government
			2 Political Economy
TUESDAY,	September 8, 9	A. M.	2 History
			5 Physics
		2 P. M.	4 Chemistry
			3 Physiography
WEDNESDAY,	September 9, 9	A. M.	1 English
		2 P. M.	1 German
			1 French
			1 Latin
			1 Scandinavian
THURSDAY,	September 10, 9	A. M.	1 Elementary Algebra
			2 Commercial Geography
		2 P. M.	1 Higher Algebra
FRIDAY,	September 11, 9	A. M.	1 Plane Geometry
		2 P. M.	1 Solid Geometry

1 Folwell Hall, 2 Library Building, 3 Pillsbury Hall, 4 Chemical Laboratory, 5 Physics Building, 6 Mechanic Arts Building.

The University

THE UNIVERSITY OF MINNESOTA comprises the following named schools, colleges and departments:

THE COLLEGE OF SCIENCE, LITERATURE AND THE ARTS

THE COLLEGE OF ENGINEERING AND THE MECHANIC ARTS

THE DEPARTMENT OF AGRICULTURE, including—

The College of Agriculture

The School of Agriculture

Short Course for Farmers

The Dairy School

The Crookston School of Agriculture

THE COLLEGE OF LAW

THE COLLEGE OF MEDICINE AND SURGERY

THE COLLEGE OF HOMEOPATHIC MEDICINE AND SURGERY

THE COLLEGE OF DENTISTRY

THE COLLEGE OF PHARMACY

THE SCHOOL OF MINES

THE SCHOOL OF ANALYTICAL AND APPLIED CHEMISTRY

THE COLLEGE OF EDUCATION

THE GRADUATE SCHOOL

The Regents of the University have entrusted to their charge:

THE EXPERIMENT STATIONS, including—

The Main Station at St. Anthony Park

The Sub-Station at Crookston

The Sub-Station at Grand Rapids

THE GEOLOGICAL AND NATURAL HISTORY SURVEY

Bulletins of these schools, colleges and departments may be obtained upon application to the University Registrar.

The Board of Regents

CYRUS NORTHROP, LL. D., MINNEAPOLIS	<i>Ex-Officio</i>
The President of the University	
The HON. JOHN LIND, MINNEAPOLIS	1914
The President of the Board	
The HON. JOHN A. JOHNSON, ST. PETER	<i>Ex-Officio</i>
The Governor of the State	
The HON. JOHN W. OLSEN, ALBERT LEA	<i>Ex-Officio</i>
The State Superintendent of Public Instruction	
The HON. THOMAS WILSON, ST. PAUL	1909
The HON. A. E. RICE, WILLMAR	1909
The HON. B. F. NELSON, MINNEAPOLIS	1910
The HON. PIERCE BUTLER, ST. PAUL	1910
The HON. CHARLES A. SMITH, MINNEAPOLIS	1910
The HON. S. M. OWEN, MINNEAPOLIS	1913
The HON. W. J. MAYO, ROCHESTER	1913
The HON. HENRY B. HOVLAND, DULUTH	1914

C. D. DECKER, MINNEAPOLIS
Secretary of the Board.

Executive Officers

THE UNIVERSITY

CYRUS NORTHROP, LL. D., *President*

ERNEST B. PIERCE, B. A., *Registrar*

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THE COLLEGES

JOHN F. DOWNEY, M. A., C. E., *Dean of the College of Science, Literature,
and the Arts*

FREDERICK S. JONES, M. A., *Dean of the College of Engineering and the
Mechanic Arts*

EUGENE W. RANDALL, *Dean and Director of the Department of Agriculture*

WILLIAM S. PATTEE, LL. D., *Dean of the College of Law*

FRANK FAIRCHILD WESTBROOK, M. A., M. D., C. M., *Dean of the College of
Medicine and Surgery*

EUGENE L. MANN, B. A., M. D., *Dean of the College of Homeopathic
Medicine and Surgery*

ALFRED OWRE, D. M. D., M. D., *Dean of the College of Dentistry*

FREDERICK J. WULLING, Phm.D., LL.M., *Dean of the College of Pharmacy*

WILLIAM R. APPLEBY, M. A., *Dean of the School of Mines*

GEORGE B. FRANKFORTER, Ph. D., *Dean of the School of Chemistry*

GEORGE F. JAMES, Ph. D., *Dean of the School of Education*

HENRY T. EDDY, C.E., Ph. D., LL. D., *Dean of the Graduate School*

ADA L. COMSTOCK, M. A., *Dean of Women*

The University Council

At the regular meeting of the Board of Regents of the University, May 31st, 1905, a University Council was established according to the following plan:

I. The name of the body shall be The University Council. It shall consist of the President of the University, the deans of the various colleges and schools, one elected representative from each college or school for each 400 students or major fraction thereof, and one representative of the general alumni association.

II. The elected members shall serve for a period of one year. They shall be chosen from the various faculties at the time of the selection of standing committees. The representative of the general alumni association shall be chosen by that body at its annual meeting from among the alumni who are not members of the University.

III. The Council shall be authorized to—

a) Apoint the following committees or the faculty representation thereon:

The University auditing committee

The University press committee

The committee on athletics

The committee on University relations to other institutions of higher learning

The committee on health and sanitation

The committee on commencement and other University functions

The committee on catalogue, programs and courses of study

The committee on student entertainments and social affairs

And such other committees as the general University interests may require

b) Receive reports from such committees and to make such recommendations as may be required.

c) Consider and act upon any matter of general University interest beyond the province of a single faculty which may be referred to it by the President of the University or any faculty.

IV. The Council shall hold stated meetings upon the first Monday of October, December, April and June, and such other meetings as the President of the University may call

Representatives to the Council

The University

PRESIDENT CYRUS NORTHROP

The College of Science, Literature and the Arts

DEAN JOHN F. DOWNEY

PROFESSOR JOHN H. GRAY

PROFESSOR J. C. HUTCHINSON

PROFESSOR H. F. NACHTRIEB

PROFESSOR NORMAN WILDE

The College of Engineering and the Mechanic Arts

DEAN FREDERICK S. JONES

PROFESSOR GEORGE D. SHEPARDSON

The College and School of Agriculture

DEAN EUGENE W. RANDALL

PROFESSOR HARRY SNYDER

PROFESSOR SAMUEL B. GREEN

The College of Law

DEAN WILLIAM S. PATTEE

PROFESSOR HENRY J. FLETCHER

The College of Medicine and Surgery

DEAN F. T. WESBROOK

PROFESSOR THOMAS G. LEE

The College of Homeopathic Medicine and Surgery

DEAN EUGENE L. MANN

The College of Dentistry

DEAN ALFRED OWRE

The College of Pharmacy

DEAN FREDERICK JOHN WULLING

The School of Mines

DEAN WILLIAM R. APPLEBY

The School of Chemistry

DEAN GEORGE B. FRANKFORTER

The College of Education

DEAN GEORGE F. JAMES

The Graduate School

DEAN HENRY T. EDDY

General Alumni Association

DAVID P. JONES

The Dean of Women

ADA L. COMSTOCK

University Council Committees

The University Auditing Committee

PROFESSORS ANDERSON, FLETCHER, OWRE, SIGERFOOS, SPRINGER

The Committee on Athletics

PROFESSORS PAIGE, BROOKE, HARDING, D. P. JONES, LITZENBERG

The Committee on Grounds and Sanitation

PROFESSORS FLATHER, BASS, BRACKEN, HICKMAN, RANDALL, SIDENER,
WESBROOK

The Committee on Catalogue, Programs and Course of Study

DEANS APPLEBY, EDDY, FRANKFORTER, JAMES, JONES, MANN, OWRE,
WULLING; PROFESSORS FLETCHER, JOHNSTON, SCHLENKER, SNYDER,
E. B. PIERCE

The Press Committee

PROFESSORS SCHAPER, BAUER, CONSTANT, ERDMANN, JAMES

The Committee on Commencement and other University Functions

PROFESSORS NACHTRIEB, JENKS, OWRE, PATTEE, RANDALL, SCHLENKER,
WASHBURN

The Committee on Student Entertainments and Social Affairs

PROFESSORS FRANKFORTER, BASS, COMSTOCK, COOKE, MULLEN, PIKE

The Committee on University Relations to other Institutions of Higher Learning

PROFESSORS DOWNEY, BOTHNE, EDDY, GRAY, GREEN, JAMES, LEE

The Committee on University Extension and University Lectures

PROFESSORS WEST, HAECKER, RANKIN, SCHLENKER, SHEPARDSON

The Committee on the Library

PROFESSORS EDDY, FLETCHER, F. S. JONES, LEE, REYNOLDS,
VAN BARNEVELD, WEST

School of Chemistry

FACULTY

- CYRUS NORTHROP, LL. D., *President*
GEORGE B. FRANKFORTER, M. A., Ph. D., *Dean and Professor of Chemistry*
WILLIAM R. APPLEBY, M. A., *Professor of Metallurgy*
GEORGE N. BAUER, Ph. D., *Professor of Mathematics*
WILLIAM E. BROOKE, B.C.E., M.A., *Professor of Mathematics*
WILLIAM H. BUSSEY, Ph.D., *Assistant Professor of Mathematics*
PETER CHRISTIANSON, B.S., E.M., *Assistant Professor of Assaying*
FREDERIC CLEMENTS, Ph.D., *Professor of Botany*
IRA H. DERBY, B. A., *Assistant Professor of Chemistry*
JOHN F. DOWNEY, M. A., C. E., *Professor of Mathematics*
HENRY T. EDDY, C.E., Ph.D., LL.D., *Professor of Mathematics and Me-
chanics*
JOHN J. FLATHER, Ph. B., M. E., *Professor of Mechanical Engineering*
JOHN H. GRAY, Ph.D., *Professor of Political Science*
CHRISTOPHER W. HALL, M. A., *Professor of Geology and Mineralogy*
EVERHART P. HARDING, M. S., Ph. D., *Assistant Professor of Chemistry*
FREDERICK S. JONES, M. A., *Professor of Physics*
HANS JUERGENSEN, *Assistant Professor of German*
WILLIAM H. KAVANAUGH, M. E., *Professor of Experimental Engineering*
WILLIAM KIRCHNER, B.S., *Professor of Drawing*
J. G. MOORE, B. A., *Professor of German*
BURT L. NEWKIRK, Ph. D., *Assistant Professor of Mathematics and Me-
chanics*
EDWARD E. NICHOLSON, M. A., *Assistant Professor of Chemistry*
LEVI B. PEASE, B. Sc. Chem., M.S., *Assistant Professor in Metallurgy*
EDWARD VAN DYKE ROBINSON, Ph.D., *Professor of Economics*
CARL OTTO ROSENDAHL, Ph.D., *Assistant Professor of Botany*
CARL SCHLENKER, B. A., *Professor of German*
GEORGE D. SHEPARDSON, M. A., M. E., *Professor of Electrical Engineering*

- CHARLES F. SIDENER, B. S., *Professor of Chemistry*
 EDWARD SIGERFOOS, Ph. B., Capt. U. S. A., *Professor of Military Science*
 FRANK W. SPRINGER, E. E., *Professor of Electrical Engineering*
 JOSEPHINE E. TILDEN, M.S., *Assistant Professor of Botany*
 CHARLES E. VAN BARNEVELD, B. A., Sc., E. M., *Professor of Mining En-
 gineering*
- MATILDA WILKIN, M.L., *Assistant Professor of German*
 JOHN ZELENY, B. S., Ph. D., *Professor of Physics*
 WALTER BADGER, B. A., *Instructor in Chemistry*
 OSCAR BURKHARD, M.A., *Instructor in German*
 LILIAN COHEN, M. A., *Instructor in Chemistry*
 LOUIS J. COOKE, M.D., *Director of the Gymnasium*
 HANS DALAKER, B.S., *Instructor in Mathematics*
 OSCAR W. FIRKINS, M.A., *Instructor in Rhetoric*
 FRANCIS C. FRARY, M. S., *Instructor in Chemistry*
 FRANK F. GROUT, B. S., *Instructor in Mineralogy*
 JOHN A. HANDY, Ph. C., *Instructor in Chemistry*
 ALOIS F. KOVARIK, B.A., *Instructor in Physics*
 JAMES E. MANCHESTER, Sc. D., *Instructor in Mathematics*
 JOHN C. MARTENIS, M. E., *Instructor in Machine Design*
 RAYMOND V. PHELAN, Ph.B., *Instructor in Economics*
 WILLIAM H. RICHARDS, *Instructor in Shop Work*
 NORMAN W. ROSE, M.E., *Instructor in Drawing*
 FRANK B. ROWLEY, B.S., M.E., *Instructor in Drawing*
 WILLIAM RYAN, E.E., *Instructor in Electrical Engineering*
 JAMES ZIMMERMAN, B.A., *Instructor in Chemistry*
 WILLIAM METHLEY, *Lecture Assistant*

COMMITTEES

Enrollment and Students' Work.—George B. Frankforter, C. F. Sidener, E. P. Harding, E. E. Nicholson.

Curriculum.—George B. Frankforter, C. F. Sidener, E. E. Nicholson, Ira H. Derby.

Program.—E. P. Harding, F. C. Frary, Lillian Cohen.

ADMISSION

Examinations for admission will be held at the beginning of the year. See calendar and program of examinations.

No student will be registered for first semester's work after September 26th, 1908, or for second semester's work after February 13th, 1909.

All applicants should present themselves to the registrar who will furnish them with application blanks and directions covering examinations and registration.

GENERAL REGULATIONS GOVERNING ADMISSION

- I. Students will be admitted to the freshman class on passing the regular entrance examinations.
- II. No student will be admitted if conditioned in more than three half-year subjects, or their equivalent. No conditions, however, in entrance mathematics shall be allowed except upon special recommendation of the department of mathematics.
- III. Graduates of any Minnesota State high school will be admitted without entrance examinations, provided:
 - (1) That the school maintain a full four-year course of high school work.
 - (2) That the applicant present to the registrar the principal's certificate showing the satisfactory completion of all the studies required for admission to the desired University course.
- IV. Graduates of Minnesota State high schools who are deficient in not more than three half-year subjects or their equivalent, may be excused from entrance examinations in such subjects as the enrollment committee may decide upon; such candidates should present themselves to that committee not later than Tuesday of examination week.
- V. Graduates of Minnesota State high schools whose principal's certificate shows them to be deficient in more than three half-year subjects or their equivalent, even though they have made such additional preparation as they deem necessary, must take, nevertheless, the regular entrance examination in all subjects, as provided in sections I and II unless excused by vote of the faculty; and persons wishing to present reasons for such excuse should report to the enrollment committee not later than Tuesday of examination week.
- VI. Graduates of the advanced courses of Minnesota normal schools will be admitted upon the same terms as graduates of State high schools.
- VII. Any Minnesota high school or academy not under supervision of the State High School Board, but requiring for graduation a four-year course, exclusive of the common school branches, conforming essen-

tially in distribution of time to the entrance requirements of at least one of the University courses, will, upon application, be inspected by a committee, and, after favorable recommendation, may be accredited by the faculty in all respects as are the State high schools, provided:

- (1) That the school be open to inspection at any time by the University;
- (2) That it take such supplementary examinations as may be prescribed from time to time.

VIII. Graduates from schools in other states, whose diplomas admit to reputable colleges in the state in which the school is located, will be received subject to the regulations that apply to graduates of Minnesota State high schools.

IX. Applicants from schools not coming within any of the above classes must take the regular entrance examinations or present State High School Board certificates.

In all cases the faculty reserves the right to require a student to take supplementary examinations if he does not sustain himself creditably in his course.

The enrollment committee will meet every day during the week commencing September 7th, in School of Chemistry Building, room 5, at 9 o'clock a. m.

REQUIREMENTS FOR ADMISSION TO THE FRESHMAN CLASS

N. B.—Time element, as indicated with each subject, is essential:—

English, four years, including:

- (a) Classics
- (b) Principles of composition
- (c) Practice in written expression

Algebra, elementary, one year

Algebra, higher, one-half year

Geometry, plane, one year

Geometry, solid, one-half year

Chemistry, one year

In addition to the above-named required subjects, for which no substitutes will be accepted, the student shall present evidence of having completed work in any of the following subjects, entitling him to eight year-credits:

Latin, four years

Grammar, one year

Caesar, four books, one year

Cicero, six orations, one year

Virgil, six books, one year

Greek, two years

Grammar, one year

Anabasis, four books, one year

German, two years

Grammar, one year

Literature, one year

French, two years

Grammar, one year

Literature, one year

Spanish, two years

Grammar, one year

Literature, one year

History, Ancient, to Charlemagne, one year

Modern, from Charlemagne, one year

English, one half year

Senior American, one half year

American Government, one half year

Political Economy, one half year

Physics, one year

Botany, one half or one year

Zoology, one half or one year

Astronomy, one half year

Geology, one half year

Physiography, one half year

Commercial Geography, one half or one year

ADVANCED STANDING

The University accepts records from all reputable colleges for credit to advanced standing. Such records are accepted as far as they are equivalent to the work done in this University. In bringing records from other institutions, the certificate must be on the official blank of the institution granting the certificate, and should show:

1. The subjects studied; if a language, the work read, etc.
2. The time spent upon each subject.
3. Ground covered in laboratory work in case of laboratory subjects.
4. The result—it is sufficient to state that the subject was creditably completed.

Records from institutions whose entrance requirements are not essentially equivalent to the requirements of the University, will not be accepted unquestioned; the credit to be allowed will be decided in individual cases by the enrollment committee.

DAILY ROUTINE

The morning session begins at 8:30 o'clock; a general assembly of the faculty and students is held each day at 10:25 o'clock, at which there are brief and simple religious exercises. Work extends through six days of the week.

FEES

All students in the college, who are residents of the state, are charged an incidental fee of fifteen dollars a semester. Non-residents are charged double the fee required of residents of the state, or thirty dollars a semester. No reduction is made for late entrance or for leaving before the end of the semester. Save in the case of the first registration, the incidental fee is increased 25 cents for each day's delay in registration, beginning with the day set for recitations to begin. In addition to this fee, students who take work in laboratories are charged a sum sufficient to cover the cost of material and breakage.

GENERAL STATEMENT

The two four-year courses in chemistry are designed for those who wish to become teachers of chemistry, analysts, investigators, manufacturing and applied chemists. The course in analytical chemistry is arranged especially for teachers, analysts and general scientists. The course in engineering chemistry is intended for those who would become manufacturing and applied chemists and chemical technologists. The courses here presented include general, organic, analytical, technical, theoretical and applied chemistry. Besides chemistry, extended work is offered in physics, mathematics, metallurgy, mineralogy, crystallography, geology, engineering, botany, language and drawing.

Electives are offered in the senior year in order to give the students an opportunity of selecting subjects of special importance to them, but which are not included in the regular courses. The degree of Bachelor of Science in Chemistry is offered to those who complete the course in Analytical Chemistry and Bachelor of Science in Chemical Engineering to those who complete the course in Applied Chemistry.

EQUIPMENT

Laboratories. The building formerly known as Science Hall has been completely remodeled to meet the needs of the department of chemistry. The building is 198 by 78 feet, and consists of several large laboratories well equipped for a wide range of chemical work. The general laboratory is located on the first floor and is large enough to accommodate 350 students. The laboratory tables are arranged with cupboards, drawers and

locks and supplied with gas and water. Connected with this laboratory by means of sliding windows, is a preparation room which is directly joined to the general store room. The remaining part of this floor is given to cloak rooms, furnace and motor rooms and a large lecture room with a gallery designed to seat comfortably 350 students. The qualitative laboratory, located on the second floor, is arranged with tables similar to those of the general laboratory and will accommodate 250 students. The library and three technical laboratories are likewise on this floor. The third floor contains the quantitative laboratory large enough to accommodate 120 students. Directly connected with this laboratory are the balance, preparation, evaporation and drying rooms. There are also on this floor, six special laboratories, an organic laboratory, a physical laboratory, a lecture room and a museum. There is a suite of rooms on the fourth floor entirely given to photography. The second building, which is one of the units in the medical quadrangle, contains three large laboratories with a combined floor space of 3,800 square feet. It is devoted largely to organic chemistry, pharmaceutical chemistry and toxicology.

Library. The chemical library contains complete sets of many of the important journals. It contains besides these special sets, a well-represented list of analytical and technical works, as well as many rare old works of great historical value. Most of the important journals are taken, thus enabling the student to keep abreast of the times. All books are easily accessible, with only the necessary restrictions to guard against injury and loss.

American Chemical Society. A local section of the American Chemical Society has been organized in Minnesota with headquarters at the University.

The Camera Club is an organization of instructors and students interested in photography and photographic chemistry.

INDUSTRIAL PHOTOGRAPHY

The photographic laboratories are equipped with process lenses, copying cameras, printing frames, presses, etching tubs, etc., for the production of half tone zinc etching and color work. Students who desire to become expert photo-engravers may specialize in this work during the senior year.

INDUSTRIAL MUSEUM

Considerable space is given to a collection in industrial, technical and applied chemistry. There is a large collection of chemicals, with specimens of each in the various stages of preparation and purification; a collection of nearly all the elements, with most of their important salts; a

large number of mining and metallurgical specimens, including most of the important ores, together with many rare specimens in crystallography. The collections of coals and petroleum are especially valuable for lecture and technical work. There is a large collection of dyes, organic and inorganic, mordants, textiles, and other materials used in dyeing and bleaching, with a rapidly increasing collection of clays and materials used in making glass, earthenware, porcelain and brick. A collection of furnace products, models and series of charts, blue prints and photographs illustrating a wide range of technical and chemical processes is being added.

Courses of Study

ANALYTICAL CHEMISTRY

FRESHMAN YEAR

First Semester

Chemistry 3, seven hours, Assistant Professor Nicholson, Mr. Frary, and Assistants

Drawing 7, six hours, Professor Kirchner, Mr. Rose and Mr. Rowley

Mathematics 3, three hours, Professor Bauer, Assistant Professor Bussey

Mineralogy 1, six hours, Professor Hall and Mr. Grout

Rhetoric 1, three hours, Mr. Firkins, Mr. Nichols, Miss Maley, Miss Griffith, Miss Whitney

Military Drill, three hours, Captain Edward Sigerfoos, U. S. A.

Gymnasium, one hour, Dr. Cooke

Second Semester

Metallurgy 1, twelve hours, Professor Appleby, Assistant Professor Christianson, Assistant Professor Pease

Chemistry 3, seven hours, Assistant Professor Nicholson, Mr. Frary and Assistants

Drawing 7, six hours, Professor Kirchner, Mr. Rose and Mr. Rowley

Mathematics 4, three hours, Professor Bauer, Assistant Professor Bussey, Dr. Manchester, Mr. Dalaker and Mr. Shumway

Rhetoric 1, three hours, Mr. Firkins, Mr. Nichols, Miss Maley, Miss Griffith and Miss Whitney

Military Drill, three hours, Captain Edward Sigerfoos, U. S. A.

Gymnasium, one hour, Dr. Cooke

SOPHOMORE YEAR

First Semester

Botany 1, six hours, Professor Clements, Assistant Professors Tilden and Rosendahl, and Instructors

Chemistry 4, eight hours, Professor Sidener and Assistants

Economics 1, three hours, Professor Robinson and Dr. Phelan

German 1 or 4, three or five hours, Professor Schlenker, Assistant Professors Wilkin and Juergensen, Mr. Burkhard and Mr. Williams
Chemistry 20, six hours, Assistant Professor Harding
Military Drill, three hours, Captain Edward Sigerfoos, U. S. A.

Second Semester

Botany 1, six hours, Professor Clements, Assistant Professors Tilden and Rosendahl, and Instructors
Chemistry 5, four hours, Professor Sidener and Assistants
Chemistry 6, twelve hours, Professor Frankforter, Assistant Professor Derby, and Mr. Handy
Economics (elective), three hours, Professor Robinson and Dr. Phelan
German 1 or 4, three or five hours, Professor Schlenker, Assistant Professors Wilkin and Juergensen, Mr. Burkhard and Mr. Williams
Military Drill, three hours, Captain Edward Sigerfoos, U. S. A.

JUNIOR YEAR

First Semester

Chemistry 12, five hours, Assistant Professor Nicholson
Chemistry 10, six hours, Assistant Professor Harding
Economics (elective), three hours, Professor Gray
Geology 1, three hours, Professor Hall
Metallurgy 3, three hours, Assistant Professor Christianson
Physics 1, three hours, Professor John Zeleny
Physics 2, two hours, Mr. Kovarik

Second Semester

Chemistry 8, two hours, Miss Cohen
Chemistry 7, two hours, Assistant Professor Derby
Economics (elective), three hours, Professor Gray
Chemistry 18, seven hours, Professor Sidener and Assistants
Chemistry 19, six hours, Professor Sidener and Assistants
Metallurgy 4, three hours, Assistant Professor Christianson
Physics 3, three hours, Professor John Zeleny
Physics 4, two hours, Mr. Kovarik

SENIOR YEAR

First Semester

Chemistry 13, five hours, Mr. Frary
Chemistry 24, seven hours, Assistant Professor Derby

Geology 5, six hours, Mr. Grout
Chemistry 11, seven hours, Assistant Professor Harding
Metallurgy 5, four hours, Assistant Professor Pease
Chemistry 9, five hours, Professor Frankforter
Thesis

Second Semester

Chemistry 22, two hours, Professor Frankforter
Chemistry 15, four hours, Mr. Frary
Chemistry 21, two hours, Miss Cohen
Chemistry 16, four hours, Mr. Frary
Chemistry 11, seven hours, Assistant Professor Harding
Metallurgy 6, four hours, Assistant Professor Pease
Chemistry 17, four hours, Assistant Professor Harding
Thesis

APPLIED CHEMISTRY

FRESHMAN YEAR

First Semester

Chemistry 3, seven hours, Assistant Professor Nicholson, Mr. Frary and Assistants
Drawing 1 and 3, six hours, Professor Kirchner, Mr. Rose and Mr. Rowley
German 1 or 4, three or five hours, Professor Schlenker, Assistant Professors Wilkin and Juergensen, Mr. Burkhard and Mr. Williams
Mathematics 3, three hours, Professor Bauer, Assistant Professor Bussey, Dr. Manchester, Mr. Dalaker and Mr. Shumway
Rhetoric 1, three hours, Mr. Firkins, Mr. Nichols, Miss Maley, Miss Griffith, Miss Whitney
Mechanical Engineering 1, eight hours, Mr. Richards
Military Drill, three hours, Captain Edward Sigerfoos, U. S. A.

Second Semester

Chemistry 3, seven hours, Assistant Professor Nicholson, Mr. Frary and Assistants
Drawing 2 and 4, six hours, Professor Kirchner, Mr. Rose and Mr. Rowley
German 1 or 4, three or five hours, Professor Schlenker, Assistant Professors Wilkin and Juergensen, Mr. Burkhard and Mr. Williams
Mathematics 4, five hours, Professor Bauer, Assistant Professor Bussey
Rhetoric 1, three hours, Mr. Firkins, Mr. Nichols, Miss Maley, Miss Griffith, Miss Whitney

Mechanical Engineering 1, eight hours, Mr. Richards
Military Drill, three hours, Captain Edward Sigerfoos, U. S. A.

SOPHOMORE YEAR

First Semester

Chemistry 4, eight hours, Professor Sidener and Assistants
Drawing 5, eight hours, Professor Kirchner, Mr. Rose and Mr. Rowley
Economics 1, three hours, Professor Robinson, Dr. Phelan
Mathematics 5, three hours, Professor Bauer
Physics 1, three hours, Professor John Zeleny
Physics 2, one hour, Mr. Kovarik
Military Drill, three hours, Captain Edward Sigerfoos, U. S. A.

Second Semester

Chemistry 5, four hours, Professor Sidener and Assistants
Drawing 5, four hours, Professor Kirchner
Economics (elective), three hours, Professor Robinson and Dr. Phelan
Mathematics 6, five hours, Professor Bauer
Physics 3, three hours, Professor John Zeleny
Physics 4, two hours, Mr. Kovarik
Military Drill, three hours, Captain Edward Sigerfoos, U. S. A.

JUNIOR YEAR

First Semester

Electric Power 5, three hours, Mr. Ryan
Machine Design 12, two hours, Professor Flather, Mr. Martenis
Mechanical Laboratory 1, two hours, Professor Kavanaugh, Mr. Shoop
Mechanics 7, five hours, Professor Eddy, Assistant Professor Brooke, Assistant Professor Newkirk
Physics 5, six hours, Professor Jones

Second Semester

Chemistry 6, twelve hours, Professor Frankforter
Electric Power 5, three hours, Mr. Ryan
Mechanics 8, five hours, Professor Eddy

SENIOR YEAR

First Semester

Chemistry 13, five hours, Mr. Frary
Economics (elective), three hours, Professor Gray

Chemistry 10, six hours, Assistant Professor Harding
Metallurgy 3, three hours, Assistant Professor Christianson
Chemistry 9, five hours, Professor Frankforter
Thesis, five hours

Second Semester

Chemistry 13, five hours, Mr. Frary
Economics (elective), three hours, Professor Gray
Chemistry 18, seven hours, Professor Sidener and Assistants
Metallurgy 4, three hours, Assistant Professor Christianson
Thesis, five hours

FIVE YEAR COURSE IN ARTS AND CHEMISTRY

The degree bachelor of arts will be conferred upon any student who completes the work prescribed in the first four years of the following course, provided that at least one long course shall be chosen from each of the following groups.

- (a) English, French, German, Greek, Latin, Rhetoric.
- (b) Animal Biology, Astronomy, Botany, Chemistry, Mineralogy, Physics.
- (c) History, Philosophy, Political Science and Sociology.

A long course means an amount of work equivalent to not less than six hours per week in one department for one year.

The degree bachelor of science in chemistry will be conferred upon the completion of the fifth year of the course.

FIVE YEAR COURSE IN ARTS AND CHEMISTRY

FIRST YEAR

First Semester

Chemistry 3, seven hours, Assistant Professor Nicholson, Mr. Frary and Assistants
Drawing 5, six hours, Professor Kirchner, Mr. Rose and Mr. Rowley
Mathematics 3, three hours, Professor Bauer, Assistant Professor Bussey
Minerology 1, six hours, Professor Hall and Mr. Grout
Rhetoric 1, three hours, Mr. Firkins, Mr. Nichols, Miss Maley, Miss Griffith, Miss Whitney
Military Drill, three hours, Captain Edward Sigerfoes, U. S. A.
Gymnasium, one hour, Dr. Cooke

Second Semester

Metallurgy 1, twelve hours, Professor Appleby, Assistant Professor Christianson, Assistant Professor Pease

Chemistry 3, seven hours, Assistant Professor Nicholson, Mr. Frary and Assistants

Drawing 5, six hours, Professor Kirchner, Mr. Rose and Mr. Rowley

Mathematics 4, three hours, Professor Bauer, Assistant Professor Bussey, Dr. Manchester, Mr. Dalaker and Mr. Shumway

Rhetoric 1, three hours, Mr. Firkins, Mr. Nichols, Miss Maley, Miss Griffith, Miss Whitney

Military Drill, three hours, Captain Edward Sigerfoos, U. S. A.

Gymnasium, one hour, Dr. Cooke

SECOND YEAR

First Semester

Botany 1, six hours, Professor Clements, Assistant Professors Tilden and Rosendahl, and Instructors

Chemistry 4, eight hours, Professor Sidener and Assistants

Economics 1, three hours, Professor Robinson and Dr. Phelan

German 1 or 4, three hours, Professor Schlenker, Assistant Professors Wilkin and Juergensen, Mr. Burkhard and Mr. Williams

Inorganic Preparations, six hours, Assistant Professor Harding

Military Drill, three hours, Captain Edward Sigerfoos, U. S. A.

Second Semester

Botany 1, six hours, Professor Clements, Assistant Professors Tilden and Rosendahl, and Instructors

Chemistry 5, four hours, Professor Sidener and Assistants

Chemistry 6, twelve hours, Professor Frankforter, Assistant Professor Derby and Mr. Handy

Economics (elective), three hours, Professor Robinson and Dr. Phelan

German 1 or 4, three hours, Professor Schlenker, Assistant Professors Wilkin and Juergensen, Mr. Burkhard and Mr. Williams

Military Drill, three hours, Captain Edward Sigerfoos, U. S. A.

THIRD YEAR

First Semester

Economics (elective), three hours, Professor Robinson and Dr. Phelan

Electives in College of Science, Literature and the Arts, eight or nine hours

Physics 1, three hours, Professor John Zeleny

Physics 2, one hour, Mr. Kovarik

Second Semester

Chemistry 8, two hours, Miss Cohen

Chemistry 7, two hours, Assistant Professor Derby
Physics 3, three hours, Professor John Zeleny
Physics 4, one hour, Mr. Kovarik
Electives in College of Science, Literature and the Arts, eight hours

FOURTH YEAR

First Semester

Chemistry 12, five hours, Assistant Professor Nicholson
Chemistry 10, six hours, Assistant Professor Harding
Economics (elective), three hours, Professor Gray
Geology 1, three hours, Professor Hall
Metallurgy 3, three hours, Assistant Professor Christianson

Second Semester

Chemistry 8, two hours, Miss Cohen
Chemistry 7, two hours, Assistant Professor Derby
Economics (elective), three hours, Professor Gray
Chemistry 18, seven hours, Professor Sidener and Assistants
Chemistry 19, six hours, Professor Sidener and Assistants
Metallurgy 4, three hours, Assistant Professor Christianson

FIFTH YEAR

First Semester

Chemistry 13, five hours, Mr. Frary
Chemistry 24, seven hours, Assistant Professor Derby
Geology 5, three hours, Mr. Grout
Chemistry 11, seven hours, Assistant Professor Harding
Metallurgy 5, four hours, Assistant Professor Pease
Chemistry 9, five hours, Professor Frankforter
Thesis

Second Semester

Chemistry 22, two hours, Professor Frankforter
Chemistry 15, four hours, Mr. Frary
Chemistry 21, two hours, Miss Cohen
Chemistry 16, four hours, Mr. Frary
Chemistry 11, seven hours, Assistant Professor Harding
Metallurgy 6, four hours, Assistant Professor Pease
Chemistry 17, four hours, Assistant Professor Harding
Thesis

WALTER BADGER, B.A., *Instructor in Chemistry*
 LILIAN COHEN, M.A., *Instructor in Chemistry*
 FRANCIS C. FRARY, M.S., *Instructor in Chemistry*
 JOHN A. HANDY, Ph.C., *Instructor in Chemistry*
 JAMES ZIMMERMAN, B.A., *Instructor in Chemistry*

FOR UNDERGRADUATES

1. GENERAL CHEMISTRY MISS COHEN, MR. BADGER AND ASSISTANTS
 Six credits (two lectures, four hours laboratory per week)
First and second semesters
 No prerequisite.
 The course includes a study of the chemical properties of the metallic and non-metallic elements, with a brief introduction to organic chemistry.
2. ADVANCED GENERAL CHEMISTRY PROFESSOR FRANKFORTER, MISS
COHEN, MR. BADGER AND ASSISTANTS
 Six credits (two lectures, four hours laboratory per week)
First and second semesters
 Open to those who have had an elementary course in chemistry.
 The course includes besides descriptive and metallurgical chemistry, an introduction to physical and organic chemistry.
3. QUALITATIVE ANALYSIS ASSISTANT PROFESSOR NICHOLSON,
MR. FRARY AND ASSISTANTS
 Six credits (one lecture, six hours laboratory per week)
First and second semesters
 Open to those who have completed course 1 or 2.
 The course includes the general reactions of the metals and acids with their qualitative separation. Besides this mechanical work, the ionic theory and the law of mass action are discussed with special reference to common qualitative reactions.
4. GRAVIMETRIC ANALYSIS PROFESSOR SIDENER AND ASSISTANTS
 Four credits (two lectures, six hours laboratory per week)
First semester
 Open to those who have completed course 3.
 The course includes an introduction to quantitative and a beginning of gravimetric analysis.
5. VOLUMETRIC ANALYSIS PROFESSOR SIDENER AND ASSISTANTS
 Two credits (one lecture, three hours laboratory per week)
Second semester
 Open to those who have completed course 4.
 The course includes an introduction to volumetric analysis with a discussion of standard solutions and the necessary stoichiometric calculations.
6. ORGANIC CHEMISTRY PROFESSOR FRANKFORTER, ASSISTANT PROFESSOR
DERBY, MR. HANDY AND ASSISTANTS
 Six credits (four lectures, eight hours laboratory per week)
Second semester
 Open to those who have completed course 3.
 This course includes the aliphatic and the aromatic series with the preparation of the more important compounds.
7. THEORETICAL CHEMISTRY ASSISTANT PROFESSOR DERBY
 Two credits (one lecture and one recitation per week)
Second semester
 Open to those who have completed course 6.

The course involves a study of the most important theories which co-ordinate and unify chemical and physico-chemical phenomena.

8. HISTORY OF CHEMISTRY MISS COHEN
Two credits (one lecture and one recitation per week)
Second semester
Open to those who have completed course 6.
This course includes a full historical discussion of alchemy and chemistry.
9. WATER ANALYSIS PROFESSOR FRANKFORTER
Two credits (one lecture, four hours laboratory per week)
First semester
Open to those who have completed course 5.
The course includes an exhaustive discussion of the chemical and sanitary properties of water.
10. GAS AND COAL ANALYSIS ASSISTANT PROFESSOR HARDING
Two credits (one lecture, four hours laboratory per week)
First semester
Open to those who have completed course 5.
The work includes an exhaustive chemical examination of the common gases, with a determination of light and heat efficiency of combustible gases; also the ultimate and proximate analysis of coals and the determination of their heat values.
11. FOOD ANALYSIS ASSISTANT PROFESSOR HARDING
Three credits (one lecture, six hours laboratory per week)
First and second semesters
Open to those who have completed course 6.
The course includes the chemical analysis of the various food products and the detection of the common adulterants.
12. SUGAR CHEMISTRY ASSISTANT PROFESSOR NICHOLSON
Two credits (one lecture, four hours laboratory per week)
First semester
Open to those who have completed course 6.
The course includes the technology and chemical control of sugar manufacture.
13. INDUSTRIAL CHEMISTRY MR. FRARY
Six credits (two lectures, three hours laboratory per week)
First and second semesters
Open to those who have completed course 6.
The course includes the discussion of methods and apparatus used in chemical technology, and the testing of commercial chemical products.
14. SPECIAL PROBLEMS PROFESSOR SIDENER
Two credits (six hours laboratory per week)
First semester
Open to those who have completed course 5.
The course includes the working out of various mineralogical, technological and metallurgical problems.
15. PHOTOGRAPHIC CHEMISTRY MR. FRARY
Two credits (one lecture, three hours laboratory per week)
Second semester
Open to those who have completed course 5.
The course includes a study of the compounds affected by the chemical rays of light, and a discussion of developers and fixers, photo-engraving, photo-reliefs and color photography.

16. **ELECTROCHEMISTRY** MR. FRARY
 Two credits (one lecture, three hours laboratory per week)
Second semester
 Open to those who have completed course 5, and also course 3 in physics.
 The course includes a discussion of electro-analytical methods and industrial electrochemical processes.
17. **MICRO-CHEMICAL ANALYSIS** ASSISTANT PROFESSOR HARDING
 Two credits (one lecture, three hours laboratory per week)
Second semester
 Open to those who have completed course 5.
 The course includes the methods for the determination of minute quantities of substance by means of the microscope.
18. **IRON AND STEEL ANALYSIS** PROFESSOR SIDENER AND ASSISTANTS
 Three credits (one lecture, six hours laboratory per week)
Second semester
 Open to those who have completed course 5.
 The course includes the rapid determination of iron by the various methods as well as the determination of the associated elements, sulphur, phosphorus, silicon, manganese and carbon.
19. **MINERAL ANALYSIS** PROFESSOR SIDENER
 Two credits (six hours laboratory per week)
Second semester
 Open to those who have completed course 5.
 The course includes the analysis of building stones and some of the most important minerals.
20. **INORGANIC PREPARATIONS** ASSISTANT PROFESSOR HARDING
 Two credits (six hours laboratory)
First semester
 Open to those who have completed course 3.
 The preparation of inorganic salts, supplemented by Thorpe's Inorganic Preparations.
21. **COLLOQUIUM** MISS COHEN
 Two credits (two hours per week)
Second semester
 Open to those who have completed course 5.
 A thorough quiz in inorganic chemistry.
22. **COLLOQUIUM** PROFESSOR FRANKFORTER
 Two credits (two hours per week)
Second semester
 Open to those who have completed course 6.
 A thorough quiz in general organic chemistry.
23. **SPECIAL PROBLEMS** PROFESSOR SIDENER
 Two credits (six hours laboratory per week)
First semester
 Open to those who have completed course 5.
 The course includes work on ores of base metals, limestones, slags, etc.
24. **PHYSICAL CHEMISTRY** ASSISTANT PROFESSOR DERBY
 Three credits (one lecture, six hours laboratory per week)
First semester
 Open to those who have completed course 6.
 This course includes a theoretical and applied study of physico-chemical principles and methods.
25. **TEACHERS' COURSE** MISS COHEN
 Two credits (two hours per week)
Second semester
 Open to those who have taken courses 1, 2 and 3.

The course is offered to those who are interested in the teaching of chemistry. No regular laboratory work will be offered, but certain experiments illustrating the difference between good and poor work may be given.

DRAWING AND DESCRIPTIVE GEOMETRY

WILLIAM H. KIRCHNER, M.E., *Professor of Drawing and Descriptive Geometry*

NORMAN W. ROSE, M.E., *Instructor in Drawing*

FRANK B. ROWLEY, B.S., M.E., *Instructor in Drawing*

L. W. MCKEEHAN, *Assistant in Drawing and Descriptive Geometry*

FRANK L. NEMEC, *Assistant in Drawing*

1. DRAWING MR. ROSE, MR. MCKEEHAN, MR. ROWLEY
 Three credits (six hours per week) First semester
 Required of all freshmen, in conjunction with course 3.
 The elements of general drafting. Mechanical drawing as a language. Lines, views, dimensions, standards, signs, abbreviations and explanatory notes.
 Sketching, lettering, tracing and blue printing. Representation of details of machines and structures, and the interpretation of working-drawings.
2. DRAWING MR. ROSE, MR. MCKEEHAN, MR. ROWLEY
 Two credits (four hours per week) Second semester
 Required of all freshmen. Preparation courses 1 and 3 D.
 Continuation of course 1.
3. DESCRIPTIVE GEOMETRY PROFESSOR KIRCHNER, MR. ROWLEY,
MR. ROSE AND MR. MCKEEHAN
 One credit (one hour per week) First semester
 Required of all freshmen, Open to students pursuing course 1 D.
 Projection-central and special cases; principles and applications. Representation of lines, planes, and solids, and of their relations; tangencies, intersections and developments.
 Recitations, lectures and the solution of problems.
4. DESCRIPTIVE GEOMETRY PROFESSOR KIRCHNER, MR. ROWLEY,
MR. ROSE AND MR. MCKEEHAN
 Two credits (two hours per week) Second semester
 Required of all freshmen.
 Preparation, courses 1, 3 D.
 Continuation of course 3.
5. DRAFTING PROFESSOR KIRCHNER, MR. ROWLEY, MR. ROSE
 Three credits each semester (six hours per week) First and second semesters
 Required of all sophomores. Preparation courses 1, 2, 3, 4 D.
 Graphics, machine drafting, structural drafting, and topography. Instruction in drafting-room methods.
6. ELEMENTS OF ARCHITECTURE PROFESSOR KIRCHNER
 Three credits First semester
 Required of juniors C. E. course. Preparation course, 5 D.

The orders and other fundamental forms; principles of design, the analysis of the characteristics of style, application of the elements in design.

(Not offered in 1908.)

7. TECHNICAL DRAWING PROFESSOR KIRCHNER, MR. ROWLEY
AND MR. ROSE
- Three credits each semester (six hours per week)
First and second semesters
- Required of freshmen, analytical chemistry course.
Theoretical and practical graphics, the reading and making of working plans. Projection, sketching, lettering, conventions, renderings and translations.

FOR GRADUATES

8. DESCRIPTIVE GEOMETRY AND APPLICATIONS
9. PROJECTIVE GEOMETRY

ECONOMICS

JOHN H. GRAY, Ph.D., *Professor of Political Science*

EDWARD VAN DYKE ROBINSON, Ph.D., *Professor of Economics*

RAYMOND V. PHELAN, Ph.B., *Instructor in Economics*

1. ELEMENTS OF ECONOMICS PROFESSOR ROBINSON, DR. PHELAN
- Three credits (three recitations per week) First or second semester
- Open to sophomores, juniors, and seniors.
- A thorough course in the elements of economic theory, with special reference to present-day economic and social problems. McVey's Outline and a text book, supplemented by lectures and problems, with a weekly quiz. This is a beginning course designed for those desiring a general knowledge of economics, as well as for those who mean to take advanced work in the department.
2. ECONOMIC GEOGRAPHY PROFESSOR ROBINSON
- Three credits (three recitations per week) First semester
- Open to sophomores, juniors, and seniors.
- A study of the economic basis of modern civilization. The course embraces: (1), a brief survey of the history of commerce prior to the modern period; (2), an analysis of the causes, both in nature and man, which control the development and the localization of industry and commerce; (3), a summary view of the development of transportation in relation to commerce; (4), some mention of the principal materials of commerce; and, (5), a more detailed consideration of the natural resources, chief industries, commercial products and commercial relations of the leading countries. Special attention is given to the United States and to international trade routes, both by land and sea.
- Text book, supplemented by lectures, reports on special topics, and quizzes.
- This is a beginning course and is intended to put the student in close touch with actual economic conditions and tendencies, throughout the world.
3. MODERN INDUSTRIAL AND COMMERCIAL HISTORY PROFESSOR GRAY
- Three credits (three recitations per week) First and second semesters
- Open to sophomores, juniors, and seniors.
- Course 3 requires no previous training in economics and may well be taken with course 1. The course continues throughout

the year, and no credit will be given unless both semesters are completed.

The industrial and commercial history of Western Europe and America since the middle of the eighteenth century. The effects of modern inventions and political changes on industry and trade.

Lectures with prescribed topical readings. One written report of considerable length will be required each semester.

4. **ADVANCED ECONOMICS** PROFESSOR ROBINSON
 Three credits (three recitations per week) Second semester
 Open to students who have had course 1, and required of all taking a major in economics.
 An advanced course in general economics, devoted largely to a study of recent theories of distribution.
 Assigned readings, reports and discussions.
5. **MONEY AND BANKING** DR. PHELAN
 Three credits (three recitations per week) First semester
 Open to students who have completed course 1.
 The history and theory of money; nature and uses of credit; functions of banks, trust companies and other financial institutions; foreign exchange and the settlement of international balances.
 Lectures, text-book, assigned readings and discussions.
6. (A) **PUBLIC FINANCE** PROFESSOR ROBINSON
 Three credits (three recitations per week) First and second semesters
 Open to students who have completed course 1.
 The development of the state as an economic organism. Public expenditures from the view point of public wants. Budget systems of the leading countries, with special emphasis on the United States. Public revenues from public domains and industries. Principles, incidence and administration of taxation. The theory of public debts.
 Text book, supplemented by lectures and assigned readings.
6. (B) **PROBLEMS OF TAXATION** PROFESSOR ROBINSON
 Three credits (three recitations per week) Second semester
 Open to students who have completed course 6 (A).
 Study of tax systems, tax reforms, and special forms of taxation, such as mortgage, corporation and inheritance taxes.
 Based on Seligman, essays in taxation, and reports of state tax commissions with lectures and reports on special topics.
7. (A) **ECONOMICS OF COMMERCE** PROFESSOR ROBINSON
 Three credits (three recitations per week) First semester
 Open to students who have completed course 1, 2 or 3.
 Theory of prices and price levels. Causes and characteristics of commercial crises.
 Theory and mechanism of international commerce. Free trade, reciprocity and protection. The balance of trade. Economic causes of the contest for foreign markets. Organization of the export trade. Commercial treaties and foreign politics. The consular and diplomatic service as a factor in commerce.
 Lectures, assigned readings, reports on special topics.
7. (B) **ECONOMICS OF COLONIZATION** PROFESSOR ROBINSON
 Three credits (three recitations per week) Second semester
 Open to students who have completed course 1, 2 or 3.
 The economic causes of human migration. Historical survey of colonization and classification of colonies with reference to their

economic bases. Existing colonial systems, with special attention to the outlying possessions of the United States. Colonial commerce in relation to modern commercial and foreign policies. Preferential tariffs and imperial federation.

Lectures, assigned readings, reports on special topics and quiz.

8. FINANCIAL HISTORY OF THE UNITED STATES DR. PHELAN

Three credits (three recitations per week) Second semester

Open to students who have completed courses 1 and 5.

The main lines of our financial development, including our monetary and banking history, are traced by means of lectures. Readings in the literature of the subject and topics for investigation are assigned.

Lectures, assigned readings and discussions.

9. (A) ECONOMICS OF TRANSPORTATION AND COMMUNICATION

PROFESSOR ROBINSON

Three credits (three recitations per week) Second semester

Open to students who have completed 1 and to students in the technical colleges.

A general course on the history and theory of transportation and communication, with special reference to the United States. Early routes and methods of migration and commerce. Causes determining the location of railways. Effect of steam and electricity in the consolidation of industries and of nations.

Signal systems, the post, telegraph and telephone. Parcels post and express service. Economic functions and relations of highways, interurban electric lines, steam railways, inland waterways and ocean transportation. The organization of ocean commerce.

Lectures, assigned readings and discussions.

9. (B) RAILWAY ECONOMICS

PROFESSOR ROBINSON

Three credits (three recitations per week) First or second semester

Open to graduates, students in the technical colleges, and upper classmen who have completed courses 1 and 9 (A).

An advanced course devoted to the study of railway problems and administration including: (1) conditions affecting economy of operation; (2) passenger and goods traffic; (3) economic principles underlying the making of railway rates; (4) competition in relation to rate wars, discrimination between persons, places and commodities, pooling, various forms of combination; (5), the great railway systems of the United States; (6), regulation by the states and the federal government; (7), government ownership and operation of railways in Europe and Australasia.

Lectures, assigned readings and discussions.

10. MUNICIPAL INDUSTRIES

PROFESSOR GRAY

Three credits (three recitations per week) Second semester

Open to students who have completed course 1. If possible, course 11 should also be taken before course 10.

The causes and the social and economic effects of the recent rapid development of municipal industries. A comparison of the results of public and of private ownership of such industries. The general question of municipal ownership.

Text books, lectures and quizzes.

11. THE MODERN BUSINESS CORPORATION

PROFESSOR GRAY

Three credits (three recitations per week) Second semester

Open to students who have completed course 1.

The organizing, financing and managing of corporations; the position of the corporation before the law; methods of account-

ing; the relation of the government to the corporation; the question of trusts in its various phases.

Text books: Ripley, Trusts, Pools and Corporations; Meade's Trust Finance; Wyman's Case.

Lectures, class discussions and reports.

12. **THEORY AND PRACTICE OF STATISTICS** PROFESSOR ROBINSON
Two credits (two recitations per week) First semester
Open to students who have six credits in economics.
An introduction to the theory and method of statistics. Aspects of economic and social life which are capable of statistical measurement. Use and limitations of index numbers.
Based on Bowley and Mayo-Smith, with lectures and practical exercises.
13. **HISTORY OF ECONOMIC THOUGHT** PROFESSOR ROBINSON
Two credits (two recitations per week) First semester
Open to students who have six credits in economics.
A survey of economic thought, especially since Adam Smith. Emphasis is placed on the recent period.
Lectures, assigned readings, reports on special topics.
14. **ECONOMICS OF AGRICULTURE** Second semester
Three credits (three recitations per week)
Open to students who have completed course 1 or 2 and to others by special permission of the instructor.
Historic development of agriculture and comparison of existing systems with reference to stage of economic development and geographic conditions. Transition in the United States from extensive to intensive and from general to specialized farming, in relation to the law of decreasing returns. Markets, transportation facilities and other causes affecting the value of land and the prices of farm products. The size, organization, labor-system and ownership of farms as bearing on economic efficiency and social and political conditions.
Lectures, assigned readings, reports on special topics and quizzes.
15. **ECONOMICS OF INSURANCE** First semester
Three credits (three recitations per week)
Open to students who have completed course 1 and to others by special permission.
Kinds and economic functions of insurance, life, fire, marine, accident, fidelity. History and theory of life insurance, forms of standard policies, public supervision. The aim is to treat those aspects of insurance which are of importance to practical men of affairs.
16. **LABOR PROBLEMS** DR. PHELAN
Three credits (three recitations per week) First semester
Open to students who have completed course 1.
Labor unions, strikes, systems of wage payment, arbitration, poverty, child labor, etc. Efforts, public and private, to secure justice and social well-being.
Lectures, text book, assigned readings, and discussions.
17. **RACES AND IMMIGRANTS IN AMERICA** DR. PHELAN
Three credits (three recitations per week) Second semester
Open to students who have completed course 1.
The economic and social contributions of the different races to American progress and civilization. The economic and social conditions in foreign countries that lead to emigration.

The general problem of immigration. The special problem of the Slav, the Italian, the Negro, the Chinese and the Japanese. Lectures, text book, topics, discussions.

18. CHARITIES AND CORRECTIONS, WITH SPECIAL REFERENCE TO ECONOMIC CONDITIONS IN AMERICAN CITIES Mr. LIES
 Three credits (three recitations per week) First or second semester
 Open to students who have completed courses 1 or 3 in economics or course 1 in sociology.
 A study of the causes of economic dependence in American cities, the standard of living, and the constructive agencies for economic betterment.
 Given by lectures with assigned readings and visits of inspection in the Twin Cities.
19. THE PRINCIPLES OF ACCOUNTING
 Three credits (three recitations per week) First and second semesters
 Open to students who have completed course 1.
 The theory and practice of accounting, with a view to general business efficiency. Methods employed in manufacturing, mercantile, banking and railway accounting. Analysis of industrial, bank and railway reports.
 Lectures and exercises.
20. ELEMENTS OF BUSINESS LAW
 Three credits (three recitations per week) First or second semester
 Open to students who have completed course 1.
 The principles of law governing ordinary commercial transactions. The aim is to teach so much of the law as every educated man ought to know for his guidance in every-day business affairs.
 Assigned readings, lectures and quizzes.
21. SEMINAR IN ECONOMICS PROFESSOR GRAY, PROFESSOR ROBINSON,
Mr. GEROULD AND DR. PHELAN
 Three to six credits (three recitations per week) First and second semesters
 Open to graduates and to others who have not less than twelve credits in economics, and are capable of making original investigations.
 A course in research and in methods of investigation.
 This course will be conducted jointly by all the instructors, each striving to be of special service to students who choose topics within the field of his special interests; Professor Gray in connection with local public service corporations; Professor Robinson in connection with taxation, transportation and industries of importance in this section, such as wheat and iron; Dr. Phelan in connection with currency questions, labor socio-economic theories, and also taxation.
 Definite topics can be assigned only after conference. This is a unit course and credit will be given only on completion of both semesters.
22. BUSINESS ORGANIZATION
 Three credits (three recitations per week) Second semester
 Open to students who have completed course 1.
 A study of the internal organization and management of large-scale industry, covering typical manufacturing and mercantile concerns.
 Based on Aparling, Introduction to Business Organization, with lectures, assigned readings and discussions.

23. **ECONOMICS OF FORESTRY**
 Three credits (three recitations per week) First semester
 Open to students who have completed course 1 or 2.
 The economic importance of forests, their relation to other industries and connection with the problems of erosion, irrigation, drainage and inland navigation. Forest reserves and other forest resources of the United States. Need and economic aspects of scientific forestry.
 Lectures, assigned readings and reports.
24. **SCOPE AND METHODS OF ECONOMICS** PROFESSOR ROBINSON
 Two credits (two recitations per week) Second semester
 Open to students who have six credits in economics.
 Consideration of the successive views which have prevailed as to the scope and logical methods of economics. Relation of economics to the other social sciences, and to ethics.
 Lectures, assigned readings and discussions.
25. **ECONOMICS OF INVESTMENT AND SPECULATION**
 Three credits (three recitations per week) Second semester
 Open to students who have taken course 1.
 The causes affecting the values of securities. Classes of investments and methods of calculating income. Bearings of investment on the formation of social classes.
 The economic functions of speculation, organization and working of stock and produce exchanges. Their relation to industry and to the money market. The work of Wall street.
 Lectures, assigned readings, and exercises in the interpretation of current quotations for securities.
26. (A) **SOCIAL THEORIES** DR. PHELAN
 Three credits (three recitations per week) First semester
 Open to students who have completed course 1.
 A survey of social Utopias from Plato to Henry George, with special attention to modern scientific socialism as a philosophy of industrial evolution and as a program of economic reform.
 Lectures, assigned readings, reports and discussions.
26. (B) **THE STATE IN RELATION TO INDUSTRY**
 Three credits (three recitations per week) Second semester
 Open to students who have completed course 1; but should, if possible, follow course 26 (A).
 A study of the influence exercised by society and by the state on the production and distribution of wealth. The force of custom; effect of private property and other social institutions; and results of economic legislation designed to limit the freedom, or raise the plane of competition. General survey of the relation of the state to industry.
 Lectures, assigned readings and reports.

ELECTRICAL ENGINEERING

WILLIAM T. RYAN, E.E., *Instructor in Electrical Engineering*

5. **ELECTRICAL POWER** MR. RYAN
 Three credits (four hours per week) First and second semesters
 Required of seniors. M. E. and Chemical courses. Preparation, courses 5, 6. Physics.
 An elementary study of the electrical problems involved in the generation, distribution, measurement and utilization of power.

Lectures, recitations and laboratory work, supplemented by numerous practical problems. Textbook: Franklin and Esty, Elements of Electrical Engineering Practice.

COURSES IN GEOLOGY AND MINERALOGY

CHRISTOPHER W. HALL, M.A., *Instructor in Geology and Mineralogy*
FRANK F. GROUT, B.S., *Instructor in Geology and Mineralogy*

GEOLOGY

1. GENERAL GEOLOGY PROFESSOR HALL
Three credits (three hours laboratory, three lectures per week) First semester
Open to juniors and seniors.
Comprises: (1) Geodynamics, in which are set forth phenomena of the atmosphere, water, heat, gravity, and plants and animals as geologic agents; (2) structural geology, wherein stratification, displacement and veining of rock masses are described; (3) physiographic geology, pointing out prominent earth features and inquiring into the causes producing them; (4) an outline of historical geology. Lectures and conferences illustrated by photographs, maps, profiles, and lantern slides.

10. ELEMENTS OF ROCK STUDY MR. GROUT
Three credits (three hours laboratory, three lectures per week) Second semester
Open to juniors and seniors.
Requisite, course 1 or equivalent.
The structures, textures, and mineral and chemical composition of rocks. A practical study of rock types with laboratory and field practice. The origin, occurrence, variation and alteration of rocks are considered with a view to their accurate description. An introduction to the use of the microscope concludes the course.
Kemp's Handbook of Rocks, reference reading and practice.

11. PETROGRAPHY MR. GROUT
Three credits (three hours laboratory, three lectures per week) Second semester
Requisite, course 9.
Open to juniors or seniors.
The identification of rocks through the optical study of the component minerals; rock structure as seen under the microscope; alterations of rocks, and stratigraphic relations are studied. Preparation of material for study, its collection in the field and an examination of some group of Minnesota crystalline rocks are features of the course.
Laboratory, lectures, reference reading and field work.

12. APPLIED GEOLOGY MR. GROUT
Three credits (three hours laboratory, three lectures per week) First semester
Open to juniors and seniors.
An outline of the economic relations of geology. The course comprises a discussion of the nature and distribution of non-metallic materials of economic value, including coal, mineral oil and natural gas; phosphates and other natural fertilizers; soils; the geologic conditions of water supply; abrasive and fireclay materials; natural and artificial building stones; mortars and cements; road-making materials; followed by a brief

summary of the nature and distribution of ore deposits. Text-book and reference reading.

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MINERALOGY

1. ELEMENTS OF MINERALOGY PROFESSOR HALL AND MR. GROUT
 Three credits (three hours laboratory, three lectures per week)
First semester
 Open to all students.
 (a) The morphology of minerals; the physical and chemical characters of minerals, with demonstrations; a study of the native elements and economic minerals; the basis of classifications.
 (b) Laboratory work; this consists of practice in the recognition of crystal forms, tests illustrating the range of minerals, and the application of chemical and blowpipe analysis to the identification of species.

2. DESCRIPTIVE MINERALOGY PROFESSOR HALL AND MR. GROUT
 Three credits (three hours laboratory, three lectures per week)
Second semester
 Open to all the students.
 (a) A study of the rock-forming minerals; the projection and construction of figures of crystals; the calculation of crystal-axes. Thesis.
 (b) Laboratory work; includes quantitative blowpipe analysis, crystal measurement, the sight determination of minerals, and reference reading.

4. OPTICAL MINERALOGY MR. GROUT
 Three credits (three hours laboratory, three lectures per week)
Second semester
 Open to juniors or seniors.
 A study of the microscopic structure of crystals and crystal grains.
 An application of methods used in determining minerals by their optical properties; goniometric and stauroscopic practice, embracing the elements of lithology. Lectures and laboratory work.

5. THE MORPHOLOGY OF MINERALS MR. GROUT
 Three credits (three hours laboratory, three lectures per week)
First semester
 Open to juniors or seniors.
 A study of crystallography, embracing projection and the geometric relations of crystal planes. The identification of minerals from crystal measurement and mathematical calculation. Crystal nomenclature.

6. PHYSICO-CHEMICAL METHODS WITH THEIR APPLICATIONS MR. GROUT
 Three credits (three hours laboratory, three lectures per week)
Second semester
 Open to seniors.
 The methods of micro-chemical analysis described and demonstrated; the leading elements found in minerals are determined through the aid of crystalline precipitates of known compounds. Special attention is given to the study and determination of the rock-making minerals.

1. Advisory, indicating what course of hygiene and exercise will best sustain and improve the health of the student, or

2. Mandatory, requiring the students to pursue the course of hygiene and physical exercise necessary for the proper care of health and the discharge of their duties as students.

Gymnasium work is required of all men in the freshman class, one hour per week (in two half-hour periods if the director so decides) throughout the year. The required work includes a course of lectures on personal hygiene, during the first term.

MACHINE DESIGN

JOHN V. MARTENIS, M.E., *Instructor in Machine Design*

12. KINEMATICS AND ELEMENTARY MACHINE DESIGN MR. MARTENIS
 Three credits (six hours per week) Second semester
 Required of juniors, M. E. and E. E. course. Preparation, course 4M.
 Graphical diagrams of the paths, speeds and accelerations of important mechanisms; centroids, analysis of mechanisms, construction of cams; roulettes, tooth profiles; kinematic pairs; machine parts.

MATHEMATICS

GEORGE N. BAUER, Ph.D., *Professor of Mathematics*

WILLIAM H. BUSSEY, Ph.D., *Assistant Professor of Mathematics*

JOHN F. DOWNEY, M.A., C.E., *Professor of Mathematics*

HANS DALAKER, B.S., *Instructor in Mathematics*

JAMES E. MANCHESTER, Sc.D., *Instructor in Mathematics*

ROYAL R. SHUMWAY, B.A., *Instructor in Mathematics*

4. TRIGONOMETRY PROFESSOR BAUER, ASSISTANT PROFESSOR BUSSEY, DR. MANCHESTER, MR. SHUMWAY, AND MR. DALAKER
 Three credits (three hours per week) First semester
 Open to those having credits in courses 1, 2, and 3. Text, tables, and numerous applications.
5. ANALYTICAL GEOMETRY PROFESSOR DOWNEY, DR. MANCHESTER
 Three credits (three hours per week) First semester
 Open to those who have completed courses 1, 2, 3 and 4.
 The conic sections, both by rectilinear and polar co-ordinates, producing equations of loci whose law of development is known, constructing and discussing such equations, transformation of co-ordinates, properties of loci by means of their equations.
6. DIFFERENTIAL CALCULUS PROFESSOR DOWNEY, DR. MANCHESTER
 Three credits (three hours per week) Second semester
 Open to those who have completed courses 1 to 5, inclusive.
 Differentiation of algebraic and transcendental functions, development of functions, indeterminate forms, maxima and minima, treatment of tangents, subtangents, normals, subnormals, asymptotes, direction and rate of curvature, evolutes, envelopes and singular points.

MECHANICAL ENGINEERING

JOHN J. FLATHER, Ph.B., M.M.E., *Professor of Mechanical Engineering*
 JOHN V. MARTENIS, M.E., *Instructor in Machine Design*
 PETER PETERSON, *Instructor in Foundry Practice*
 EDWARD QUIGLEY, *Instructor in Forge Work*
 WILLIAM H. RICHARDS, *Instructor in Carpentry and Pattern Work*
 S. CARL SHIPLEY, B.S., *Instructor in Machine Work*
 C. F. SHOOP, B.S., *Instructor in Mechanical Engineering*

SHOP WORK

1. CARPENTRY AND PATTERN MAKING MR. RICHARDS
 Four credits (six hours per week, twenty-four weeks)
First and second semesters
 Required of all freshmen.
 Wood working, use of tools; lathe and bench work. Patterns for moulding, core boxes, flasks. Lectures and practice.
2. BLACKSMITHING MR. SHIPLEY AND MR. QUIGLEY
 Two credits (six hours per week, twelve weeks)
First or second semester
 Required of all freshmen.
 Use of tools, forging, welding, tool dressing, tempering. Lectures and practice.

MECHANICAL LABORATORY

WILLIAM H. KAVANAUGH, M.E., *Professor of Experimental Engineering*
 C. F. SHOOP, B.S., *Instructor in Mechanical Engineering*

1. MATERIALS TESTING LABORATORY PROFESSOR KAVANAUGH, MR. SHOOP
 Two credits (lecture and laboratory) First semester
 Required of juniors.
 Investigation of the strength and physical qualities of iron, steel, brass, copper, wood, belting, ropes, chains and cement. Supplemented by lectures on the various materials of construction and standard methods of testing.

MECHANICS

WILLIAM E. BROOKE, B.C.E., M.A., *Professor of Mathematics*
 HENRY T. EDDY, C.E., Ph.D., LL.D., *Professor of Mathematics and Mechanics*
 BURT L. NEWKIRK, Ph.D., *Assistant Professor of Mathematics and Mechanics*

- 7a'. APPLIED MECHANICS PROFESSOR BROOKE, ASSISTANT PROFESSOR NEWKIRK
 Five credits (five hours per week) First semester
 Required of all juniors in the mechanical and electrical engineering courses. Prerequisites the same as course 7'. The principles of statics and dynamics, and the mechanics of the materials of construction.

and sophomore classes; and to encourage this, as it is considered beneficial, not only to the individual student, but to the State generally, the extra work is encouraged by allowing a year's drill to count as a two-hour credit for one semester, but no credit will be allowed for such drill for less than one year.

In addition to the above, a course is given in Military Science, optional with the seniors and juniors, during the second semester, two hours a week. This work, when satisfactorily completed, taken in connection with the year's drill, will give a four-hour credit for the semester.

Military instruction is intended to be so conducted as to develop a soldier-like bearing and foster a spirit of gentlemanly courtesy, soldierly honor and obedience to lawful authority, as well as to familiarize students with company and battalion manoeuvres, guards and the theoretical and practical use of firearms.

On graduation of each class the commandant will report to the adjutant general of the army the names of the graduates who have shown special aptitude for the military service and furnish a copy thereof to the adjutant general of the state.

The officers and non-commissioned officers are required to be good students in the other departments, soldier-like in the performance of their duties, exemplary in their general deportment and able to pass a creditable examination in drill regulations. In general, the officers are selected from the senior class; the sergeants from the junior class; and the corporals from the sophomore class.

Freshman—Practical instruction in schools of the soldier, company and battalion; signals, ceremonies; schools of the cannoneer and battery.

Sophomore—Practical and theoretical instruction in schools of the company and battalion; advance and rear guard drill; practical and theoretical instruction in guard duty. Gallery practice. Ceremonies.

Junior and senior—Theoretical instruction—Advance and rear guards, outposts, reconnaissance, camping, duties of company commander, articles of war, records.

PHYSICS

HENRY A. ERICKSON, E.E., *Assistant Professor of Physics*

FREDERICK S. JONES, M.A., *Professor of Physics*

ANTHONY ZELENY, M.S., *Assistant Professor of Physics*

JOHN ZELENY, B.A., Ph.D., *Professor of Physics*

ALOIS F. KOVARIK, B.A., *Instructor in Physics*

1. GENERAL PHYSICS

PROFESSOR JOHN ZELENY

Three credits (three recitations per week)

First semester

Open to sophomores, juniors and seniors.

Mechanics of solids and fluids, heat and sound. This is the first part of a general course in physics. The treatment is experimental rather than mathematical. The course is designed to give the student a general knowledge of the fundamental principles of the subject and will be found especially useful to those pursuing other sciences.

2. GENERAL LABORATORY PRACTICE

MR. KOVARIK

One credit (two hours laboratory work per week)

First semester

Open to sophomores, juniors and seniors.

Physical measurement in the mechanics of solids and fluids, and in heat and sound, giving the student a knowledge of experimental methods. This course is intended to accompany course 1.

3. GENERAL PHYSICS PROFESSOR JOHN ZELENY
 Three credits (three recitations per week) Second semester
 Open to sophomores, juniors and seniors.
 Light, electricity and magnetism. This is the second part of a general course in physics. The treatment is experimental and the fundamental principles of the subjects, including those of radioactivity, ionization, and radiation and the electrical constitution of matter are discussed and illustrated.
4. GENERAL LABORATORY PRACTICE MR. KOVARIK
 One credit (two hours laboratory work per week) Second semester
 Open to sophomores, juniors and seniors.
 Physical measurements in light, electricity and magnetism, giving the student a knowledge of experimental methods. This course is intended to accompany course 3.
5. GENERAL PHYSICS (Advanced Course) PROFESSOR JONES,
 ASSISTANT PROFESSORS A. ZELENY AND ERIKSON
 Six credits (eight hours per week) First semester
 Open to sophomores, juniors and seniors.
 Mechanics of solids and fluids, the properties of matter, heat and sound. This course is intended to give a thorough training in general physics including the solution of numerous problems. It is adapted to those students who expect to specialize in physics, to teach the science or to enter upon a technical course.
6. GENERAL PHYSICS (Advanced Course) PROFESSOR JONES,
 ASSISTANT PROFESSORS A. ZELENY AND ERIKSON
 Six credits (eight hours per week) Second semester
 Open to sophomores, juniors and seniors.
 Light, electricity and magnetism. This course completes the work in general physics and is intended for those students who wish to specialize in the science, to teach the subject, or to enter upon a technical course.
7. ELECTRICAL MEASUREMENTS ASSISTANT PROFESSOR A. ZELENY
 Three credits (four hours laboratory, two lectures per week) First semester
 Open to juniors and seniors.
 The course aims to give a thorough, practical knowledge of electrical instruments and of the fundamental electrical measurements. The system of electrical units is developed theoretically and experimentally.
8. PHYSICAL MANIPULATION AND LABORATORY TECHNIQUE PROFESSOR JOHN ZELENY
 Three credits (three recitations per week) Second semester
 Open to juniors and seniors.
 The object of this course is to give the student a knowledge of the essential physical manipulations, such as the cleaning and distilling of mercury, soldering, glass blowing, glass cutting, glass grinding, making of quartz fibers, etc.; and to acquaint him with the use of some instruments of precision, such as the cathetometer, comparator, the dividing engine, the balance, mercury air pumps and gauges, etc. The course is especially valuable to those who intend to teach the science or to specialize in it.
9. DYNAMICS PROFESSOR JONES
 Three credits (three recitations per week) First semester
 Open to juniors and seniors.

A discussion of some problems in dynamics which are important in the study of advanced physics.

10. **ADVANCED PHYSICAL MEASUREMENTS** PROFESSOR JOHN ZELENY
Three credits (four hours laboratory, two lectures per week)
First semester
Open to seniors and graduates.
The course consists of individual work in the laboratory on topics especially chosen to serve best the needs and capacity of each student. The course is intended to introduce the student to some of the more intricate physical measurements and to teach him self-reliance.
11. **ADVANCED PHYSICAL MEASUREMENTS** PROFESSOR JOHN ZELENY
Six credits
First semester
Open to seniors and graduates.
The same as course 10, except that twice as much time is devoted to the subject.
12. **THE THEORY OF LIGHT** PROFESSOR JONES
Three credits (three recitations per week)
Second semester
Open to graduates. Hours to be arranged.
A study of the important optical phenomena. Preston's Theory of Light is used as a text.
13. **ELECTRICAL MEASUREMENTS OF PRECISION** PROFESSOR A. ZELENY
Three credits (three recitations per week)
Second semester
Open to seniors. Hours to be arranged.
The course is chiefly experimental and includes the following: making of standard cells; calibration of wheatstone box bridge; adjustment of resistances, ammeters and voltmeters; use of the potentiometer in measurements of highest precision; experimental problems involving capacity, inductance and magnetic flux; measurement of temperatures by electrical methods.
14. **RADIOACTIVITY** MR. KOVARIK
Three credits (three recitations per week)
Second semester
Open to graduates.
The course consists entirely of lectures, experimental and descriptive. The various theories and the methods of investigation are fully considered.
15. **ADVANCED PHYSICAL MEASUREMENTS** PROFESSOR JOHN ZELENY
Three credits (three recitations per week)
Second semester
Open to seniors and graduates.
This course consists of the experimental study of some physical phenomena, the nature or laws of which are not yet understood.
16. **ADVANCED PHYSICAL MEASUREMENTS** PROFESSOR JOHN ZELENY
Six credits
Second semester
Open to seniors and graduates.
The same as course 15, except twice as much time is devoted to the subject.
17. **THE KINETIC THEORY OF GASES** ASSISTANT PROFESSOR ERIKSON
Three credits (three recitations per week)
Second semester
Open to graduates. Hours to be arranged.
This course is a study of Meyer's Kinetic Theory of Gases.
18. **DISCHARGE OF ELECTRICITY THROUGH GASES** PROFESSOR JOHN ZELENY
Three credits (three recitations per week)
First semester

Open to graduates. Hours to be arranged.

The course consists of lectures, with experimental illustrations, on the conduction of electricity through gases. A study is made of the conductivity imparted to gases by the action of X-rays, ultra-violet light, radioactive substances, and glowing metals; of the discharge of electricity from points and in vacuum tubes; and of the spark arc discharges. The methods of measuring the velocity of the ions and the charges carried by them are studies in detail.

19. THE MATHEMATICAL THEORY OF ELECTRICITY AND MAGNETISM

PROFESSOR JOHN ZELENY

Three credits (three recitations per week)

Second semester

Open to graduates. Hours to be arranged.

This course consists in the study of J. J. Thompson's Elements of the Mathematical Theory of Electricity and Magnetism.

RHETORIC

OSCAR W. FIRKINS, M.A., *Instructor in Rhetoric*

LINDA H. MALEY, B.L., *Instructor in Rhetoric*

CHARLES W. NICHOLS, M.A., *Instructor in Rhetoric*

HELEN GRIFFITH, B.A., *Assistant in Rhetoric*

NELLIE A. WHITNEY, *Assistant in Rhetoric*

1 (a). RHETORIC

MR. FIRKINS, MR. NICHOLS, MISS MALEY,

MISS GRIFFITH AND MISS WHITNEY

Six credits (three hours per week)

First and second semesters

Open to all freshmen who have passed the entrance test in English.

This course includes the study of formal rhetoric, the writing of compositions, and the study and analysis of masterpieces of prose.

2 (a). RHETORIC

MR. FIRKINS AND MISS MALEY

Six credits (three hours per week)

First and second semesters

Open to students who have completed course 1, and to sophomores of whom, at entrance, rhetoric was not required.

The course consists of a study of the short story in the first semester, and of the essay and forms of public address in the second semester. The writing of compositions and the keeping of a note book form a greater part of the work.

SOCIOLOGY

ALBERT ERNEST JENKS, Ph.D., *Professor of Anthropology*

SAMUEL G. SMITH, Ph.D., LL.D., *Professor of Sociology*

1. DESCRIPTIVE SOCIOLOGY

PROFESSOR JENKS

Three credits (three hours per week)

First semester

Open to juniors and seniors.

This is a preliminary course designed as the first work of students in the sociology department. It presents concrete data concerning human association, showing groups of peoples living in the four grades of culture called savagery, barbarism, civilization, and enlightenment; and it discovers the activities and

institutions natural and peculiar to these cultures. Text book, lectures, assigned readings, and thesis.

2. **ELEMENTS OF SOCIOLOGY** PROFESSOR JENKS
Three credits (three hours per week) Second semester
Open to juniors and seniors.
This course is designed to give a general knowledge of the field of modern sociology, the attempt being to prepare students for such special sociological investigations as they may wish to make. Text book, lectures, assigned readings and thesis.
3. **SOCIAL PATHOLOGY** PROFESSOR SMITH
Three credits (three hours per week) First semester
Open to juniors and seniors.
Dealing with problems of poverty, crime, insanity, social degeneration, and a discussion of the child problem and methods of social amelioration.
4. **SOCIAL THEORY** PROFESSOR SMITH
Three credits (three hours per week) First semester
Open to juniors and seniors who have had courses 1 or 2.
This course includes a study of the leading American, English, French, and German writers to discover their methods of approach to the science and the leading results they have secured.
5. **SOCIAL GROUPS** PROFESSOR SMITH
Three credits (three hours per week) First semester
Open to juniors and seniors who have completed course 1.
An examination of the clan and the village in primitive life, a study of demography to discover the effect of environment upon social organization, and a comparison with the nature of and reason for the modern city.



The
University of Minnesota
Bulletin

College of Education

1908-1909

Volume XI

April 14, 1908

No. 7

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MINNEAPOLIS, MINN

The University catalogues are published by authority of the Board of Regents, as a regular series of bulletins. One bulletin for each college is published every year, and in addition a bulletin of general information outlining the entrance requirements of all colleges of the University, and embodying such items as University equipment, organizations and publications, expenses of students, loan and trust funds, scholarships, prizes, etc. Bulletins will be sent gratuitously, postage paid, to all persons who apply for them. In calling for bulletins, please state the college or school of the University concerning which information is desired. Address,

THE REGISTRAR,

The University of Minnesota,

Minneapolis, Minnesota.

CALENDAR FOR 1908-1909

1908

1909

MAY

S.	M.	T.	W.	T.	F.	S.
..	1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
31

JUNE

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SEPTEMBER

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OCTOBER

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NOVEMBER

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JANUARY

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FEBRUARY

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MARCH

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APRIL

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MAY

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JUNE

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20	21	22	23	24	25	26
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University Calendar

1907-1908

THE UNIVERSITY YEAR

The University year covers a period of thirty-eight weeks beginning on the second Tuesday in September. Commencement day is always the second Thursday in June.

FEBRUARY	4 T	Second semester begins—classes called for regular work
	12 W	Lincoln's birthday—legal holiday
	22 S	Washington's birthday—legal holiday
APRIL	17 F	Good Friday. Recess two days
MAY	2 Th	Regular meeting Board of Regents
	25 M	Senior examinations begin
	30 S	Decoration Day—legal holiday
JUNE	1 M	Semester examinations begin
	6 S	Semester examinations close

COMMENCEMENT WEEK, 1908

SUNDAY	June 7	Baccalaureate service
MONDAY	June 8	Senior class exercises
TUESDAY	June 9	Phi Beta Kappa address. Senior promenade
WEDNESDAY	June 10	Alumni Day. Regular meeting Board of Regents
THURSDAY	June 11	Commencement Day. The thirty-sixth annual commencement
FRIDAY	June 12	Summer vacation begins

1908-1909

SEPTEMBER	7-14	Entrance examinations, condition examinations and registration
	15 T	Classes called for regular work. Seventeenth annual session
OCTOBER	1 Th	Regular meeting Board of Regents
	5 M	Regular meeting University Council
NOVEMBER	26 Th	Thanksgiving Day. Recess three days
DECEMBER	7 M	Regular meeting University Council
	8 T	Annual meeting Board of Regents
	19 S	Holiday recess begins (no classes)
JANUARY	5 T	Work resumed in all departments
	23 S	Semester examinations begin
	30 S	Semester examinations close
FEBRUARY	2 T	Second semester begins—classes called for regular work
	12 F	Lincoln's birthday—legal holiday
	22 M	Washington's birthday—legal holiday
APRIL	5 M	Regular meeting University Council
	9 F	Good Friday—Recess two days

MAY	6 Th	Regular meeting Board of Regents
	24 M	Senior examinations begin
	31 M	Decoration Day—legal holiday
JUNE	1 T	Semester examinations begin
	5 S	Semester examinations close
	7 M	Regular meeting University Council

COMMENCEMENT WEEK, 1909

SUNDAY	June 6	Baccalaureate service
MONDAY	June 7	Senior class exercises
TUESDAY	June 8	Sigma Xi address. Senior promenade
WEDNESDAY	June 9	Alumni Day. Regular meeting Board of Regents
THURSDAY	June 10	Commencement Day. The thirty-seventh annual commencement
FRIDAY	June 11	Summer vacation begins

PROGRAM—ENTRANCE EXAMINATIONS

MONDAY,	September 7, 9	A. M.	3 Botany
			3 Zoology
			1 Astronomy
			3 Geology
		2 P. M.	2 American Government
			2 Political Economy
TUESDAY,	September 8, 9	A. M.	2 History
			5 Physics
		2 P. M.	4 Chemistry
			3 Physiography
WEDNESDAY,	September 9, 9	A. M.	1 English
		2 P. M.	1 German
			1 French
			1 Latin
			1 Scandinavian
THURSDAY,	September 10, 9	A. M.	1 Elementary Algebra
			2 Commercial Geography
		2 P. M.	1 Higher Algebra
FRIDAY,	September 11, 9	A. M.	1 Plane Geometry
		2 P. M.	1 Solid Geometry

1 Folwell Hall, 2 Library Building, 3 Pillsbury Hall, 4 Chemical Laboratory, 5 Physics Building, 6 Mechanic Arts Building.

The University

THE UNIVERSITY OF MINNESOTA comprises the following named schools, colleges and departments:

THE COLLEGE OF SCIENCE, LITERATURE AND THE ARTS

THE COLLEGE OF ENGINEERING AND THE MECHANIC ARTS

THE DEPARTMENT OF AGRICULTURE, including—

The College of Agriculture

The School of Agriculture

Short Course for Farmers

The Dairy School

The Crookston School of Agriculture

THE COLLEGE OF LAW

THE COLLEGE OF MEDICINE AND SURGERY

THE COLLEGE OF HOMEOPATHIC MEDICINE AND SURGERY

THE COLLEGE OF DENTISTRY

THE COLLEGE OF PHARMACY

THE SCHOOL OF MINES

THE SCHOOL OF ANALYTICAL AND APPLIED CHEMISTRY

THE COLLEGE OF EDUCATION

THE GRADUATE SCHOOL

The Regents of the University have entrusted to their charge:

THE EXPERIMENT STATIONS, including—

The Main Station at St. Anthony Park

The Sub-Station at Crookston

The Sub-Station at Grand Rapids

THE GEOLOGICAL AND NATURAL HISTORY SURVEY

Bulletins of these schools, colleges and departments may be obtained upon application to the University Registrar.

The Board of Regents

CYRUS NORTHROP, LL.D., MINNEAPOLIS	<i>Ex-Officio</i>
The President of the University	
The HON. JOHN LIND, MINNEAPOLIS	1914
The President of the Board	
The HON. JOHN A. JOHNSON, ST. PETER	<i>Ex-Officio</i>
The Governor of the State	
The HON. JOHN W. OLSEN, ALBERT LEA	<i>Ex-Officio</i>
The State Superintendent of Public Instruction	
The HON. THOMAS WILSON, ST. PAUL	1909
The HON. A. E. RICE, WILLMAR	1909
The HON. B. F. NELSON, MINNEAPOLIS	1910
The HON. DANIEL R. NOYES, ST. PAUL	1910
The HON. PIERCE BUTLER, ST. PAUL	1910
The HON. S. M. OWEN, MINNEAPOLIS	1913
The HON. W. J. MAYO, ROCHESTER	1913
The HON. HENRY B. HOVLAND, DULUTH	1914

C. D. DECKER, MINNEAPOLIS,
Secretary of the Board

Executive Officers

THE UNIVERSITY

CYRUS NORTHROP, LL. D., *President*

ERNEST B. PIERCE, B. A., *Registrar*

JAMES T. GEROULD, B. A., *Librarian*

C. D. DECKER, *Purchasing Agent*

J. D. BREN, *Cashier*

THE COLLEGES

JOHN F. DOWNEY, M. A., C. E., *Dean of the College of Science, Literature
and the Arts*

FREDERICK S. JONES, M. A., *Dean of the College of Engineering and the
Mechanic Arts*

EUGENE W. RANDALL, *Dean and Director of the Department of Agriculture*

WILLIAM S. PATTEE, LL. D., *Dean of the College of Law*

FRANK FAIRCHILD WESBROOK, M. A., M. D., C. M., *Dean of the College of
Medicine and Surgery*

EUGENE L. MANN, B. A., M. D., *Dean of the College of Homeopathic
Medicine and Surgery*

ALFRED OWRE, D. M. D., M. D., *Dean of the College of Dentistry*

FREDERICK J. WULLING, Phm.D., LL.M., *Dean of the College of Pharmacy*

WILLIAM R. APPLEBY, M. A., *Dean of the School of Mines*

GEORGE B. FRANKFORTER, Ph. D., *Dean of the School of Chemistry*

GEORGE F. JAMES, Ph. D., *Dean of the School of Education*

HENRY T. EDDY, C.E., Ph. D., LL. D., *Dean of the Graduate School*

ADA L. COMSTOCK, M. A., *Dean of Women*

The University Council

At the regular meeting of the Board of Regents of the University, May 31st, 1905, a University Council was established according to the following plan:

I. The name of the body shall be The University Council. It shall consist of the President of the University, the Deans of the various colleges and schools, one elected representative from each college or school for each 400 students or major fraction thereof, and one representative of the general alumni association.

II. The elected members shall serve for a period of one year. They shall be chosen from the various faculties at the time of the selection of standing committees. The representative of the general alumni association shall be chosen by that body at its annual meeting from among the alumni who are not members of the University.

III. The Council shall be authorized to—

a) Appoint the following committees or the faculty representation thereon:

The University auditing committee

The University press committee

The committee on athletics

The committee on University relations to other institutions of higher learning

The committee on health and sanitation

The committee on commencement and other University functions

The committee on catalogue, programs and courses of study

The committee on student entertainments and social affairs

And such other committees as the general University interests may require

b) Receive reports from such committees and to make such recommendations as may be required.

c) Consider and act upon any matter of general University interest beyond the province of a single faculty which may be referred to it by the President of the University or any faculty.

IV. The Council shall hold stated meetings upon the first Monday of October, December, April and June, and such other meetings as the President of the University may call

Representatives to the Council

The University

PRESIDENT CYRUS NORTHROP

The College of Science, Literature and the Arts

DEAN JOHN F. DOWNEY

PROFESSOR JOHN H. GRAY

PROFESSOR J. C. HUTCHINSON

PROFESSOR H. F. NACHTRIEB

PROFESSOR NORMAN WILDE

The College of Engineering and the Mechanic Arts

DEAN FREDERICK S. JONES

PROFESSOR GEORGE D. SHEPARDSON

The College and School of Agriculture

DEAN EUGENE W. RANDALL

PROFESSOR HARRY SNYDER

PROFESSOR SAMUEL B. GREEN

The College of Law

DEAN WILLIAM S. PATTEE

PROFESSOR HENRY J. FLETCHER

The College of Medicine and Surgery

DEAN F. F. WESBROOK

PROFESSOR THOMAS G. LEE

The College of Homeopathic Medicine and Surgery

DEAN EUGENE L. MANN

The College of Dentistry

DEAN ALFRED OWRE

The College of Pharmacy

DEAN FREDERICK JOHN WULLING

The School of Mines

DEAN WILLIAM R. APPELBY

The School of Chemistry

DEAN GEORGE B. FRANKFORTER

The College of Education

DEAN GEORGE F. JAMES

The Graduate School

DEAN HENRY T. EDDY

General Alumni Association

DAVID P. JONES

University Council Committees

The University Auditing Committee

PROFESSORS ANDERSON, FLETCHER, OWRE, SIGERFOOS, SPRINGER

The Committee on Athletics

PROFESSORS PAIGE, BROOKE, HARDING, D. P. JONES, LITZENBERG

The Committee on Grounds and Sanitation

PROFESSORS FLATHER, BASS, BRACKEN, HICKMAN, RANDALL, SIDENER,
WESBROOK

The Committee on Catalogue, Programs and Course of Study

DEANS APPLEBY, EDDY, FRANKFORTER, JAMES, JONES, MANN, OWRE,
WULLING; PROFESSORS FLETCHER, JOHNSTON, SCHLENKER, SNYDER,
E. B. PIERCE

The Press Committee

PROFESSORS SCHAPER, BAUER, CONSTANT, ERDMANN, JAMES

The Committee on Commencement and other University Functions

PROFESSORS NACHTRIEB, JENKS, OWRE, PATTEE, RANDALL, SCHLENKER,
WASHBURN

The Committee on Student Entertainments and Social Affairs

PROFESSORS FRANKFORTER, BASS, COMSTOCK, COOKE, MULLEN, PIKE

The Committee on University Relations to other Institutions of Higher Learning

PROFESSORS DOWNEY, BOTHNE, EDDY, GRAY, GREEN, JAMES, LEE

The Committee on University Extension and University Lectures

PROFESSORS WEST, HAECKER, RANKIN, SCHLENKER, SHEPARDSON

The Committee on the Library

PROFESSORS EDDY, FLETCHER, F. S. JONES, LEE, REYNOLDS,
VAN BARNEVELD, WEST

The College of Education

FACULTY

- CYRUS NORTROP, LL. D., *President*
GEORGE F. JAMES, Ph. D., *Dean and Professor of Education*
A. W. RANKIN, B. A., *Professor of Education*
FLETCHER HARPER SWIFT, Ph. D., *Assistant Professor of Education*
JOHN F. DOWNEY, M. A., C. E., *Professor of Mathematics*
JOHN G. MOORE, B. A., *Professor of German*
CHRISTOPHER W. HALL, M. A., *Professor of Geology and Mineralogy*
JOHN C. HUTCHINSON, B. A., *Professor of Greek*
MARIA L. SANFORD, *Professor of Rhetoric and Elocution*
CHARLES W. BENTON, M. A., Litt. D., *Professor of French*
HENRY F. NACHTRIEB, B. S., *Professor of Animal Biology*
FREDERICK S. JONES, M. A., *Professor of Physics*
WILLIS M. WEST, M. A., *Professor of History*
J. J. FLATHER, Ph. B., M. M. E., *Professor of Mechanical Engineering*
GEORGE B. FRANKFORTER, Ph. D., *Professor of Chemistry*
FRANCIS P. LEAVENWORTH, M. A., *Professor of Astronomy*
JOSEPH BROWN PIKE, M. A., *Professor of Latin*
SAMUEL G. SMITH, Ph. D., LL. D., *Professor of Sociology*
NORMAN WILDE, Ph. D., *Professor of Political Science*
JOHN HENRY GRAY, Ph. D., *Professor of Political Science*
WILLIAM A. SCHAPER, Ph. D., *Professor of Political Science*
FREDERIC E. CLEMENTS, Ph. D., *Professor of Botany*

EDWARD VAN DYKE ROBINSON, Ph. D., *Professor of Economics*

FRANCES S. POTTER, M. A., *Professor of English*

LOUIS J. COOKE, M. D., *Director of Gymnasium*

EDWARD M. LEHNERTS, M. S., *Assistant Professor of Geography*

JAMES BURT MINER, Ph. D., *Assistant Professor of Psychology*

CARLYLE M. SCOTT, *Assistant Professor of Music*

JOHN B. JOHNSTON, Ph. D., *Associate Professor of Neurology*

D. D. MAYNE, *Principal of the School of Agriculture*

INSTRUCTORS

MARGARET BLAIR, *Domestic Art*

ANNA M. BUTLER, *Physical Culture*

HENRIETTA CLOPATH, *Drawing*

CHARLES M. HOLT, *Education*

S. C. SHIPLEY, B. S., M. E., *Machine Work*

JUNIATA SHEPPERD, *Domestic Science*

W. H. RICHARDS, *Sloyd and Woodwork*

THE COLLEGE OF EDUCATION

The College of Education was authorized by a special enactment of the Legislature of Minnesota in 1905, and was established by the Regents of the University in the following year.

It offers both a practical and a theoretical training for prospective high school teachers and principals, for principals of elementary schools, for supervisors of special studies, and for superintendents of school systems.

ADMISSION

Entrance examinations are held only at the beginning of the college year. Students prevented from entering at that time may be admitted later if the circumstances justify this action. Such students are however at a great disadvantage and all students expecting to enter the college are urged to be present at the beginning of the year.

All applicants should present themselves to the Registrar, who will furnish them with application blanks and directions how to proceed with their examinations and registration.

CONDITIONS OF ADMISSION

Students who plan to enter the College of Education are advised to consult with the Dean in regard to their course of study during their first year of college study. When they have completed with credit at least two full years of college work, they will be admitted to this college. During these two years they should have pursued one or more of the subjects which they expect to teach and, in addition, at least one course in general psychology.

ADMISSION TO ADVANCED STANDING

I. *From other colleges*

This college accepts records from all colleges of equal rank for credit to advanced standing. All candidates for graduation must however meet the conditions established by this college as indicated in a succeeding paragraph.

II. *From Minnesota Normal Schools*

Graduates of the "advanced graduate course" of a Minnesota State Normal School who have completed in addition a full year of college work will be admitted to the College of Education, but will not be permitted to elect either course 5 or course 7 in education. Individual

graduates of either of the five-year courses of a Minnesota State Normal School will be admitted under the same regulations.

UNCLASSED STUDENTS

Applicants who present satisfactory reasons for not taking the regular course may be admitted as unclassified students upon proof of fitness to profit by the work. The same general attainments are expected of these students as are required of those who enter the regular course. Unclassified students must take the same number of hours as regular students, except that men and women actually engaged in teaching may be allowed to enter for a less amount of work upon the approval of the committee in charge.

EXAMINATIONS

At the close of each semester examinations are held and students are reported as "excellent," "good," "passed," "incomplete," "conditioned," or "failed". An "incomplete" must be removed within one month from the opening of the following semester, or it becomes a "condition."

A "condition" not made up before the subject is offered again becomes a "failure," subject to rules governing failures. "Failures" must be pursued again in class. A student who at any time is deficient in more than half a year's work loses his class rank and is regarded as a member of the next lower class. Students whose absences in any term exceed four weeks in the aggregate, are not permitted to take the term examinations without special permission of the faculty.

FAILURE TO KEEP UP WITH THE CLASS

Any student receiving conditions or failures in 60 per cent of the work the first semester shall be dropped from the rolls and shall not be allowed to re-enter the University until the opening of the following year.

Any student failing to pass in one-half of the work of any year shall not be allowed to register until reinstated by action of the faculty upon recommendation of the committee on students' work.

FEEES

All students in the college, who are residents of the state, are charged an incidental fee of ten dollars a semester. Non-residents are charged double the fee required of residents of the state, or twenty dollars a semester. No reduction is made for late entrance or for leaving before the end of the semester. Save in the case of the first registration, the incidental fee is increased by twenty-five cents for each day's delay in registration beginning with the first day set for recitations. The usual fees for shop work are required of students in manual training.

COURSE OF STUDY

The College of Education offers a two-year course of study leading to the degree of Bachelor of Arts in *Education*. The preparation for teaching, which is afforded in these two years, in addition to two years of previous collegiate study, is planned to include first of all a thorough grounding in the correct use of English, both spoken and written. No student should propose to go into his work without adequate training of this kind no matter what subjects he himself expects to teach and no one will be graduated from the College of Education who has not attained a satisfactory standard in this particular.

A second element in the preparation of the future teacher is found in the courses in general and educational psychology, in the history and the organization of schools, in educational theory, and in the practice of teaching. Courses in psychology and in the history of education must be pursued by all students and additional courses are elective in the theory and the practice of elementary and of secondary teaching, in the history of secondary education, in school organization and law, and in school hygiene.

A third part of the teacher's training is found in the specific subjects which he proposes to teach. In this particular the standard in Minnesota schools is constantly rising and year by year school trustees are asking of all high school teachers more definite and adequate preparation in the subjects assigned them. This preparation is not possible unless the prospective teacher selects his subjects early in the college course and effects also a desirable and natural combination. When this is done the work required for a bachelor's degree may be arranged to give both a liberal and a special training.

A third year of study leads to the degree of Master of Arts. The work of this year includes advanced studies in education and in philosophy, and in one or more of the subjects of the secondary curriculum at the option of the candidate. The course is planned especially for those holding the degree of Bachelor of Arts who desire to prepare themselves more carefully either for high school teaching or for work as principals and superintendents. Young men and young women who propose to take up this work permanently will find it advisable to do graduate study either immediately upon receiving the bachelor's degree or after a period of practical experience in teaching.

THE DEGREE OF BACHELOR OF ARTS IN EDUCATION

The degree of Bachelor of Arts in *Education* is granted to candidates on the following conditions:

A. The completion of college courses amounting to one hundred and twenty-six (126) credits, in addition to the required exercises in drill, gymnasium and physical culture. The courses selected must be approved by the committee in charge. No student shall elect less than fifteen or more than eighteen hours per week without special permission.

A credit is one hour per week through one semester.

B. At least fifteen (15) credits shall be secured in Education, including courses 1 and 2.

C. An amount of work shall be taken in at least three departments concerned with the studies of the secondary curriculum sufficient to secure one major and two minor recommendations. Each minor recommendation will require not less than twelve (12) credits and each major not less than eighteen (18) credits in one department.

D. Each candidate for graduation must show an average of scholarship through four years of college work indicated by at least as many marks of "good" as of "pass," and must be counted as "good" by the department which recommends him.

E. A maximum of twelve credits is elective from the laboratory and shop courses in the manual arts and agriculture, but, in addition, credit is allowed for allied courses toward the bachelor's degree, in the case of students who desire to specialize in manual training, domestic art, domestic science or agriculture.

GRADUATION "WITH DISTINCTION"

The bachelor's degree "with distinction" is granted to students of this college on the following conditions:

A. The degree "with distinction" is based on special excellence in the major subject.

B. Students who wish to be candidates for this degree must register before the beginning of the senior year, and are advised to register upon entering the college.

C. At the time of application the student must have an average of "good" in all of his previous work. (For the purpose of this count one "excellent" shall balance one "pass").

D. To receive the degree "with distinction" the student must meet all the conditions applying to the ordinary degree, must show a record higher than "pass" in four-fifths of all his work, must present a satisfactory thesis upon his major subject by May first of the senior year, must comply with the special requirements of the department chosen, must be recommended to the faculty for special excellence, and be approved by the vote of the faculty.

OBSERVATION AND PRACTICE TEACHING

The critical observation of good teaching and the practice of teaching under skilled supervision form a most important part of the preparation of the teacher. In connection with two courses on the practice of elementary and secondary teaching, opportunity has been given students during the past two or three years to observe and to discuss the best methods of teaching employed in the public schools of Minneapolis, St. Paul, and adjacent towns. This plan was adopted as the only feasible substitute at that time for adequate opportunities in the way of observation and of practice. These opportunities, it was recognized from the first, can be furnished only in a school organized under the direct control of this college.

In November, 1907, a small school was installed in temporary quarters provided by the regents, and during that academic year classes were conducted in seventh grade and in eighth grade work. In September, 1908, the school will, it is expected, be ready to admit pupils from the sixth grade and the ninth grade also, and thereafter, as facilities may be organized, the courses of the school will be extended up through the high school years and down through the elementary years. The primary purpose in this school is to afford prospective high school teachers an opportunity for seeing the work of the secondary schools conducted under normal conditions in as efficient a way as possible, in order that they may gain by observation and, to some extent, by practice familiarity with the instruction and management proper to a school of this grade. In addition, a fully graded elementary school, with kindergarten, ungraded room, and a three grade group is planned as a place of observation and practice for prospective school principals and superintendents.

The elementary and high school for observation and practice in connection with the training of teachers is the prime condition of success. To organize this adequately means buildings of considerable size, suitable and sufficient furniture and equipment, school libraries, laboratories, shops, gardens, and playgrounds. To secure this is the first aim and desire of the college. Meanwhile, the fullest use will be made of the temporary facilities, which are all that, during this year, the governing board is able to provide.

COMMERCIAL TRAINING

No definite course is now prescribed for those who are planning to teach business subjects (including commercial geography) in the high schools, but all are advised to take at least a three years' course in economics and to elect courses also in political science and in history.

Each student is advised further to select work in rhetoric, in English literature, and in one modern foreign language.

Students who expect to teach commercial geography will do well to select courses in some of the following subjects: essentials of physical geography, advanced general chemistry, industrial botany, economic zoology, applied geology, and anthropology. In economics courses are suggested in economic geography, in industrial and commercial history, the principles of accounting, and the elements of business law. These are general suggestions for those who wish to prepare themselves for the teaching of commercial subjects, but each candidate should very early consult with the committee in regard to the outlining of his entire course.

MANUAL TRAINING

The increasing demand for teachers who are able not only to handle two or three of the ordinary high school subjects, but also to direct the manual training work of the elementary and of the high school grades, is straining the facilities of our training schools for teachers in Minnesota. This college is not yet in a position to provide adequate facilities, but in co-operation with the College of Engineering is able to offer at least introductory courses of this kind. Young men who desire to prepare themselves for manual training work may register in the college for courses of this description. By utilizing the shops on the campus and other opportunities here offered, future manual training teachers may prepare themselves both in woodwork and in ironwork. With these, students may also unite courses in descriptive geometry, in mechanical drawing, and in allied subjects, and in this way they may secure a fairly satisfactory preparation for the teaching of these branches in connection with some of the regular high school studies.

DOMESTIC ART AND DOMESTIC SCIENCE

These subjects are being added each year to the school course in an increasing number of Minnesota towns. So far superintendents and boards of education have experienced considerable difficulty in securing teachers in these lines. The larger towns and cities can engage trained teachers and supervisors, but in the smaller communities on the first introduction of these subjects, it is necessary to entrust them to teachers able to give instruction in some high school studies.

A good opportunity, therefore, lies before prospective teachers, who in addition to a preparation in the ordinary studies of the high school course will prepare for the direction of these subjects. Students, who are interested in this line of work, will be directed early in their college course in the selection of foundation work in geography, chemistry, physics and

other related subjects, and will thus be prepared to elect during the last year or two the more technical instruction in domestic art and domestic science.

SATURDAY CLASSES AND COLLEGE EXTENSION COURSES

The college has offered during the past year a number of professional courses for those actually engaged in teaching, and most of this work has been organized for Saturdays and for the latter part of the afternoon on other days of the week. Teachers of Minneapolis and of St. Paul have registered in considerable numbers for this work, and teachers have come also from smaller adjacent towns. The courses arranged on the campus of the university for teachers will be continued and increased in number during the coming year.

Extension courses by members of the college faculty were given during 1907-8 in St. Paul under the auspices of a citizens' committee, and under the immediate direction of the city superintendent. Lectures on literature, anthropology, on general and on educational psychology, and on the history of education were given each week through the school year, and the enrollment in the courses was large. The college plans to make available, as far as possible, its resources in teachers and equipment to all the school systems of Minnesota, particularly those of towns in the neighborhood of the Twin Cities. It will be possible, from time to time, to secure from the college a series of weekly or fortnightly lectures upon almost any of the ordinary branches of higher study.

THE UNIVERSITY SUMMER SCHOOL

The summer school which has been held at the university for more than fifteen years is under the direction, not of the regents, but of the state department of public instruction. There is no official connection, therefore, between the summer school and the College of Education, but the school has been planned for many years especially to suit the needs and desires of Minnesota teachers, and in the college section the courses are arranged for teachers in state high schools who desire further preparation for their work. At the same time graduate courses are provided in connection with the school for teachers, principals, and superintendents who cannot attend during the academic year, and undergraduate courses leading to the degree of bachelor of arts are also provided for teachers. Men and women who have not completed the requirements for the bachelor's degree are enabled in this way to supplement their previous studies and to bring themselves where a few months of resident study will enable them to finish their college course. The courses provided during

this six weeks' session in June and July are given to a considerable extent by members of the faculty of this college.

LIBRARY FACILITIES

The professional library of the college contains a large selection of works on the various phases of education and is at the service not only of the students of the college, but of visiting teachers. During the coming year a text-book collection will be added covering the field of secondary schools. As soon as possible this illustrative library will be supplemented by model equipment of other kinds, thus offering concrete suggestions on questions of school furnishing and supplies.

Under certain restrictions the use of part of the professional library will presently be made possible for non-resident students.

THE DEGREE OF MASTER OF ARTS

Graduates of the University of Minnesota and of other institutions of equal rank will be admitted to work leading after one year of study to the degree of Master of Arts, upon the usual conditions attaching to that degree. They will be expected, however, to have given considerable attention in their collegiate work to psychology, and to the history, the theory and the practice of teaching.

Men and women actually engaged in teaching in Minnesota and possessing the bachelor's degree from a college of good rank will be allowed to pursue graduate studies *in absentia*. For non-resident students a special course is arranged with education as the major subject. Two years are required and three are allowed for the completion of this work.

THE UNIVERSITY TEACHERS' CERTIFICATE

The University Teachers' Certificate is granted to all graduates of the College of Education and to those graduates of the College of Science, Literature, and the Arts who complete one course in general psychology and three courses in education, including courses 1 and 2, and who secure on the basis of excellent scholarship one major recommendation as qualified for teaching from a department of that college concerned with some branch of the secondary curriculum.

SPECIAL LECTURES

In addition to the courses announced for the College of Education, special lectures will be given from time to time, open to all students, by men closely identified with public education in Minnesota. Educational organization, ideals and methods, will be treated from the point of view of those concerned with the state department of public instruction, the

inspection of state graded and high schools, the state normal schools, city school systems, and with the conduct of schools in smaller communities.

Public lectures will be given also by men familiar with the educational conditions, experiments, and tendencies in other states.

THE EDUCATIONAL CLUB

This organization is made up of those giving instruction in the College of Education and of students registered for advanced work. Meetings are held from time to time during the college year for the discussion of current questions in education and for reports and discussions upon recent educational literature, books, magazines and journals.

COURSES OF INSTRUCTION

Fuller descriptions of some of the courses offered may be found in bulletins of the College of Science, Literature and the Arts, the College of Engineering, the School of Chemistry and the College of Agriculture.

SEQUENCE OF SUBJECTS

The subjects in the following announcement are arranged in this order:

- I. Education
- II. English Literature and Rhetoric
- III. Ancient Languages—(a) Greek, (b) Latin
- IV. Modern Languages—(a) German, (b) French
- V. Biological Sciences—(a) Animal Biology, (b) Botany
- VI. Physical Sciences—(a) Chemistry, (b) Physics, (c) Geology
- VII. Mathematical Sciences, (a) Astronomy, (b) Mathematics
- VIII. Philosophy and Psychology
- IX. Economics, Political Science, History and Sociology
- X. Drawing, Music
- XI. Agriculture, Domestic Art and Science, and Manual Training.

Courses of Study

EDUCATION

1. HISTORY OF EDUCATION TO THE REFORMATION ASSISTANT PROFESSOR SWIFT
Three credits First semester
Open to juniors and seniors.
An introductory study in the history of education conducted by lectures, assigned readings, discussions and reports. The purpose of the course is to arouse an interest in educational problems, to secure some perspective for use in current investigation, with some command of the facts of educational history, and some ease in the methods of historical study. An attempt is made to bring out education as one phase of civilization and to show the connection of schools with other social institutions. Attention will be given especially to an examination of the schools of Greece and of Rome, the education of the early Christian centuries, the development of the different types of schools in Medieval times, the rise of the university and of the humanistic schools of the Renaissance.
2. HISTORY OF MODERN EDUCATION ASSISTANT PROFESSOR SWIFT
Three credits Second semester
Open to juniors and seniors who have completed course 1.
A somewhat intensive study of the periods in the history of modern education, with special reference to the development of the various national systems of public instruction. Different types of educational theory are considered in connection with a study of the men who first advanced them, and of the schools in which they were first put into effect. This course is a direct preparation for an understanding of the educational systems, theories, and practices of the present.
3. EDUCATIONAL PSYCHOLOGY ASSISTANT PROFESSOR MINER
Three credits First or second semester
Open to juniors who have completed philosophy 1.
Identical with philosophy 2.
The study of mental development in its relation to heredity and training. Lectures and student reports on the facts and theories of childhood and adolescence with special reference to their bearing on education.
4. SECONDARY EDUCATION PROFESSOR JAMES
Three credits First semester
Open to seniors who have completed courses 1 and 2.
A study of secondary education in the United States, with such references to the secondary schools of other countries as will lead to a clearer understanding of the place and function of the high school, its curriculum, the problems of present-day importance, and the relation of the high school to other parts of the system of public instruction. The course will be conducted by lectures, reports and discussions.

5. PRINCIPLES AND ORGANIZATION OF ELEMENTARY TEACHING
PROFESSOR RANKIN
Three credits First semester
Open to seniors who have completed courses 1 and 2 and philosophy 1.
This course includes a consideration of the course of study of the elementary school and of the best methods of instruction. It is conducted by means of lectures, assigned readings, discussions and reports. It is planned for all students who expect to teach in the high schools or to be principals or superintendents. No credit is given in this course to graduates of normal schools, who have received one year's credit at the university.
6. PRINCIPLES AND ORGANIZATION OF SECONDARY TEACHING
PROFESSOR RANKIN
Three credits Second semester
Open to seniors who have completed courses 1 and 2 and who have completed course 4 or are pursuing course 10.
This course includes lectures on the general methods of secondary teaching, assigned readings, reports, and discussions. It is planned more particularly for those who expect to teach in high schools.
7. THE THEORY OF EDUCATION
PROFESSOR JAMES
Three credits First semester
Open to juniors and seniors who have completed philosophy 1.
An introductory course in educational theory, including a somewhat detailed study of the principles on which is based the present practice in teaching. No credit is given in this course to graduates of normal schools who have received one year's credit at the university.
8. SCHOOL ADMINISTRATION
PROFESSOR RANKIN
Three credits First semester
Open to seniors who have completed courses 1 and 2.
An introductory study of school administration, conducted by lectures, reports and discussions; the organization of school systems, the work of school boards, superintendents, principals and teachers, school buildings, and hygiene. This course is planned for students without any teaching experience, who hope later to do work in supervision.
9. SCHOOL SUPERVISION
PROFESSOR RANKIN
Three credits Second semester
Open to seniors; intended only for students with experience in teaching.
An advanced course treating of the duties of school principals and superintendents. Credit will not be given both for course 8 and for course 9.
10. COMPARATIVE STUDY OF SCHOOL SYSTEMS
PROFESSOR JAMES
Three credits Second semester
Open to seniors who have completed courses 1 and 2.
This course deals with the school systems of Germany, France, England and the United States, with special reference to principles and methods of administration. Elementary, secondary and higher institutions are examined with emphasis varying in successive years. The course is conducted partly by lectures and partly by assigned readings, reports and discussions.
11. MODERN EDUCATIONAL THEORIES
PROFESSOR JAMES
Three credits Second semester
Open to seniors who have completed courses 1 and 2 and philosophy 1.

18. PRACTICE TEACHING PROFESSOR RANKIN
 Three credits First or second semester
 Open only to seniors and to graduate students.
 The registrar will accept enrollment only on written permission to the student from the instructor in charge, specifying one of the morning periods to be kept free for this work on each day of the week; five periods of teaching and Saturday conference; not counted as one of the five courses in education required for graduation.
 This is a course in observation and practice teaching, related for the present to the work of the advanced grammar and first high school grades. As facilities permit, the work of other grades will be added.
19. TECHNIQUE OF READING MR. HOLT
 Three credits First or second semester
 Open only to a limited number of seniors after individual tests by the instructor.
 This course is given in two sections for those who are specializing in this work and for those noticeably deficient in voice control.

ENGLISH LANGUAGE AND LITERATURE

ENGLISH

1. OUTLINE OF ENGLISH LITERATURE PROFESSOR BURTON, ASSISTANT
PROFESSORS PECK AND BEACH
 Three credits First semester
 Open to all.
 Full credit only for freshmen, who must complete course 2 before credit for this will be allowed.
 An outline sketch of the main personalities of English literature, from the earliest times to the present.
2. OUTLINE OF AMERICAN LITERATURE PROFESSOR BURTON, ASSISTANT
PROFESSORS PECK AND BEACH
 Three credits Second semester
 Open to freshmen who have completed course 1, and at half credit to sophomores, juniors, and seniors; not credited toward a minor in English.
 A study of the salient figures of our native literary development; special attention is given to contemporary writers.
3. EARLY ENGLISH PROFESSOR KLAEBER, MR. FIRKINS
 Six credits Both semesters
 Open to sophomores, juniors, and seniors. The first semester is required of all who take a major or obtain a teacher's certificate in English.
 A study of the language and reading of representative selections of Old English prose and poetry; the relation to the modern English will be particularly emphasized.
4. INTRODUCTION TO MIDDLE ENGLISH LANGUAGE AND LITERATURE PROFESSOR KLAEBER
First semester
 Two credits
 Open to sophomores, juniors, and seniors who have completed the first semester of course 3; alternates with course 5.
 An outline of Middle English grammar, including the interpretation of selected texts.

5. **PIERS THE PLOWMAN** PROFESSOR KLAEBER
Two credits First semester
Open to sophomores, juniors, and seniors who have completed the first semester of course 3; alternates with course 4; not given in 1908-9.
6. **CHAUCER** ASSISTANT PROFESSORS PECK AND BEACH, AND MR. FIRKINS
Three credits First semester
Open to sophomores.
A study of the grammar and literary forms of fourteenth century English, with selected readings from Chaucer's works; special attention is given to the Canterbury Tales.
7. **SPENSER** ASSISTANT PROFESSORS PECK AND BEACH, AND MR. FIRKINS
Three credits Second semester
Open to sophomores.
8. **OUTLINE OF EIGHTEENTH CENTURY LITERATURE** ASSISTANT PROFESSOR BEACH
Three credits First Semester
Open to sophomores and juniors who have completed one year of work in English.
9. **OUTLINE OF NINETEENTH CENTURY LITERATURE** ASSISTANT PROFESSOR BEACH
Three credits Second semester
Open to sophomores and juniors who have completed one year of work in English.
10. **EARLY NINETEENTH CENTURY POETRY** MR. FIRKINS
Three credits First semester
Open to juniors.
A course in forms and literary influence of the early nineteenth century, with a critical study of selected readings from Wordsworth, Coleridge, Byron, Shelley, and Keats.
11. **THE ENGLISH NOVEL** PROFESSOR POTTER
Three credits First semester
Open to juniors and seniors who have completed one year of work in English.
12. **THE BIBLE AS LITERATURE** PROFESSOR POTTER
Three credits Second semester
Open to sophomores, juniors, and seniors.
13. **MILTON** PROFESSOR POTTER
Three credits First semester
Open to juniors who have completed one year of work in English, preferably courses 6 and 7.
14. **SHAKESPEARE** PROFESSOR POTTER
Three credits Second semester
Open to juniors who have completed one year and a half in English, preferably courses 6, 7 and 14.
15. **CONSTRUCTION AND DEVELOPMENT OF THE MODERN DRAMA** ASSISTANT PROFESSOR PECK
Six credits Both semesters

Open to seniors who have completed two years in English, including course 15.

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| 18. | TEACHERS' COURSE IN ENGLISH
Two credits
Open to seniors who have completed courses 6, 7, 14, and 15; both semesters must be completed before credit is allowed for the first semester. | PROFESSOR POTTER
Both semesters |
| 19. | THE DEVELOPMENT OF LITERARY CRITICISM
Two credits
Open to juniors and seniors; both semesters must be completed before credit is given for the first semester. | PROFESSOR BURTON
Both semesters |
| 20. | ENGLISH PROSE
Three credits
Open to juniors and seniors who have completed one year of English. | PROFESSOR BURTON
First semester |
| 21. | BROWNING AND TENNYSON
Three credits
Open to juniors and seniors who have completed one year of English. | PROFESSOR BURTON
Second semester |
| 22. | HISTORY OF THE ENGLISH LANGUAGE
One credit
Open to sophomores, juniors, and seniors, who have completed the first semester of course 3; required of all who take their major or obtain a teacher's recommendation in English. | PROFESSOR KLAEBER
Second semester |

Courses 3 (first semester), 6, 7, 14, 15, 18 and 22 are prescribed for those who offer a major in English toward graduation, with six additional credits in English, and course 2 in rhetoric. Three years in English will be required for a minor in this college, the courses to be selected after consultation. Students may select extra courses from any work announced by the English department.

RHETORIC AND ELOCUTION

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| 1. | (a) RHETORIC
Six credits
Open to all; but juniors and seniors must obtain the consent of the department, and will receive only half credit. | MR. FIRKINS AND MR. NICHOLS
Both semesters |
| | (b) ARGUMENTATION
Six credits
Open to freshmen and sophomores who are recommended by the department. | MR. GISLASON
Both semesters |
| 2. | (a) RHETORIC
Six credits
Open to freshmen who have obtained a grade of "excellent" upon the entrance examination in English, and to sophomores, juniors, and seniors who have completed course 1. | MR. FIRKINS, MISS MALEY, AND MISS WHITNEY
Both semesters |
| | (b) ARGUMENTATION
Six credits
Open to sophomores, juniors, and seniors who have completed course 1, and have had some previous experience in debate. | MR. GISLASON
Both semesters |
| 3. | LITERARY CRITICISM
Three credits
Open to sophomores (by special permission), juniors, and seniors who have completed course 1. | PROFESSOR SANFORD
First semester |

4. ART LECTURES PROFESSOR SANFORD
 Three credits Second semester
 Open to sophomores (by special permission), juniors, and seniors
 who have completed course 1.
5. DEBATE PROFESSOR SANFORD
 Six credits Both semesters
 Open to juniors and seniors who have completed courses 1 (b)
 and 2 (b); not offered in 1908-9.
6. ADVANCED RHETORIC ASSISTANT PROFESSOR COMSTOCK
 Six credits Both semesters
 Open to juniors and seniors who have completed courses 1 and
 2. This course should be taken by all who expect to teach
 English in the secondary schools.
7. ADVANCED RHETORIC ASSISTANT PROFESSOR COMSTOCK
 Six credits Both semesters
 Open to juniors and seniors who have completed courses 1, 2
 and 6.
8. READING PROFESSOR SANFORD
 Six credits Both semesters
 This course carries three credits each semester for sophomores only.
 The object of this course is voice building and training in
 interpretation and expression. The text used is Shakespere's
 plays.
9. VOCAL EXPRESSION Both semesters
 Six credits Both semesters
 Open to juniors and seniors who have completed course 1; not
 offered in 1908-9.
10. PSYCHOLOGICAL SIDE OF VOCAL EXPRESSION Both semesters
 Six credits Both semesters
 Open to juniors and seniors who have completed course 1; not
 offered in 1908-9.
11. AMERICAN ORATORY Both semesters
 Six credits Both semesters
 Open to juniors and seniors who have completed course 1; not
 offered in 1908-9.

Courses 1, 2, 3 and 6, are prescribed for those who offer a major in rhetoric toward graduation in this college, and these credits must be supplemented by at least three years of approved work in English.

GREEK

In addition to at least two of the preliminary courses, students who expect to teach Greek in the high schools should take the following:

4. ORATORY—Lysias and Demosthenes ASSISTANT PROFESSOR SAVAGE
 Three credits First semester
 Open to those who have completed course 2 or course 3.
 The course consists chiefly of readings from Lysias and Demos-
 thenes; this work is supplemented by lectures on Greek oratory,
 and some attention is given to Greek rhetoric.

5. PHILOSOPHY—Plato's Apology and Crito ASSISTANT PROFESSOR SAVAGE
 Three credits Second semester
 Open to those who have completed course 2 or course 3.
 The course consists chiefly in the reading of Plato's Apology and Crito; selections from Xenophon's Memorabilia may also be read. The reading of texts is supplemented by lectures on Greek philosophy.
7. TRAGEDY PROFESSOR BROOKS
 Three credits Second semester
 Open to juniors and seniors who have completed course 5.
10. ADVANCED COURSE IN EPIC POETRY—The Odyssey PROFESSOR HUTCHINSON
 Three credits Second semester
 Open to juniors and seniors who have completed course 7.
14. GREEK COMPOSITION PROFESSOR HUTCHINSON
 Two credits Both semesters
 Open to juniors and seniors who have completed courses 4 and 5; both semesters must be completed before credit is given for the first semester. Recommended to those who expect to teach Greek.

Courses 4, 5, 7, 10 and 14 are prescribed for students who offer a major in Greek toward graduation in this college. Eighteen credits are required for a minor. Students who desire further courses in Greek will consult with the head of the department.

LATIN

Students who desire a recommendation to teach Latin are expected to take courses 1, 2, 3 and 4 during the first two college years.

6. ADVANCED COURSE IN CAESAR PROFESSOR PIKE
 Three credits First semester
 Open to those who have completed courses 1 to 4, inclusive; required for a teacher's recommendation in Latin.
 Selections from books five to seven of the Gallic War and from the Civil War; thorough study of the principles of indirect discourse; intermediate composition; approximately one hour for one half semester will be spent upon technical portions of the work, e. g. class drill work and discussion of the various problems connected with secondary school work in Latin.
7. ADVANCED COURSE IN VIRGIL PROFESSOR PIKE
 Three credits Second semester
 Open to those who have completed courses 1 to 4 inclusive; required for a teacher's recommendation in Latin.
 An interpretation of selections from books seven to twelve of the Aeneid; a study of the quantitative method of pronouncing Latin verse; practice in the metrical rendering of selected passages; approximately one hour for one half semester will be spent upon the strictly technical portions of the subject.
10. LATIN COMPOSITION PROFESSOR PIKE
 Two credits Second semester
 Open to those who have completed courses 1 to 4, inclusive.
12. CORRESPONDENCE OF CICERO PROFESSOR CLARK
 Two credits First semester
 Open to those who have completed courses 1 to 4, inclusive.

Selections from the letters of Cicero, with a study of the life and history of his times.

Courses 6 and 7 are prescribed for students who offer a major in Latin toward graduation in this college. Those who desire additional work may select, on the approval of the head of the department, from other courses announced in Latin.

GERMAN

Courses 1, 2 or 3, and 5 are introductory courses. Students who present German for entrance may select courses 4 and 6 or 7 during the first two college years.

8. ADVANCED CONVERSATION, GRAMMAR AND COMPOSITION PROFESSOR
SCHLENKER, ASSISTANT PROFESSOR WILKIN, AND MR. SCHROEDEL
Four credits Both semesters
Open to those who have completed courses 1 and 2 or course 4; recommended that it be preceded by course 5; required of those who obtain a teacher's recommendation in German.
Essays on assigned subjects; oral exercises in German by means of discussions on everyday subjects.
9. GERMAN LITERATURE OF THE CLASSIC PERIOD PROFESSOR MOORE
Six credits Both semesters
Open to those who have completed courses 1 and 2 (by special permission), or 3 and 7, or 4 and 6; both semesters must be completed before credit is given for the first semester; required of those who obtain a teacher's recommendation in German.
10. MODERN AUTHORS, GERMAN LITERATURE OF THE NINETEENTH CENTURY PROFESSOR MOORE
Six credits Both semesters
Open to those who have completed courses 1, 2 and 9 (by special permission), or 4, 6, and 9 or 3, 7 and 9; both semesters must be completed before credit is given for the first semester; required of those who obtain a teacher's recommendation in German.
11. TEACHERS' COURSE PROFESSOR MOORE
One credit Second semester
Open to those who have completed course 10; this course is especially designed for those who expect to become teachers of German in high schools.

Courses 8, 9, 10, and 11 are prescribed for those who offer a major in German for graduation in this college. Eighteen credits are required for a minor, to be selected after consultation. Students may select additional work, on the approval of the head of the department, from other courses announced in German.

FRENCH

1. BEGINNING FRENCH ASSISTANT PROFESSORS ANDRIET AND FRELIN,
MADAME BERTIN
Ten credits Both semesters
Open to all, but juniors and seniors receive only half credit; both semesters must be completed before credit is given for the first semester; not counted toward a minor in French.

2. INTERMEDIATE FRENCH ASSISTANT PROFESSOR FRELIN AND MADAME BERTIN
Six credits Both semesters
Open to sophomores, juniors, and seniors who have completed course 1; both semesters must be completed before credit is given for the first semester.
3. ADVANCED FRENCH GRAMMAR AND COMPOSITION ASSISTANT PROFESSOR ANDRIST
Six credits Both semesters
Open to all who enter the university with two years of French; both semesters must be completed before credit is given for the first semester.
4. BEGINNING FRENCH CONVERSATION ASSISTANT PROFESSORS ANDRIST AND FRELIN, AND MADAME BERTIN
Two credits Both semesters
Open only to those who have completed or are taking course 2 or course 3; both semesters must be completed before credit is given for the first semester.
5. THE CLASSICAL PERIOD OF FRENCH LITERATURE PROFESSOR BENTON
Six credits Both semesters
Open to those who have completed course 2 or course 3; both semesters must be completed before credit is given for the first semester.
6. ADVANCED FRENCH CONVERSATION PROFESSOR BENTON
Four credits Both semesters
Open to those who have completed course 2 or course 3; both semesters must be completed before credit is given for the first semester.
7. FRENCH LITERATURE OF THE NINETEENTH CENTURY PROFESSOR BENTON
Six credits Both semesters
Open to those who have completed course 2 or course 3; both semesters must be completed before credit is given for the first semester.
8. TEACHERS' COURSE IN FRENCH PROFESSOR BENTON
Two credits Both semesters
Open to those who have completed course 5; both semesters must be completed before credit is given for the first semester.

Courses 1, 2, and 4, or courses 3 and 6, together with courses 5, 7, and 8 are prescribed for those who offer a major in French toward graduation. Eighteen credits are required for a minor.

ANIMAL BIOLOGY

1. GENERAL ZOOLOGY PROFESSOR SIGERFOOS, ASSISTANT PROFESSORS OESTLUND, BROWN, AND DOWNEY
Six credits Both semesters
Open to all; the laboratory fee is three dollars per semester.
Lectures, quizzes, and laboratory work. Text book—Hertwig's Manual of Zoology. This course should be taken in the first or the second college year by all who expect to teach the subject.

2. **ADVANCED ZOOLOGY** PROFESSOR SIGERFOOS AND ASSISTANT PROFESSOR BROWN
Six credits Both semesters
Open to those who have completed course 1; both semesters must be completed before credit will be given for the first; the laboratory fee is three dollars per semester.
3. **ESSENTIALS OF HISTOLOGY AND EMBRYOLOGY** PROFESSOR NACHTRIEB AND ASSISTANT PROFESSOR DOWNEY
Six credits Both semesters
Open to those who have completed course 1; the laboratory fee is three dollars per semester.
4. **COMPARATIVE ANATOMY OF VERTEBRATES** ASSISTANT PROFESSOR BROWN AND MR. JOHNSON
Six credits Both semesters
Open to those who have completed course 1; both semesters must be completed before credit is given for the first semester; the laboratory fee is three dollars per semester.
5. **GENERAL PHYSIOLOGY** PROFESSOR NACHTRIEB
Six credits Both semesters
Open to those who have completed course 1; both semesters must be completed before credit is given for the first semester.
In the first semester are considered the physical, structural, and functional features of living substance and the cell, present conditions and expressions of life, and the theories of the origin of life and death. In the second semester the life of the cell is considered in its relations to that of other cells, and the course is concluded with special reference to the teaching of physiology in our high schools.
Demonstrations and simple experiments constitute a part of the course in both semesters.
13. **TEACHERS' COURSE** PROFESSOR NACHTRIEB AND ASSISTANTS
One credit First semester
Open to those who have completed a minor in zoology; given in alternate years.
Lectures and discussions on the ends to be attained through courses in general zoology, and on the methods and means by which such ends may be gained.
Course 1, and courses 2, 3, 4, 5, or 15 are prescribed with course 13, for students who offer a major in animal biology toward graduation, and six other credits in animal biology are required, together with a year in botany. Students may select additional work, on the approval of the head of the department, from other courses announced in animal biology.

BOTANY

1. **GENERAL BOTANY** PROFESSOR CLEMENTS, ASSISTANT PROFESSORS TILDEN AND ROSENDAHL, AND ASSISTANTS
Six credits Both semesters
Open to all; both semesters must be completed before credit will be given for the first semester; the laboratory fee is three dollars per semester.
2. **ADVANCED BOTANY** PROFESSOR CLEMENTS, ASSISTANT PROFESSORS TILDEN AND ROSENDAHL, AND MISS MISZ
Six credits Both semesters
Open to those who have completed course 1; the laboratory fee is three dollars per semester.

3. **PHYSIOLOGY AND ECOLOGY** PROFESSOR CLEMENTS AND MR. HUFF
Six credits Both semesters
Open to those who have completed courses 1 and 2; by permission of the department the course may be taken in conjunction with course 2; the laboratory fee is three dollars per semester.
4. **ALGAE** ASSISTANT PROFESSOR TILDEN
Six credits Both semesters
Open to those who have completed courses 1 and 2; the laboratory fee is three dollars per semester.
5. **FUNGI** PROFESSOR CLEMENTS AND MISS HONE
Six credits Both semesters
Open to those who have completed courses 1 and 2; the laboratory fee is three dollars per semester.
6. **MOSSES AND FERNS** ASSISTANT PROFESSOR ROSENDAHL AND MR. HUFF
Six credits Both semesters
Open to those who have completed courses 1 and 2; the laboratory fee is three dollars per semester.
16. **TEACHERS' COURSE—Plant Studies and Methods** PROFESSOR CLEMENTS
Six credits Both semesters
Open to those who have completed courses 1 and 2; the laboratory fee is three dollars per semester.
A course for teachers and for students intending to teach; the subjects of nature study and high school botany are presented as they are to be taught, and not from the university point of view. The material is taken up in detail, in its proper sequence, and training in method is afforded, as far as possible, by practice in the elementary school of the College of Education.

Courses 1, 2, and 16 are prescribed for students who offer a major in botany toward graduation, and these must be supplemented by at least one year in animal biology. Students may select additional work, on the approval of the head of the department, from other courses announced in botany.

CHEMISTRY

1. **GENERAL CHEMISTRY** MISS COHEN AND MR. BADGER
Six credits Both semesters
Open to all who do not present any entrance credits in chemistry; but juniors and seniors receive only half credit; both semesters must be completed before credit is given for the first semester; the laboratory fee is five dollars per semester.
Recitations and laboratory work; the course includes a study of the common elements and their compounds, with an introduction to the modern theories of chemistry.
2. **ADVANCED GENERAL CHEMISTRY** PROFESSOR FRANKFORTER
Six credits Both semesters
Open to all who have completed a satisfactory course in general chemistry; both semesters must be completed before credit is given for the first semester; the laboratory fee is five dollars per semester.
Lectures and laboratory work; the ground covered includes an introduction to physical and technological chemistry, with an exhaustive study of the chemical elements.

3. **QUALITATIVE ANALYSIS** PROFESSOR NICHOLSON AND MR. FRARY
Six credits Both semesters
Open to those who have completed course 2; the laboratory fee is five dollars per semester.
Lectures and laboratory work, with recitations and collateral reading. The course includes the general reactions of the metals and the acids, with their qualitative separation. Beside this mechanical work, the ionic theory and the law of mass action are discussed with special reference to common qualitative reactions.
4. **QUANTITATIVE ANALYSIS (Gravimetric)** PROFESSOR SIDENER
Three credits First semester
Open to those who have completed course 3; the laboratory fee is five dollars.
Lectures and laboratory work. The course includes an introduction to quantitative and the beginning of gravimetric analysis.
5. **QUANTITATIVE ANALYSIS (Volumetric)** PROFESSOR SIDENER
Three credits Second semester
Open to those who have completed course 4; the laboratory fee is five dollars.
Lectures and laboratory work. The course includes an introduction to volumetric analysis, with a discussion of standard solutions and the necessary stoichiometric calculations.
6. **ORGANIC CHEMISTRY** PROFESSOR FRANKFORTER
Six credits Second semester
Open to those who have completed course 3; the laboratory fee is ten dollars.
Lectures and laboratory work. The course includes an exhaustive study of the theories of organic chemistry, with one or more important preparations in each of the advanced series and groups of compounds.
7. **TEACHERS' COURSE** MISS COHEN
One credit Second semester
Open to seniors who have completed course 3; this course is especially arranged for students who expect to teach.
The course will be largely didactic, with experimental work necessary to a thorough understanding of the new methods and theories.

Courses 1, 2, 3, and 7 are prescribed for students who offer chemistry as a major toward graduation in this college, together with at least six credits in physics. Students who enter with credit in chemistry may offer course 4 instead of course 1.

PHYSICS

1. **GENERAL PHYSICS** PROFESSOR JOHN ZELENY
Three credits First semester
Open to sophomores, juniors, and seniors; may be taken separately or in conjunction with course 2.
Mechanics of solids and fluids, heat and sound. This is the first part of a general course in physics; the treatment is experimental rather than mathematical; the course is designed to give the students a general knowledge of the fundamental principles of the subject, and will be found especially useful to those pursuing other sciences. There will be one experimental lecture and two recitations each week.

2. GENERAL LABORATORY PRACTICE MR. KOVARIK
One credit First semester
Open to sophomores, juniors, and seniors who have completed or are taking course 1; the laboratory fee is three dollars.
Physical measurements in the mechanics of solids and in heat and sound, giving the student a knowledge of experimental methods.
3. GENERAL PHYSICS PROFESSOR JOHN ZELENY
Three credits Second semester
Open to sophomores, juniors, and seniors who have completed course 1; may be taken separately or in conjunction with course 4.
Light, electricity and magnetism. This is the second part of a general course in physics; the treatment is experimental, and the fundamental principles of the subject, including those of radioactivity, ionization and radiation, and the electrical constitution of matter are discussed and illustrated. There will be one experimental lecture and two recitations each week.
4. GENERAL LABORATORY PRACTICE MR. KOVARIK
One credit Second semester
Open to sophomores, juniors, and seniors who have completed or are taking course 3; the laboratory fee is three dollars.
Physical measurements in light, electricity, and magnetism, giving the students a knowledge of experimental methods.
5. ADVANCED GENERAL PHYSICS PROFESSOR JONES, ASSISTANT PROFESSORS ANTHONY ZELENY, AND ERIKSON
Six credits First semester
Open to sophomores, juniors, and seniors who have completed mathematics 4 (trigonometry); the laboratory fee is three dollars. Adapted to those students who expect to specialize in physics, to teach science, or to enter upon a technical course.
Mechanics of solids and fluids; the properties of matter, heat, and sound. This course is intended to give a thorough training in general physics, and includes the solution of numerous problems; there will be two lectures, three recitations, and one laboratory (double) period each week.
6. ADVANCED GENERAL PHYSICS PROFESSOR JONES, ASSISTANT PROFESSORS ANTHONY ZELENY, AND ERIKSON
Six credits Second semester
Open to sophomores, juniors, and seniors who have completed course 5; the laboratory fee is three dollars. Intended for those students who wish to specialize in the science, to teach the subject, or to enter upon a technical course.
Light, electricity and magnetism. This course completes the work in general physics; there are two experimental lectures, three recitations, and one double laboratory period each week.
20. TEACHERS' COURSE PROFESSOR JONES
One credit Second semester
Open to seniors who have completed courses 1 to 4, inclusive, or courses 5 and 6.
No special matter is discussed, but methods of presentation and the selection of lecture material and laboratory experiments are considered; the work is conducted by the students under the supervision of the instructor.

Courses 1 to 4, inclusive, and course 20, with four other credits in this department and six credits in chemistry are prescribed for those who offer a major in physics toward graduation in this college; students may offer courses 5 and 6 in lieu of courses 1 to 4, inclusive.

GEOLOGY

1. GENERAL GEOLOGY PROFESSOR HALL
 Three credits First semester
 Open to juniors and seniors.
 This course comprises: (1) geodynamics, (2) structural geology, (3) physiographic geology, (4) an outline of historical geology. Lectures and conferences, illustrated by photographs, maps, profiles, and lantern slides.
2. ESSENTIALS OF PHYSICAL GEOGRAPHY ASSISTANT PROFESSOR LEHNERTS
 Three credits First semester
 Open to juniors and seniors.
 A discussion of earth sculpture and description of the structural features of continents, with special reference to the ethnic movements and commercial activities of mankind.
3. INDUSTRIAL GEOGRAPHY ASSISTANT PROFESSOR LEHNERTS
 Three credits Second semester
 Open to juniors and seniors who have completed course 1 or course 2.
 The structural features of the North American continent outlined as an introduction; following this is a study of the types of soil and dominating climatic characters of the several agricultural regions of the continent; a discussion of the geography of industries as they have grown up within the past hundred years and their dependence upon physiographic conditions; a study of local industries effected through excursions and reports; a brief survey of industries in other parts of the world parallels the more detailed study of North America; throughout the course cause and effect are kept in view.
4. ELEMENTS OF METEOROLOGY ASSISTANT PROFESSOR LEHNERTS
 Three credits Second semester
 Open to juniors and seniors who have completed course 1 or course 2.
 The general principles of meteorology are treated, embracing the properties and phenomena of the atmosphere, including an explanation of the ordinary observations of pressure and temperature, together with a more extended study of the apparatus and practice of a weather bureau office. This is followed by a study of storms and climatic elements generally; the conditions of climatic changes are studied and the influence of physiographic conditions is discussed. Text book, lectures, and reference reading.
5. GEOGRAPHY AND GEOLOGY OF MINNESOTA PROFESSOR HALL
 Three credits Second semester
 Open to juniors and seniors who have completed course 1.
 (a) The physical geography of the state in its relations to geological history and industrial development; (b) a study of the principles and facts of pre-Cambrian geology as exemplified within the state, and the extension of these into general application; (c) the present problems of the state in agriculture, drainage, water power, mining, quarrying, etc., are considered in some detail.
6. HISTORICAL GEOLOGY ASSISTANT PROFESSOR SARDESON
 Three credits Second semester
 Open to juniors and seniors who have completed course 1, course 7, or course 8.
 A course in historical geology, including a study of the more important types of fossils in their geological relations; a

history of the North American continent in particular is considered; lectures and demonstrations.

15. THE METHOD AND MATERIAL OF GEOGRAPHY ASSISTANT PROFESSOR LEHNERTS
 Two credits Both semesters

Open to juniors and seniors; designed especially for teachers.
 The earth as an object of study in the grades and in the high school; the guiding principles; the course of study; text books and their use; practical laboratory work; excursions; collection and preparation of illustrative material; map drawing; chalk modeling; relief work; organization of geographical subject matter for class room instruction, and the method of recitation.

Students will not offer a major in geology toward graduation in this college except by special permission, but all who intend to teach any biological or physical science are advised to take at least some of the elementary courses, to be selected after consultation.

ASTRONOMY

1. GENERAL ASTRONOMY PROFESSOR LEAVENWORTH
 Six credits Both semesters
 Open to those who have completed mathematics 4 (trigonometry).
 The study of the general principles of astronomy, illustrated by lantern slides and telescopic observations.
2. PRACTICAL ASTRONOMY PROFESSOR LEAVENWORTH
 Six credits Both semesters
 Open to juniors and seniors who have completed course 1, and mathematics 5, 6, and 7.
 The theory and use of astronomical instruments in determining time, latitude, longitude, and positions of heavenly bodies; astronomical photography, with measurements of plates; study of the method of least squares.

MATHEMATICS

1. FIRST PART HIGHER ALGEBRA DR. MANCHESTER AND MR. SHUMWAY
 Three credits First semester
2. SOLID GEOMETRY MR. MANCHESTER AND MR. SHUMWAY
 Three credits (not to be given after 1908) Second semester
3. SECOND PART HIGHER ALGEBRA PROFESSOR BAUER, ASSISTANT PROFESSOR BUSSEY, MR. DALAKER, DR. MANCHESTER, AND MR. SHUMWAY
 Three credits First semester
4. TRIGONOMETRY PROFESSOR BAUER, ASSISTANT PROFESSOR BUSSEY, MR. DALAKER, DR. MANCHESTER, AND MR. SHUMWAY
 Three credits Second semester
5. ANALYTICAL GEOMETRY PROFESSOR DOWNEY, ASSISTANT PROFESSOR BUSSEY, MR. DALAKER, AND DR. MANCHESTER
 Three credits First semester
 Open to those who have completed courses 3 and 4; courses 8 and 9 may be taken in conjunction with this course and course 6, and this is recommended to students specializing in mathematics.

6. DIFFERENTIAL CALCULUS PROFESSOR DOWNEY, ASSISTANT PROFESSOR
BUSSEY, MR. DALAKER, AND DR. MANCHESTER
Three credits Second semester
Open to those who have completed courses 3, 4, and 5.
7. INTEGRAL CALCULUS PROFESSOR DOWNEY
Three credits First semester
Open to those who have completed courses 3, 4, 5, and 6.
9. THEORY OF EQUATIONS MR. SHUMWAY
Three credits Second semester
Open to those who have completed courses 3, 4, and 8; may
be taken in connection with course 6.
10. DIFFERENTIAL EQUATIONS PROFESSOR DOWNEY
Three credits Second semester
Open to those who have completed courses 1 to 7, inclusive.
13. MATHEMATICAL PEDAGOGY PROFESSOR BAUER
One credit Second semester
Open to those who have completed courses 3 and 4.
A lecture course in which special attention is paid to the
fundamental principles of algebra and geometry.

Courses 3, 4, 5, 6, 7, and 13, with either course 9 or course 10, are prescribed for students who offer a major in mathematics toward graduation in this college. Courses 3, 4, 5, and 6 are required for a minor.

PHILOSOPHY AND PSYCHOLOGY

1. INTRODUCTORY PSYCHOLOGY PROFESSOR WILDE, ASSISTANT PROFESSORS
MINER AND SWENSON, AND MR. HAYNES
Three credits First semester
Open to sophomores, juniors, and seniors.
Required for all advanced work in psychology and for the
teacher's certificate; it also serves as an introduction to the
courses in philosophy. Students who expect to teach are
advised to take this course during the second college year.
2. LOGIC PROFESSOR WILDE, ASSISTANT PROFESSOR SWENSON,
AND MR. HAYNES
Three credits First or second semester
Open to sophomores, juniors, and seniors.
3. EDUCATIONAL PSYCHOLOGY ASSISTANT PROFESSOR MINER AND MR. HAYNES
Three credits Second semester
Open to those who have completed course 1.
This course is commended to those who expect to teach; it is
announced also as course 3 in education, and is accepted
toward the requirements of the teacher's certificate, and
counts as one of the five courses in education required for
graduation in this college.
4. EXPERIMENTAL PSYCHOLOGY ASSISTANT PROFESSOR MINER AND
MR. HAYNES
Three credits First semester
Open to juniors and seniors who have completed course 1. As
the number in each laboratory section will be limited, students
must arrange with their instructor as to their section before
registration.

5. **EXPERIMENTAL PSYCHOLOGY—Higher Mental Processes** ASSISTANT PROFESSOR MINER
 Three credits Second semester
 Open to juniors and seniors who have completed courses 1 and 4.

6. **OUTLINES OF EXPERIMENTAL PSYCHOLOGY** ASSISTANT PROFESSOR MINER
 Three credits Second semester
 Open to juniors and seniors who have completed course 1; not given in 1908-9.

All of the above courses have direct bearing upon the problems of education. The attention of future teachers is directed also to courses in ethics, the history of philosophy, the philosophy of religion, and other courses which are announced in the bulletin of the college of Science, Literature, and the Arts.

The following course in neurology, offered by the College of Medicine and Surgery, is of value to students who are taking advanced courses in psychology, and who are preparing to specialize in the teaching of education and psychology.

26. **THE NERVOUS SYSTEM AND MENTAL LIFE** PROFESSOR JOHNSTON
 Three credits Second semester
 Open to juniors and seniors.

ECONOMICS AND POLITICAL SCIENCE

ECONOMICS

1. **ELEMENTS OF ECONOMICS** PROFESSOR ROBINSON AND DR. PHELAN
 Three credits First semester
 Open to sophomores, juniors and seniors.
 Designed for those who desire a general knowledge of economics, and as an introduction to the more advanced courses offered in the department.
 A thorough course in the elements of economic theory, with special reference to present day economic and social problems; McVey's Outlines and a text book; supplemented by lectures and problems, with a weekly quiz.
2. **ECONOMIC GEOGRAPHY** PROFESSOR ROBINSON
 Three credits First semester
 Open to sophomores, juniors, and seniors.
 A study of the economic basis of modern civilization. Text book, supplemented by lectures, reports on special topics, and quizzes.
3. **MODERN INDUSTRIAL AND COMMERCIAL HISTORY** PROFESSOR GRAY
 Six credits Both semesters
 Open to sophomores, juniors, and seniors.
 This course may be taken in conjunction with course 1 or course 2. Both semesters must be completed before credit is given for the first semester.
 The industrial and commercial history of western Europe and America since the middle of the eighteenth century; the effects of modern inventions and political changes on industry and trade. Lectures with prescribed topical reading; one written report of considerable length will be required each semester.
4. **ADVANCED ECONOMICS** PROFESSOR ROBINSON
 Three credits Second semester
 Open to those who have completed course 1; required for a major in economics and for a recommendation to teach commercial subjects.

An advanced course in general economics, devoted largely to a study of recent theories of distribution. Assigned readings, reports, and discussions.

5. **MONEY AND BANKING** DR. PHELAN
 Three credits First semester
 Open to those who have completed course 1.
 The history and theory of money, nature and uses of credit, functions of banks, foreign exchange. Lectures, text book, assigned readings, and discussions.
6. **PUBLIC FINANCE** PROFESSOR ROBINSON
 Three credits First semester
 Open to those who have completed course 1.
 The development of the state as an economic organism. Text book, supplemented by lectures and assigned readings.
7. **PROBLEMS OF TAXATION** PROFESSOR ROBINSON
 Three credits Second semester
 Open to those who have completed course 6.
 Study of tax systems, tax reforms, and special forms of taxation, based on Seligman, *Essays in Taxation*. Reports of state tax commissions, with lectures and reports on special topics.

POLITICAL SCIENCE

1. **ELEMENTS OF AMERICAN GOVERNMENT** PROFESSOR SCHAPER AND
MR. ALLIN
 Three credits First or second semester
 Open to sophomores, juniors, and seniors.
 An elementary course in American government, intended as a preparation for the advanced courses in political science, for teaching in secondary schools, and for good citizenship. Text, lectures, and special topics.
2. **COMPARATIVE GOVERNMENT** MR. ALLIN
 Three credits First semester
 Open to those who have completed course 1; a description and analysis of the government as the agent of the state. Texts, with lectures and assigned readings.
7. **MUNICIPAL ADMINISTRATION** PROFESSOR SCHAPER
 Three credits Second semester
 Open to those who have completed course 1.
 A comparative study of modern city charters and methods of administration. Text, lectures, and special topics.
8. **THEORY OF THE STATE** PROFESSOR SCHAPER
 Three credits Second semester
 Open to those who have completed courses 1 and 2.
 A study in the theory of the state, its origin, nature, purpose, and its justification. Text book, with lectures and topical readings.
13. **TEACHERS' COURSE IN GOVERNMENT** PROFESSOR SCHAPER
 One credit Second semester
 Open to students of suitable preparation who intend to teach American government in the secondary schools.
 Lectures and the examination of text books, maps, and other materials useful to teachers.

Students will not offer economics and political science as a major for graduation in this college, unless intending to teach commercial subjects.

except by special permission of the advisory committee, but all are recommended to take courses in these subjects. The attention of students who expect to teach history and American government is called to courses 2, 3, 5, and 28 in economics, and to courses 2, 3, 7, 9, and 15 in political science. All of these are open for election, on the approval of the head of the department, as well as the other courses announced in economics and political science.

HISTORY

INTRODUCTORY COURSES

1. EUROPEAN HISTORY FROM THE ESTABLISHMENT OF THE ROMAN EMPIRE TO THE REFORMATION, 31 B. C. TO 1500 A. D. ASSISTANT PROFESSOR WESTERMANN
Six credits Both semesters
Open to all; juniors and seniors receive only half credit.
Especially designed for freshmen who have had less than two years of history in the secondary schools; not credited toward a minor in history.
2. ENGLISH CONSTITUTIONAL HISTORY TO THE ACCESSION OF GEORGE I. PROFESSOR WHITE AND MISS JUDSON
Six credits Both semesters
Open to all who have had two years of history in the secondary schools, or who have completed course 1.

GENERAL COURSES

3. RENAISSANCE AND REFORMATION PROFESSOR WHITE
Three credits First semester
Open to those who have completed course 1 or course 2.
The Renaissance and the Reformation will be studied as general European movements, with the emphasis upon the work of individual men and upon ideas rather than upon politics and institutions. The purpose of the course will be to show how the medieval world became the modern world.
4. EUROPE SINCE 1789 PROFESSOR ANDERSON
Six credits Both semesters
Open to those who have completed course 1 or course 2.
The history of France occupies the most prominent place in the course, that of other countries being grouped about it as far as possible.
5. AMERICAN CONSTITUTIONAL HISTORY TO 1840 PROFESSOR WEST
Six credits Both semesters
Open to those who have completed course 2.
Required for courses 6 to 9, inclusive, 11, 13, 14, and 19, and therefore recommended for the sophomore year to students who expect to specialize in history.
6. AMERICAN CONSTITUTIONAL HISTORY, 1841-1885 PROFESSOR WEST
Six credits Both semesters
Open to those who have completed course 2 and at least the first semester of course 5; given in 1908-9 and in alternate years thereafter.
15. HISTORICAL METHOD AND BIBLIOGRAPHY PROFESSOR WHITE
Two credits Second semester
Open to those who have completed course 1 or course 2; designed only for those who intend to specialize in history.

16. **TEACHERS' COURSE** PROFESSOR WEST
 One credit Second semester
 Open to seniors and graduates who have, including courses in progress, twenty-four credits in history; required of those who obtain a teacher's recommendation in history.
 This course is designed to assist those who expect to teach history in the high schools. Mr. West will be aided by other members of the department.

20. **ENGLAND SINCE 1815** PROFESSOR ANDERSON
 Three credits Second semester
 Open to those who have completed course 2; may be taken to advantage in connection with course 4; not given in 1908-9.

21. **HISTORY OF GREECE** PROFESSOR WESTERMANN
 Three credits First semester
 Open to those who have completed course 1 or course 2.
 The course is general in its nature, and will cover the political and social development of the Greek states to the time of their incorporation in the Roman Empire, with particular emphasis upon the latter part of the period. Special attention will be given to the permanent influence of Greek civilization.

INTENSIVE COURSES

7. **THE MAKING OF THE CONSTITUTION** PROFESSOR WEST
 Six credits Both semesters
 Open to juniors, seniors, and graduates who have completed course 5, but only on the approval of the instructor; both semesters must be completed before credit is given for the first semester.

8. **AMERICAN HISTORY SINCE 1789, AS SHOWN IN THE DEVELOPMENT OF CONSTITUTIONAL LAW** PROFESSOR WEST
 Three credits First semester
 Open to seniors and graduate students who have completed courses 2, 5, 6, and 7; not given in 1908-9.

9. **STUDIES IN AMERICAN STATESMEN** PROFESSOR ANDERSON
 Three credits Second semester
 Open to juniors, seniors, and graduates who have completed course 2, and at least the first semester of course 5.

10. **A CRITICAL STUDY OF HISTORICAL MASTERPIECES** PROFESSOR ANDERSON
 Three credits First semester
 Open to those who have completed course 5.

11. **THE HISTORY OF AMERICAN DIPLOMACY** PROFESSOR ANDERSON
 Three credits First semester
 Open to seniors and graduates who have completed course 5.

12. **THE HISTORY OF EUROPEAN DIPLOMACY SINCE 1789** PROFESSOR ANDERSON
 Three credits First semester
 Open to seniors and graduates who have completed or are taking course 4; ability to read easy French is required.

13. **COLONIAL EXPANSION AND ADMINISTRATION** PROFESSOR WEST
 Three credits Second semester
 Open to seniors and graduates who have completed course 4 or course 5; given in alternate years; not offered in 1908-9.

14. CRITICAL STUDY OF AUTHORITIES FOR EARLY NEW ENGLAND
 HISTORY PROFESSOR WEST
 Four credits Both semesters
 Open to seniors and graduates who have completed eighteen credits, including course 5; both semesters must be completed before credit is given for the first semester; given in alternate years.
17. MEDIEVAL ECONOMIC DOCUMENTS PROFESSOR WHITE
 Two credits Second semester
 Open to seniors and graduates who have completed twelve credits in history.
18. ORIGIN OF THE ENGLISH JUDICIAL SYSTEM PROFESSOR WHITE
 Three credits Second semester
 Open to juniors, seniors, and graduates who have completed six credits in history, including course 2, and who obtain permission of the instructor. Students must be able to read medieval Latin.
19. THE EXPANSION OF AMERICA, AS STUDIED IN ITS HIGHWAYS OF IMMIGRATION
 Six credits Both semesters
 Open to seniors and graduates who have completed course 5; both semesters must be completed before credit is given for the first semester; not given in 1908-9.
22. GREEK POLITICAL INSTITUTIONS ASSISTANT PROFESSOR WESTERMANN
 Three credits Second semester
 Open to juniors, seniors, and graduates who have completed courses 1 or 2, 21, and six additional credits.
23. ROMAN IMPERIAL ORGANIZATION ASSISTANT PROFESSOR WESTERMANN
 Three credits Second semester
 Open to juniors, seniors, and graduates who have completed twelve credits.

Twenty-four credits, not counting course 1, six of which must be for intensive courses, and, in addition, course 16, are required of all who offer a major in history toward graduation in this college; eighteen credits are required for a minor. Students who expect to teach history are advised to consult in respect to their courses with the head of the department during the freshman year.

SOCIOLOGY

1. DESCRIPTIVE SOCIOLOGY PROFESSOR JENKS
 Three credits First semester
 Open to juniors and seniors.
2. ELEMENTS OF SOCIOLOGY MR. REEP
 Three credits First or second semester
 Open to juniors and seniors.
3. SOCIAL PATHOLOGY PROFESSOR SMITH
 Three credits First semester
 Open to juniors and seniors.
4. SOCIAL THEORY MR. REEP
 Three credits First semester
 Open to those who have completed course 1 or course 2.

- | | |
|---|------------------------------------|
| 5. SOCIAL GROUPS
Three credits
Open to those who have completed course 1. | PROFESSOR SMITH
First semester |
| 6. THE STUDY OF INSTITUTIONS
Three credits
Open to those who have completed course 1. | PROFESSOR SMITH
First semester |
| 7. ANTHROPOLOGY
Three credits
Open to juniors and seniors. | PROFESSOR JENKS
First semester |
| 8. ETHNOLOGY
Three credits
Open to juniors and seniors who have completed course 1, 2, or 7,
and to graduate students. | PROFESSOR JENKS
Second semester |
| 9. THE PHILIPPINE PEOPLE
Three credits
Open to juniors, seniors, and graduate students. | PROFESSOR JENKS
Second semester |
| 10. PHYSICAL ANTHROPOLOGY
Three credits
Open to juniors and seniors who have completed course 7 or
course 8, and to graduate students. | PROFESSOR JENKS
Second semester |
| 11. THE AMERICAN NEGRO RACE
Three credits
Open to juniors, seniors, and graduate students; not given in
1908-9. | PROFESSOR JENKS
Second semester |
| 12. THE AMERICAN PEOPLE
Three credits
Open to juniors, seniors, and graduate students. | PROFESSOR JENKS
First semester |
| 13. BIBLICAL SOCIOLOGY
Three credits
Open to juniors, seniors, and graduate students. | PROFESSOR SMITH
First semester |
| 14. MODERN SOCIAL INSTITUTIONS
Three credits
Open to those who have completed course 7. | MR. REEP
First semester |

DRAWING

- | | |
|---|---------------------------------|
| 1. ELEMENTARY DRAWING
Three credits
Open to juniors and seniors.
The course includes drawing from objects, from plants, from
landscape, and from figure poses, in pencil and in water color;
the study of perspective; work from cast in charcoal; brush
drawing. | MISS CLOPATH
First semester |
| 2. ADVANCED DRAWING
Three credits
Open to juniors and seniors who have completed course 1.
More advanced work from objects and from cast; work in water
color and in colored chalks; pen and ink drawing; simple
exercises in lettering and composition. | MISS CLOPATH
Second semester |

3. DESIGN MISS CLOPATH
Six credits Both semesters
Open to seniors who have completed courses 1 and 2.
Exercises in composition, illustrating the various principles of decorative work, adaptation of plant forms, stencils, illuminated lettering; designs applied to simple forms of handicraft. Lectures on the fundamental principles of design, illustrated by art masterpieces.
4. HISTORICAL DESIGN MISS CLOPATH
Six credits Both semesters
Open to juniors and seniors who have completed course 1.
Original designs in different styles applied to articles of household use; color harmony; simple forms of pottery with applied designs. Lectures and collateral reading.
5. DRAWING AS RELATED TO EDUCATION MISS CLOPATH
Three credits First semester
Open to juniors and seniors who have completed courses 1 and 2.
Exercises in all the different kinds of art work used in the schools; advanced work in black and white, and in color.
6. THE TEACHING OF DRAWING MISS CLOPATH
One credit Second semester
Open to seniors who have completed course 3.
This course is conducted by lectures and collateral reading on the methods and value of drawing, as revealed through a study of the instincts and mental processes of the child.

MUSIC

1. HARMONY ASSISTANT PROFESSOR SCOTT
Four credits Both semesters
Open to juniors and seniors; the fee is four dollars per semester.
2. COUNTERPOINT ASSISTANT PROFESSOR SCOTT
Four credits Both semesters
Open to juniors and seniors who have a thorough knowledge of harmony; the fee is four dollars per semester.
3. MUSICAL FORM AND FREE COMPOSITION ASSISTANT PROFESSOR SCOTT
Two credits Second semester
Open to seniors who have completed course 1 and the first semester of course 2.
Intended for those specializing in music, and can be taken only with the consent of the instructor; the fee is four dollars per semester.
4. PIANOFORTE PROFESSOR OBERHOFFER AND ASSISTANT PROFESSOR SCOTT
Three or six credits Both semesters
Open to juniors and seniors.
Intended for those who propose to pursue the higher branches of pianoforte playing, or to fit themselves for piano teaching. Other arrangements may be ascertained upon application.
5. CHORAL CULTURE PROFESSOR OBERHOFFER
Four credits Both semesters
Open to juniors and seniors.
A single credit may be secured for chorus work, provided that students pursuing work for credit take course 1 or 2 at the

same time; students may pursue chorus work without credit by paying the required fee and securing the consent of the director.

6. **HISTORY OF MUSIC** ASSISTANT PROFESSOR SCOTT
Two credits Both semesters
Open to juniors and seniors; the fee is four dollars per semester.
7. **TEACHERS' COURSE (Elementary)** ASSISTANT PROFESSOR SCOTT
Two credits Both semesters
This is an elementary course open to all students possessing a fair voice and a good ear and is given as a partial preparation for teaching music in the public schools. It includes the fundamentals of music and will aid students in their preparation to teach music in the advanced grammar grades and in the high schools. Especial attention will be given to chorus direction. One hour each week is given to this work and the course is planned to continue through three semesters, two in elementary music and the third a semester of harmony such as is announced in course 1. The fee for this work will be four dollars for each semester; three credits for the complete course.

AGRICULTURE

1. **ELEMENTS OF AGRICULTURE** MR. MAYNE
Three credits First semester
Open to juniors and seniors, with credit toward the degree of bachelor of science (in education).
This course is planned to meet the increasing demand for a knowledge of the elements, at least, of agriculture on the part of graded school principals, rural school teachers, county superintendents of schools and others concerned with education in the agricultural sections of the state. The course is given at the School of Agriculture, on Tuesday and Saturday afternoons.
2. **ELEMENTS OF AGRICULTURE (Continued)** MR. MAYNE AND ASSISTANTS
Three credits Second semester
Open to juniors and seniors, with credit toward the degree of bachelor of science (in education).
This is a continuation of course 1 and is planned to give the student some familiarity with the underlying principles and the simple processes connected with various forms of agricultural work. Tuesday and Saturday afternoons. Mr. Mayne will have the co-operation of others connected with this branch of the University. Students who are interested are advised to read the bulletin of the School of Agriculture and to note the various opportunities which are there afforded, for all of these will be made available to some extent in connection with these courses.

DOMESTIC ART AND DOMESTIC SCIENCE

These courses cover specifically the science and the art of the home. In the reactionary movement, away from the theoretical, and toward the practical in education, the need of teachers of scientific and artistic home-making has become marked. To meet this demand the following courses have been organized:

DOMESTIC ART

Domestic art has to do with the very beginning of home-making, the selection of a site, the adaptation of architecture to the needs of the family, the

choice of materials, colors, etc., and their relation to the surroundings, the interior of the home, its furniture and keeping. All of these topics are viewed in both their economic and their social aspect. In addition a full course is offered in needle-work in all its branches.

1. A STUDY IN TEXTILES

MRS. BLAIR

Three credits

First semester

Open primarily to those who expect to teach this subject, with credit toward the degree of bachelor of science (in education).

Animal and vegetable fibres, weaves and dyes, testing fabrics for household use and personal wear, the hygiene values of various fabrics, harmony of color. This course is designed especially to assist the teaching of sewing in graded schools, and includes the preparation, explanation and making of models suited to grade work in the public schools. This course will be given upon Monday and Thursday afternoons, at the School of Agriculture.

2. DESIGN AND GARMENT DRAFTING

MRS. BLAIR

Three credits

Second semester

Open to those who have completed course 1, with credit toward the degree of bachelor of science (in education).

This course is in the design and drafting of children's and adults' garments and includes also a series of lectures upon the home.

This course will be given Monday and Thursday afternoons at the School of Agriculture.

DOMESTIC SCIENCE

Domestic science has to do with the chemistry of the table, the science of cooking, and the housewifely care of the kitchen and dining-room; household accounts, and the administration of the home upon an economical basis, are discussed in their various relations in these courses and the effort is toward system, economy and effectiveness in home management. Students who look forward to teaching are trained to assist in the teaching or supervision of this work in city schools or to have the entire charge of the work, in connection with other teaching, in the smaller high schools.

1. LAUNDERING AND FOOD ECONOMICS

MISS SHEPPERD

Three credits

First semester

Open primarily to those who expect to teach this subject, with credit toward the degree of bachelor of science (in education).

In this course the subject of domestic and commercial laundering and cleaning is first considered, with a study of removing stains, dyeing, setting colors, cleaning delicate fabrics, the use of cleaning agents, starches and bluing. By far the larger part of the semester is given to a study of food economics, with a consideration of all phases of the selection of food materials and the preparation of food. The course is conducted by means of lectures, readings, with the writing of a thesis and by full individual practical experience in all parts of the work.

The course is given on Wednesday and Friday afternoons at the School of Agriculture.

2. MANAGEMENT OF KITCHEN AND DINING ROOM

MISS SHEPPERD

Three credits

Second semester

Open to those who have completed course 1 with credit toward the degree of bachelor of science (in education).

- (a) The kitchen equipment, sanitation, labor saving devices, etc.
- (b) The dining room, equipment, furniture, decorations, management, etc.
- (c) Household inventories, bills of fare, fancy cookery, etc.

The above course is made, as far as possible, both practical and

scientific. It requires three hours of work on each of two afternoons. Students who are interested in this line are advised to read a fuller description, which will be found in the Bulletin of the School of Agriculture.

MANUAL TRAINING

- | | |
|---|---------------------------------|
| 1. INTRODUCTORY COURSE IN WOODWORK
Three credits
Open to juniors or seniors.
Planned to give the elementary principles of sloyd and familiarity with material and tools. | MR. RICHARDS
First semester |
| 2. ADVANCED COURSE IN WOODWORK
Three credits
Open to juniors and seniors.
Each credit hour calls in all manual training courses for at least three hours of shopwork. | MR. RICHARDS
Second semester |
| 3. INTRODUCTORY COURSE IN IRON WORK
Three credits
Open to juniors and seniors. | MR. SHIPLEY
First semester |
| 4. ADVANCED COURSE IN IRON WORK
Three credits
Open to juniors and seniors. | MR. SHIPLEY
Second semester |

Students may register for credit in manual training courses only with the approval of the committee.

Students

CANDIDATES GRANTED M. A. DEGREE, 1907.

Levi Harrison Beeler, Stillwater. B.A., '06, Macalester. Major, Education; Minors, History, Political Economy.	William C. L. Schaefer, St. Paul. B.A., '06, Minnesota. Major, Education; Minors, Psycholo- gy, German.
Louis W. Rapeer, Minneapolis. B.S., '04, University of Chicago. Major, Education; Minor, Geology.	

CANDIDATES GRANTED B. A. DEGREE, 1907.

Edgar C. Higbie, Minneapolis.	Conrad G. Selvig, Rushford.
Fred Barnum Reed, Decorah, Ia.	Charles Phillip Stanley, Waupaca, Wis.

GRADUATE STUDENTS

MAJOR IN EDUCATION

Clarence H. Barnes, Wells.	Martin Lien, Minneapolis.
B. P. Chapple, Bathgate, N. D.	Freeman E. Lurton, Moorhead.
I. Dorrum, Fergus Falls.	Carroll E. Payne, Long Prairie.
E. S. Hatch, St. Louis Park.	J. W. Petterson, St. Paul.
James H. Harris, Minneapolis.	Leonard H. Pryor, Fairmont.
E. C. Higbie, Canby.	Louis W. Rapeer, Minneapolis.
M. L. Jacobson, Dawson.	C. G. Selvig, Glencoe.
E. M. Lehnerts, Minneapolis.	W. G. Shirer, Buffalo.
Lora Levens, Minneapolis.	C. W. Van Cleve, Barnesville.

SENIORS. 11.

Bush, Carrie, Minneapolis.	Manning, V. R., Minneapolis.
Ethel Bush, Minneapolis.	Newton, Willis T., Minneapolis.
Bush, Maude, Minneapolis.	Oakes, Reuben W., Worthington.
Catur, Louise, St. Cloud.	Sachs, G. M., New Prague.
Dunivon, Nellie, St. Paul.	Winter, Alice, Minneapolis.
Hutchinson, Lucy, Minneapolis.	

JUNIORS. 6.

Collins, Melva, Minneapolis.	Norton, William W., Minneapolis.
Hewitt, Alden, Minneapolis.	Ringdahl, N. Robert, Lisbon, N. D.
Nelson, Mildred R., Waverly.	Southworth, Mira M., Minneapolis.

UNCLASSED. 15.

Cleary, Francis, Minneapolis.	Larkin, Jennie V., Minneapolis.
Corcoran, John B., Minneapolis.	Larsen, Kathryn Rowell, Minneapolis.
Covel, Susie A., Minneapolis.	Miller, O. H., Minneapolis.
Ford, Annie G., Minneapolis.	Pollock, M. Battelle, St. Paul.
Halstensaard, Alice, Fertile.	Shook, Jennie L., Minneapolis.
Hern, Angie K., St. Paul.	Shook, Kate P., Minneapolis.
Hern, E. F., St. Paul.	West, S. H., St. Paul.
Hunter, Edna J., Minneapolis.	





The
University of Minnesota
Bulletin

The College of Medicine and Surgery

1908-1909

Volume XI

April 21, 1908

No. 1

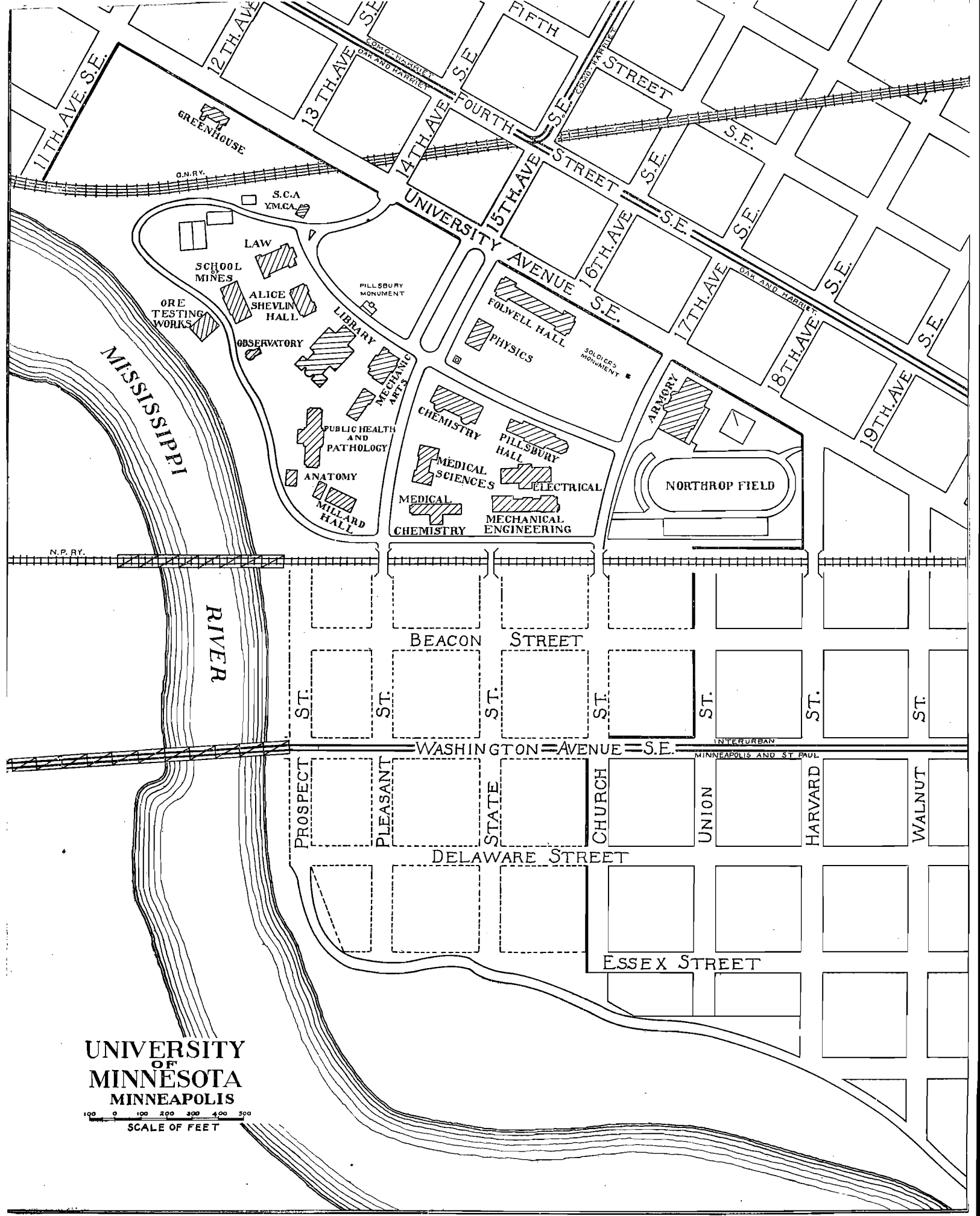
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The University catalogues are published by authority of the Board of Regents, as a regular series of bulletins. One bulletin for each college is published every year, and in addition a bulletin of general information giving the entrance requirements of all colleges of the University, and embodying such items as University equipment, organizations and publications, expenses of students, loan and trust funds, scholarships, prizes, etc. Bulletins will be sent gratuitously, postage paid, to all persons who apply for them. In calling for bulletins, please state the college or school of the University concerning which information is desired. Address,

THE REGISTRAR,

The University of Minnesota,

Minneapolis, Minnesota



**UNIVERSITY
OF
MINNESOTA
MINNEAPOLIS**

100 0 100 200 300 400 500
SCALE OF FEET

MISSISSIPPI
RIVER

UNIVERSITY AVENUE

BEACON STREET

WASHINGTON AVENUE S.E.

DELAWARE STREET

ESSEX STREET

SCHOOL MINES

LAW

ORE TESTING WORKS

ALICE SHEVLIN HALL

OBSERVATORY

PILLSBURY MONUMENT

LIBRARY

MECHANICAL ARTS

PUBLIC HEALTH AND PATHOLOGY

ANATOMY

MILLARD HALL

CHEMISTRY

MEDICAL SCIENCES

MEDICAL CHEMISTRY

PILLSBURY HALL

ELECTRICAL

MECHANICAL ENGINEERING

FOLWELL HALL

PHYSICS

ARMORY

NORTHROP FIELD

GREENHOUSE

S.C.A. Y.M.C.A.

SOLDIER'S MONUMENT

INTERURBAN MINNEAPOLIS AND ST. PAUL

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CALENDAR FOR 1908-1909

1908

1909

MAY

S.	M.	T.	W.	T.	F.	S.
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JUNE

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27	28	29	30

University Calendar

1907-1908

THE UNIVERSITY YEAR

The University year covers a period of thirty-eight weeks beginning on the second Tuesday in September. Commencement day is always the second Thursday in June.

FEBRUARY	4 T	Third quarter begins. Classes called for regular work
	12 W	Lincoln's birthday—legal holiday
	22 S	Washington's birthday—legal holiday
APRIL	4 S	Third quarter ends
	6 M	Fourth quarter begins
	17 F	Good Friday. Recess two days
MAY	2 S	Regular meeting Board of Regents
	30 S	Decoration Day—legal holiday
JUNE	5 F	Annual faculty meeting
	6 S	Fourth quarter ends

COMMENCEMENT WEEK, 1908

SUNDAY	June 7	Baccalaureate service
MONDAY	June 8	Senior class exercises
TUESDAY	June 9	Phi Beta Kappa address, Senior promenade
WEDNESDAY	June 10	Alumni Day. Regular meeting Board of Regents
THURSDAY	June 11	Commencement Day. The thirty-sixth annual commencement
FRIDAY	June 12	Summer vacation begins

1908-1909

SEPTEMBER	7-14	Entrance examinations, condition examinations and registration
	14 M	Classification of students. Opening lecture, 8 p. m.
	15 T	Classes called for regular work. Twenty-first annual session
OCTOBER	1 Th	Regular meeting Board of Regents
	5 M	Regular meeting University Council
NOVEMBER	14 S	First quarter ends
	16 M	Second quarter begins
	26 T	Thanksgiving Day. Recess three days
DECEMBER	7 M	Regular meeting University Council
	8 T	Annual meeting Board of Regents
	19 S	Holiday recess begins (no classes)
JANUARY	5 T	Work resumed in all departments
	30 S	Second quarter ends

FEBRUARY	2 T	Third quarter begins. Classes called for regular work
	12 F	Lincoln's birthday—legal holiday
	22 M	Washington's birthday—legal holiday
APRIL	3 S	Third quarter ends
	5 M	Fourth quarter begins. Regular meeting University Council
	9 F	Good Friday—recess two days
MAY	6 Th	Regular meeting Board of Regents
	31 M	Decoration Day—legal holiday
JUNE	4 F	Annual Faculty meeting
	5 S	Fourth quarter ends
	7 M	Regular meeting University Council

COMMENCEMENT WEEK, 1909

SUNDAY	June 6	Baccalaureate service
MONDAY	June 7	Senior class exercises
TUESDAY	June 8	Sigma Xi address. Senior promenade
WEDNESDAY	June 9	Alumni Day. Regular meeting Board of Regents
THURSDAY	June 10	Commencement Day. The thirty-seventh annual commencement
FRIDAY	June 11	Summer vacation begins

PROGRAM ENTRANCE EXAMINATIONS

MONDAY,	September 7, 9 A. M.	3 Botany
		3 Zoology
		1 Astronomy
		3 Geology
	2 P. M.	2 American Government
		2 Political Economy
TUESDAY,	September 8, 9 A. M.	2 History
		5 Physics
	2 P. M.	4 Chemistry
		3 Physiography
WEDNESDAY,	September 9, 9 A. M.	1 English
	2 P. M.	1 German
		1 French
		1 Latin
		1 Scandinavian
THURSDAY,	September 10, 9 A. M.	6 Elementary Algebra
		3 Commercial Geography
	2 P. M.	6 Higher Algebra
FRIDAY,	September 11, 9 A. M.	6 Plane Geometry
	2 P. M.	6 Solid Geometry

1 Folwell Hall, 2 Library Building, 3 Pillsbury Hall, 4 Chemical Laboratory, 5 Physics Building, 6 Mechanic Arts Building.

SCHEDULE OF EXAMINATIONS FOR ADVANCED STANDING
AND TO REMOVE CONDITIONS

September 7-12, 1908.

<p style="text-align: center;">Monday, Sept. 7, 9:00 a. m.</p> <p>I. Year. II. Year Histology and Embryology, practical. III. Year Special Pathology and Bacteriology, practical. IV. Year by arrangement.</p>	<p style="text-align: right;">2:00 p. m.</p> <p>I. Year Histology and Embryology, practical. II. Year General Pathology and Bacteriology, practical. III. Year Practical Pharmacy. IV. Year by arrangement.</p>
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<p style="text-align: center;">Tuesday, Sept. 8, 9:00 a. m.</p> <p>I. Year Physiology. II. Year Chemistry. III. Year Principles of Surgery.</p>	<p style="text-align: right;">2:00 p. m.</p> <p>I. Year Histology and Embryology, written. II. Year Histology and Embryology, written. III. Year Surgery.</p>
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<p style="text-align: center;">Wednesday, Sept. 9, 9:00 a. m.</p> <p>I. Year Chemistry. II. Year Physiology. III. Year Practice of Medicine.</p>	<p style="text-align: right;">2:00 p. m.</p> <p>I. Year. II. Year General Pathology and Bacteriology, written. III. Year Special Pathology and Bacteriology, written.</p>
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<p style="text-align: center;">Thursday, Sept. 10, 9:00 a. m.</p> <p>I. Year Anatomy. II. Year Anatomy. III. Year Surgical Anatomy.</p>	<p style="text-align: right;">2:00 p. m.</p> <p>I. Year. II. Year Materia Medica and Pharmacology. III. Year Therapeutics.</p>
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Examination for advanced standing and to remove conditions in the following third- and all fourth-year subjects will be held by *appointment* during September 7-12: Diseases of Children, Physical Diagnosis, all elective subjects, and all subjects not listed above. In all subjects not specifically scheduled, condition examinations must be arranged for not later than Sept. 7.

Students must register for examinations in dean's office at least twenty-four hours prior to any examination they may wish to take. See also under Rules, page 41, for regulations concerning unremoved conditions, etc.

Conditioned students will not be admitted to any examination without presenting receipt from the cashier for the examination fee, to the dean and obtaining entrance ticket.

The University

THE UNIVERSITY OF MINNESOTA comprises the following named schools, colleges and departments:

THE COLLEGE OF SCIENCE, LITERATURE AND THE ARTS

THE COLLEGE OF ENGINEERING AND THE MECHANIC ARTS

THE DEPARTMENT OF AGRICULTURE, including—

The College of Agriculture

The School of Agriculture

Short Course for Farmers

The Dairy School

The Crookston School of Agriculture

THE COLLEGE OF LAW

THE COLLEGE OF MEDICINE AND SURGERY

THE COLLEGE OF HOMEOPATHIC MEDICINE AND SURGERY

THE COLLEGE OF DENTISTRY

THE COLLEGE OF PHARMACY

THE SCHOOL OF MINES

THE SCHOOL OF ANALYTICAL AND APPLIED CHEMISTRY

THE COLLEGE OF EDUCATION

THE GRADUATE SCHOOL

The Regents of the University have entrusted to their charge:

THE EXPERIMENT STATIONS, including—

The Main Station at St. Anthony Park

The Sub-Station at Crookston

The Sub-Station at Grand Rapids

THE GEOLOGICAL AND NATURAL HISTORY SURVEY

Bulletins of these schools, colleges and departments may be obtained upon application to the University Registrar.

The Board of Regents

CYRUS NORTHROP, LL. D., MINNEAPOLIS	<i>Ex-Officio</i>
The President of the University	
The HON. JOHN LIND, MINNEAPOLIS	1914
The President of the Board	
The HON. JOHN A. JOHNSON, ST. PETER	<i>Ex-Officio</i>
The Governor of the State	
The HON. JOHN W. OLSEN, ALBERT LEA	<i>Ex-Officio</i>
The State Superintendent of Public Instruction	
The HON. THOMAS WILSON, ST. PAUL	1909
The HON. A. E. RICE, WILLMAR	1909
The HON. B. F. NELSON, MINNEAPOLIS	1910
The HON. PIERCE BUTLER, ST. PAUL	1910
The HON. CHARLES A. SMITH, MINNEAPOLIS	1910
The HON. S. M. OWEN, MINNEAPOLIS	1913
The HON. W. J. MAYO, ROCHESTER	1913
The HON. HENRY B. HOVLAND, DULUTH	1914

C. D. DECKER, MINNEAPOLIS
Secretary of the Board.

Executive Officers

THE UNIVERSITY

CYRUS NORTHROP, LL. D., *President*

ERNEST B. PIERCE, B. A., *Registrar*

JAMES T. GEROULD, B. A., *Librarian*

C. D. DECKER, *Purchasing Agent*

J. D. BREN, *Cashier*

THE COLLEGES

JOHN F. DOWNEY, M. A., C. E., *Dean of the College of Science, Literature,
and the Arts*

FREDERICK S. JONES, M. A., *Dean of the College of Engineering and the
Mechanic Arts*

EUGENE W. RANDALL, *Dean and Director of the Department of Agriculture*

WILLIAM S. PATTEE, LL. D., *Dean of the College of Law*

FRANK FAIRCHILD WESBROOK, M. A., M. D., C. M., *Dean of the College of
Medicine and Surgery*

EUGENE L. MANN, B. A., M. D., *Dean of the College of Homeopathic
Medicine and Surgery*

ALFRED OWRE, D. M. D., M. D., *Dean of the College of Dentistry*

FREDERICK J. WULLING, Phm.D., LL.M., *Dean of the College of Pharmacy*

WILLIAM R. APPLEBY, M. A., *Dean of the School of Mines*

GEORGE B. FRANKFORTER, Ph. D., *Dean of the School of Chemistry*

GEORGE F. JAMES, Ph. D., *Dean of the School of Education*

HENRY T. EDDY, C.E., Ph. D., LL. D., *Dean of the Graduate School*

ADA L. COMSTOCK, M. A., *Dean of Women*

The University Council

At the regular meeting of the Board of Regents of the University, May 31st, 1905, a University Council was established according to the following plan:

I. The name of the body shall be The University Council. It shall consist of the President of the University, the deans of the various colleges and schools, one elected representative from each college or school for each 400 students or major fraction thereof, and one representative of the general alumni association.

II. The elected members shall serve for a period of one year. They shall be chosen from the various faculties at the time of the selection of standing committees. The representative of the general alumni association shall be chosen by that body at its annual meeting from among the alumni who are not members of the University.

III. The Council shall be authorized to—

a) Appoint the following committees or the faculty representation thereon:

The University auditing committee

The University press committee

The committee on athletics

The committee on University relations to other institutions of higher learning

The committee on health and sanitation

The committee on commencement and other University functions

The committee on catalogue, programs and courses of study

The committee on student entertainments and social affairs

And such other committees as the general University interests may require

b) Receive reports from such committees and to make such recommendations as may be required.

c) Consider and act upon any matter of general University interest beyond the province of a single faculty which may be referred to it by the President of the University or any faculty.

IV. The Council shall hold stated meetings upon the first Monday of October, December, April and June, and such other meetings as the President of the University may call

Representatives to the Council

The University

PRESIDENT CYRUS NORTHROP

The College of Science, Literature and the Arts

DEAN JOHN F. DOWNEY

PROFESSOR JOHN H. GRAY

PROFESSOR J. C. HUTCHINSON

PROFESSOR H. F. NACHTRIEB

PROFESSOR NORMAN WILDE

The College of Engineering and the Mechanic Arts

DEAN FREDERICK S. JONES

PROFESSOR GEORGE D. SHEPARDSON

The College and School of Agriculture

DEAN EUGENE W. RANDALL

PROFESSOR HARRY SNYDER

PROFESSOR SAMUEL B. GREEN

The College of Law

DEAN WILLIAM S. PATTEE

PROFESSOR HENRY J. FLETCHER

The College of Medicine and Surgery

DEAN F. F. WESBROOK

PROFESSOR THOMAS G. LEE

The College of Homeopathic Medicine and Surgery

DEAN EUGENE L. MANN

The College of Dentistry

DEAN ALFRED OWRE

The College of Pharmacy

DEAN FREDERICK JOHN WULLING

The School of Mines

DEAN WILLIAM R. APPLEBY

The School of Chemistry

DEAN GEORGE B. FRANKFORTER

The College of Education

DEAN GEORGE F. JAMES

The Graduate School

DEAN HENRY T. EDDY

General Alumni Association

DAVID P. JONES

The Dean of Women

ADA L. COMSTOCK

University Council Committees

The University Auditing Committee

PROFESSORS ANDERSON, FLETCHER, OWRE, SIGERFOOS, SPRINGER

The Committee on Athletics

PROFESSORS PAIGE, BROOKE, HARDING, D. P. JONES, LITZENBERG

The Committee on Grounds and Sanitation

PROFESSORS FLATHER, BASS, BRACKEN, HICKMAN, RANDALL, SIDENER,
WESBROOK

The Committee on Catalogue, Programs and Course of Study

DEANS APPLEBY, EDDY, FRANKFORTER, JAMES, JONES, MANN, OWRE,
WULLING; PROFESSORS FLETCHER, JOHNSTON, SCHLENKER, SNYDER,
E. B. PIERCE

The Press Committee

PROFESSORS SCHAPER, BAUER, CONSTANT, ERDMANN, JAMES

The Committee on Commencement and other University Functions

PROFESSORS NACHTRIEB, JENKS, OWRE, PATTEE, RANDALL, SCHLENKER,
WASHBURN

The Committee on Student Entertainments and Social Affairs

PROFESSORS FRANKFORTER, BASS, COMSTOCK, COOKE, MULLEN, PIKE

The Committee on University Relations to other Institutions of Higher Learning

PROFESSORS DOWNEY, BOTHNE, EDDY, GRAY, GREEN, JAMES, LEE

The Committee on University Extension and University Lectures

PROFESSORS WEST, HAECKER, RANKIN, SCHLENKER, SHEPARDSON

The Committee on the Library

PROFESSORS EDDY, FLETCHER, F. S. JONES, LEE, REYNOLDS,
VAN BARNEVELD, WEST

The Department of Medicine

The Department of Medicine includes the following colleges:

The College of Medicine and Surgery

FRANK F. WESBROOK, M.A., M.D., C.M., *Dean.*

THOMAS G. LEE, B.S., M.D., *Secretary and Librarian, Department of Medicine*

The College of Homeopathic Medicine and Surgery

EUGENE L. MANN, B.S., M.D., *Dean.*

The College of Dentistry

ALFRED OWRE, D.M.D., M.D., *Dean.*

The College of Pharmacy

FREDERICK J. WULLING, Phm.D., LL.M., *Dean.*

Each College is self-governed as to its internal affairs, having its own faculty and an independent curriculum. The laboratories and staff of the College of Medicine and Surgery provide instruction for all students in each of the four colleges, as required, in the following branches:

Gross and microscopic anatomy, histology, embryology, neurology, physiology, chemistry, physiological chemistry, pathology and bacteriology, pharmacology, principles of surgery and clinical microscopy.

For the betterment of medical education in Minnesota, it was deemed advisable, after consultation, that the College of Physicians and Surgeons of the Medical Department of Hamline University should merge with the College of Medicine and Surgery of the University of Minnesota. The final formalities were completed at a special meeting of the Board of Regents of the University of Minnesota, held March 4, 1908.

Arrangements have been perfected whereby the members of the present freshman, sophomore and junior classes of the Medical Department of Hamline University will receive their instruction in the University of Minnesota, being required to comply with the rules and regulations which govern the College of Medicine and Surgery of the University of Minnesota. At the end of each year, certificates will be issued by the State University authorities to President Geo. H. Bridgman, Vice-President J. T. Moore, M. D., and Dean C. A. McCollom, M. D., as representing the trustees of the College of Physicians and Surgeons, Medical Department, Hamline University. This arrangement is continued for the next four years only, for the purpose of enabling the students now enrolled in Hamline Medical Department, who satisfactorily complete the requirements for the degree in medicine, to receive the usual degrees from Hamline University.

The College of Medicine and Surgery

FACULTY

CYRUS NORTHROP, LL.D., *President*

CHARLES A. WHEATON, M.D., *Emeritus Professor of Surgery*

J. W. BELL, M.D., *Emeritus Professor of Medicine and Physical Diagnosis*

FRANK F. WESBROOK, M.A., M.D., C.M., *Dean and Professor of Pathology and Bacteriology*

AMOS W. ABBOTT, M.D., *Clinical Professor of Diseases of Women*

EVERTON J. ABBOTT, A.B., M.D., *Clinical Professor of Medicine and Chief of Medical Clinic*

RICHARD O. BEARD, M.D., *Professor of Physiology*

HENRY MARTYN BRACKEN, M.D., L.R.C.S. (Edin.), *Professor of Preventive Medicine*

E. D. BROWN, Phm.D., M.D., *Acting Professor of Materia Medica and Pharmacology*

A. B. CATES, A.M., M.D., *Professor of Obstetrics*

JAMES T. CHRISTISON, M.D., *Professor of Diseases of Children*

FREDERICK A. DUNSMOOR, M.D., *Professor of Operative and Clinical Surgery*

CHARLES A. ERDMANN, M.D., *Professor of Anatomy*

BURNSIDE FOSTER, A.B., M.D., *Clinical Professor of Diseases of the Skin and Lecturer upon the History of Medicine*

GEORGE B. FRANKFORTER, M.A., Ph.D., *Professor of Chemistry*

ARTHUR J. GILLETTE, M.D., *Professor of Orthopedic Surgery*

CHARLES L. GREENE, M.D., *Professor of Medicine*

GEORGE D. HEAD, B.S., M.D., *Professor of Clinical Microscopy and Medicine*

CHARLES H. HUNTER, A.M., M.D., *Clinical Professor of Medicine and Chief of Medical Clinic*

JOHN BLACK JOHNSTON, Ph.D., *Associate Professor in Comparative Neurology*

WILLIAM A. JONES, M.D., *Clinical Professor of Nervous and Mental Diseases*

- FREDERICK LEAVITT, M.D., *Clinical Professor of Obstetrics and Clerk of Clinics*
- THOMAS G. LEE, B.S., M.D., *Professor of Histology and Embryology, Secretary of the Faculty, and Librarian, Department of Medicine*
- J. C. LITZENBERG, B.S., M.D., *Clinical Professor of Obstetrics and Chief of Dispensary Staff*
- ARCHIBALD MACLAREN, A.B., M.D., *Clinical Professor of Surgery*
- A. T. MANN, B.S., M.D., *Clinical Professor of Surgery and Clerk of Clinics*
- JAMES E. MOORE, M.D., *Professor of Surgery*
- WILLIAM R. MURRAY, A.B., M.D., *Clinical Professor of Rhinology and Laryngology*
- LOUIS A. NIPPERT, M.D., *Clinical Professor of Medicine*
- CHARLES NOOTNAGEL, M.D., *Clinical Professor of Medicine and Physical Diagnosis*
- HENRY J. O'BRIEN, M.D., *Clinical Professor of Surgery*
- JUSTUS OHAGE, M. D., *Clinical Professor of Surgery*
- C. EUGENE RIGGS, A.M., M.D., *Professor of Nervous and Mental Diseases*
- PARKS RITCHIE, M.D., *Professor of Obstetrics*
- THOMAS S. ROBERTS, M.D., *Clinical Professor of Diseases of Children*
- JOHN T. ROGERS, M.D., *Clinical Professor of Surgery*
- JOHN L. ROTHROCK, A.M., M.D., *Clinical Professor of Diseases of Women*
- JACOB E. SCHADLE, M.D., *Professor of Rhinology and Laryngology*
- GEORGE E. SENKLER, M.D., *Clinical Professor of Medicine*
- HENRY L. STAPLES, A.M., M.D., *Clinical Professor of Medicine*
- J. CLARK STEWART, B.S., M.D., *Professor of the Principles of Surgery*
- ALEXANDER J. STONE, M.D., LL.D., *Professor of Diseases of Women*
- ARTHUR SWEENEY, M.D., *Professor of Medical Jurisprudence*
- H. B. SWEETSER, M.D., *Clinical Professor of Surgery*
- FRANK C. TODD, M.D., *Professor of Ophthalmology and Otology*
- MAX P. VANDER HORCK, M.D., *Professor of the Diseases of the Skin and Genito-Urinary Organs*
- S. MARX WHITE, B.S., M.D., *Associate Professor of Pathology and Bacteriology*
- J. FRANK CORBETT, M.D., *Assistant Professor of Surgical Pathology*
- IRA H. DERBY, B.S., *Assistant Professor of Chemistry*
- H. W. HILL, M.D., *Assistant Professor of Bacteriology*
- ARTHUR W. MEYER, A.B., M.D., *Assistant Professor of Anatomy*
- WINFIELD S. NICKERSON, ScD., M.D., *Assistant Professor of Histology and Embryology*
- M. R. WILCOX, M.D., *Assistant Professor of Physiology*
- LOUIS B. WILSON, M.D., *Assistant Professor of Clinical Pathology*

- F. H. SCOTT, M.A., M.D., Ph.D., *Assistant Professor of Physiology*
 F. L. ADAIR, M.D., *Clinical Instructor in Obstetrics*
 E. V. APPLEBY, M.D., *Clinical Instructor in Ophthalmology*
 CHARLES R. BALL, M.D., *Clinical Instructor in Nervous and Mental Diseases*
 GEO. C. BARTON, M.D., *Clinical Instructor in Gynecology*
 A. E. BENJAMIN, M.D., *Clinical Instructor in Diseases of Women*
 CHARLES H. BRADLEY, M.D., *Clinical Instructor in Medicine*
 JNO. B. BRIMHALL, M.D., *Clinical Instructor in Orthopedic Surgery*
 R. A. CAMPBELL, M.D., *Clinical Instructor in Rhinology and Laryngology*
 A. R. COLVIN, M.D., *Clinical Instructor in Surgery*
 W. H. CONDIT, B.S., M.D., *Instructor in Therapeutics and Materia Medica*
 GEORGE M. COON, M.D., *Clinical Instructor in Genito-Urinary Diseases*
 J. G. CROSS, M.D., *Clinical Instructor in Medicine*
 WARREN A. DENNIS, M.D., *Clinical Instructor in Surgery*
 CHAS. F. DIGHT, M.D., *Instructor in Pharmacology*
 A. W. DUNNING, M.D., *Clinical Instructor in Nervous and Mental Diseases*
 R. E. FARR, M.D., *Clinical Instructor in Surgery*
 JAMES GILFILLAN, M.D., *Clinical Instructor in Medicine*
 JUDD GOODRICH, M.D., *Clinical Instructor in Surgery*
 GEORGE D. HAGGARD, M.D., *Instructor in Physiology*
 ARTHUR S. HAMILTON, M.D., *Instructor in Pathology of the Nervous System*
 EARLE R. HARE, B.S., M. D., *Instructor in Anatomy*
 P. A. HOFF, M.D., *Clinical Instructor in Medicine*
 C. E. INGBERT, M.D., *Associate in Neurology*
 H. W. JONES, M.D., *Clinical Instructor in Nervous and Mental Diseases*
 DAVID LANDO, M.D., *Clinical Instructor in Medicine*
 ARTHUR A. LAW, M.D., *Instructor in Operative Surgery*
 JEANETTE M. McLAREN, M.D., *Clinical Instructor in Obstetrics*
 J. S. MACNIE, M.D., *Clinical Instructor in Diseases of the Eye and Ear*
 R. H. MULLIN, B.A., M.B., *Senior Demonstrator in Pathology and Bacteriology*
 CHELSEA C. PRATT, M.D., *Junior Demonstrator in Pathology and Bacteriology*
 WALTER R. RAMSEY, M.D., *Clinical Instructor in Diseases of Children*
 S. P. REES, B.S., M.D., *Instructor in Physical Diagnosis and Clinical Medicine*
 H. P. RITCHIE, Ph.B., M.D., *Clinical Instructor in Surgery*
 H. E. ROBERTSON, A.B., M.D., *Demonstrator in Pathology*
 JULIUS PARKER SEDGWICK, B.S., M.D., *Instructor in Physiological Chemistry and Clinical Assistant in Diseases of Children*

- W. D. SHELDON, M.D., *Clinical Instructor in Medicine and Instructor in Therapeutics*
- CHAS. N. SPRATT, M.D., *Clinical Instructor in Diseases of the Eye and Ear*
- THOS. W. STUMM, M.D., *Clinical Instructor in Medicine*
- S. E. SWEITZER, M.D., *Clinical Instructor in Dermatology and Genito-Urinary Diseases*
- HENRY L. ULRICH, M.D., *Instructor in Clinical Microscopy*
- J. A. WATSON, M.D., *Clinical Instructor in Diseases of Nose and Throat*
- VAN H. WILCOX, M.D., *Instructor in Operative Surgery*
- H. L. WILLIAMS, M.D., *Clinical Instructor in Diseases of Women*
- F. R. WRIGHT, M.D., *Clinical Instructor in Dermatology and Genito-Urinary Diseases*
- W. H. AURAND, M.D., *Clinical Assistant in Medicine*
- JOHN M. ARMSTRONG, M.D., *Clinical Assistant in Genito-Urinary Diseases*
- HERMAN A. BOUMAN, M.D., *Clinical Assistant in Physical Diagnosis*
- FRANK E. BURCH, M.D., *Clinical Assistant in Diseases of the Eye and Ear*
- PAUL B. COOK, M.D., *Clinical Assistant in Diseases of Children*
- L. O. DART, M.D., *Clinical Assistant in Diseases of Children*
- EMIL S. GEIST, M.D., *Clinical Assistant in Orthopedia*
- E. K. GREEN, A.B., M.D., *Clinical Assistant in Medicine*
- ALEX R. HALL, M.D., *Clinical Assistant in Medicine*
- JOHN E. HYNES, M.D., *Clinical Assistant in Medicine*
- A. E. LOBERG, M.D., *Clinical Assistant in Nervous and Mental Diseases*
- H. JOURNEY WELLS, M.D., *Clinical Assistant in Diseases of Eye and Ear*
- ARCHA WILCOX, M.D., *Clinical Assistant in Surgery*
- CHAS. B. WRIGHT, A.B., M.D., *Clinical Assistant in Diseases of Children*

Clinical and Laboratory Facilities

All of the clinical facilities of the State of Minnesota are now available, all of the medical interests of the state are harmonized, and the highest standards in medical education and development are assured.

The medical group of buildings is located on the University campus overlooking the Mississippi River and is between the business centers of the Twin Cities and connected therewith by two trunk trolley lines which bring the student in ready connection with all of the hospitals of the two cities. The quadrangle contains Millard Hall, Medical Science Building, the Chemistry laboratories, the laboratory of Anatomy and the Institute of Public Health and Pathology, while use is made of the laboratory of Animal Research of the State Board of Health which immediately adjoins the Institute of Public Health and Pathology.

The University Hospital for the College of Medicine and Surgery, the gift of the late Dr. A. F. and Mrs. Elliott and Mr. Walter J. Trask, of Los Angeles, Cal., is in the process of construction at a cost of about \$120,000. The hospital is being located on a site of ten acres overlooking the river and will form a part of the present medical group of buildings. This hospital site of ten acres was purchased by means of a gift of \$50,000 from generous citizens of Minneapolis to the college. Provision for the enlargement of the hospital site and for the acquirement of the land which intervenes between it and the medical quadrangle has already been made by the last state legislature's appropriation of \$450,000 for campus extension.

The University clinical building is located across the river within a few hundred yards of the University. It is owned and controlled by the University and is located in a portion of the city best suited for a satisfactory outdoor service.

The Free Dispensary of St. Paul is advantageously located, thoroughly well equipped and manned and under the control of the college.

The College of Medicine and Surgery is in intimate relationship with the numerous hospitals, infirmaries and dispensaries of the Twin Cities and also with the medical departments of the various state correctional and charitable institutions for which Minnesota is so justly noted. St. Mary's Hospital, Rochester, St. Mary's Hospital, Duluth, and the Duluth Health Department are in close affiliation with the college through their laboratories.

HOSPITALS

The Twin Cities with a population of over 500,000, through their several hospitals, afford clinical service to the amount of 1,620 beds. During the last year important additions have been made to almost every hospital in the two cities, some of them having doubled their capacity.

The hospital facilities of the University are thus exceptionally good, since they are not limited to one large amphitheatre, where but a few students can closely observe diagnostic and surgical methods, but are divided among a number of hospitals where the various professors care for their clinical cases. This makes it possible to divide the classes into small sections, so that each student has equal opportunities of observation and is in close touch with both teacher and patient.

St. Paul City and County Hospital has a capacity of 400 beds and is the largest and most complete of its kind in the northwest. Many of the members of its staff are on the staff of this college and its entire clinical facilities are at the disposal of the college. It enters over 2,000 patients annually, a large proportion of whom are of the emergency order or are suffering from acute disease. The opportunities for bedside instruction are very great and the hospital theatres, which are new and perfectly appointed, are maintained for teaching purposes. A recent and thoroughly modern fireproof pavilion for contagious diseases is provided, where the students have unexcelled opportunities to study diphtheria, scarlatina, erysipelas, etc. A separate building is provided for midwifery, and senior students see labor cases under the personal supervision of the professor or instructor in obstetrics.

The orthopedic department contains a large number of crippled and deformed children, and houses the State Hospital for Crippled and Deformed Children. All of this work is under the control of the Professor of Orthopedic Surgery of this college.

The City Hospital, Minncapolis, places its entire clinical material at the command of the clinical teachers of the University. It is a large, thoroughly modern hospital with splendid equipment and has a capacity of 200 beds. During the year 1906, 1,836 patients were treated in the hospital, and 2,450 patients in the out-patient department and hospital dispensary. A new administration building has just been completed by the city at a cost of \$55,000, and a pavilion for the care of the incurable is planned for early completion. A modern, newly-erected contagious ward furnishes excellent opportunities for bedside clinical instruction in contagious diseases under the direction of the professor of diseases of children. In the City Hospital, bedside and amphitheatre, medical or surgical clinics are conducted daily throughout the year by members of the faculty. Clinics in diseases of the skin, nervous diseases, obstetrics,

etc., are likewise given in the hospital throughout the school year. A special feature is made of medical bedside clinics in the wards of the hospital to small sections of senior students, during the year, by members of the faculty.

Asbury Methodist Hospital, Minneapolis, affords clinical material for the State University. The authorities have recently erected a large and beautiful building, only a portion of which is as yet occupied. It has a capacity of 160 beds, and, when the building is entirely completed, the hospital will have a capacity of nearly 350 beds. Many members of the faculty are on the staff of the hospital and give clinics.

St. Joseph's Hospital, St. Paul, with 130 beds and one of the finest amphitheatres with every modern device, contributes largely to the clinical instruction. Members of the faculty are on the staff and give clinics there to the students.

Northwestern Hospital, Minneapolis, affords splendid surgical material, available to this college alone. Semi-weekly clinics in surgery are given in its amphitheatre, and in three operating rooms and wards, by members of the faculty. It has a capacity of 100 beds and during 1906 treated 1,000 patients.

St. Luke's Hospital, St. Paul, with a capacity of 100 beds, is largely devoted to surgical clinics. Clinics of this college are held in this hospital by many members of its staff who are on the college faculty. Two operating rooms, with conveniences for students, give unusual facilities and a service of the highest order.

The Swedish Hospital, Minneapolis, with a capacity of 115 beds, is housed in a newly-constructed modern building and members of this faculty exclusively utilize the material of the hospital for teaching purposes. During the year 1906 1,456 patients were treated.

St. Barnabas Hospital, Minneapolis, with a capacity of 100 beds, furnishes medical and surgical material for clinics to junior and senior classes of the University. Clinics are held throughout the college year. During the preceding year 1,617 patients were treated at this hospital.

St. Mary's Hospital, Minneapolis, also furnishes clinical material for the University. The hospital is located directly across the Mississippi River from the new University Hospital. It has a capacity of 100 beds and treated 1,200 patients during the last year.

The Norwegian Hospital, Minneapolis, is being erected immediately across the river from the new University Hospital. Among other things it provides a sanatorium, now completed, for the treatment of tuberculosis.

DISPENSARIES

In its clinical instruction the medical department makes use of two well-organized free dispensaries, each having a large outdoor service. The University clinical building is located across the river from the medical department proper at 1810 Washington Ave. S. It is a three-story building, 40x150 feet, situated in a thickly populated part of Minneapolis, and receives 2,500 new patients per year or an average of 33 daily. The staff is composed exclusively of the members of the faculty and their assistants and is organized under a chief of staff.

The service is divided into medical, surgical, gynecological, eye and ear, nose and throat, skin and venereal, mental and nervous departments. Senior students are required to attend daily the clinics at the free dispensary. They are drilled in the taking of histories, the making of physical examinations, etc. Sections of senior students are assigned each day to the drug room of the dispensary and to the laboratory of clinical microscopy, located in the basement of the building. The free dispensary also provides a residence service for senior students, which is elective and open to a limited number of the senior students. Students electing this service are required to reside at the dispensary and attend the emergency, sick and accident calls, under the direction of a resident, graduate, qualified house officer. This appointment is open to the graduates of this college. An obstetrical out-service department is also conducted and obstetrical cases are assigned to sections of senior students. These clinics are conducted under the direction of some member of the obstetrical staff.

The St. Paul Free Dispensary is centrally located in a twenty-room building, and its clinical service is wholly under the control of the staff of University instructors. Forty patients daily are treated throughout the year. The students of the third and fourth years are on duty two days per week at this dispensary and for certain of the clinical divisions attend every day.

CLINICAL OPPORTUNITIES*

Clinical records are kept by each member of the junior and senior classes, in which are listed the cases seen, with dates, name of instructor, name of hospital, and other important data. These records must be filed with the heads of departments and finally in the dean's office.

During the year 1906-07 these records were carefully kept and, in order to gain an idea of the opportunities which a single student might expect to have at his disposal, the record of one of the senior students, taken at random, has been analyzed. It is not exceptional, but may be taken as representative.

Seven hundred and twenty-eight cases have been reported by this single member of the senior class as coming under his observation and study during a period of nine months. This number by no means represents the total of clinics, but simply those seen by him alone, nor are any of the junior year clinics included. Approximately, it is the work done by every member of the class, although the clinical instruction is constantly varying because of the small sections and individual teaching which form the basis of modern methods. Indeed, comparatively few clinical lectures are given to the class as a whole. Students come in close relation with patients and study them much the same as though the cases were their own.

*See also under Alumni Association, page 71.

The following is a summary of the clinics as reported by this one student :

	Number of Cases.	Number of Instructors.	Number of Hospitals and Dispensaries.
Internal medicine	168	13	8
Surgery	158	16	11
Orthopedia	48	4	4
Pediatrics	33	3	4
Neurology	68	7	4
Skin, Venereal and Genito-Urinary.....	72	11	5
Nose and throat	61	5	4
Gynecology	40	8	5
Eye and ear	70	3	3
Obstetrics	10	5	4
	<hr/>	<hr/>	<hr/>
Total.....	728	75	

MINNEAPOLIS CLINICS.

Monday	11:30-12:30	Pediatrics	Prof. Roberts, Dr. Dart	1 sec. Srs.	City
"	1:00-2:00	Medicine (bedside)	Prof. White	1 sec. Srs. 2d qu.	City
"	4:00-5:00	Medicine "	Prof. White	1 sec. Srs. 1st & 3d q.	City
"	" "	Pediatrics "	Dr. Sedgwick	1 sec. Srs. 3d qu.	City
"	" "	Medicine "	Dr. Sheldon	1 sec. Srs. 1st qu.	City
Mon. & Thu	1:00-3:00	Medicine	Prof. Head, Drs. Aurand and Hynes	2 secs.	Clin. Bldg.
"	" "	Surgery	Dr. Condit	Section	" "
"	" "	Nose and Throat	Dr. Campbell	Section	" "
Mon., Wed. and Friday	" "	Pediatrics	Dr. C. B. Wright	Section	" "
"	" "	Eye and Ear	Dr. Macnie	Section	" "
"	" "	Skin and Venereal	Dr. F. R. Wright	Section	" "
"	" "	Nervous & Mental	Dr. Hamilton	Section	" "
"	" "	Gynecology	Dr. Benjamin	2 Students	" "
"	" "	Orthopedics	Dr. Geist		" "
Daily	" "	Clin. Microscopy	Dr. Ulrich	1 Section	" "
Tuesday	12:30-1:30	Physical Diagnosis	Prof. Nootnagle	1/2 Class Js	City
"	1:00-2:00	Medicine	Dr. Sheldon	1 sec. Srs. 2 qu.	City
"	" "	Pediatrics	Dr. C. B. Wright	1 sec. Srs.	City
"	4:00-5:00	Pediatrics	Dr. Sedgwick	1 sec. Srs. 1st & 4th q.	City
"	" "	Medicine (bedside)	Prof. White	1 sec. Srs. 4th qu.	City
"	" "	Medicine "	Dr. Cross	1 sec. Srs. 1st & 4th q.	Clin. Bldg.
Tues. & Fri.	1:00-3:00	Medicine	Dr. Rees Dr. Bowman	Section	" "
" "	" "	Surgery	Dr. Law	Section	" "
" "	" "	Nose and Throat	Prof. Murray	Section	" "
Tues., Thur. & Saturday	" "	Pediatrics	Dr. Dart	Section	" "
"	" "	Eye and Ear	Dr. Wells	Section	" "
"	" "	Skin and Venereal	Dr. Sweitzer	Section	" "
"	" "	Gynecology	Dr. Williams	2 Students	" "
"	" "	Nervous & Mental	Prof. W. A. Jones or Dr. Loberg	Sec. or Cl.	" "
Wednesday	11:30-12:30	Contag. Diseases	Prof. Roberts, Dr. Dart	1 sec. Srs.	City
"	12:30-1:30	Physical Diagnosis	Prof. Nippert	1/2 Cl. Jrs.	Clin. Bldg.
"	1:00-2:00	Medicine (bedside)	Dr. Sheldon	1 sec. Srs. 2 qu.	City

MINNEAPOLIS CLINICS.

Wednesday	1:00—2:00	Pediatrics (bedside)	Dr. Sedgwick	1 sec. Srs. 2 qu.	City
"	4:00—5:00	Medicine "	Dr. Cross	1 sec. Srs. 3 qu.	City
"	1:00—3:00	Medicine	Prof. Nippert Dr. Green	2 sections	Clin. Bldg.
Wed. & Sat.	" "	Surgery	Prof. Mann Dr. Goehrs	Section	" "
"	" "	Nose and Throat	Dr. Parker	Section	" "
Thursday	8:30-10:30	Med. & Th'rp'utics	Dr. Sheldon	$\frac{1}{3}$ Cl.	City
"	10:30-12:00	Gynecology	Dr. Benjamin	$\frac{1}{3}$ Cl.	N. W.
"	8:30-10:30	Eye and Ear	Prof. Todd	$\frac{1}{3}$ Cl.	N. W., Asb.
"	10:30-12:00	Medicine	Dr. Rees	$\frac{1}{3}$ Cl.	City
"	8:00-10:30	Medicine	Prof. Bell Prof. Nootnagel Dr. Rees	$\frac{1}{3}$ Cl.	City
"	11:00-12:00	Nose and Throat	Prof. Murray		City
"	1:00—2:00	Medicine	Prof. Hunter	$\frac{1}{3}$ Cl.	Asb., City
"	" "	Surgery	Prof. Mann	$\frac{1}{3}$ Cl.	St. Barn.
"	" "	Medicine	Prof. Head	$\frac{1}{3}$ Cl.	City
"	2:00—3:00	Nervous & Mental	Dr. W. A. Jones	Class	Clin. Bldg.
"	3:00—4:00	Dermatology	Prof. Wright	Class	City, Clin.
"	4:00—6:00	Autopsies	Prof. White	1 section	City
Friday	11:00-12:00	Contag. Diseases	Prof. Roberts or Dr. Dart	1 sec. Srs.	City
"	12:00—1:30	Physical Diagnosis	Dr. Rees	$\frac{1}{3}$ Cl. Jrs.	Clin. Bldg.
"	1:00—2:00	Medicine (bedside)	Dr. Cross	1 sec. Srs. 2 qu.	City
Saturday	8:30-10:30	Surgery	Prof. Dunsmoor	$\frac{1}{3}$ Cl.	Swedish
"	8:30-10:00	Medicine	Prof. Nippert	$\frac{1}{3}$ Cl.	City
"	" "	Medicine	Prof. Head	$\frac{1}{3}$ Cl.	City
"	10:30-12:00	Surgery	Prof. Moore	$\frac{1}{3}$ Cl.	N. W.
"	" "	Gynecology	Prof. Abbott or Dr. Williams	$\frac{1}{3}$ Cl. 3 mo.	City
"	" "	Surgery	Dr. Farr	$\frac{1}{3}$ Cl. 3 mo.	St. Mary's
"	1:00—2:30	Pediatrics	Dr. Dart	$\frac{1}{3}$ Cl.	Clin. Bldg.
"	" "	Medicine	Prof. Staples, Dr. Cross	$\frac{1}{3}$ Cl.	City
"	" "	Surgery	Prof. Stewart	$\frac{1}{3}$ Cl.	City or N.W.
"	2:30—3:30	Obstetrics	Prof. Litzben'g	$\frac{1}{3}$ Cl.	City or Clin. Bld
"	" "	Orthopedics	Dr. Geist	$\frac{1}{2}$ Cl.	Clin. Bldg.
"	1:00—6:00	Autopsies	Prof. White	$\frac{1}{3}$ Cl.	City

Parturition clinics throughout the year by Prof. Litzenberg and Dr. Adair for Seniors at City Hospital and in the out-patient service.

ST. PAUL CLINICS.

Thursday	9:00-12:00	Orthopedics	Prof. Gillette	Class	Every 3rd week during entire year. City Hospital.
"	"	Surgery	Prof. MacLaren	½ Class	Two weeks out of three during entire year. St. Luke's Hospital.
"	"	"	Prof. O'Brien	½ Class	Two weeks out of three during entire year. St. Joseph's Hosp'l.
"	10:15-12:00	Gynecology	Prof. Rothrock	Class	Two weeks out of three, after Jan. 1st. City Hospital.
"	1:30-3:30 (until Jan.) 1:30-2:30 (after Jan.)	Ophthalmology	Dr. Appleby	Section	Every week during year. Dispensary.
"	1:30-3:00	Gen. Urin.	Dr. Coon	Section	Every week after January 1st. City Hospital.
"	3:00-4:00	Medicine	Prof. Abbott	Class	"
Thur. & Sat.	1:30-3:00	Medicine	Prof. Greene	Section	"
"	"	"	"	Section	Every week until January 1st. Dispensary.
"	1:30-3:00 (until Jan.) 1:30-2:30 (after Jan.)	"	Dr. Hoff	Section	Every week during year. Dispensary.
"	Same hrs.	"	Dr. Hall	Section	"
"	"	Ear, Nose, Throat	Prof. Schadle	Section	"
"	"	Nervous & Ment'l	Dr. Dunning	Section	"
"	1:30-3:00	Surgery	Dr. Goodrich	Section	Every week until January 1st. Dispensary
"	1:30-2:30	"	Dr. Dennis	Section	Every week after January 1st. Dispensary
"	1:30-3:00	Children	Prof. Christison	Section	Every week until January 1st. Dispensary
"	1:30-2:30	Nervous & Ment'l	Dr. Ball	Section	Every week after April 1st. Dispensary.
"	1:30-3:00	Surgery	Dr. Colvin	Section	Every week after January 1st. City Hospital
"	"	Children	Dr. Cook	Section	Every week until January 1st. City Hospital

ST. PAUL CLINICS.

Thur. & Sat.	1:30-3:00	Gen. Urin.	Dr. Armstrong	Section	Every week until January 1st. City Hospital
"	4:00-5:00	Medicine	Prof. Abbott	Section	Every week after January 1st. City Hospital
"	"	Obstetrics	Prof. Leavitt	Section	"
"	"	Children	Prof. Senkler	Section	"
"	"	Eye and Ear	Dr. Burch	Section	"
"	"	Surgery	Dr. Ancker	Section	"
Saturday	9:00-10:00	Nervous & Ment'l	Prof. Riggs	Class	Every wk. until Jan. 1st at Dispensary, after Jan. 1, City H.
"	10:15-12:00	Surgery	Prof. Rogers	Class	Every week until Jan. 1st, at St. Luke, after Jan. 1st, at City H.
"	"	Surgery	Prof. Ohage	Class	
"	1:30-3:00 (until Jany.) 1:30-2:30 (after Jany.)	Skin and Ven.	Prof. Foster	Section	Every wk. during year. Dispensary.
"	3:00-4:00	Medicine	Prof. Greene	Class	Every wk. after Jan. 1st, City Hospital.

Gynecology. Prof. Stone at St. Joseph's Hospital.

Gynecology. Prof. Rothrok and Dr. H. P. Ritchie, daily clinic at Dispensary. (One student.) 1:00 to 2:00.

Parturition clinics throughout the year at City Hospital, Maternities, and Dispensary out-service with Prof. Leavitt and Dr. Jeanette McLaren. (One to five students.)

DISPENSARY CLINICS *

At the University Clinical Building from 1:00 to 3:00 p. m.

FIRST AND SECOND SEMESTERS, 1908-1909

	Monday	Tuesday	Wednesd'y	Thursday	Friday	Saturday	
Medicine	Prof. Head Dr. Aurand Dr. Hynes	Dr. Rees and Dr. Bouman	Prof. Nip- pert and Dr. Green	Prof. Head Dr. Aurand Dr. Hynes	Dr. Rees and Dr. Bouman	Dr. Shel- don and Dr. Adair	2 Sections
Surgery	Dr. Condit	Dr. Law	Dr. Mann	Dr. Condit	Dr. Law	Dr. Green and Dr. Goehrs	1 Section
Nose & Throat	Dr. Campbell	Dr. Murray	Dr. Parker	Dr. Campbell	Prof. Murray	Dr. Parker	1 Section
Pediatrics	Dr. C. B. Wright	Dr. Dart	Dr. C. B. Wright	Dr. Dart	Dr. C. B. Wright	Dr. Dart	1 Section
Eye and Ear	Dr. Macnie	Dr. Wells	Dr. Macnie	Dr. Wells	Dr. Macnie	Dr. Wells	1 Section
Skin and Venereal	Dr. F. R. Wright	Dr. Sweitzer	Dr. F. R. Wright	Dr. Sweitzer	Dr. F. R. Wright	Dr. Sweitzer	1 Section
Neurology	Dr. Hamilton	Dr. W. A. Jones or Dr. Loberg	Dr. Hamilton	Dr. W. A. Jones or Dr. Loberg	Dr. Hamilton	Dr. W. A. Jones or Dr. Loberg	1 Section
Gynecology	Dr. Benjamin	Dr. Williams	Dr. Benjamin	Dr. Williams	Dr. Benjamin	Dr. Williams	2 Students
**Practical Dispensing	Mr. Bachmann	Mr. Bachmann	Mr. Bachmann	Mr. Bachmann	Mr. Bachmann	Mr. Bachmann	2 Students
Clinical Microscopy	Dr. Ulrich	Dr. Ulrich	Dr. Ulrich	Dr. Ulrich	Dr. Ulrich	Dr. Ulrich	2 Students
Orthopedics	Dr. Geist		Dr. Geist		Dr. Geist	Dr. Geist	1 Section

*These clinics have been included for the most part in the list of Minneapolis clinics already given.

**The dispensary drug room is under the supervision of the University College of Pharmacy, as also this practical teaching.

LIBRARY OF MEDICAL DEPARTMENT

Thomas G. Lee, B.S., M.D., Librarian

The medical library consists of the following collections: The general clinical library, the libraries of the colleges of Dentistry and Pharmacy, the departmental libraries of pathology and bacteriology, histology and embryology, anatomy, and physiology. These contain nearly 10,000 bound volumes, 14,000 unbound volumes, monographs, reprints, dissertations, etc., and about 175 current periodicals. In addition to the above, the libraries of the State Board of Health, of Hennepin County Medical Society, containing 4,000 volumes and 50 journals, and of the Ramsey County Medical Society with some 7,000 volumes and 150 journals, give the student additional opportunity to consult all the more important medical publications.

The general University library contains some 115,000 bound volumes, 30,000 unbound volumes and pamphlets, and several hundred current periodicals. The public libraries of Minneapolis, with 160,000 volumes, and of St. Paul, with some 90,000 volumes, the State Historical Library of 85,000 volumes, and the State Library of 59,000 volumes, the Library of the Minnesota Academy of Natural Sciences of some 12,000 titles, place before the student the greater part of the important literature relating to all branches of the physical and natural sciences as well as works of general culture and those pertaining particularly to medicine. All of these collections are readily accessible to the student.

A noteworthy addition to the medical library is the recent acquisition by the department of histology and embryology, through the generosity of Alfred F., John S. and Charles C. Pillsbury, of a large portion of the working library of the late Professor William His, of Leipzig, containing about 8,500 titles and representing some 2,500 authors.

LABORATORY BUILDINGS AND EQUIPMENT

Over \$500,000.00 is invested in the laboratories and equipment of this college exclusive of site.

The location of the medical buildings in a central portion of the campus offers all the advantages to student and staff which come from a close association with the other University departments, such as general library, laboratories of physics, chemistry, biology, botany, geology, etc.

Millard Hall, a large, four story, brown stone, and cream brick building, (65x125 ft.) the oldest of any in the group, contains a faculty room, a large amphitheatre and lecture rooms, library and reading rooms of the department together with the laboratory of pharmacology and materia

medica. In addition the College of Dentistry and the College of Homeopathic Medicine and Surgery are temporarily provided with rooms.

The Medical Science Building, a large, four-story, brick building, (75x150 ft.), is especially designed for laboratories. The building houses the department of histology and embryology and the department of physiology of this college. A portion of the south wing is temporarily occupied by the College of Pharmacy.

The department of histology and embryology occupies the four floors of the north wing and a part of the center of the building and the department of physiology occupies the greater part of the south wing and the center of the building.

Chemistry is taught in two buildings. The main, four-story, brick building (198x78 ft.) constitutes the headquarters of the School of Chemistry. The laboratory of medical chemistry is a one-story, brick building devoted to the use of this department and is included as a part of the Medical Quadrangle. It is equipped with an amphitheatre, two teaching laboratories (3,800 sq. ft.), preparation rooms, balance room, storage rooms and private offices of the staff of this department.

The laboratory of anatomy is a two-story, basement building.

The Institute of Public Health and Pathology is the newest of any in the Medical Quadrangle.

SIX-YEAR COURSE IN SCIENCE AND MEDICINE LEADING TO THE DEGREES OF BACHELOR OF SCIENCE AND DOCTOR OF MEDICINE

In the year 1903-04 the University established a six-year course of study arranged especially for students of medicine. The first two years of the course are given in the College of Science, Literature and the Arts, and the last four years are given in the College of Medicine and Surgery. It leads to the degree of bachelor of science at the end of the first four years, and to the degree of doctor of medicine at the end of the six-year course.

In the College of Science, Literature, and the Arts the year is divided into two semesters. In the College of Medicine and Surgery the year is divided into four quarters (half semesters). In the College of Medicine and Surgery the work is given on a concentration plan, but two subjects being carried at a time, and consequently a greater number of hours per week.

Students who enter without French or German are required to take Beginning German, Course 1, ten credits, and Scientific German, Course 3, six credits.

Students entering with two years of German may take Beginning French, Course 1, ten credits, in either first or second year, and German, Course 3, six credits, in the other year.

Page references refer to the bulletins of the College of Science, Literature, and the Arts, and of the College of Medicine and Surgery for more detailed information.

Courses in the College of Science, Literature and the Arts

FIRST YEAR

ANIMAL BIOLOGY (See p. 69)

1. GENERAL ZOOLOGY PROFESSOR SIGERFOOS, ASSISTANT PROFESSORS
OESTLUND, BROWN, AND DOWNEY
Six credits (six hours per week) First and second semesters
BOTANY (See p. 72)
1. GENERAL BOTANY PROFESSOR CLEMENTS, ASSISTANT PROFESSORS
TILDEN AND ROSENDAHL AND INSTRUCTORS
Six credits (six hours per week) First and second semesters

CHEMISTRY (See pp. 75-76)

1. GENERAL CHEMISTRY MISS COHEN AND MR. BADGER
OR,
2. ADVANCED GENERAL CHEMISTRY PROFESSOR FRANKFORTER, MISS COHEN,
AND MR. BADGER
Six credits (six hours per week) First and second semesters

GERMAN (See p. 63)

1. BEGINNING GERMAN PROFESSOR SCHLENKER, ASSISTANT PROFESSORS
WILKIN AND JURGENSEN, MR. BURKHARD AND MR. WILLIAMS
Ten credits (five hours per week) First and second semesters

MATHEMATICS (See p. 86)

3. SECOND PART HIGHER ALGEBRA PROFESSOR BAUER, ASSISTANT PROFESSOR
BUSSEY, DR. MANCHESTER, MR. DALAKER AND MR. SHUMWAY
Three credits (three hours per week) First semester
4. TRIGONOMETRY PROFESSOR BAUER, ASSISTANT PROFESSOR BUSSEY
DR. MANCHESTER, MR. DALAKER AND MR. SHUMWAY
Three credits (three hours per week) Second semester

- MILITARY DRILL CAPTAIN EDWARD SIGERFOOS, U. S. A.
Required of all men First and second semesters
- GYMNASIUM DR. COOKE
Required of all men First and second semesters

SECOND YEAR

ANIMAL BIOLOGY (See p. 70)

4. COMPARATIVE ANATOMY OF VERTEBRATES ASSISTANT PROFESSOR BROWN
MR. JOHNSON
Six credits (six hours per week) First and second semesters

CHEMISTRY (See p. 76)

3. QUALITATIVE ANALYSIS ASSISTANT PROFESSOR NICHOLSON,
MR. FRARY AND ASSISTANTS
Six credits (six hours per week) First and second semesters

ECONOMICS (See pp. 98 and 101)

1. ELEMENTS OF ECONOMICS PROFESSOR ROBINSON, DR. PHELAN, AND
MR. COULTER
Three credits (three hours per week) First semester
18. CHARITIES AND CORRECTIONS MR. LIES
Three credits (three hours per week) Second semester

FRENCH (See p. 65)

1. BEGINNING FRENCH ASSISTANT PROFESSORS ANDRIST AND
FRELIN, MADAME BERTIN
Ten credits (five hours per week) First and second semesters

GERMAN (See p. 63)

3. SCIENTIFIC INTERMEDIATE ASSISTANT PROFESSOR JUERGENSEN
Six credits (three hours per week) First and second semesters

PHYSICS (See pp. 82-83)

- 1 and 3. GENERAL PHYSICS PROFESSOR JOHN ZELENY
Six credits (three hours per week) First and second semesters
2 and 4. GENERAL LABORATORY PRACTICE MR. KOVARIK
Two credits (two hours per week) First and second semesters

RHETORIC (See p. 54)

- 1a. RHETORIC MR. FIRKINS, MR. NICHOLS, MISS MALEY,
MISS GRIFFITH, MISS WHITNEY
Six credits (three hours per week) First and second semesters

- MILITARY DRILL CAPTAIN EDWARD SIGERFOOS, U. S. A.
Required of all men First and second semesters

Courses in the College of Medicine and Surgery

THIRD YEAR

ANATOMY (See p. 45)

1. OSTEOLOGY PROFESSOR ERDMANN, DR. HARE
Six credits (18 lectures and recitations per week for six weeks)
First quarter
2. SYNDESMOLOGY PROFESSOR ERDMANN, DR. HARE
Three credits (18 lectures and recitations per week for three weeks)
First quarter
3. DISSECTIONS ASSISTANT PROFESSOR MEYER, DRs. HARE AND TYRELL
Seven and one-half credits (21 hours per week for nine weeks)
Second quarter

CHEMISTRY (See p. 50)

6. ORGANIC CHEMISTRY PROFESSOR FRANKFORTER, ASSISTANT PROFESSOR DERBY, MR. HANDY
Fifteen credits (six lectures, six laboratory periods)
Third and fourth quarters

HISTOLOGY AND EMBRYOLOGY (See pp. 46-48)

1. GENERAL VERTEBRATE MORPHOLOGY AND HISTOLOGY PROFESSOR LEE
ASSOCIATE PROFESSOR NICKERSON
Four and one-half credits (six lectures and recitations, three laboratory periods)
First quarter
2. MICROSCOPIC ANATOMY OF MAN AND VERTEBRATES PROFESSOR LEE,
ASSOCIATE PROFESSOR NICKERSON
Four and one-half credits (six lectures and recitations, three laboratory periods)
Second quarter
11. ELEMENTS OF VERTEBRATE EMBRYOLOGY PROFESSOR LEE, ASSOCIATE PROFESSOR JOHNSTON
Four and one-half credits (six lectures and recitations, three laboratory periods)
First quarter
12. ADVANCED VERTEBRATE EMBRYOLOGY PROFESSOR LEE, ASSOCIATE PROFESSOR JOHNSTON
Three credits (two lectures and recitations, one laboratory period)
Second quarter
21. ELEMENTS OF MAMMALIAN NEUROLOGY ASSOCIATE PROFESSOR JOHNSTON, DR. INGBERT
Three credits (two lectures and recitations, one laboratory period)
Second quarter

PHYSIOLOGY (See pp. 51-52)

1. GENERAL CELLULAR PHYSIOLOGY PROFESSOR BEARD, ASSISTANT PROFESSOR WILCOX, DR. SEDGWICK
Four and one-half credits (twelve lectures and recitations, six laboratory periods)
Third quarter
2. PHYSIOLOGY OF MUSCULO-NERVOUS MECHANISMS PROFESSOR BEARD,
ASSISTANT PROFESSOR WILCOX, DR. SEDGWICK
Four and one-half credits (twelve lectures and recitations, six laboratory periods)
Third quarter

PHARMACOLOGY (See p. 53)

1. ELEMENTARY PHARMACY PROFESSOR BROWN
Four and one-half credits (six lectures and recitations, three laboratory periods) First quarter
2. GENERAL PHARMACODYNAMICS PROFESSOR BROWN
Four and one-half credits (six lectures and recitations, three laboratory periods) Second quarter

PHYSIOLOGY (See p. 52)

5. METABOLISM AND NUTRITION PROFESSOR BEARD, ASSISTANT
PROFESSOR WILCOX, DR. SEDGWICK
Four and one-half credits (twelve lectures and recitations, six laboratory periods) First quarter
6. PHENOMENA OF STIMULATION PROFESSOR BEARD, ASSISTANT
PROFESSOR WILCOX, DR. SEDGWICK
Four and one-half credits (twelve lectures and recitations, six laboratory periods) First quarter
7. PHYSIOLOGY OF SPECIAL SENSE ORGANS PROFESSOR BEARD, ASSISTANT
PROFESSOR WILCOX, DR. SEDGWICK
Four and one-half credits (twelve lectures and recitations, six laboratory periods) Second quarter
8. PHYSIOLOGY OF CENTRAL NERVOUS SYSTEM PROFESSOR BEARD, ASSISTANT
PROFESSOR WILCOX, DR. SEDGWICK
Four and one-half credits (twelve lectures and recitations, six laboratory periods) Second quarter

Seven-Year Course Leading to the Degrees of A. B.
and M. D.

Seniors in the College of Science, Literature and the Arts and in other colleges, who contemplate entering the College of Medicine and Surgery, are permitted to elect courses in anatomy, histology and embryology, physiology and chemistry in this college in lieu of similar science courses in the College of Science, Literature and the Arts or in other colleges. Since the medical practice act of this state requires full four years of medical study, these students must elect this work in the College of Medicine and Surgery, in order that it may be contributive toward the two degrees given in both colleges.

AFFILIATION WITH OTHER COLLEGES

Carleton College has entered into an arrangement with the University of Minnesota whereby students from Carleton who have completed three full years' work without conditions and who have also met all the requirements for admission to the College of Medicine and Surgery may elect as the work

of their Senior year the first year's work in the College of Medicine and Surgery, upon the satisfactory completion of which they will receive a bachelor's degree from Carleton College.

By this arrangement students from this college, having satisfactorily completed their four years' work in the College of Medicine and Surgery, will have received both degrees in a period of seven years.

Opportunity is offered to other colleges meeting the University requirements to enter into similar relations of affiliation for the purpose of shortening the time whereby a student can secure both degrees.

CURRICULUM

The course in the College of Medicine and Surgery leads to the degree of doctor of medicine. It covers a period of four years of collegiate study, each year representing nine months in actual residence.

The studies are graded, so far as practicable, throughout the four years and this grading is arranged with careful reference to the relation which the subjects naturally bear to each other.

The work of the first two years deals with the so-called scientific or laboratory branches; while that of the last two years includes the principles and practice of medicine and surgery, their associated specialties and the application of scientific or laboratory methods to clinical experience.

GRADED SYSTEM OF STUDY

The year is divided into four periods of nine weeks each, called quarters. The credit value of each course is computed in terms of credits in the College of Science, Literature, and the Arts.

FIRST YEAR

FIRST QUARTER

Anatomy 1, six credits, Professor Erdmann, Dr. Hare

Anatomy 2, three credits, Professor Erdmann, Dr. Hare

Embryology 11, four and one-half credits, Professor Lee, Associate Professor Johnston

Histology 1, four and one-half credits, Professor Lee and Assistant Professor Nickerson

SECOND QUARTER

Anatomy 3, seven and one-half credits, Assistant Professor Meyer, Drs. Hare and Tyrell

Embryology 12, three credits, Professor Lee, Associate Professor Johnston

Histology 2, four and one-half credits, Professor Lee, Assistant Professor Nickerson

Neurology 21, three credits, Associate Professor Johnston, Dr. Ingbert

THIRD QUARTER

Chemistry 6, fifteen credits, Professor Frankforter, Assistant Professor Derby, Mr. Handy

Physiology 1, four and one-half credits, Professor Beard, Assistant Professor Wilcox, Dr. Sedgwick

Physiology 2, four and one-half credits, Professor Beard, Assistant Professor Wilcox, Dr. Sedgwick

FOURTH QUARTER

Chemistry 6, continued

Physiology 3 and 4, nine credits, Professor Beard, Assistant Professor Wilcox, Dr. Sedgwick

SECOND YEAR

FIRST QUARTER

Neurology 22, four and one-half credits, Associate Professor Johnston, Dr. Ingbert

Pharmacology 1, four and one-half credits, Professor Brown

Physiology 5 and 6, nine credits, Professor Beard, Assistant Professor Wilcox, Dr. Sedgwick

SECOND QUARTER

Chemistry 7, three and three-quarter credits, Professor Frankforter, Assistant Professors Harding and Derby

Physiology 7 and 8, nine credits, Professor Beard, Assistant Professor Wilcox, Dr. Sedgwick

THIRD QUARTER

Anatomy 4, nine credits, Assistant Professor Meyer, Drs. Hare and Tyrell

Embryology 13, four and one-half credits, Professor Lee

Histology 3, four and one-half credits, Professor Lee

FOURTH QUARTER

Pathology 1, three credits, Professor Wesbrook

Pathology 2, three credits, Dr. Mullin, Dr. Robertson

Pathology 3, three credits, Professor Wesbrook, Drs. Mullin and Robertson

Bacteriology 4, three credits, Assistant Professor Hill, Dr. Pratt

Bacteriology 5, four and one-half credits, Professor Wesbrook, Assistant Professor Hill, Dr. Pratt

For the statement of the courses of the third and fourth years the schedules and detailed announcements must be consulted.

THIRD YEAR

Topographical anatomy, special pathology and bacteriology, surgical pathology, principles of surgery, operative surgery, practice of surgery, practice of medicine, diseases of children, obstetrics, pathology of the nervous system, special neurology, medical jurisprudence, physical diagnosis, pharmacology and therapeutics, electives.

FOURTH YEAR

Practice of surgery, practice of medicine, clinical obstetrics, surgical pathology, practical physical diagnosis, therapeutic conferences, nervous and mental diseases, gynecology, ophthalmology and otology, clinical microscopy, orthopedia, dermatology and genito-urinary diseases, diseases of the nose and throat, hygiene, electives.

COLLEGE YEAR

The twenty-first annual course of study in this college will begin on Tuesday, September 14, 1908, and will continue nine months, or thirty-six weeks, exclusive of holidays, closing upon Saturday, June 5, 1909. The college year is divided into two semesters; each semester is further divided into two quarters of nine weeks each; the first semester ends January 30, 1909. The last week is devoted mainly to mid-year examinations, which will be conducted in many of the departments. The second semester will begin February 2, 1909, and will close June 5, 1909. Certain of the courses of study terminate on November 14th, and April 3d. Commencement exercises will occur in common with the other departments of the University, during the week ending June 11, 1909.

Rules and Regulations of the College

REQUIREMENTS FOR ADMISSION

I. Candidates for admission to the College of Medicine and Surgery who have received degrees in arts or science from approved universities or colleges will be admitted on presenting their diplomas or other satisfactory testimonials (subject to conditions under IV).

II. Students will be admitted who present evidence that they have satisfactorily performed the equivalent of at least two full years of work of collegiate grade of fifteen hours per week (subject to conditions under IV).

III. Other candidates who have not completed the two years of required work will be required to pass examinations, conducted by the

College of Science, Literature and the Arts, upon such subjects as may be lacking (subject to conditions under IV).

IV. All candidates for admission must furnish evidence that they have completed one year of at least three credit* hours per week in each of the following named subjects, either in this University or in some other college or university of equal rank:

1. Physics
2. General Inorganic Chemistry
3. Qualitative Analysis
4. Biology, i. e., Zoology or Botany
5. Language, i. e., German or French

Since the two years of required collegiate work must include the aforementioned subjects, students are advised to choose the prescribed six-year course which leads to the degrees of bachelor of science and doctor of medicine. For detailed outline of this course see pages 28-33.

V. In addition students must offer for entrance two years of Latin.

VI. Candidates may be allowed to enter with not more than one condition in the second year of academic work. This condition, however, must be removed before the beginning of the second-year work in medicine.

For regulations governing admission to the College of Science, Literature and the Arts, and detailed information concerning its curriculum, see the bulletin of that college.

ENROLLMENT

Students are advised to matriculate or register in the office of the University Registrar on or before September 7, 1908. Entrance and condition examinations will be held September 7 to 12. Opening lecture, September 14. Classes called for regular work on September 15.

Students are fined twenty-five cents per day who matriculate or register in the Registrar's office after September 14, 1908, for the first semester's work, or after February 2, 1909, for the second semester's work.

MATRICULATION

Students who are entering the College of Medicine and Surgery for the first time must present to the Registrar satisfactory evidence of having completed the required amount of work for admission, and obtain proper classification card and statement of fees. The Registrar will determine and record any deficiency in the entrance qualifications of a student, and will arrange with the student for the removal of such deficiencies.

* NOTE.—A credit hour in a laboratory subject is taken to be two or more hours of consecutive work.

Students who have matriculated in previous years must first present registration slips and obtain statement of fees in the Registrar's office at the beginning of each semester.

REGISTRATION

The registration of all students consists of three parts and should be carried out in the following order:

1st. Present registration slip to the Registrar and secure a statement of fees.

2nd. Present this statement at once to the cashier and pay fees.

3rd. Report to the dean at once for final classification and registration. Students must follow this order and complete registration as promptly as possible in order to secure tickets for entrance to the various courses.

NOTE.—If there is any sufficient reason for temporary delay in payment of fees, the student must report at once to the Dean.

As the rules of the Minnesota State Board of Medical Examiners and of the Council on Medical Education of the American Medical Association, and the examining boards of several other states require four full years' work in a medical college, students are not given time credit for work done outside a medical school. However, when a student presents *satisfactory* evidence of good work done elsewhere, he may be given subject credit for such work, and be permitted to take *optional* or *advanced* work in the branches and for the time in which he has received subject credit. It is consequently of considerable advantage to a student to be able to present subject credits.

No student may be advanced with his class or given advanced standing unless he has passed the majority of the required studies of the previous year; nor shall any student be admitted to the second semester's work of the fourth year who has any unremoved conditions of any of the preceding years.

TERMS OF TUITION

The annual tuition fee in the College of Medicine and Surgery is one hundred dollars. This includes all charges for matriculation, lecture and laboratory courses, dissections and graduation, except a hospital fee of three dollars for juniors and seniors and a rental fee for microscopes, payable by all students who do not own their own instruments. (See microscope rental.)

One-half of the annual fee will be payable when the student matriculates. The cashier's receipt for this portion of the fee will entitle the holder to take the entrance examinations and to classify. The second half will be payable at the opening of the second semester, February 2, 1909.

Failure to register within the dates assigned for registration will subject the delinquent to an increase in the registration fee, amounting to twenty-five cents for each day of such delinquency. If the applicant fails to pass the entrance examination, his fees will be returned by the cashier. Absence or failure to continue study will not entitle the student to return of fees, except in cases of special hardship, when application may be made to the executive committee of the Board of Regents.

A student who takes advanced standing will not receive any credit therefor upon his annual fees.

The fee of one dollar is charged for permission to take any examination to remove a condition. The student obtains a fee statement from the Registrar for the conditions charged against him, this he presents to the cashier, and the cashier's receipt must be registered with the Dean at least twenty-four hours prior to the examination.

Special examinations may be ordered by the faculty under exceptional circumstances for which a fee of five dollars must be paid to the University cashier.

MICROSCOPE RENTAL

To students who do not own their own instruments, microscope fees are charged as follows: First year, first semester, four dollars, second year, first semester, three dollars; second semester, four dollars; third year, first semester, four dollars. Fourth year, clinical microscopy, two dollars.

In all elective courses requiring the use of microscopes, the fee of two dollars for each course is charged.

BREAKAGE AND LOSS

In each laboratory course the student will be assigned a certain amount of apparatus and material, for which he will give a receipt.

For apparatus and material attaching to his laboratory desk he will also be held responsible. At the end of each course, if such apparatus and material are restored in good condition, this receipt will be returned to him.

A deposit of five dollars will be made with the University cashier each year, by every student, at the time of enrollment as a caution fee. This fee is intended to cover the cost of unnecessary damage in the college buildings and of breakage and loss of laboratory apparatus and materials. It will be returned to the student at the close of each year, minus the cost of articles assigned to him, which are not returned in good condition, or of damage to college property for which he is individually responsible. If responsibility for such damage cannot be individually fixed, a pro rata charge upon all students will be made.

GRADUATE AND SPECIAL STUDENTS

Special students will pay to the cashier a fee of twenty dollars per year for each study they elect to pursue. They will be charged additional fees, varying from five to twenty dollars, for each laboratory course they may enter.

Graduate students will pay an admission of ten dollars, which will entitle them to attend any lectures they may desire in regular courses.

Additional charges varying from ten to twenty dollars per course are made for laboratory courses, and microscope rental must also be paid.

EXAMINATIONS—FINAL STANDINGS

No student with an entrance condition will be allowed to register for any second-year subject, nor will any student with any first-year condition or failure be allowed to register for a third-year subject; nor will any student having a second-year condition or failure be allowed to register for any fourth-year subject.

No student will be allowed to omit any freshman work in order to make up entrance conditions, except by special permission of the department affected.

Habitual absence without satisfactory excuse, continued indifference to study, or persistently poor scholarship will subject the student to temporary or permanent suspension.

Students will not be permitted to substitute private work in any branch for the regular college courses.

Final examination in every required subject is held at the close of the work at the end of the semester or quarter, according to the extent of the course given. Opportunity is offered to remove conditions at the opening of the school year in September. The examinations at the end of the semester or quarter are only for those who are taking the courses, while the September examinations are only for those who are attempting to remove conditions or are applicants for advanced standing.

The final standing of any student in a given subject shall be determined as the result of his (a) practical work (laboratory or clinical), (b) recitations, and (c) oral or (d) written examinations.

All of these factors shall be taken into consideration in making up the final grading in any subject.

Students' standings shall be determined at the end of the year by a conference of the heads of the departments in which the work is pursued during that year.

All standings shall be reported officially to and from the registrar's office at the end of the year.

Students shall be reported as Passed, Incomplete, Conditioned or Failed.

No student will be registered for any examination to remove conditions until he presents a receipt from the cashier for the fee for said examination. (See Terms of Tuition.)

Conditions must be removed at the beginning of the school year in September. No student who has any conditions unremoved at the close of this examination is allowed to continue with his class without the express permission of the dean on the recommendation of the department concerned.

A condition not removed at the first opportunity becomes a failure subject to the rule governing failures.

Failures necessitate the taking of the work again in class.

A student repeating work, by reason of having failed, must pay the fees connected with that course.

A student who is conditioned in the majority of the subjects given in any year will become a "failed" student and must repeat the whole work of that year.

Students who carry failures into a succeeding year may find a resultant conflict of study hours; in that event they will give preference to the unfinished studies of the lower conflicting course.

ADVANCED STANDING

All persons applying for advanced standing must present satisfactory evidence of time spent in medical studies, as well as official credentials, their own records, notes, drawings, and other evidence of work covered and pass examinations in the branches already taken by the class they seek to enter and satisfy all other admission requirements, but any student who has satisfactorily completed the requirements of any department of this college in any other medical college of recognized standing may be excused from repeating such examinations if the instruction which he has received is considered satisfactory by the head of the corresponding department in this college.

No condition of advanced standing will entitle the student to take the two years of any graded study coincidentally.

Seniors in the College of Science, Literature, and the Arts, or in other recognized colleges, who contemplate entering the department of medicine, are permitted to elect courses in anatomy, histology, embryology, neurology, physiology and chemistry in this department in lieu of equivalent science courses in the College of Science, Literature, and the Arts or in other colleges.

REQUIREMENTS FOR GRADUATION

The degree of doctor of medicine is conferred by the Board of Regents upon the students who are recommended by vote of the faculty for graduation. Candidates for the degree must possess the following qualifications:

Every candidate for the degree of doctor of medicine must be at least twenty-one years of age, and of good moral character. He must have satisfied all the requirements for admission to the College of Medicine and Surgery, and have completed in a satisfactory manner the full four years' course of study in this college.

The degree of doctor of medicine will also be given to candidates who have completed a portion of their medical work in some other recognized medical school, provided that they have satisfied all entrance requirements and have completed a four years' course of medical study equivalent to the standards maintained here, of which the final year must be spent in this college.

A graduate of another medical school of recognized standing may obtain the degree of doctor of medicine at this University by fulfilling all the requirements for undergraduates, completing in full the final year's work in this college, and passing satisfactory examinations.

Theses.—Every candidate for the degree of doctor of medicine in this college is required to prepare a thesis on some laboratory or clinical subject, done in this college. This thesis must embody the results of original research made by the student himself, and be creditable from a literary as well as from a technical point of view.

A thesis will be required of those who have completed their third-year work in medicine, i. e., the class of 1909, and all who have entered subsequently. Great emphasis is laid upon the careful and accurate preparation of the theses. Students are advised to make selection and begin preparation of thesis not later than the beginning of the junior year.

A detailed statement of the rules and regulations governing the preparation of the theses may be obtained from the chairman of the thesis committee.

THE ROLLIN E. CUTTS PRIZE IN SURGERY

Dr. Mary E. Smith Cutts, '91 Medical, has given the University, as a memorial of her husband, Dr. Rollin E. Cutts, '91 Medical, the sum of \$500, the income from which is to be awarded in the form of a gold medal to that member of the senior class of the College of Medicine and Surgery who presents the best thesis showing original work upon a surgical subject.

Course of Instruction

DEPARTMENT OF ANATOMY

- | | |
|---|---|
| THOMAS G. LEE, B. S.,
<i>Professor of Histology and Embryology</i> | CHARLES A. ERDMANN, M.D.,
<i>Professor of Anatomy</i> |
| JOHN BLACK JOHNSTON, Ph. D.,
<i>Associate Professor in Comparative Neurology</i> | ARTHUR W. MEYER, B.S., M.D.,
<i>Assistant Professor of Anatomy</i> |
| WINFIELD S. NICKERSON, Sc.D., M.D.,
<i>Assistant Professor of Histology and Embryology</i> | EARLE R. HARE, B.A., M.D.,
<i>Instructor in Anatomy</i> |
| JARL FERDINAND LEMSTROM, M.D.,
<i>Assistant in Micro-Technique</i> | C. C. TYRELL, B.A., M.D.,
<i>Prosecutor in Anatomy</i> |
| CHARLES E. INGBERT, Ph.D., M.D.,
<i>Associate in Neurology</i> | E. E. HEMINGWAY, Ph.D.,
<i>Assistant in Anatomy</i> |
| E. M. WATSON, B.A.,
<i>E. M. WATSON, B.A., Departmental Laboratory Assistant</i> | |
| KATE WYMAN, B.A.,
<i>KATE WYMAN, B.A., Departmental Laboratory Assistant</i> | |

The department of anatomy is located in two separate buildings, adapted to its work, and equipped with the best modern appliances. The building devoted to gross anatomy includes one large students' dissecting room, the general laboratories of anatomy, a bone laboratory for osteological research work, the offices of the professor and assistants in anatomy, preparation rooms and morgue. An ample supply of dissecting material is provided.

In the first year the subjects of osteology and syndesmology are pursued by means of lectures, laboratory demonstrations and recitations from the specimen.

The bones of a human skeleton are loaned to the student for purposes of study and recitation.

Myology, angiology, splanchnology and neurology are studied in connection with the dissection and laboratory demonstrations of the thoracic, abdominal and pelvic viscera upon the lower animal. This is followed by the dissection of the human body and a comparative brain.

In the second year the alimentary canal, respiratory tract, genito-urinary system, organs of special sense and the cerebro-spinal nervous system are pursued by means of lectures, recitations and laboratory demonstrations. The dissection of the human body is repeated and followed by a series of lectures and demonstrations on descriptive and surgical anatomy. The student dissects in the first semester of the first year, and in the first half of the second semester of the second year, recites upon the subject and observes demonstrations made by a corps of assistants under the direction of the professor of anatomy.

Dissection is supplemented by drawings from dissections made upon outlines of the human skeleton, which are furnished to the student.

In the third year the student takes up the study of the human body from a topographical and surgical standpoint and is given a thorough review of the surgical regions, emphasizing the practical points in relation to their clinical application.

The work in *microscopic anatomy, histology, embryology, neurology* and *micro-technique* occupies all four floors of the entire north wing and center of the Medical Science Building, amounting to about 17,000 square feet. The main laboratory on the first floor measures 44x72 feet, lighted by windows on three sides and a part of the fourth. Each student is provided with a sink, gas, electric light, copper heating table, microscope locker and microscope, and a locker for the storage of apparatus and material. On the other floors there are to be found a lecture room and well equipped laboratories for courses in neurology, micro-technique, experimental work in histology and embryology, private rooms for investigators, various storage and preparation rooms, and rooms for reconstruction, chemical, photographic and photomicrographic work. These various laboratories and rooms are very well equipped with microscopes, microtomes, thermostats, a great variety of technical glassware, and other apparatus.

The departmental library contains a carefully selected collection of reference literature, both standard and periodical. There has been recently added to the library a large part of the working anatomical library of the late Professor William His of Leipzig, amounting to about 8,500 titles by 2,500 authors. In addition to this collection the other libraries of the University, together with the public libraries of Minneapolis and

A comprehensive review of the relations of structures composing the surgical regions of the human body; demonstrations with dissections, lantern, and upon the living model, showing the anatomical and surgical landmarks, and their applications.

6. **THE LYMPHATIC SYSTEM** ASSISTANT PROFESSOR MEYER
 A comprehensive review of the human lymphatic system including the tonsils, adenoids and hemolymph glands. This course will consist of a series of lectures incorporating the results of recent research, and demonstrations on specially prepared dissections and injections, supplemented by a consideration of the lymphatic system of some of the lower vertebrates.
 Students who have completed their dissections are eligible. This and the following course will be given at an hour which is most convenient for those electing it.
7. **THE GENITO-URINARY ORGANS** ASSISTANT PROFESSOR MEYER
 The scope of this course is similar to the above, but students will be expected to do actual laboratory work on gross sections made in various planes, of the cadavers of foetuses near term, of infants, adolescents and adults. An opportunity will also be afforded to study specially prepared dissections and preparations, and the aim will be to consider the human reproductive organs in their broadest relations as well as in their minute anatomical details. The development history will be referred to only as required. This course will be given under the same conditions as the above.
8. **TOPOGRAPHICAL ANATOMY OF CROSS SECTIONS** PROFESSOR ERDMANN
 AND DR. TYRELL
 Open to third and fourth year students.
 A series of lectures and demonstrations, supplemented by the individual study of frozen and specially prepared cross sections of the human body, and a series of lantern slides representing actual sections.
9. **RESEARCH WORK** PROFESSOR ERDMANN
 The laboratory is equipped for the original investigation of anatomical problems. Students suitably fitted who have the time to do such work are encouraged to undertake it.
10. **ADVANCED PRACTICAL ANATOMY** PROFESSOR ERDMANN
 Opportunity is afforded for advanced work in practical anatomy to suitably trained students and practitioners, at any time during the college year.

HISTOLOGY, EMBRYOLOGY AND NEUROLOGY

1. **GENERAL VERTEBRATE MORPHOLOGY AND HISTOLOGY** PROFESSOR LEE,
 ASSISTANT PROFESSOR NICKERSON
 Four and one-half credits (six lectures and recitations, and six hours laboratory work per week) First quarter
 Open to freshmen.
 The structure and properties of protoplasm; the cell, its structure; the phenomena of cell division. A comparative study of the histology of the epithelial, connective and muscular tissues, the blood, and the vascular and lymphatic systems of man and vertebrates.
2. **MICROSCOPIC ANATOMY OF MAN AND VERTEBRATES** PROFESSOR LEE,
 ASSISTANT PROFESSOR NICKERSON
 Four and one-half credits (six hours lecture and recitation, and six hours laboratory work per week) Second quarter
 Open to freshmen who have completed course 1 or equivalent.
 A comparative study of the morphology, microscopic anatomy, origin and development of the various organs of the alimentary, respiratory, and uro-genital systems.
3. **MICRO-TECHNIQUE AND THE MORPHOLOGY OF THE SPECIAL SENSE ORGANS** PROFESSOR LEE
 Four and one-half credits (six hours lecture and recitation and six hours laboratory work per week) Third quarter

- Open to sophomores or those who have completed courses 2 and 12, or equivalent.
A detailed study of the structure of the organs of special sense, together with practical exercises in micro-technique, methods of fixation, embedding, sectioning, staining, reconstruction, etc.
5. DENTAL HISTOLOGY AND EMBRYOLOGY ASSISTANT PROFESSOR NICKERSON
Three credits (four lectures, four recitations, eight hours laboratory per week) Fourth quarter
Open to first-year students. A modified course specially arranged and open only to dental students.
The structure and histogenesis of the organs and tissues, the structure and development of the teeth and jaws, the mouth cavity and glands.
7. CYTOLOGY AND HISTOGENESIS PROFESSOR LEE
Three credits (lectures and laboratory) Third quarter
Elective course open to students who have had course 3 or 13, or equivalent.
10. RESEARCH WORK IN HUMAN AND VERTEBRATE MORPHOLOGY PROFESSOR LEE
Properly qualified students will be provided every facility for original investigation of anatomical problems.
11. ELEMENTS OF VERTEBRATE EMBRYOLOGY PROFESSOR LEE, ASSOCIATE PROFESSOR JOHNSTON
Four and one-half credits (six lectures and recitations, and six laboratory hours per week) First quarter
Open to first-year students.
A comparative study of reproduction; the ovum, the spermatozoan, fertilization, cleavage, formation of the blastodermic layers, the formation of the embryo and foetal envelopes, with practical work on mammalian and other vertebrate embryos.
12. ADVANCED VERTEBRATE EMBRYOLOGY PROFESSOR LEE, ASSOCIATE PROFESSOR JOHNSTON
Three credits (six lectures and recitations, and six hours laboratory per week) Second quarter
Open to first-year students who have completed course 11 or equivalent.
A comparative study of human and mammalian embryos, including impregnation, segmentation and implantation of the ovum, the formation, structure and relationships of the placenta and the foetal envelope, and the details of organogenesis studied in a practical manner upon a very large collection of serial sections of human and mammalian embryos cut in various planes, and representing all phases of development.
13. SPECIAL EMBRYOLOGY OF MAN AND VERTEBRATES PROFESSOR LEE
Four and one-half credits (six lectures and recitations, and six hours laboratory per week) Third quarter
Open to second-year students who have completed courses 2 and 12.
A study of assigned problems including the elements of teratology.
17. EXPERIMENTAL EMBRYOLOGY
Three credits (lectures and laboratory) Fourth quarter
Special course for advanced students.
20. THE ANIMAL PARASITES OF MAN ASSISTANT PROFESSOR NICKERSON
Three credits (six hours per week lectures and laboratory) Third quarter
An elective course in Medical Zoology. The general outlines of the morphology and classification of the different groups which contain members parasitic upon man, with special consideration of each species of medical importance, including its distribution, life history, methods of infection, means of diagnosis, and the chief symptoms produced by it.

21. **ELEMENTS OF MAMMALIAN NEUROLOGY** ASSOCIATE PROFESSOR
JOHNSTON AND DR. INGBERT
Three credits (six lectures and recitations, and six hours laboratory per week) Second quarter
Open to first-year students who have completed courses 1 and 11, or equivalent.
A study of the structure and relations of the nerve elements and of the general morphology of the central nervous system.
22. **THE HUMAN NERVOUS SYSTEM** ASSOCIATE PROFESSOR JOHNSTON
AND DR. INGBERT
Four and one-half credits (six lectures and recitations, and six hours laboratory) First quarter
Open to second-year students who have completed courses 11, 12 and 21, or equivalent.
A detailed study of the internal structure and functional organization of the central nervous system by means of sections of the human brain, with comparison of mammals and lower vertebrates.
23. **SPECIAL AND APPLIED NEUROLOGY** ASSOCIATE PROFESSOR JOHNSTON
AND DR. INGBERT
One and one-half credits (two lectures and recitations, and two hours demonstrations per week) Fourth quarter
Open to third year students.
Special studies in preparation for the work of the fourth year in pathology and diseases of the nervous system.
24. **NEUROLOGICAL TECHNIQUE** ASSOCIATE PROFESSOR JOHNSTON
Three credits Fourth quarter
Elective course for qualified students.
Practical work in the preparation of the nervous system for gross and microscopic study.
26. **THE NERVOUS SYSTEM AND MENTAL LIFE** ASSOCIATE PROFESSOR
JOHNSTON
Two credits (two lectures, two demonstrations and reading with reports and discussions per week) Second quarter
Open to a limited number of students by special permission.
The course will include an analysis of nervous mechanisms on the basis of function, followed by a study of the mechanisms of correlation, the growth and education of the nervous system, cerebral functions and localization, and the neural basis of elementary phenomena of consciousness.
27. **COMPARATIVE NEUROLOGY OF VERTEBRATES** ASSOCIATE PROFESSOR
JOHNSTON
Six credits (six hours lecture and recitations, and four hours laboratory per week) Second quarter
Intended for graduates; open by special permission to seniors who meet the requirements. Prerequisite courses 1 and 2, or 3 in Animal Biology, or courses 2 and 12 in Histology and Embryology.
30. **RESEARCH IN NEUROLOGY** ASSOCIATE PROFESSOR JOHNSTON
Open only to those who are qualified to carry on investigation.
Problems and special work in vertebrate neurology.
40. **ANATOMICAL JOURNAL CLUB AND SEMINAR**
Weekly meetings during year for reviews of the current literature and discussion of special topics in anatomy, histology, embryology, and neurology, and of the research work being carried on in the department. The department library, which is large and rapidly growing, receives all the leading anatomical journals.

The following text-books should be consulted:
Anatomy. Cunningham, Piersol, Morris, Gray, Spalteholz Atlas, Barker's Laboratory Manual, Cunningham's Manual of Dissection, Treve's Applied Anatomy, Barker's Anatomy of the Nervous System.
Collateral Readings. Quain's Anatomy, Flower's Osteology of Mammals, Gegenbauer's Elements of Comparative Anatomy, Chauveau's Comparative Anatomy, Wiedersheim's Elements of Comparative Anatomy, McClellan's

Regional Anatomy, Deaver's Surgical Anatomy, Edinger's Anatomy of the Nervous System, Hildebrans's Chirurgisch Topographise Anatomie, Schultze's Applied Anatomy, Eisendrath Clinical Anatomy, Box and Eccles' Applied Clinical Anatomy.

Histology. Wilson's The Cell; Bohm-Davidoff-Huber's Histology; Stöhr-Lewis' Histology; Bailey's Histology; Piersol's Histology; Ferguson's Histology; Szymonowicz-MacCullum's Histology; Sobotta-Huber's Atlas; Klein's Histology; Mann's Histology; Lee's Vade Mecum; Kolliker's Gewebelehre; Oppel's Mikroskopischen Anatomie; Duval's Histologie; Ranvier's Histologie.

Embryology. Minot's Human Embryology; Minot's Laboratory text books; Hertwig-Mark's Embryology; McMurrich's Embryology; Heisler's Embryology; Marshall's Embryology; Kolliker's Embryologie; Schultze's Embryologie; Kollman's Embryologie; Schenk's Embryologie; Reese's Embryology.

Neurology. Johnston's Nervous System of the Vertebrates; Barker's Nervous System; Edinger's Lectures Nervous System; Gordinier's Nervous System; Van Gehuchten's Systeme Nerveaux; Kolliker's Gewebelehre; Obersteiner; Sabin's Atlas.

DEPARTMENT OF CHEMISTRY

- GEORGE B. FRANKFORTER, M.A., Ph.D., *Professor of Chemistry*
 CHAS. F. SIDENER, B.S., *Professor of Chemistry*
 EDWARD E. NICHOLSON, M.A., *Assistant Professor of Chemistry*
 EVERHART P. HARDING, M.S., Ph.D., *Assistant Professor of Chemistry*
 IRA HARRIS DERBY, B.S., *Assistant Professor of Chemistry*
 LILLIAN COHEN, M.S., *Instructor in Chemistry*
 FRANCIS C. FRARY, M.S., *Instructor in Chemistry*
 JOHN A. HANDY, Ph.C., *Instructor in Chemistry*
 JAMES ZIMMERMAN, B.A., *Instructor in Chemistry*
 WALTER L. BADGER, B.A., *Instructor in Chemistry*

CHEMISTRY

1. GENERAL CHEMISTRY MISS COHEN AND MR. BADGER
 Six credits (six hours per week) Both semesters
 Open to all who do not present any entrance credits in chemistry;
 but juniors and seniors receive only half credit; both semesters
 must be completed before credit is given for the first semester;
 the laboratory fee is five dollars per semester.
 Recitations and laboratory work; the course includes a study of
 the common elements and their compounds, with an introduc-
 tion to the modern theories of chemistry.
2. ADVANCED GENERAL CHEMISTRY PROFESSOR FRANKFORTER
 Six credits (six hours per week) Both semesters
 Open to all who have completed a satisfactory course in general
 chemistry; both semesters must be completed before credit is
 given for the first semester; the laboratory fee is five dollars
 per semester.
 Lectures and laboratory work; the ground covered includes an
 introduction to physical and technological chemistry, with an
 exhaustive study of the chemical elements.
3. QUALITATIVE ANALYSIS PROFESSOR NICHOLSON AND MR. FRARY
 Six credits (six hours per week) Both semesters
 Open to those who have completed course 2; the laboratory fee
 is five dollars per semester.
 Lectures and laboratory work, with recitations and collateral
 reading. The course includes the general reactions of the
 metals and the acids, with their qualitative separation. Besides
 this mechanical work, the ionic theory and the law of mass
 action are discussed with special reference to common quali-
 tative reactions.

6. ORGANIC CHEMISTRY PROFESSOR FRANKFORTER
Six credits (six hours per week) Second semester
Open to those who have completed course 3; the laboratory fee
is ten dollars.
Lectures and laboratory work. The course includes an exhaustive
study of the theories of organic chemistry, with one or more
important preparations in each of the advanced series and
groups of compounds.
7. TOXICOLOGY AND HYGIENE PROFESSOR FRANKFORTER, ASSISTANT
PROFESSORS HARDING AND DERBY
Open to first-year students. Second semester
Toxicology.—This course includes the general methods for the
separation and identification of the poisons both organic and
inorganic. Attention will be given to the identification of
poisons associated with medicines and with vegetable and animal
matter. Besides this qualitative and quantitative work,
attention is given to the structure of those organic groups of
compounds which have poisonous properties.
Hygiene.—Chemistry lectures and laboratory work. This course
includes the chemical analysis of air, water, and some of the
common foods, milk, sugar and fruit products. Special atten-
tion is given to food adulteration and to food preservations.

For work in other special or technical lines of chemistry, numerous
courses are offered (see Bulletin of the School of Chemistry). Facilities for
research work are also afforded in a large number of lines.

The analysis of the urine is dealt with under physiological chemistry in
the department of physiology, in the pathology of the urinary system in the
department of pathology, and in the clinical laboratories in connection with
the microscopy of the urine.

DEPARTMENT OF PHYSIOLOGY

RICHARD O. BEARD, M.D., *Professor of Physiology*

M. R. WILCOX, M.D., *Assistant Professor of Physiology*

F. H. SCOTT, M.A., M.D., Ph.D., *Assistant Professor of Physiology*

JULIUS PARKER SEDGWICK, B.S., M.D., *Instructor in Physiological Chem-
istry*

GEORGE D. HAGGARD, M.D., *Instructor in Physiology*

COURSES OF INSTRUCTION

The department of physiology occupies rooms in the medical science build-
ing, including a laboratory of experimental physiology, a laboratory of
physiological chemistry, demonstration and recitation rooms, the laboratory
library and the office of the chief of the department. A large amphitheatre
adapted to the demonstration of major experiments adjoins the laboratories
and is used by the department for lecture purposes.

In the basement of the medical science building is a well-equipped work-
shop for the manufacture and repair of apparatus. Here, also, are animal
rooms, furnished with enclosures, breeding cages, frog-tanks and aquarium.
From the animal room supplies of animals and materials are obtained for
the work in physiological chemistry and experimental physiology. The
hygienic conditions of the room are carefully studied, with a view to main-
taining the physiological and structural integrity of its animal occupants as
perfectly as possible.

The physiological laboratories are equipped with a full supply of ap-
paratus, instruments, etc., for experimental purposes, including artificial res-
piratory machines, batteries, Du Bois Reymond coils, galvanometers, rheo-
stats, Despretz signals, chronographs, moist muscle-chambers, kymographions,
spring myographs, stethoscopes, phonendoscopes, stethometers, sphygmo-
graphis, cardiographs, sphygmometers, Gaskell's clamps, oncometers, onco-
graphs, hemometers, hemocytometers, hematocrits, ergograph, plethysmo-
graph, and microscopes. Electric motor power is provided for driving ap-
paratus.

The course in physiology is graded in the first and second years. Under the concentration system in vogue, something more than one-half of the student's time is occupied with this study during one semester of each of these years.

Each phase of the subject is treated as a unit; i. e., the laboratory courses in physiological chemistry, experimental physiology, physical chemistry, etc., are correlated and interwoven with the lecture courses throughout. The work is essentially practical and is individualized as much as possible.

In the first year, the student takes up the study, first, of the physiologic components of the animal body; next, the physiological and physical properties of tissue-cells in general; the nutritive media; and the neuromuscular mechanisms. He then enters upon the study of systematic physiology, taking, in turn, the circulation, digestion, secretion, respiration and excretion. Urinalysis is made a special feature of the work in physiological chemistry. The student is thoroughly drilled in the technique of analytical and estimative methods in the study of the body-fluids.

In the second year, the same methods are applied to the problems of metabolism and nutrition. The student makes a complete nutritive balance, based upon a series of actual feeding experiments, including the analysis of a standard dietary, the qualitative and quantitative examination of the feces and urine, the estimation of the total and differential nitrogens and the determination of respiratory quotients.

In relation to the question of nutrition the distinctive physiologic conditions of successive ages of human life are discussed.

The last three-quarters of the year are occupied with the discussion and laboratory study of the physiology of the nervous system, special attention being paid to the observation and testing of special sense phenomena, cerebral localization, etc.

A laboratory reference library is accessible to the students for purposes of collateral reading.

COURSES OF STUDY (See p. 31)

FIRST YEAR

1. GENERAL CELLULAR PHYSIOLOGY PROFESSORS BEARD AND WILCOX,
AND DR. SEDGWICK
Four and one-half credits (twelve lecture and recitation periods,
six laboratory periods) First quarter
The study of the physiologic components of the animal body; the
physiologic and physical properties of the tissue-cells in general;
the specializations of function; the nutritive media,
including methods of blood examination.
2. THE MUSCULO-NERVOUS MECHANISMS PROFESSORS BEARD AND WILCOX
Four and one-half credits (twelve lecture and recitation periods,
six laboratory periods) First quarter
The study of the phenomena of muscle and nerve action, including
the principles of nerve control in general. The student is
introduced in this course to the technique of experimental
study.
3. SYSTEMIC PHYSIOLOGY PROFESSORS BEARD AND WILCOX AND DR.
SEDGWICK
Four and one-half credits (twelve lecture and recitation periods,
six laboratory periods) Second quarter
The vascular mechanism, including the estimation of blood-
pressure, the mapping of cardiac areas, the study of heart
sounds, and the making of sphygmograms.
The digestive system, including the process of secretion, the
analysis of the digestive fluids, the examination of the normal
stomach contents and the conduct of digestions.
4. SYSTEMIC PHYSIOLOGY (Continued) PROFESSORS BEARD AND WILCOX AND
DR. SEDGWICK
Four and one-half credits (twelve lecture and recitation periods,
six laboratory periods) Second quarter
The respiratory mechanism; the mechanics, physics, chemistry
and nerve control of respiration.
The excretory system, including the study of excretion by
the air-passages, the intestinal tract, the skin and the kid-

ney. Analysis of the physiological urine is addressed both to the determination of functional facts and to the attainment of the technique of clinical diagnosis in this field.

SECOND YEAR

5. METABOLISM AND NUTRITION PROFESSOR BEARD AND DR. SEDGWICK
Four and one-half credits (twelve lecture and recitation periods,
six laboratory periods) Third quarter
A study of metabolic and nutritional problems for the determination of nutritive balance, nitrogenous and body equilibrium, and specific dietetic results; including the analysis of standard dietaries and the further examination of the normal stomach contents and the fecal debris, the estimation of nitrogen excretion in total and in differential forms, the relation of fat splitting and fat-absorption, and the determination of respiratory quotients, etc.
A study, also, of the distinctive physiologic features of foetal and infantile life, of childhood, puberty, pregnancy, parturition, the climacteric and old age.
6. PHENOMENA OF STIMULATION PROFESSORS BEARD AND WILCOX
Four and one-half credits (twelve lecture and recitation periods,
six laboratory periods) Third quarter
A study of the conditions of stimulation, the nature of stimuli and their effects upon the nervous mechanism, including the phenomena of absence, section, and the reactions of degeneration.
7. PHYSIOLOGY OF SPECIAL SENSE ORGANS PROFESSORS BEARD AND WILCOX
Four and one-half credits (twelve lecture and recitation periods,
six laboratory periods) Fourth quarter
A study of special sense phenomena and of the means of determining the acuity of, and the influences which condition, special sense function in all its fields.
8. THE PHYSIOLOGY OF THE CENTRAL NERVOUS SYSTEM PROFESSORS
BEARD AND WILCOX
Four and one-half credits (twelve lecture and recitation periods,
and six laboratory periods) Fourth quarter
A study of the functions of the nervous system in general, including the functional relations of nerve tracts, association paths, and central localization.

Text-Books:

First and second years—

The American Text-book of Physiology.

Howell's Text-book of Physiology.

Foster's Physiology, Sixth English edition.

Hammarstein's Physiologic Chemistry.

Collateral Reading—Landois and Sterling's Handbook of Physiology; Van Noorden's Text-book of Metabolism; Stewart's Practical Physiology; Tigerstedt's Physiology; Blyth's Foods and their Composition; Hutchinson's Dietetics.

DEPARTMENT OF PHARMACOLOGY, MATERIA MEDICA,
THERAPEUTICS

E. D. BROWN, Phm.D., M.D., *Acting Professor of Pharmacology and
Materia Medica*

W. H. CONDIT, B.S., M.D., *Instructor in Therapeutics and Materia Medica*

W. D. SHELDON, M.D., *Clinical Instructor in Medicine and Instructor in
Therapeutics*

CHAS. F. DIGHT, M.D., *Instructor in Pharmacology*
..... *Assistant in Pharmacology, and Materia Medica*

The instruction in this department aims to give the student a knowledge of the characters and actions of drugs, and a scientific knowledge of their use in the treatment of disease.

The course comprises lectures, recitations, demonstrations, and experimental laboratory work which is done by the students.

1. ELEMENTARY PHARMACY, GENERAL TOXICOLOGY AND PRINCIPLES OF
PRESCRIPTION WRITING PROFESSOR BROWN
Three credits (three hours lecture or recitation per week) First semester, second year

Required of sophomores.

The course includes the following subdivisions:

- (a) Elementary pharmacy; the gross, microscopic and chemic structure of drugs; weights and measures; pharmaceutical processes; and classes of pharmaceutical preparations.
- (b) General treatment of poisoning; principles of prescription writing and incompatibilities; principles and rules of incompatibility; rules for solubility; construction of prescriptions; grammar and phrases of prescription-Latin, with class practice in writing simple prescriptions; use and materia medica of flavors.
- (c) Materia medica is studied from the crude drugs and pharmaceutical preparations taken from the museum of materia medica to which the student has access at all times.

2. GENERAL PHARMACODYNAMICS (Experimental) PROFESSOR BROWN
Four and one-half credits (nine hours laboratory work per week) First semester

Required of sophomores.

Experiments on cold-blooded and warm-blooded animals, illustrating the action of drugs and the methods of pharmacologic experimentation. The class is divided into sections and these sections into groups of three to six students, each group performing experiments in the same line, but by modified methods or different drugs having a similar pharmacologic action. The results are discussed at conferences, and the conclusions arrived at from the sum of the results. The knowledge thus obtained is by direct observation and serves to impress the student with the actions of drugs, and prepares him for the systematic didactic courses given in the third year.

The experimental course includes the following subdivisions:

- (a) Actions of drugs on tissues outside the body, corrosives, hemoglobin, osmosis, etc.
- (b) Exercises on intact mammals, absorption and excretion of drugs; racial idiosyncrasy; treatment of poisoning; emetics; convulsants and depressants; pulse; pupils; salivation, etc.
- (c) Exercises on frogs, convulsants, central depressants, local anesthetics, striped and cardiac muscle, cardiac nerves, etc.
- (d) Operative work on mammals, general anesthetics, the effects of important drugs on blood pressure, respiration, oncometric and myocardiographic work, diuresis, peristalsis, perfusion of excised organs, isolated heart, etc.

3. SYSTEMATIC PHARMACOLOGY, TOXICOLOGY, MATERIA MEDICA AND THERAPEUTICS
 PROFESSOR BROWN
 Three credits (two hours lecture and recitation per week)
 First, second and third quarters

Required of all juniors.

This course is the principal didactic course given in the department. The instruction is given by lectures and recitations. Each drug or group of drugs is studied in detail under the following subdivisions:

- (a) *Pharmacodynamics*. The effects of drugs are studied from the experimental and clinical evidence. Constant reference is made to the results obtained in the experimental course (course 2).
- (b) *Toxicology*. Symptoms and treatment of poisoning.
- (c) *Materia Medica*. The student is required to be able to identify the more important drugs, learn their physical characters, doses, etc.
- (d) *Therapeutics*. The conditions in which the drugs are rationally indicated or in which their empirical use has been found of value.
4. PRESCRIPTION WRITING
 One credit (two hours lecture and recitations per week)
 Fourth quarter

Required of all juniors.

Hypothetical cases are given and the student is required to write a prescription for the treatment, using the proper drugs which have already been covered in the text.

Text-Books: Pharmacology, Sollmann.

5. CLINICAL THERAPEUTICS
 Two credits (one hour weekly)
 DRs. SHELDON AND CONDIT
 First and second semesters

Required of all seniors.

Bedside work in hospital and dispensary will be conducted having in view the therapy of cases which are under the special care of and study by the department of medicine.

6. THERAPEUTIC CONFERENCES
 Two credits (one hour weekly)
 DRs. CONDIT AND SHELDON
 First and second semesters

Required of all seniors.

Conferences on assigned topics to be prepared by students from the point of view of literature and current clinic records, will be conducted weekly. These will include the therapy of some of the common diseases and also the varied application of some of the common drugs and methods.

7. PRACTICAL PHARMACY
 One credit (four laboratory and lecture hours per week)
 PROFESSOR WULLING
 Third quarter

Required of all juniors.

1. U. S. Pharmacopeia.
 1. Metrology.
 2. Grades of drugs in use.
 3. Pharmacopoeial requirements as to purity.
2. Identity and impurities with U. S. Pharmacopoeial tests of six official substances.
3. Dispensing.
 1. The prescription.
 2. Compounding of prescriptions calling for the preparation of fourteen types of pharmacopoeial preparations.

Text-Books:

Pharmacology, Materia Medica and Therapeutics—Sollmann.

Collateral Reading—U. S. Pharmacopeia; Dosebook and Manual of Prescription Writing—Thornton; National Dispensary; National Formulary.

DEPARTMENT OF PATHOLOGY AND BACTERIOLOGY

FRANK F. WESBROOK, M.A., M.D., C.M., *Professor of Pathology and Bacteriology*

S. MARX WHITE, B.S., M.D., *Associate Professor of Pathology and Bacteriology*

H. W. HILL, M.D., *Assistant Professor of Bacteriology*

LOUIS B. WILSON, M.D., *Assistant Professor of Clinical Pathology*

J. FRANK CORBETT, B.S., M.D., *Assistant Professor of Surgical Pathology*

R. H. MULLIN, B.A., M.D., *Senior Demonstrator in Pathology and Bacteriology*

H. E. ROBERTSON, A.B., M.D., *Demonstrator in Pathology*

CHELSEA C. PRATT, M.D., *Junior Demonstrator in Pathology and Bacteriology*

J. L. ROTHROCK, A.M., M.D., *Clinical Instructor in Pathology*

ARTHUR S. HAMILTON, B.S., M.D., *Instructor in Pathology of the Nervous System*

Hospital Laboratory Assistants: Carl O. Estrem, B.A., M.D., and Tolbert Watson, A.B.

Departmental Laboratory Assistant: Lee Pollock.

The Institute of Public Health and Pathology, to which attention has already been directed, provides adequate room and facilities for teaching and research in pathology, bacteriology and public health.

The main laboratory, 56x75 feet, lighted on three sides and by a skylight, is used for the general or required courses. It is divided into twelve loges, each fully and independently equipped in every detail for the use of six students, who are responsible for all equipment therein contained. Supplies are distributed from a supply room opening off the main laboratory. Books and specimens required in teaching are easily procurable from the museum library, which is connected by a special or private passageway with the main laboratory. A combined lecture and autopsy room opens both from the main laboratory and from the hall so that autopsies, lantern demonstrations or lectures may be given during the period devoted to the laboratory exercises without interference with the practical work.

A smaller laboratory, one-half the size of the main laboratory, is provided for special work in graduate and optional courses in the diagnosis of tumors, pathology of the nervous system, practical public health, etc. The same loge arrangement obtains as in the main laboratory.

The hospitals of Minneapolis, St. Paul, Duluth, Rochester and St. Peter, in which members of the staff are working, afford a large supply of material and frequent opportunities for post-mortem examinations. From many institutions and physicians throughout the state, valuable and interesting gross and microscopic materials are received from time to time and are made available in the museum and for macroscopic and microscopic class use.

The State Board of Health laboratories for research and routine investigation are located in the institute as well as a Pasteur Institute for the study and treatment of rabies. This affords an abundance of illustrative material for public health, pathology and bacteriology.

A full equipment of microscopes permits of the rental of an instrument to each student, if he is not provided with one suitable for his purpose.

METHODS OF INSTRUCTION

In this department the center around which all instruction is grouped is constituted by the student's own personal practical experience in the laboratories. This is supplemented and coordinated by lectures, laboratory and lantern demonstrations and recitations as required.

1. GENERAL BACTERIOLOGY

PROFESSOR WESBROOK, ASSISTANT
PROFESSOR HILL, DR. MULLIN AND DR. PRATT

(Twelve lecture and recitation hours and twelve laboratory hours per week) Fourth quarter

Required of sophomores.

Lectures and demonstrations. The general scope of bacteriology, the history of its development and the biological and chemical problems involved in the life history of bacteria are dealt with. The classification of the various bacterial forms, the methods of isolation and culture and the composition and manufacture of culture media are studied until a thorough knowledge of technique is acquired. General and special study of the various antiseptics, disinfectants and bactericidal substances and conditions will be undertaken.

Laboratory work, involving the making of their own culture media by the students, the study of bacteria in cultures and under the microscope, technique of staining and other methods, including observations of chemical and biological peculiarities, is thoroughly carried out. Testing of various germicides, chemical and physical, and the use of bacteriological methods in the examination of drinking water form an important part of the work. Bacterial activities concerned in sewage purification, etc., receive attention.

2. GENERAL PATHOLOGY

PROFESSOR WESBROOK, DR. MULLIN, ASSOCIATE
PROFESSOR WHITE, DR. ROBERTSON, DR. PRATT

Nine credits (twelve lecture and recitation hours, and twelve laboratory hours per week) Fourth quarter

Required of sophomores.

Lectures, demonstrations and laboratory work on the general processes involved in disease, which includes

- (a) Inflammation. The cell reaction to various irritants is carefully studied throughout a variety of tissues and animals so as to be comparative. As soon as familiarity with cell reaction is insured, the inflammatory processes in the various organs and systems are studied.
- (b) Regeneration not already dealt with under inflammation is illustrated by specimens especially prepared from experimental animals and clinical and autopsy material.
- (c) Inflammatory reactions and pathological processes dependent upon the activities of the circulatory system, including metastasis, thrombosis, embolism, infarction, etc., are systematically studied.
- (d) Degeneration. The theories as to causation and the chemical processes involved are presented on the basis afforded by experimental work, together with a large amount of illustrative clinical material.
- (e) The general physical, chemical and biological processes involved in immunity are presented together with practical and illustrative work on precipitins, agglutinins, opsonins, etc. The pathology of fever is also fully given.
- (f) The theories of causation, the general principles involved and classification of tumors are illustrated by a carefully selected assortment of the various types.

3. PATHOLOGY OF SPECIAL DISEASES (includes Bacteriology)

PROFESSOR WESBROOK, ASSOCIATE
PROFESSOR WHITE, DR. MULLIN, DR. ROBERTSON AND DR. PRATT

Ten credits (four lecture or recitation hours and twelve laboratory hours per week, eighteen weeks) First semester

Required of juniors.

Disease processes will be grouped, so far as practicable, according to their etiology. Instruction will be afforded by means of lectures, demonstrations of museum specimens and preparations, and laboratory work on materials secured from clinical cases and at autopsy.

The course will consist of instruction in

1. Pathology of infectious diseases.
 - (a) Special bacteriology of the infectious diseases with the cultivation on the various media of all the important patho-

genic bacteria, sown and kept under observation by each student. Fluids and tissues from clinical cases and autopsies (human and animal) will be supplied for microscopic and cultural examination and an intimate relationship with clinical pathological work maintained.

- (b) Special pathology of the infectious diseases. Concurrently with the bacteriology and parasitology of each of the diseases, the pathology of each infection will be studied.

The important gross and microscopic lesions in all the organs will be illustrated from clinical and autopsy material, fresh and preserved, and supplemented by experimental work. Each student will be required to prepare and examine under the microscope selected fresh and stained specimens of morbid tissues, fluids, etc.

2. Pathology of toxic and obscure origin. Under this are included the special degenerations, inflammations and other pathological conditions not already included under infectious diseases.

4. AUTOPSIES AND POST-MORTEM TECHNIQUE ASSOCIATE PROFESSOR WHITE, DR. ROTHROCK, DR. MULLIN, DR. ROBERTSON AND DR. PRATT
Students will have an opportunity of personally taking part in this work, under the direction of the pathologists in charge, in the hospitals of Minneapolis and St. Paul. A knowledge of the technique of post-mortem work and of morbid anatomy will be thus afforded. Throughout the third and fourth years.

5. SPECIAL PATHOLOGY OF THE NERVOUS SYSTEM DR. HAMILTON AND DR. ROBERTSON
Two credits (twelve hours per week, first four weeks) Second semester

Required of juniors.

So far as possible, the clinical history, autopsy notes, gross specimens and sections stained by various special methods will be presented of individual cases representing the principal organic diseases of the nervous system.

6. PRACTICAL PATHOLOGY OF TUMORS ASSOCIATE PROFESSOR WHITE AND DR. R. H. MULLIN
(Twelve hours per week, four weeks) Second semester
(Elective for a limited number of students in fourth year.)
Laboratory course on the microscopic study and diagnosis of tumors.

This course includes the comprehensive study of tumors, with the view of giving the student a knowledge of the methods employed in the laboratory diagnosis of this class of pathological conditions and familiarizing him with the characters of the commoner as well as the rarer types, special attention, however, being given to the latter. It is intended to supplement the course on the surgical pathology of tumors by Professor Stewart.

7. RESEARCH WORK IN ONE OF THE FOLLOWING LINES: Second semester of third and throughout the fourth year, hours assigned.

(a) General pathology.

(b) Special pathology and bacteriology and technique.

8. SURGICAL PATHOLOGY PROFESSOR STEWART
(Two hours lecture and one hour recitation a week, first semester third year, and two hours per week, second semester, fourth year).

(See Principles of Surgery and Tumors.) This course will consist of lectures and laboratory demonstrations and will cover the general subject of the pathological and bacteriological basis of surgery. The lectures will be illustrated by charts and diagrams, by fresh and preserved specimens, and, so far as practicable, demonstrations will be given of the various processes of the bacteria concerned. Especial attention will be given to inflammation and its complications, to the infectious diseases of surgical importance and to tumors.

PATHOLOGICAL SOCIETY

The medical men of the State who are especially interested and are actually working in pathology and bacteriology formed a society in the autumn of 1901, which meets monthly from October to June, in the laboratories of the department. Papers embodying original work with illustrative specimens are presented at each meeting and once a year the society invites a special guest of honor to give an address in pathology or some allied subject.

Text-books :

Pathology—

- Delafield and Prudden's Handbook of Pathological Anatomy and Histology.
 American Text-Book of Pathology.
 Ziegler's General and Special Pathology.
 Schmaus-Ewing: Pathology and Pathological Anatomy.
 Coplin's Manual of Pathology.
 Cattell's Post-Mortem Pathology.
 Durck-Hektoen: Special Pathologic Histology.
 Jakob: Nervous System.
 Mallory and Wright's Pathological Technique.

Collateral Reading—Hamilton's Text-Book of Pathology; Woodhead's Practical Pathology; von Kahlden's Pathological Histology; Thoma's Text-Book of General Pathology; Lubarsch Ostertag, Ergebnisse der Pathologie u. Anatomie; Orth, Pathologische Anatomie; Birch-Hirschfeld, Pathologische Anatomie; Osler's System of Medicine; Clifford Allbutt's System of Medicine; Leukhart's die Thierische Parisiten des Menschen; Bouchard, Traite de Pathologie Generale; Eichorst, Pathologie du Therapie; Gaylord and Aschoff, Pathological Histology; Nothnagel, Encyclopedia of Practical Medicine; Wood, Chemical and Microscopical Diagnosis.

Surgical Pathology—

- Bland-Sutton, Tumors, Innocent and Malignant.
 Lexer's Handbook of Surgery.

HYGIENE

- HENRY MARTYN BRACKEN, M.D., L.R.C.S., (Edin.), *Professor of Preventive Medicine and Secretary of the Minnesota State Board of Health*
- F. F. WESBROOK, M.A., M.D., C.M., *Professor of Pathology and Bacteriology and Director of the Minnesota State Board of Health laboratories*
- F. H. BASS, *Assistant Professor of Municipal Engineering and Acting Sanitary Engineer, Minnesota State Board of Health*

Open to fourth-year students.

Second semester

The fundamental portions of this subject are covered in the practical and lecture courses on chemistry of water, air, soil, milk and other food, and in the department of physiology in physiological chemistry.

The life histories of bacteria and parasites which act as the causes of communicable diseases are covered in pathology and bacteriology as also the bacteriology of water and milk and courses on germicides and disinfection are given.

The remaining portions of the subject and the application of these principles already inculcated in practical sanitation are given in a special course of lectures and trips of inspection in the fourth year.

The legal phases of sanitation, including federal, state and municipal hygiene, together with the sanitation of various industries and the control of epidemic and communicable diseases are fully dealt with.

The relation of the laboratory and field methods to the location of foci of infection, the practical study of selection and purification of water supplies and the sanitary disposal of sewage and garbage, are thoroughly covered as is also the matter of the sanitary construction of buildings, ventilation and practical school hygiene.

In addition to the lectures and practical work at the college, visits of inspection will be made to abattoirs, sources of water supply, sewage disposal plants, garbage plants, detention hospitals for small pox and other communicable diseases, sanitary camps and sanatoria for tuberculosis, etc.

DEPARTMENT OF MEDICINE

CHARLES L. GREENE, M.D., *Professor of Medicine*

J. W. BELL, M.D., *Emeritus Professor of Physical Diagnosis and Clinical Medicine*

EVERTON J. ABBOTT, A.B., M.D., *Clinical Professor of Medicine*

CHARLES H. HUNTER, A.M., M.D., *Clinical Professor of Medicine*

JAMES T. CHRISTISON, M.D., *Professor of Diseases of Children*

GEORGE D. HEAD, B.S., M.D., *Professor of Clinical Microscopy and Clinical Medicine*

LOUIS A. NIPPERT, M.D., *Clinical Professor of Medicine*

CHARLES NOOTNAGEL, M.D., *Clinical Professor of Medicine and Physical Diagnosis*

THOMAS S. ROBERTS, M.D., *Clinical Professor of Diseases of Children*

GEORGE E. SENKLER, M.D., *Clinical Professor of Medicine*

HENRY L. STAPLES, A.M., M.D., *Clinical Professor of Medicine*

C. H. BRADLEY, M.D., *Clinical Instructor in Medicine*

W. H. CONBIT, B.S., M.D., *Instructor in Therapeutics and Materia Medica*

J. G. CROSS, M.D., *Clinical Instructor in Medicine*

JAMES GILFILLAN, M.D., *Clinical Instructor in Medicine*

P. A. HOFF, M.D., *Clinical Instructor in Medicine*

DAVID LANDO, M.D., *Clinical Instructor in Medicine*

WALTER R. RAMSEY, M.D., *Clinical Instructor in Diseases of Children*

SOREN P. REES, B.S., M.D., *Instructor in Physical Diagnosis and Clinical Medicine*

W. D. SHELDON, M.D., *Clinical Instructor in Medicine and Instructor in Therapeutics*

THOS. W. STUMM, M.D., *Clinical Instructor in Medicine*

HENRY L. ULRICH, M.D., *Instructor in Clinical Microscopy*

ASSISTANTS IN MEDICINE

W. H. AURAND, M.D., *Clinical Assistant in Medicine*

HERMAN A. BOUMAN, M.D., *Clinical Assistant in Medicine*

PAUL B. COOK, M.D., *Clinical Assistant in Medicine*

- L. O. DART, M.D., *Clinical Assistant in Diseases of Children*
 E. K. GREEN, A.B., M.D., *Clinical Assistant in Medicine*
 ALEX. R. HALL, M.D., *Clinical Assistant in Medicine*
 JOHN E. HYNES, M.D., *Clinical Assistant in Medicine*
 J. P. SEDGWICK, M.D., *Clinical Assistant in Diseases of Children*
 CHAS. B. WRIGHT, A.B., M.D., *Clinical Assistant in Diseases of Children*

GENERAL MEDICINE

THIRD YEAR

1. CASE-TAKING AND GENERAL SYMPTOMATOLOGY PROFESSOR GREENE
 (Three hours a week) First quarter
 (a) Lectures and recitations (three hours a week) Second quarter
 (b) Practical clinical exercises at University clinical building
 and St. Paul Free Dispensary.
2. PHYSICAL DIAGNOSIS PROFESSORS GREENE, NOOTNAGEL AND SENKLER
 (Three hours a week) Second quarter
 (a) Lectures and recitations.
 (b) Clinical exercises throughout the junior year at the hos-
 pitals and dispensaries of Minneapolis and St. Paul.
 This course includes:
 (a) The thorax, its topography and the methods of examina-
 tion applied to both the normal and abnormal chest.
 (b) The cardiac region, its topography and methods of examina-
 tion.
 (c) The lungs and pleura in health and disease.
 (d) The abdominal organs including both general and special
 methods of examination, i. e., examination of stomach con-
 tents, practical urinary examination, etc.
 In this course especial attention is given to the study of the
 normal as well as the abnormal chest and abdomen, and,
 wherever possible, opportunity is given the student to examine
 cases personally and watch their progress and termination.
3. PROFESSOR GREENE
 (Three hours a week) Second semester
 (a) Systematic lectures, case analyses and quizzes on the
 diseases of the heart and blood vessels.
 (b) Diseases of the lung and pleura.
 (c) Diseases of the kidney.
 (d) Practical clinical exercises in the form of clinical lectures
 and work in small sections in the wards of the various hos-
 pitals and St. Paul Free Dispensary, twice weekly, and in
 the University Dispensary daily throughout the whole
 semester.
4. ACUTE INFECTIOUS DISEASES
 Work in small sections in the city hospitals of Minneapolis and
 St. Paul, twice weekly (in St. Paul after January 1st).

FOURTH YEAR

5. SYSTEMATIC LECTURES, CASE ANALYSIS AND RECITATIONS PROFESSOR GREENE
 This course covers the acute infectious diseases.
 In this connection special attention is given to the so-called tropi-
 cal diseases, at the present day important because of our terri-
 torial extension.
6. CLINICAL EXERCISES AT THE CITY HOSPITALS OF THE TWIN CITIES
 Correlated with the instruction given in course 5. Minneapolis
 City Hospital throughout the year. St. Paul City Hospital
 after January 1st, each year.
7. PROFESSOR GREENE
 (a) Diseases of the blood and ductless glands. Systematic lec-
 tures, case analyses and recitations, fourth quarter, twice
 weekly.

- (b) Special instruction in sections at the hospitals and dispensaries, correlated with the course as given above.

8

PROFESSOR GREENE

Systematic lectures and recitations twice weekly.

- (a) Diseases of the stomach, liver and intestines.
- (b) Special clinical work in sections correlated with course given above.

The clinical courses 1 b, 2 b, 3 b, 4, 6, 7 b, and 8 b, are given for the most part to small sections of the junior and senior classes in the wards and amphitheatres of the several hospitals and dispensaries of Minneapolis and St. Paul, as follows:

- (a) City Hospital, Minneapolis, two hours a week, both years. Professors J. W. Bell, H. L. Staples and C. Nootnagel, Dr. L. A. Nippert and Dr. S. P. Rees. One hour a week, senior year. Dr. Geo. D. Head and Dr. S. Marx White, Dr. J. G. Cross and Dr. W. D. Sheldon.
- (b) St. Barnabas Hospital, Minneapolis, two hours a week, both years. Professor C. H. Hunter.
- (c) City and County Hospital, St. Paul, two hours a week both years. Professor E. J. Abbott.
- (d) City and County Hospital, St. Paul, two hours a week, both years. Professor C. L. Greene and Dr. Senkler.
- (e) Free Dispensary at St. Paul, two hours a week, both years. Professor C. L. Greene and Drs. Ramsey and Hoff.
- (f) University Clinical Building, Minneapolis, four hours a week, both years. Dr. L. A. Nippert, Dr. Geo. D. Head.

9. GENERAL CLINICAL COURSE

In addition to the courses above named, clinical lectures are given twice weekly to both junior and senior classes. At each are shown cases of unusual interest and importance. The section work throughout the two years is exceptionally valuable by reason of the small size of the sections, every effort being made to bring the student closely in touch with the teacher and patient.

10. CASE ANALYSIS

PROFESSOR GREENE AND CLINICAL INSTRUCTOR HOFF

Throughout both the junior and senior years special attention is given to the analysis of actual cases illustrating those portions of the courses that have been dealt with in the lecture room or in the clinical lectures, students being in this way compelled to apply practically such knowledge as they have gained and not only make a diagnosis but go thoroughly into the analysis and bearing of general symptomatology. The older method of simply quizzing in connection with lecture work has been abandoned so far as possible. Exercises throughout the year.

Text and Reference Books—Practice of Medicine: Osler's Practice; Tyson's Practice; Thompson's Practical Medicine; Ander's Practice. Physical Diagnosis and Clinical Methods: Greene's Medical Diagnosis; Butler's Diagnosis; Sahli's Diagnostic Methods; Cabot's Diagnosis; Musser's Diagnosis; Hare's Diagnosis; Bramwell's Practical Medicine; Cabot's Medical Cases; Hutchinson and Rainey's Clinical Methods. Collateral Reading: Cabot on the Blood; Du Costa on the Blood; Himmeter's Diseases of the Stomach; Bons' Diseases of the Stomach; Allbutt's System of Medicine; American Text Book of Medicine; Gibson's Practice; Gibson on Diseases of the Heart and Aorta; Babcock on Diseases of the Heart; Ebstein and Schwalbe, Handbuch der Praktischen Medizin.

DISEASES OF CHILDREN

1.

PROFESSOR J. T. CHRISTISON

Second semester

(Two lectures a week)

Open to third-year students.

Lectures arranged to cover so far as possible the general subject of pediatrics. This course begins with a consideration of the special characteristics of the normal infant and child, as distinguished

from the adult, and passing on to a detailed description of the features and management of the diseases peculiar to infancy and childhood and of the more or less specialized forms in which certain diseases common to all ages exist during the early years of life. These lectures will be suitably illustrated by charts, colored plates, specimens, and the occasional use of the stereopticon.

2. PROFESSOR CHRISTISON, DR. RAMSEY AND DR. COOK
Clinical Instruction will be given at the St. Paul Free Dispensary and the St. Paul City Hospital four hours weekly throughout the third and fourth years.
3. PROFESSOR ROBERTS, DR. DART AND DR. WRIGHT
Clinical instruction will be given at the St. Paul Free contagious wards of the City Hospital, the Children's Home, the University Free Dispensary and other specially designated places at such times as opportunity presents. Third and fourth years.

Text-Books:

Holt's Diseases of Children.
 Rotch's Pediatrics.
 American Text-Book of Diseases of Children.
 Collateral Reading—Osler's Practice of Medicine; Keating's Cyclopedia of Diseases of Children; Corlett's Acute Infectious Exanthemata; Chapin's Theory and Practice of Infant Feeding; Stengel's Nootnagel's Encyclopedia.

CLINICAL MICROSCOPY

1. PROFESSOR GEORGE DOUGLAS HEAD
Two credits (two lecture hours and four laboratory hours per week) Third quarter
Required of senior students.
The course includes:
 - (a) The urine; a macroscopical study of its colors, and sediments, and the microscopical study of blood, pus, epithelial casts, spermatozoa, etc., in the urine of disease.
 - (b) The blood; the counting of red and white cells in the blood, the estimation of hemoglobin, the making of blood smears, and the fixing, staining, mounting and studying of all forms of normal and pathological red and white blood cells. In this course students are given specimens of blood from cases of pernicious anemia, myelogenous leukemia, and lymphatic leukemia, for study.
 - (c) Stomach contents; the macroscopical, chemical, and microscopical study of gastric contents in various diseases of the stomach, with special reference to differential diagnosis, by lectures and demonstrations.
 - (d) Exudates and transudates in various diseases of the pleura and peritoneum. Nine hours a week during half of the second semester.

Books of Reference:

Simon's Clinical Diagnosis.
 Cabot's Clinical Examination of the Blood.
 Ewing's Clinical Pathology of the Blood.
 Reider's Atlas of Urinary Sediments.
 Sahll's Lehrbuch der Klinischen Untersuchungs Methoden.
 Ogdens's Clinical Examination of the Urine.
 Boston's Clinical Diagnosis.
 Wood's Chemical and Microscopical Diagnosis.
 Emmerson's Clinical Diagnosis.

The senior class is divided into sections of four each and assigned to the laboratory of clinical microscopy four days of the week throughout the college year. In this work the students are required to make urine, sputum, and stomach contents examinations of the cases coming to the free dispensary. This instruction is under the charge of Dr. Henry L. Ulrich.

DEPARTMENT OF SURGERY

- CHARLES A. WHEATON, M.D., *Emeritus Professor of Surgery*
 JAMES E. MOORE, M.D., *Professor of Surgery*
 J. CLARK STEWART, B.S., M.D., *Professor of the Principles of Surgery*
 FREDERICK A. DUNSMOOR, M.D., *Professor of Operative and Clinical Surgery*
 ARTHUR J. GILLETTE, M.D., *Professor of Orthopedic Surgery*
 J. FRANK CORBETT, M.D., *Assistant Professor of Surgical Pathology*
 ARCHIBALD MACLAREN, A.B., M.D., *Clinical Professor of Surgery*
 A. T. MANN, B.S., M.D., *Clinical Professor of Surgery*
 HENRY J. O'BRIEN, M.D., *Clinical Professor of Surgery*
 JUSTUS OHAGE, M. D., *Clinical Professor of Surgery*
 JOHN T. ROGERS, M.D., *Clinical Professor of Surgery*
 H. B. SWEITZER, M.D., *Clinical Professor of Surgery*
 JNO. B. BRIMHALL, M.D., *Clinical Instructor in Orthopedic Surgery*
 A. R. COLVIN, M.D., *Clinical Instructor in Surgery*
 WARREN A. DENNIS, M.D., *Clinical Instructor in Surgery*
 JUDD GOODRICH, M.D., *Clinical Instructor in Surgery*
 ARTHUR A. LAW, M.D., *Instructor in Operative Surgery*
 HARRY P. RITCHIE, M.D., *Instructor in Surgery*
 VAN H. WILCOX, M.D., *Instructor in Operative Surgery*
 R. E. FARR, M.D., *Clinical Instructor in Surgery*
 EMIL S. GEIST, M.D., *Clinical Assistant in Orthopaedia*
 ARCHA WILCOX, M. D., *Clinical Assistant in Surgery*

COURSES OF INSTRUCTION

The course in surgery is graded in the third and fourth years. Examinations are held at the close of each of these years. Lectures and recitations are given by the teaching staff in surgery and clinics at the dispensaries and hospitals of Minneapolis and St. Paul by a large corps of instructors.

1. THE PRINCIPLES OF SURGERY PROFESSOR STEWART
 Lectures and recitations (two hours a week) First semester
 Open to juniors.
 Inflammation; traumatic fevers, suppurations; acute inflammations of joints; ulceration, gangrene; thrombosis and embolism; septicemia; pyemia; erysipelas; tetanus; surgical tuberculosis; actinomycosis, anthrax and glanders.
2. OPERATIVE SURGERY PROFESSOR DUNSMOOR
 (Two hours a week) Third quarter
 Open to juniors.
 Lectures upon the principles of operative procedure; the preparation of patient, operator and operating rooms, the principles of asepsis, antiseptics and sterilization; anesthesia and anesthetics; hemostasis, ligatures and sutures; dressings, bandages and the treatment of wounds.
3. THE PRACTICE OF SURGERY PROFESSOR MOORE
 Lectures and recitations (three hours a week) Second semester
 Open to juniors.

Fractures and dislocations; injuries of joints; injuries and surgical diseases of the skin; of the lymphatics, blood vessels and nerves; of the tendons, fasciae and bursae; of the face, mouth tongue, jaws (excepting the study of tumors).

4. THE PRACTICE OF SURGERY PROFESSOR MOORE
(Three hours a week) First semester
Open to seniors.
Surgery of the head, neck, chest, back, breast, abdomen, including hernia, anus, rectum and urinary tract. Lectures and recitations.
5. OPERATIVE SURGERY PROFESSOR DUNSMOOR AND DR. LAW
(Six hours a week) First quarter
Open to seniors.
An elective laboratory work, consisting of operations, performed by sections of the class under the supervision of the instructors, upon the cadaver and upon animals.
6. ORTHOPEDIC SURGERY PROFESSOR GILLETTE
Lectures and recitations (three hours a week) Fourth quarter
Open to seniors.
This includes diseases of bones, joints, synoviae and bursae, congenital and acquired deformities; dystrophies, with the principles of treatment.
7. TUMORS PROFESSOR STEWART
Lectures and recitations (two hours a week) Second semester
Open to seniors.
A special course upon tumors, taking up the general pathology and the general principles of the treatment of tumors. Each variety of tumor is then discussed, together with its histology, life-history, diagnosis and treatment. The course is illustrated by charts and museum specimens and lantern slide demonstrations.
8. BANDAGING AND DRESSING PROFESSOR DUNSMOOR AND DR. LAW
(Eight hours)
Open to seniors.
A practical course of instruction, by means of demonstrations and drill upon animals and cadaver by the student in person, under the supervision of the chair of operative surgery.
9. CLINICAL SURGERY
Courses of clinics at which operations, in the whole domain of surgery, are witnessed by the students of the third and fourth years. These clinics are held in the dispensaries and hospitals of the cities of Minneapolis and St. Paul, upon Thursdays and Saturdays throughout the year. The classes alternate at the two cities in their attendance upon these clinics. They are conducted personally throughout the year, by the clinical chiefs and their associates as follows:
At the City and County Hospital, St. Joseph's Hospital, St. Luke's Hospital in St. Paul, weekly, by Professor John T. Rogers.
At the City and County Hospital, St. Joseph's Hospital, St. Lukes' Hospital or Free Dispensary, in St. Paul, with sections of class weekly, by Professor John T. Rogers, Dr. G. M. Coon, Professor A. J. Gillette, Dr. W. A. Dennis, Dr. Judd Goodrich and Dr. A. Colvin.
At St. Luke's Hospital, Professor Archibald McLaren.
At St. Joseph's Hospital, Professor H. J. O'Brien.
At the City and County Hospital, or at St. Joseph's Hospital, or at St. Luke's Hospital, St. Paul, weekly, by Professor Justus Ohage.
At the Northwestern Hospital, Minneapolis, weekly, by Professor J. E. Moore.
At the Asbury Hospital, Swedish Hospital or the City Hospital, Minneapolis, weekly, by Professors F. A. Dunsmoor and J. Warren Little.
At the City Hospital, Minneapolis, weekly, by Professors J. Clark Stewart, J. Warren Little and A. T. Mann.

At St. Mary's Hospital, Minneapolis, by Dr. Farr.
At the University Free Dispensary, by Professor Mann, Drs.
Law and Condit.

Text-Books:

Lexer's Handbook of Surgery.
Parks' Surgery.
International Text-Book of Surgery.
Warrens' Surgical Pathology and Therapeutics.
Surgical Diagnosis, Berg.
Bryant's Operative Surgery.
Rinnie's Operative Surgery.
Scudder on Fractures.

Collateral Reading—

Moore's Orthopedic Surgery.
Bradford's and Lovett's Orthopedic Surgery.
Witman's Orthopedic Surgery.

OPHTHALMOLOGY AND OTOTOLOGY

FRANK C. TODD, M.D., *Professor of Ophthalmology and Otology*

E. V. APPLEBY, M.D., *Clinical Instructor in Ophthalmology*

JOHN S. MACNIE, M. D., *Clinical Instructor in Ophthalmology and Otology*

CHAS. N. SPRATT, B.S., M.D., *Clinical Instructor in Ophthalmology and Otology*

H. JOURNEY WELLS, M.D., *Clinical Assistant in Ophthalmology and Otology*

FRANK E. BURCH, M.D., *Clinical Assistant in Ophthalmology and Otology*

COURSES OF INSTRUCTION

1. DISEASES OF THE EYE AND ITS APPENDAGES PROFESSOR TODD
(Three hours a week) First quarter
Lectures and recitations.
Refraction and its errors. Illustrated with specimens and stereopticon.
2. DISEASES OF THE EAR PROFESSOR TODD
(One hour a week) First quarter
Lectures and recitations.
3. PROFESSOR TODD
Clinical lectures will be given and operations performed at Asbury or Northwestern Hospital, Minneapolis, every Thursday, third and fourth year. Clinics will be given at the Minneapolis City Hospital during December, January, February and March, third and fourth years.
4. Clinical instruction will be given at the University, and St. Paul Free Dispensaries in the diagnosis of diseases of the eye and ear; in the methods of examination; in the use of instruments, including the ophthalmoscope, and in the treatment of eye and ear diseases, etc. Fourth year.
Diseases of ear, St. Paul, Professor Schadle
Diseases of the eye, St. Paul, Dr. Appleby and Dr. Burch
Diseases of eye and ear, Minneapolis, Dr. Macnie and Dr. Wells
5. OPHTHALMOSCOPY DR. J. S. MACNIE
A practical course of instruction, elective in the senior year.

Text-Books:

May, Diseases of the Eye.
Wood & Woodruff, Common Diseases of the Eye.
Fox's Diseases of the Eye.
Bacon's Diseases of the Ear.

Collateral Reading—DeSchweinitz's Diseases of the Eye; American Text-Book; Norris and Oliver's Ophthalmology; Politzer's Diseases of the Ear; Vassey's Diseases of the Eye; Posey & Wright, Diseases of the Eye, Ear, Nose and Throat.

DISEASES OF THE THROAT AND NOSE

JACOB E. SCHADLE, M.D., *Professor of Rhinology and Laryngology*
WILLIAM R. MURRAY, A.B., M.D., *Clinical Professor of Rhinology and Laryngology*
R. A. CAMPBELL, M.D., *Clinical Instructor in Rhinology and Laryngology*
J. A. WATSON, M.D., *Clinical Instructor in Rhinology and Laryngology*

COURSES OF INSTRUCTION

1. ANATOMY AND PHYSIOLOGY OF THE NOSE AND THROAT PROFESSOR SCHADLE
Lectures and recitations (two hours a week, eight weeks).
Open to seniors.
Pathology, diagnosis and treatment.
2. CLINICAL INSTRUCTION PROFESSOR MURRAY AND DR. CAMPBELL
(Five hours a week) Both semesters
Open to seniors.
Given at the University Free Dispensary, Minneapolis, in the diagnosis and treatment of diseases of the nose and throat; in the methods of examination; in the use of instruments, and in the application of remedies, etc.
3. OPERATIVE CLINICS PROFESSOR MURRAY
These will be held at Asbury or City Hospital, Minneapolis, every Thursday, third and fourth year.
4. CLINICAL INSTRUCTION PROFESSOR SCHADLE
(Two hours a week) Fourth year
Given at the St. Paul Free Dispensary, in the diagnosis of diseases of the nose and throat; in the methods of examination; in the practical use of instruments and application of remedies; and in the applied anatomy of the nose and throat, illustrated by dry and wet preparations.

Text-Books:

Schadle's Outlines of Diseases of Nose and Throat.
Coakley's Diseases of the Nose and Throat.
Grayson's Diseases of the Nose and Throat.
Collateral Reading—Bosworth's Diseases of the Nose and Throat.
Posey and Wright's Diseases of the Ear, Nose and Throat.
Kyle's Diseases of the Nose and Throat.

SKIN, GENITO-URINARY, AND VENEREAL DISEASES

MAX P. VANDER HORCK, M.D., *Professor of the Diseases of the Skin and the Genito-Urinary System*

BURNSIDE FOSTER, M.A., M.D., *Clinical Professor of Diseases of the Skin*

F. R. WRIGHT, M.D., *Clinical Instructor in Dermatology and Genito-Urinary Diseases*

GEORGE M. COON, M.D., *Clinical Instructor in Genito-Urinary Diseases*

JOHN M. ARMSTRONG, M.D., *Clinical Assistant in Genito-Urinary Diseases*

S. W. SWEITZER, M.D., *Clinical Instructor in Dermatology and Genito-Urinary Diseases*

COURSES OF INSTRUCTION

This subject is taught by lectures, recitations and clinical demonstrations.

1. THE ANATOMY AND PHYSIOLOGY OF THE SKIN PROFESSOR VANDER HORCK
(Two hours a week) Second semester
Open to seniors.
Diseases of the skin and its appendages; venereal and genito-urinary diseases.
2. CLINICAL LECTURES PROFESSORS VANDER HORCK AND FOSTER,
AND DR. WRIGHT
(Once a week) Third and fourth years
In connection with the dispensaries and hospitals of Minneapolis and St. Paul.

Text-Books:

Keye's or White and Martin's Diseases of Urinary Organs.

Lydston's Genito-Urinary, Venereal and Sexual Diseases.

Hyde's Diseases of the Skin.

Walker's Dermatology.

Jackson's Diseases of the Skin.

Hyde and Montgomery's Venereal Diseases.

Collateral Reading—Crocker's Diseases of Skin; Morris' Diseases of the Skin; Hayden's Diseases of the Skin; Stelwagon's Diseases of the Skin; Taylor's Genito-Urinary and Venereal Diseases of the Skin.

GYNECOLOGY

ALEXANDER J. STONE, M.D., LL.D., *Professor of Diseases of Women*

AMOS W. ABBOTT, M.D., *Clinical Professor of Diseases of Women*

JOHN L. ROTHROCK, A.M., M.D., *Clinical Professor of Diseases of Women*

GEO. C. BARTON, M.D., *Clinical Instructor in Gynecology*

ARTHUR E. BENJAMIN, M.D., *Clinical Instructor in Gynecology*

H. L. WILLIAMS, A.B., M.D., *Clinical Instructor in Gynecology*

COURSES OF INSTRUCTION

The course in the diseases of women consists of lectures, recitations, clinical instruction and the witness of operations upon the human subject, as they may offer.

1. LECTURES AND RECITATIONS PROFESSOR STONE
Two hours per week, first semester. One hour a week, second semester.
Open to fourth-year students.

2. CLINICAL COURSES AT THE CITY AND OTHER HOSPITALS IN MINNEAPOLIS AND ST. PAUL. Observations and examinations of patients, methods of examination, diagnosis and treatment. Weekly clinics in Minneapolis hospitals, by Prof. Abbott, Dr. Benjamin and Dr. Williams.
Weekly clinics held in St. Joseph's Hospital, St. Paul, by Prof. Stone.
Weekly clinics held at the City and County Hospital, St. Paul, during January, February, and March, by Dr. Rothrock.

The above announcements represent the surgical work given in gynecology throughout the entire year. Every operation in this branch of surgery is presented in these clinics. Owing to the limited field within which this work must be done, the attempt is always made to divide the class into small sections. Daily clinics for small sections are held at the University and St. Paul Free Dispensaries by Drs. A. E. Benjamin, H. L. Williams, and J. L. Rothrock. This work is especially valuable since it brings the student into direct acquaintance with the patient. Individual instruction is given in history-taking, diagnosis, methods of examination, treatment and minor gynecology.

Text-Books:

- Dudley's Diseases of Women.
 - Reed's Text-Book of Gynecology.
 - Kelly's Operative Gynecology.
- Collateral Reading—Penrose, Gleist and Ashton.

OBSTETRICS

- PARKS RITCHIE, M.D., *Professor of Obstetrics*
 A. B. CATES, A.M., M.D., *Professor of Obstetrics*
 FREDERICK LEAVITT, M.D., *Clinical Professor of Obstetrics*
 J. C. LITZENBERG, B.S., M.D., *Clinical Professor of Obstetrics*
 JEANETTE M. McLAREN, M.D., *Clinical Instructor in Obstetrics*
 F. L. ADAIR, M.D., *Clinical Instructor in Obstetrics*

COURSES OF INSTRUCTION

The subject of obstetrics is taught by lectures, recitations and demonstrations upon the manikin; by illustrative drawings and by attendance upon cases of labor. The didactic work is done in the third year; the clinical study is had in the fourth year. A large part of the obstetric service of the City Hospital in St. Paul and of the Minneapolis City Hospital is at the disposal of the department of obstetrics. Clinics are also held at other hospitals in St. Paul and Minneapolis.

1. THE ANATOMY AND PHYSIOLOGY OF THE PELVIC ORGANS
PROFESSORS CATES AND RITCHIE
 (Lectures and recitations two hours a week in October and January, and three hours a week, second semester)
 Open to third-year students.
 The development of the embryo and appendages; pregnancy; symptoms and diseases; operative obstetrics; the complications of labor and its sequelæ.
2. THE THEORY AND PRACTICE OF OBSTETRICS
PROFESSOR LEAVITT
 (Lectures and recitations two hours a week in November, December and January)
 Open to third-year students.
 The mechanism and conduct of normal labor, with its complications; abortions.
3. HOSPITAL WARD WORK
PROFESSOR LEAVITT
 Twice a week, from January 1st to May 1st, small sections of the senior and junior classes will study the signs of pregnancy,

pelvimetry, obstetric diagnosis, the puerperal state, the early care of infants, incubation, etc., in the maternity wards of the City and County Hospital, St. Paul.

4. **CLINICAL OSTETRICS**

The study of and the participation in the conduct of two or more hospital deliveries in the fourth year under the direction of Professors Leavitt and Litzenberg. Also a number of confinements in maternities and private homes, conducted by Doctors Adair and Jeanette McLaren.

5. **MANIKIN DEMONSTRATIONS**

PROFESSOR LITZENBERG AND DR. ADAIR

Once a week during the third and fourth years the various positions, presentations and obstetric operations will be demonstrated by means of the manikin.

6. **RECITATIONS**

PROFESSORS LEAVITT AND LITZENBERG

(One hour a week)

First and second semesters

Open to fourth-year students.

This course will be a review of the subject of practical obstetrics by recitations.

Text-Books:

Edgar, Williams, Jewett, Lusk, Hirst, Peterson, and the American Text-Book of Obstetrics.

THE HISTORY OF MEDICINE

PROFESSOR BURNSIDE FOSTER

(Two hours a week)

Fourth year

An elective course of lectures is given on the history of medicine and of the medical profession from the earliest times, including accounts of the epoch-making discoveries in medicine, brief sketches of the lives of eminent physicians and an account of the great plagues in history.

MEDICAL JURISPRUDENCE

PROFESSOR SWEENEY

(Two hours a week)

Fourth year

A course of lectures and recitations, in the legal relations of medicine.

Text-Books:

Taylor's Medical Jurisprudence.

Collateral Reading—Withaus' Principles of Forensic Medicine and Toxicology; Wharton and Stille's Medical Jurisprudence; Reese's Medical Jurisprudence and Toxicology; Draper's Medical Jurisprudence.

Alumni Association

No alumni of the University are more loyal than those of the College of Medicine and Surgery nor has any group of alumni done more for the institution. The alumni of this college through its association organized many years ago, were probably the first to take united and official action in forwarding college and general University interests. Many of the alumni of the association are alumni also of the College of Science, Literature and the Arts or of some other college of the University and there is an increasing percentage of such persons. On this account the alumni of this college are also able and willing supporters of matters of general University import.

All graduates of this college in good standing are eligible to membership in the Alumni Association by payment of the annual dues of \$1.

The officers of the association for the year ending June, 1908, are as follows:

President, Dr. Harry P. Ritchie, St. Paul.

First Vice-President, Dr. J. C. Litzenberg, Minneapolis.

Second Vice-President, Dr. Geo. E. Sherwood, Kimball.

Secretary-Treasurer, Dr. Herbert W. Jones, Minneapolis.

An advisory committee consisting of twelve graduates and the president and secretary of the Alumni Association, by keeping in touch with teaching and practice in this and other centers, has been most helpful in suggesting improvements. Not only has it given valuable suggestions but its enthusiastic and active support is largely responsible for the securing of contributions from the citizens of Minneapolis for hospital site and in the general interest which resulted in the legislative support of the new University hospital for the College of Medicine and Surgery. This donation perhaps did more than anything else to show the legislature the absolute need of more land for University purposes and in that way led to the generous state appropriations by which the campus will be more than doubled.

The advisory committee for the year 1906-7 is as follows, the new committee being not yet appointed:

Dr. John C. Boehm, St. Cloud, Minn.

Dr. Frank C. Todd, Minneapolis, Minn.

Dr. L. B. Wilson, Rochester, Minn.

Dr. John T. Christison, St. Paul, Minn.

Dr. E. H. Beckman, Rochester, Minn.

Dr. W. R. Ramsey, St. Paul, Minn.

Dr. Paul Cook, St. Paul, Minn.

Dr. A. E. Hedback, Minneapolis, Minn.

Dr. W. A. Dennis, St. Paul, Minn.

Dr. C. J. Ringnell, Minneapolis, Minn.

Dr. A. E. Benjamin, Minneapolis, Minn.

Dr. Chas. Bray, Biwabik, Minn.

Dr. Geo. D. Head, President.

Dr. Herbert W. Jones, Secretary-Treasurer.

All medical alumni should join the Alumni Association so as to keep in touch with their fellow alumni, and with the college, and University, and thus place themselves in a position to loyally serve their alma mater. Subscription to the Alumni Weekly should be made by all. The cost is \$1 per year, if paid in advance. The editor, Mr. E. B. Johnson, is giving his whole time to this work and the work as secretary of the General Alumni Association, and he is anxious to get into and keep in touch with all of the alumni of the University.

The College of Medicine and Surgery is maintaining a Bureau of Information for its graduates. Among other things, hospital positions, new openings for practice, opportunities for *locum tenens* work, etc., are recorded.

There were available in the dean's office, hospital internships for each member of the graduating class, and all of our available graduates who had served as internes were provided with desirable salaried positions or suitable locations. More than fifty other men could have been given similar advantages. This is the result of the first year's informal operation of the bureau of information and the mutual advantages are apparent.

It is very important that the exact address of each alumnus be on file in the office, and the Board of Regents has authorized the publication of the list of alumni which follows.

Each alumnus is earnestly requested to scrutinize the directory carefully, and if any mistakes are seen concerning either himself or anyone else, it will be taken as a kindness if the proper information is forwarded to the dean's office. Furthermore, at this time request is made of each alumnus that he keep the office informed as to his movements and his progress in professional work, including appointments, publications or honorary recognitions which may come to him. It is desired to keep on file all data concerning our alumni for historical purposes.

All correspondence relative to Medical Alumni Association matters should be addressed to Dr. Herbert W. Jones, Secretary-Treasurer, Pillsbury Building, Minneapolis, Minn.

Alumni College of Medicine and Surgery

University of Minnesota (Including year 1906-7)

Abbott, Claude U., '04	Minneapolis
Abbott, William P., '06	St. Paul
Adams, Bertram S., '01	Hibbing
<i>B. S., University of Minnesota.</i>	
Adams, J. W., '86	Philadelphia, Pa.
Adams, Rollin T., '93	Mantorville
<i>B. S., Carleton.</i>	
Agnew, Anna M., '99	Hudson, Wis.
*Ahlstrom, Alfred E., '00	St. Peter
Aitkins, Herbert B., '93	Le Sueur Center
<i>B. A., Manitoba University.</i>	
Alexander, Frank H., '97	Barnesville
Alger, Edmund W., '02	Minneapolis
Allen, Harry W., '00	Minneapolis
<i>M. S.</i>	
Allen, Mason, '97	St. Paul
Alley, Albert G., '05	Buffalo
Anderson, Arnt G., '04	Hillsboro, N. D.
Anderson, August R., '91	Sioux City, Ia.
Anderson, Carl A., '05	Deer Creek
Anderson, Christopher A., '92	Rush City
Anderson, Edwin C., '97	Billings, Mont.
Anderson, Wilmar L., '04	Minneapolis
Anderson, William S., '03	Houston
Angell, William A., '95	Canby
Appleby, E. Villiers, '94	St. Paul
Arey, Hugh C., '02	Excelsior
Argue, George Wm., '01	Breckenridge
Argue, Hiram S., '05	Bathgate, N. D.
Armstrong, John M., '01	St. Paul
Arneberg, John G., '05	Leeds, N. D.
Aronsohn, David M., '05	St. Paul
*Arslandides, Michael T., '94	Caesarea, Asia Minor
<i>B. A., Anatolia College.</i>	
Arzt, Carl P., '95	St. Paul
Arzt, Phillip G., '05	St. Paul
Ashley, E. Mayo, '06	Missoula, Mont.
Ashley, Paul L., '06	Frazee
Aspelund, Joseph S., '06	Minneapolis
Aubin, Louise M., '93	Racine, Wis.
Aurand, William H., '01	Minneapolis
Aurness, Peter A., '92	Minneapolis
Austin, William J., '05	Watkins
Avery, J. Fowler, '99	Aitkin
Axilrod, David R., '03	Hutchinson
Bacon, Harry P., '97	Milaca, Minn.
Bacon, Knox, '94	St. Paul
Bailey, John Wm., '94	Seattle, Wash.
Baillie, Willtams F., '03	Hunter, N. D.
• Deceased.	

Baker, Mary K., '00	St. Paul
Bakke, Peter R., '92	Grantsburg, Wis.
*Bakke, Peter H., '91	Kenyon
Baldwin, Louis B., '97	Jamestown, N. D.
Baldwin, William P., '01	Casselton, N. D.
Ball, Chas. R., '94	St. Paul
<i>B. A., Ohio Wesleyan.</i>	
Barclay, Alexander, Jr., '07	St. Paul
Barre, William de la, '95	Minneapolis
Barness, Nellie O., '02	St. Paul
Barton, Harry J., '06	Lake City
Bassett, Mary E., '95	Hastings
<i>B. S.</i>	
Batchelder, Edwin J., '93	New Richland
Batcheller, Oliver T., '99	Brainerd
Baxter, Stephen H., '02	Minneapolis
Beaudoux, Henry A., '95	Fargo, N. D.
Bebb, Rose A., '99	Seattle, Wash.
<i>B. L.</i>	
Beckman, Emil H., '01	Rochester
<i>B. A., Grinnell, '94.</i>	
Beebe, Dan G., '96	Minneapolis
Beek, R. Hudson, '94	Lakota, N. D.
Belden, Geo. G., '04	Spokane, Wash.
Belt, W. E., '89	Dodge Center, Minn.
Benedict, Erle E., '01	Racine, Minn.
Benham, Edward W., '95	Amboy
Benjamin, Arthur E., '02	Minneapolis
Bennett, Chas. E., '95	Aneat, N. D.
Bennett, O. E., '90	Correll
Bennion, Percival H., '02	St. Paul
Benoit, Frank T., '05	Crookston
Benson, Geo. E., '00	Minneapolis
Benson, Oscar T., '05	Appleton
Benson, Theo. J., '04	Minneapolis
Bergan, O. K., '91	Fort Worth, Texas
Bergh, L. N., '06	Montevideo
Bernard, John A., '89	Minneapolis
Bertelson, Oskar L., '00	Crookston
Best, Robert A., '99	Mankato
Bevans, T. F., '03	Perley
Bickford, Frank J., '02	Milroy
Biederman, Jacob, '04	Somerset, Wis.
Bierbauer, B. W., '88	Brooklyn, N. Y.
Bigelow, Chas. E., '04	Dodge Center
Binder, Geo. A., '92	St. Paul
Birdsall, A. T., '96	Brooklyn, N. Y.
<i>B. L.</i>	
Birnberg, Tobias, '04	St. Paul
Bissell, Frank S., '02	Maple Lake
Bjelland, Adolph O., '96	Mankato
Bjornstad, Gisle, '94	Albert Lea
Blackman, Ernest L., '01	Alden
<i>B. S., Coe College, Ia.</i>	
Blais, Chas., '04	Minneapolis
Blake, Jas., '01	Hopkins
Blanchard, H. G., '97	Waseca
Boeckmann, M. W. H., '03	Thief River Falls
Boehm, John C., '93	St. Cloud
Bohland, Fuchs F. J., '91	Belle Plaine
Boleyn, E. Sydney, '94	Stillwater
Bolkcom, Geo. W., '94	Minneapolis
Bomberger, Franklin J., '02	Mapleton
Booker, Gertrude, '97	Dover
*Borchardt, Edward A., '93	St. Paul
Bouman, H. A., '97	Minneapolis
<i>A. H.</i>	
Boyum, Peter A., '07	Rushford
Braasch, Wm. F., '03	Minneapolis
* Deceased.	

Brabec, Frank J., '93	Perham
B. S., '90	
Brand, Wm. A., '04	Redwood Falls
Brandt, Albert M., '05	Forest City
Branton, Berton J., '05	Atwater
Bratrud, Theo., '99	Warren
Bray, Chas. W., '95	Biwabik
B. A.	
Bray, E. R., '06	St. Paul
Brede, Wm. G., '06	St. Paul
Brigham, Chas. F., '01	St. Cloud
Brigham, Frank T., '05	St. Cloud
Brimhall, Silas J., '02	San Diego, Calif.
Brooks, Geo. F., '00	Faribault
Brown, Chas. E., '04	Highland, Kan.
Brown, Harry, '96	Rolling Stone
Brown, Paul, '05	Eveleth
Brown, William G., '02	Park River, N. D.
Brown, Walter M., '02	Grand Rapids, Mich.
Brunelle, Adelaïd, '86	Cloquet
Brush, Fred H., '05	St. Paul
Bryant, Oliver R., '05	Minneapolis
Buck, Carroll D., '97	San Isidro, P. I.
Buckley, Daniel, '98	Seattle, Wash.
B. S.	
Budworth, Benj. F., '02	Shelly
Buell, Mary C., '97	Minneapolis
Bulkley, N. C., '06	Danbury, Conn.
Burch, Frank E., '97	St. Paul
Burgan, Jas. H., '99	Minneapolis
Burns, M. Alpheus, '96	Milan
Burns, Robert M., '05	St. Paul
Bussen, L. H., '02	Valley City, N. D.
Butler, David R., '94	Minneapolis
Butler, John, '02	Minneapolis
Button, A. J., '06	Bowdle, S. D.
Cahoon, Grace W. W., '97	Butte, Mont.
Caine, Chas. E., '96	Morris
Caley, G. Ross, '00	Princeton
Call, Alfred M., '03	Stoum, Wis.
Callerstrom, G. W., '06	Gowrie, Ia.
Cameron, John A., '02	St. Paul
Campbell, Charlotte P., '00	Mantorville
Campbell, D. R., '05	Pullman, Wash.
Campbell, Geo. E., '95	Rochester
Campbell, John E., '01	Minneapolis
M. S., University of Minnesota '00.	
Campbell, Lorne A., '04	Campbell
Campbell, Paul E., '03	St. Paul
Campbell, Robt. A., '96	Minneapolis
Campbell, Robert W., '05	Tracy
Canfield, Harry E., '06	Halton, N. D.
Carlson, E. L., '06	Missoula, Mont.
Carman, Chas. L., '97	St. Paul
Carman, Jas. E., '01	Brooks
Carpenter, Carrol C., '97	Bird Island
Cassel, Rufus J., '01	Detroit
Cater, G. N., Miss, '01 (Mrs. G. C. Sweeting)	Morton Park, Ill.
Catlin, John F., '03	Buffalo
Cavanaugh, Jas. O., '97	St. Paul
Chamberlain, Henry W., '01	La Crosse, Wis.
Chambers, W. C., '05	Stillwater
Chapple, Chas. L., '98	Rochester
B. S.	
Chase, R. R., '89	Eau Claire, Wis.
Chase, E. Frank, '05	Adams
Cheleen, Sigfrid, '06	St. Paul
Cheney, W. W., '89	Port Angeles, Wash.
Chesley, Albert J., '07	Minneapolis

- Childgren, G. Arthur, '92 Burlington, Ia.
 Chilton, Leo W., '04 Canyon City, Idaho
 Chowning, Wm. M., '01 Minneapolis
 B. A., Johns Hopkins.
 Crewe, John E., '96 Rochester
 Christenson, Chas. R., '96 Starbuck
 Christison, Jas. T., '01 St. Paul
 M. D., Long Island, Col.
 Clark, Howard S., '97 Glencoe
 B. S.
 Clarke, Robert, '03 Elysian
 Claydon, Leonard E., '95 Red Wing
 Clement, L. O., '02 Lamberton
 Cleveland, Hiram E., '01 Northfield
 Coffin, Samuel D., '04 Minneapolis
 Cohen, H. A., '01 Minneapolis
 Coleman, Harry M., '97 Barron, Wis.
 Condit, Wm. H., '99 Minneapolis
 B. S., University of Minnesota, '95.
 Cook, Paul B., '00 St. Paul
 Coon, William F., '03 Eau Claire, Wis.
 Corbett, J. Frank, '96 Minneapolis
 Cosgrove, Joseph H., '06 Montevideo
 Coria, Leon, '04 Minneapolis
 Corse, Chas. A., '97 Verndale
 Corwin, G. P., '89 Pomona, Calif.
 *Cotton, Henry, '94 Prescott, Wis.
 Coulter, C. F., '93 Wadena
 Coulter, Herbert R., '03 Azusa, Calif.
 Cowles, Danforth C., '01 Minneapolis
 Crewe, John, '96 Devils Lake, N. D.
 Crommett, H. B., '96 Amery, Wis.
 Crosselette, Geo. D., '04 Minneapolis
 Cuff, Wm. S., '97 St. Paul
 Culver, Chas. F., '99 Chetek, Wis.
 Cummings, J. H., '02 St. Paul
 Current, Earl H., '07 New Ulm, Minn.
 Cutts, Geo., '07 Minneapolis
 Cutts, Geo. A. C., '00 Grove City
 *Cutts, Rollin E., '93 Forest City
 B. S., '90.
 Dahlquist, Gustav W., '93 Kokato
 Dahlstedt, N. G., '89 Elliott, Ill.
 Danner, E. W., '95 New York City, N. Y.
 Darling, Walter R., '95 St. Peter
 D'Arms, Harry L., '92 Hector
 Dart, Leslie O., '01 Minneapolis
 Davidson, James, '92 Minneapolis
 Davis, Frederick U., '02, '03 Faribault
 B. S., '98.
 Davis, F. W., '03 Kasson
 Davis, Luther A., '01 Dalton
 Dawson, Albert M., '05 Minneapolis
 Day, Floyd McA., '01 Charnelton, Eugene, Ore.
 Dean, F. W., '90 Council Bluffs, Ia.
 *Dean, Sidney W., '00 Minneapolis
 DeCoster, W. G., '97 Windom
 Dennis, Warren A., '96 St. Paul
 B. L., University of Wisconsin.
 Denton, Herbert D., '97 Eveleth
 Deslauriers, A. A., '03 Duluth
 Devine, J. L., '04 Lansford, N. D.
 Dickman, Lester A., '01 Lismore
 Dittman, Geo. C., '04 St. Paul
 Dix, Geo. E., '04 Canby
 Dodge, Albert A., '94 Faribault
 B. S., '91
 Dodge, Warren M., '93 Farmington
 B. S., '90.

* Deceased.

Dohm, Chas. L., '95	St. Paul
Donovan, John Jos., '01	Eden Valley
Dougherty, Edwin B., '04	Duluth
Dougherty, Louis E., '04	Duluth
Doyle, J. W., '01	Minneapolis
Drake, Frederick A., '96	Lanesboro
Dreschler, Herman, '02	St. Paul
Drew, Geo. F., '00	Crary, N. D.
Dugan, Rollo C., '90	Eyota
Dunn, J. T., '04	Wykoff
Durand, Jay L., '05	Atlantic City, N. J.
Dutton, Chas. E., '89	Minneapolis
Dyar, Burt A., '05	St. Charles
Earl, Robt. O., '96	St. Paul
Eberlein, Edw. A., '01	Glenwood
Eby, Cyrus B., '93	Spring Valley
Eby, J. R., '92	Elko, Nevada
Edgerton, W. M., '96	Faultkton, S. Dak.
*Edholm, Edw. A., '89	Minneapolis
Edlen, E. A., '92	Moline, Ill.
Edsall, Jos. L., '92	Bradley, S. D.
Edward, Geo., '97	Sebringville, Ont.
Egan, John M., '07	Osseo, Minn.
Edge, Thron S., '93	Moorhead
Eisengraeber, G. A., '01	Young America
Eklund, Elmer J., '07	Young America
Eklund, John J., '85	Superior, Wis.
Ellis, Benj. Jas., '00	Reardon, Wash.
Ellis, Burton K., '03	Sparta
Ely, O. S., '06	St. Paul
Emanuel, H. J., '07	Minor, N. D.
Emmerson, William S.	Port Perry, Ont.
Endress, Karl John, '89	St. Paul
Erb, Fred'k R., '02	Minneapolis
Erdmann, Chas. A., '93	Minneapolis
Erickson, John G., '92	Minneapolis
Estrem, Carl O., '07	New London
Evans, Owen, '01	La Crosse, Wis.
Ewing, C. F., '01	Wheaton
*Fanset, John J., '96	Milbank, S. D.
Farmer, J. C., '95	McKinley
Farmer, Sidney S., '01	Owatonna
Farrand, Corydon, '93	Oronoco
Farrish, Robt. C., '01	Sherburne
Ferguson, Jas. Cory, '01	Olivia
Field, Merton, '02	Minnesota Lake
Finstad, G. J., '93	Menomonie, Wis.
Fisher, Otto F., '97	Houston
Fitzgerald, Don. F., '03	Minneapolis
Fjelde, Herman O., '95	Abercrombie, N. D.
Fjelstad, Carl A., '92	Glenwood, Minn.
Fligman, Louis H., '01	Helena, Mont.
Ford, Corydon, L., '90	Ann Arbor, Mich.
Forrest, Chas. G., '99	Bagley
*Foster, Alson James, '01	St. Paul
Foster, Olson J., '01	St. Paul
Foster, W. C., '02	Gulch, Colo.
Foster, William B., '07	Hector
Fowler, H. A., '95	Washington, D. C.
Fowler, Paul H., '03	Rochester
Franchere, Frederick E., '90	Lake Crystal
Frazier, Geo. W., '05	Detroit City
Freeburg, H. M., '04	Watertown, S. D.
Freeman, Charles D., '04	St. Paul
Freeman, Geo. H., '05	Hector
French, E. J., '00	Plainview
French, Ernest A., '03	Plainview
French, Leigh H., '94	Minneapolis
* Deceased.	

Frost, W. S., '04	Willmar
Fullerton, Ellen, '03	Rochester
Fulton, Thos. C., '02	White Bear
Gaard, R. R., '04	Roland, Ia.
Gaffney, T. J., '97	Lakeville
Gaines, Everett C., '00	Buffalo Lake
Gallagher, Patrick J., '04	Graceville
Gallup, G. D., '04	River Falls, Wis.
Gans, Edward M., '05	St. Cloud
Gerber, Lou M., '93	Jasper
Garrison, J. F., '00	Oldham, S. Dak.
Gates, Chester E., '04	Rochester
Gates, Jos. A., '95	Kenyon
Gauger, E. C., '05	Chamberlain, S. D.
*Geiger, John, '96	Osceola Mills, Wis.
Geist, Emil S., '00	Minneapolis
George, Jas. Woodward, '02	Aitkin
Germo, Chas., '95	Balaton
Gerrish, W. A., '96	Enderlin, N. D.
Geyerman, P. T., '99	Worthington
Gibbon, Luther L., '97	Lowry
*Gibbs, Thomas C., '91	Lake City
Giere, Eric, '92	Madison
*Gilbertson, Julius C., '91	Minneapolis
Gilkinson, Andrew J., '93	Osakis
Gillfillan, Jas. S., '97	St. Paul
*Glenn, William, '93	Minneapolis
Goddard, N. A., '97	Sand Point, Idaho
*Godfrey, Harvey B., '02	Minneapolis
Goehrs, Henry W., '05	Minneapolis
Goldsworthy, Wm., '97	Two Harbors
Goodman, Minerva R., '02	Stockton, Calif.
Goodrich, Judd U., '95	St. Paul
Gowenlock, Harry J., '04	Barnesville
Grafton, G. A., '99	Hayward, Wis.
Gramenz, F. H., '00	Bryant, S. D.
Granger, Gertrude B., '97	Rochester
Grant, A. T., '94	West Concord
Gray, Clyde E., '03	Minneapolis
Gray, Geo. A., '98	Spokane, Wash.
Greeley, Liston, '96	Duluth
Green, Eugene K., '03	Minneapolis
Greene, Chas. Lyman, '99	St. Paul
Green, G. H., '06	Minneapolis
Griffin, Miriam E., Miss, '05	St. Paul
Griswold, F. E., '97	Hoffman
Grout, Sam E., '99	Hillman, Ala.
Guilford, Harry M., '98	Minneapolis
Gunn, F. H., '95	Independence
Gunz, A. N., '04	Center City
Guthrie, Chas. E., '02	Columbia, Wash.
Guthrie, J. D., '97	Seattle, Wash.
Haas, Chas. A., '94	St. Paul
Hack, Chas. W., '97	Minneapolis
Hagaman, Geo. K., '03	Anoka
Hagen, Olaf J., '06	Abercromble, N. D.
Haggard, Geo. D., '93	Minneapolis
Halgren, Harry A., '97	Watertown
Hall, Charlotte C., '99	St. Paul
Halvarson, K. K., '89	Audubon
Hammerel, Ambrose, '05	St. Cloud
Hammes, E. M., '06	St. Paul
Haney, Claude L., '06	Duluth
*Hanscom, William H., '89	Minneapolis
Hanson, Marius, '94	Hendrum
Hanson, Martin O., '01	Lemond
Hardin, Cath. C., '03	Minneapolis
Hare, Earl R., '00	Minneapolis
* Deceased.	

Harrington, Chas. D., '95	Minneapolis
Harrison, E. E., '97	West Concord
Hart, Alfred B., '03	Canton
Hart, Milan J., '95	LeRoy
Hartshorn, W. E., '98	New Haven, Conn.
B. Ph., Colorado.	
Hartzell, Thomas B., '94	Minneapolis
Haskell, A. Dair, '00	Carlos
Haugen, Gilbert, '05	Maynard
Haugseth, Enoch, '02	Lake Park
Haverfield, Addie, '95	Minneapolis
Haynes, Fred'k, '99	Minneapolis
Hazeltine, Harry H., '01	Ashland, Wis.
Head, Geo. D., '95	Minneapolis
B. S.	
Heath, Albert C., '94	St. Paul
B. A., Dartmouth.	
Hebard, Sue, '03	Mondovi, Wis.
Hedback, Axel E., '97	Barron, Wis.
Heidekker, Arne, '02	St. Paul
Heilscher, Juliana, '91	Preston
Heinze, C. F., '96	Clifford, N. D.
Helland, John W., '05	Maynard
Hendrickson, Hans W., '95	Montevideo
Hendrickson, John F., '05	Montevideo
Hennemuth, J. L., '90	Waterford, Calif.
Henry, Anna Mae, '99	Pattonsburg, Mo.
Henry, Fanny Jae, '99	Kansas City, Mo.
Hesselgrave, Sherman S., '94	St. Paul
Hilger, Andrew W., '05	St. Paul
Higgins, John H., '03	Rockford
Higgins, John Turner, '94	Morgan Hill, Calif.
B. C. E.	
Higgins, Irving W., '04	Morgan Hill, Calif.
Hilger, David D., '05	St. Paul
Hilbert, Ferd, '92	Albany
Hilbert, Pierre A., '93	Melrose
Hilger, Andrew W., '05	St. Paul
Hill, Eleanor J., '02	Jamestown, N. D.
Hirschfield, Adolph, '93	Minneapolis
Hoff, Peder A., '00	St. Paul
Hoffman, Walter F., '04	Minneapolis
Hoffman, Wm. L., '04	Sioux Falls, S. D.
Holbrook, John S., '96	Mankato
Holdale, Andrew D., '04	Tracy
Holmes, Walter B., '94	Ada
B. S., '88	
Holst, Claude Fred'k, '01	Little Falls
Holst, J. Burton, '95	Little Falls
Holte, Halvor, '93	Crookston
Hopkins, Mary P., '01	St. Peter
Hotveit, Ingvald M. J., '99	Minneapolis
Houston, C. A., '01	Grand Marais
Hovde, Anders G., '03	Biwabik
Howard, Seth E., '93	Minneapolis
Hubbard, F. G., '03	Cayuga, No. D.
Hubert, R. I., '38	St. Cloud, Minn.
Hughes, Helen M., '96	Mankato
*Hunn, Carl, '98	Minneapolis
B. A., '95 (M. D. post ob.)	
Humiston, Ray, '03	Worthington
*Hutchinson, Henry J., '04	Lynn, Mass.
Huxley, F. R., '00	Faribault
Hynes, John E., '04	Minneapolis
Hyslin, E. R., '00	Kindred, N. D.
Ilstrup, Francis O., '94	Grasston
Ilstrup, Orlando, '99	Cokato
Irish, P. H., '00	Akeley
Irvine, Harry G., '03	Minneapolis
* Deceased.	

Ivers, M. W., '02	Abercrombie, N. D.
Ivers, M. U., '02	Christine, N. D.
Iverson, L. U., '97	Christine, N. D.
Jacobs, J. C., '05	Spicer
Jacobson, Leonard H., '05	Luverne
James, Ralph C.,	Mankato
Janson, Elliv, '92	Minneapolis
Janson, Evar, '92	Minneapolis
Jennings, Geo., '07	Cavalier, N. D.
Jennison, J. E., '94	De Lamar, Nev.
Jensen, Marius J., '02	Minneapolis
Jenson, Charles A., '02	Brighton
Jenson, Jas. C., '03	Hendricks
Jewell, Emory, '02	Pine Island
Johnson, A. Einar, '03	White Rock, S. D.
Johnson, Andrew E., '91	Cloquet
Johnson, Asa M., '96	St. Paul
Johnson, Hans, '04	Murdock
Johnson, Ed. Martin, '98	Albuquerque, N. Mex.
Johnson, H. M., '01	Dawson
Johnson, Nimrod A.,	Winthrop
Johnson, Oscar V., '05	Sebeka
Johnston, W. W., '02	Lafayette
Jones, Chas. H., '90	Tempe, Ariz.
Jones, Elmer H., '07	Minneapolis
Jones, Herbert W., '01	Minneapolis
Jonsson, Guntaugur, '04	Grand Forks, N. D.
Judd, Edward S., '02	Rochester
Judson, William E., '07	Forman, N. D.
Juliar, Richard O., '03	Alice, N. D.
Justice, O. M., '97	Los Angeles, Calif.
Kaess, Andrew J., '03	Moorhead
Kane, Jos. P., '05	Minneapolis
Karn, Burt R., '07	Ortonville
Kaukel, Otto Wm., '00	Fertile
Kearney, B. F., '04	Bismarck
Keene, Ralph Kendall, '97	Mankato
Kelly, S. M., '05	Canby
Kelly, T. C., '04	Garden City
Kelsey, Carleton G., '07	Arriba, Colo.
Kennedy, Jane F., '00	Minneapolis
Kibbe, Orel A., '05	St. Paul
Kiefer, Michael A., '04	Hampton, Ia.
Kiehle, F. A., '01	Sleepy Eye
B. A., '94.	Portland, Oregon
King, E. E., '91	Alexandria, N. D.
King, J. C. Elliott, '86	Portland, Ore.
Kirk, Geo. F., '96	East Grand Forks
Kirkwood, Sam'l M., '92	St. Paul
Kistler, Chas. M., '93	Minneapolis
Kittleson, Theo., '02	Fergus Falls
*Kjos, Knute A., '89	Minneapolis
Klein, Henry N., '05	St. Paul
*Klemer, Carl A., '04	Faribault
Klove, Lewis, '03	Dunbar, Ia.
Knauff, Muhlenberg K., '95	St. Paul
Knight, Ray R., '06	Minneapolis
*Koch, John C., '02	Blooming Prairie
Kohler, Christian H., '98	Minneapolis
Koivulpalo, Edward H., '95	Calumet, Mich.
Koren, Finn., '01	Appleton
B. A., '98.	
Kranz, Martin, '05	Lake Crystal
Krch, Geo. C., '96	St. Paul
Krueger, Louis W., '96	Mapleton
Kuhlman, August, '05	Duluth
Kuth, Jos., '04	Duluth
Labbett, LaRoy H., '07	Detroit

* Deceased.

Lamb, H. L., '02	Sauk Center
Landeen, F. G., '94	Stillwater
LaRose, V. J., '01	Bismarck, N. D.
Larsen, Anders, '93	Herman
Larsen, Oscar, '07	River Falls, Wis.
Larson, Frank E., '02	Winthrop
Law, Arthur Ayer, '94	Minneapolis
Leavitt, Fred'k., '94	St. Paul
Lee, Wm. P., '94	Fairfax
Lees, R. B., '01	White, S. D.
Lemstrom, Jarl F., '07	Minneapolis
Lenfest, J. W., '03	Bowbells, N. D.
Lenont, Chas. B., '99	Virginia
LeVasseur, Irma R., '00	Quebec, Can.
*Levinson, Archibald E., '01	Minneapolis
Lewis, Wm. W., '02	St. Paul
Liedloff, Adolph, '02	Mankato
Liland, Ragnvald, '95	Kenyon
Limburg, A. M., '03	Bowbells, N. D.
Lind, Alfred, '91	Minneapolis
Lindstrom, Josephine, '03	Oberon, N. D.
Linjer, Ole E., '89	Minneapolis
Linneman, Nicholas L., '02	Duluth
Linton, Laura A., '00	Rochester
Litzenberg, Jennings C., '99	Minneapolis
B. S., '94.	
Loberg, Adolph E., '01	Minneapolis
Loe, A. O., '97	Seattle, Wash.
Lohrbauer, E. R., '02	Northwood, N. D.
Lommen, Andreas P., '95	Lanesboro
Loomis, Earl A., '07	Owatonna
Ludemann, A. H., '06	Minneapolis
Ludtke, Gustav H., '99	Fairmont
Lund, Axel Luther B., '06	St. Paul
Lundmark, Lambert, '04	Cumberland, Wis.
Lyman, Fred V., '03	Caledonia
Lynde, Roy, '05	Ellendale, N. D.
Lynge, John, '90	Minneapolis
McCarthy, W. F., '99	Maple Lake
McCloud, C. Nauman, '01	St. Paul
Phm. G.	
McCreery, W. B., '02	Tacoma, Wash.
McCuery, Charles R., '02	Northfield
MacDonald, Irving C., '02	Minneapolis
McDonnell, Wm. N., '03	Detroit
McGroarty, John J., '07	Rosemount
McGuigan, Henry F., '01	Mazeppa
McKibben, H. E., '04	Hector
McKinnon, J. J., '93	Wadena
McLaughlin, Ernest W., '96	Willmar
McLaughlin, J. E., '06	Granada
McLung, Alberta V., '97	St. Paul
McMahon, Chas. G., '06	Minneapolis
MacMillan, Mary A., '07	St. Peter
McNerthey, J. B., '99	Tacoma, Wash.
Mackel, Bertha K., '99	Ada
Magnusson, Herman V., '03	Clinton
Makinson, H. A., '03	Manhattan, Kans.
Maland, Clarence, '07	Minneapolis
Maloney, Thos. J., '01	St. Paul
Manson, F. M., '99	Worthington
B. S., '94.	
Marshall, Nelson, H., '92	Chaska
Martin, Thomas R., '07	Mantorville
Maschger, Albert P., '05	St. Paul
Mathon, John Albert, '04	Dassel
Matthews, Justus A., '05	Rochester
Matthieu, A. L., '05	St. Cloud

* Deceased.

Maurer, Edwd. L., '04	Clara City
Mayer, L. P., '00	Hudson, Wis.
Mayland, Louis L., '96	Bagley
Mayland, Martin R., '92	Faribault
Meckstroth, Chas. W., '95	Brandon
Meckstroth, Louis W., '93	Wahpeton, No. D.
D. D. S., '91.	
Mee, Patk. Henry, '03	Gaylord
Meighen, J. W., '96	Ulen
Melby, Benedict, '03	Blooming Prairie
Merrill, Jas. E., '96	Amboy
Merrill, Rose M., '96	McMillan, Mont.
Mesker, Geo. H., '96	Olivia
Metcalf, J. H., '06	Minneapolis
Meyerding, Edward A., '02	St. Paul
Meyer, E. L., '05	Walnut Grove
Midford, F. J., '04	Grand Forks, N. D.
Miller, Arthur W., '97	St. Paul
Miller, H. W., '06	Spokane, Wash.
Millett, Josiah L., '02	Graceville
Millet, Melvin C., '95	Rochester
Miner, Clarence J., '91	Manilla, P. I.
Moch, John K., '93	Windom
Mohn, Frederick Voss, '92	Minot, N. Dak.
Moir, W. W., '06	Minneapolis
Moore, Albert H., '97	Minneapolis
B. S.	
Moore, G. W., '92	Hopkins
Moren, Edward, '06	Minneapolis
Morrill, Robert A., '05	Byron
Movius, Arthur J., '04	Bridger, Montana
Moynihan, A. F., '03	Sauk Center
Muir, E. S., '94	Winona
Munns, J. F., '03	Bremerton, Wash.
Munro, A. T., '97	KallsPELL, Mont.
Nelson, Henry S., '93	Minneapolis
Nelson, Kent, '00	Litchfield, Ill.
Nelson, Louis A., '96	St. Paul
Nessa, Nelins J., '05	Brewster
Nevitt, Orme R., '00	Lakefield
Newgord, J. G., '03	Missoula, Mont.
Newman, Gustavus A., '95	New London
Nicholson, Jos., '03	Brainerd
Nickerson, Bernd. S., '03	Glencoe
Nickerson, Margaret L., '04	Minneapolis
Nickerson, Winfield S., '05	Minneapolis
Nicholson, D. A., '97	Seattle, Wash.
Nicholson, Elmer, '05	Strout
Nielson, Niels, '06	China
Norton, Harvey H., '00	St. Paul
*Norred, W. R., '02	Chicago, Ill.
Noth, H. W., '03	Marine Mills
Nuzum, H. B., '95	St. Louis, Mo.
Nyquist, Jacob E., '05	Cloquet
Nyquist, J. E., '05	Hibbing
O'Brien, Henry B., '06	St. Paul
O'Connor, D. F., '90	Maxbass, N. D.
O'Connor, John V., '95	St. Paul
*O'Connor, Timothy, '90	Annandale
Olander, J. E., '04	St. Paul
Old, Herbert Wm., '03	St. Paul
Olson, Geo., '04	Minneapolis
Olson, J. W., '00	Troy, Idaho
Olson, O. A., '02	Missoula, Mont.
Olson, Sterling H., '01	Milaca
O'Malley, Wm. P., '02	Waunake, Wis.
Oppliger, Gottlieb, '96	Minneapolis
Osborn, Lida, '00	Mankato

* Deceased.

Owen, Geo. B., '00	Anaconda, Mont.
*Palmquist, John Emil, '96	Princeton, Ill.
Parker, H. G., '01	Madison Lake
Parker, Owen W., '00	Ely
Parrot, Byron W., '97	Long Prairie
Parsons, Geo. E., '05	Elk River
Parsons, J. G., '98	Brookings, S. D.
Patton, Frederic J., '99	Duluth
Peabody, Percy D., '02	Webster, S. D.
Pearce, Nay O., '05	Duluth
Pederson, Harold, '07	Grand Forks, N. D.
Pederson, R. M., '06	Minneapolis
Perkins, Geo. A., '97	Dickinson, N. D.
Perry, G. R., '97	Amery, Wis.
Peterson, J. R., '97	Willmar
Peterson, Olans L., '05	Cokato
Peterson, V. N., '06	St. Paul
Pettit, Chas. W., '03	Minneapolis
*Pettit, Loretta J., '94	Minneapolis
Phelan, Richard, '03	Lake Falls, Ia.
Phillips, Geo. W., '89	St. Paul
Phillips, Wm. H., '94	Jordan
Pineo, Willard Byther, '85	Minneapolis
*Pitblado, John D., '96	Minneapolis
Platt, John T., '95	St. Paul
Poehler, Franklin T., '96	Minneapolis
B. S.	
Poppe, Frederick H., '07	Minneapolis
B. A.	
Porter, O. M., '05	Bellingham
Powell, Chas. B., '94	Bellingham
Pratt, Chelsea C., '06	Minneapolis
Preisinger, Jos. W., '04	Renville
Pretlow, C. L., '95	Fairmont, Ind.
Prim, Jos. A., '99	Comfrey
Prinzing, J. R., '01	Ontario, Ore.
Putnam, Cath. E., '01	St. Paul
Quain, E. P., '98	Bismarck, N. D.
Quist, Henry W., '07	Chicago City
Ramaley, Louis, '05	St. Paul
Ramsey, Walter R., '96	St. Paul
Ph. B., Handline.	
Ramstad, N. O., '99	Bismarck, N. D.
Rankin, A. A., '00	Waconia
*Ranson, Geo., '95	Dodge Center
Ranson, Mary E., '98	Dodge Center
Read, Harry K., '98	Minneapolis
Reed, Chas. A., '98	Minneapolis
B. S.	
Rees, Soren P., '97	Minneapolis
B. S.	
Regner, J. A., '89	Evansville
Reimstad, Christian S., '96	Brainerd
*Reimstad, Sven S., '95	Minneapolis
Reiter, Henry W., '93	Shakopee
Reynolds, James S., '05	New Hampton, Ia.
Ribbel, Geo. B., '04	La Moure, N. D.
Rice, C. P., '06	Minneapolis
Rice, Geo. D., '03	Pipestone
Richards, Wm. G., '04	Hardin, Mont.
Richmond, Charles D., '05	Windom
Ridgway, Alfred M., '06	Annandale
Ringnel, Clark J., '91	Minneapolis
Ringnell, Frank O., '95	Orion, Ill.
Ritchie, Harry P., '96	St. Paul
Ph. B., Yale.	
Roadman, Ira McC., '98	Minneapolis
Robitshek, Emil '03	Minneapolis
* Deceased.	

Rodgers, Charles L., '07	Farmington
Rogers, John L., '05	Rice Lake, Wis.
Rogers, J. T., '91	St. Paul
Robbins, Ray P., '04	Portland, Ore.
Rose, Frank R., '01	Spokane, Wash.
Rosen, Sam'l, '04	Minneapolis
Rosenthal, Ignatius P., '07	St. Paul
Rothschied, Harold J., '05	St. Paul
Rothwell, W. P., '92	Pawtucket, R. I.
Rousseau, Victor, '05,	French Lake
Rowe, O. W., '03	Towner, N. D.
Rudell, Gustaf L., '06	St. Paul
Rullen, Frank W., '97	New Richmond, Wis.
Russell, Clarence W., '03	Augusta, Wis.
Ryley, Marie J., '95	Minneapolis
Sanborn, Courtland R., '07	Parker's Prairie
Savage, Frank J., '01	St. Paul
Sawyer, H. P., '95	Goodhue
Sanford, Jas. A., '01	Minneapolis
Scace, Lee Arbor, '07	Pringhar, Ia.
Schacht, F. E., '03	Seattle, Wash.
Schaleben, H. O., '03	Lake Benton
Schmidt, Walter R., '05	Chisholm
Schneider, H. A., '01	Jordan
Schneider, J. P., '06	Minneapolis
Schoonmaker, Edward P., '99	Perham
Schuldt, Fred C., '03	St. Paul
Schulze, Albert G., '04	Duluth
Schutt, J. P., '06	Minneapolis
Seaberg, S. P., '06	Minneapolis
Seashore, David E., '02	Duluth
Seashore, Gilbert, '02	Minneapolis
Senkler, Geo. E., '92	St. Paul
Serkland, J. C., '00	Rothsay
*Setnan, John M., '99	
Sewall, Ralph J., '95	Nashwauck
Shaleen, Arthur W., '02	Hallock
Shaw, Albert Wm., '99	Buhl
Shellman, John L., '03	Nashwauck
Sheppard, Fred, '95	Hutchinson
Sheppard, P. E., '91	Hutchinson
Sherwood, G. E., '94	Kimball
Siemins, Abram, '90	Mountain Lake
Slipperrn, Halfdan, '95	Fosston
Smith, Arthur E., '05	Minneapolis
Smith, Ernest V., '07	Minneapolis
Smith, F. Dale, '05	Oronoco
Smith, Fred L., '06	Duluth
Smith, H. Wm., '97	Crookston
Smith, Martha J., '91	Yankton, S. D.
Smith, M. Isabel, '06	Minneapolis
*Smith, William S., '92	Waseca
Soderlind, Andrew, '02	Minneapolis
Sogge, Louis, '05	Jackson
Soper, John E., '96	Norwood
*Sorenson, Anthony N., '99	Minneapolis
*Sorg, John A., '96	Hastings
Sorkness, P. R., '95	Fargo, N. D.
South, J. R., '89	Ouray, Colo.
Spottswood, E. W., '93	Missoula, Mont.
Stack, Geo. F., '96	Independence, Wis.
<i>B. A.</i>	
Stahl, Harriet S., '97	Harmony
Staley, J. C., '03	St. Paul
*Stebbins, Albert M., '94	Glenwood
Steel, Darwin Edwin '89	Mankato
Stemsrud, A. A., '01	Dawson
Stephan, E. Leonard, '93	Hinckley

* Deceased.

Stephenson, John L., '95	Monango, N. D.
Sterner, O., '03	Cambridge
Stevens, Charles S., '07	Farmington
B. A.	
Stevens, John, Jr., '97	Belfast, Me.
Stewart, Allan B., '91	Owatonna
Stewart, M. A., '02	Omamee, N. D.
Stierle, Adolph, Jr., '01	St. Paul
Ph. G., New York.	
Stimpson, E. W., '03	Newport, Ore.
Stockman, B. G., '96	Woodville, Wis.
Stolpestad, Harold L., '01	St. Paul
Stowell, Joab, Jr., '90	North Amherst, Mass.
Strang, David M., '07	Alexandria
Strathern, Fred P., '95	St. Peter
B. S., '94.	
Strathern, Moses Lanc, '07	Minneapolis
B. A.	
Strout, G. E., '01	Winthrop
Stuhr, Henry C., '00	Argyle
Swanson, Cephas, '07	Minneapolis
B. A.	
*Swartz, West J., '00	Forest Lake
Sweitzer, Sam'l E., '01	Minneapolis
Swenson, G. B., '00	Baldwin, Wis.
Taylor, Wm. W., '00	Kalispell, Mont.
Tebbitt, R. L., '04	Laramie, Wyo.
Teisberg, Carl B., '06	St. Paul
Tenneant, Russell W., '99	Brookings, S. D.
Tenny, Jacob S., '95	Alma, Wis.
Tennyson, Falk, '93	Minneapolis
Thabes, John A., '96	Brainerd
Thelen, W. P., '02	Wilton, N. D.
Thomas, Geo., '04	St. Paul
Thompson, Albert, '05	St. James
Thomson, A. M., '04	South Park, Wash.
Thoraldsen, Thorfinn, '01	Cottonwood
Thorpe, A. C., '97	Los Angeles, Calif.
Thrane, Marcus M., '94	Madison
Thyng, Date Kimball, '96	Willow City, N. D.
Tilderquist, David L., '93	Duluth, Minn.
Tirrell, J. M., '00	Portal, N. D.
Titus, Wm. S., '04	Mora
Todd, Frank C., '92	Minneapolis
Todd, G. D., '03	Melina, N. D.
Towers, Mary E., '98	Minneapolis
Tripp, G. A., '99	South Bend, Wash.
True, Augusta Isabella, '94	Minneapolis
Truscott, Jos. R., '01	Binford, N. D.
Trutna, Thomas J., '05	Silver Lake
Tuohy, Edward L., '05	Duluth
Tupper, Eugene L., '97	Minneapolis
*Turner, Arthur L., '94	Faribault
Turner, Mrs. Frances E., '95	Rose Creek
Tyler, Frank A., '06	St. Paul
Tyrrell, C. C., '06	Minneapolis
Vallentine, W. H., '00	Tracy
Vallely, Rose V., '01	Minneapolis
van Slyke, Chas. A., '91	St. Paul
Van Valkenberg, B. F., '93	Long Prairie
Varco, Albert Raymond, '07	Austin
Verne, V. E., '06	Parker's Prairie
Vigen, Jorgen G., '94	Fergus Falls
Vinje, Syver, '02	Henning
Vistaunet, Peter, '06	St. Paul
Vistaunet, P. L., '92	Thief River Falls
Voges, Adolph, '04	St. Paul
Wagar, Wm. D., '98	Michigan City, N. D.

* Deceased.

Wallace, C. J., '04	Superior, Wis.
Walter, Guy F., '06	Lake City
Walters, Eugene, '95	London, England
Wangelin, Hugo E., '91	Minneapolis
Wanous, Ernest Z., '97	Minneapolis
Ward, A. L., '00	Boulder, Mont.
Warner, Eugene F., '92	St. Paul
Warren, Frank S., '96	Faribault
Watkins, F. A., '89	Wilkesbarre, Pa.
Watson, T. R., '95	Zumbrota
Webster, A. M., '04	Portland, Ore.
Wheeler, Frederick L., '04	Minneapolis
Weishaar, Charles, '05	Osseo
Wells, H. Journeay, '01	Minneapolis
Wells, Horace Renslaer, '98	North Yakima, Wash.
Westeen, Anders A., '92	Grand Forks, N. D.
Wethal, Anton G., '03	Minneapolis
Weyrens, Joseph P., '07	St. Cloud
B. S.	
Weyrens, P. J., '00	Ivanhoe
Wheeler, F. E., '00	Esmond, N. D.
Whipple, Clarence D., '03	Minneapolis
Whitacre, J. Clifford, '01	St. Paul
White, Jas. B., '91	Faribault
Wiger, N. N., '03	River Falls, Wis.
Wilk, Johan C., '07	Minneapolis
Wilcox, M. Russell, '97	Minneapolis
Wilcox, Van H., '02	Minneapolis
Wilkinson, Stella L., '03	Duluth
Will, William W., '05	Mapleton
Williams, Archie E., '00	Minneapolis
B. A., '94	
Williams, S. E., '04	River Falls, Wis.
Williams, Ulysses G., '89	Minneapolis
Willson, H. S., '04	Crystal, N. D.
Wilson, Louis B., '96	Rochester
Winberg, Oesten K., '92	Lake Park
Wiseman, Robert L., '97	Fine City
Witham, Carl A., '06	Minneapolis
Wolner, Oscar H., '02	St. Anthony Park
Wolski, R. A., '00	Winona
Woods, Ernest A., '99	Clear Lake
Wright, Chas. O., '90	Luverne
Wright, Franklin R., '94	Minneapolis
Wunder, Henry E., '92	Soudan
Wyllie, A. R., '06	Faribault
Yoseph, Yoseph David, '94	Minneapolis
Youngs, Alfred H., '07	Minneapolis

Students

1907-8

GRADUATES OF 1907.

Barclay, Alexander, Jr.,	St. Paul, Minn.
Boyum, Peter Arndt,	Rushford, Minn.
Chesley, Albert Justus,	Minneapolis, Minn.
Current, Earl,	New Ulm, Minn.
Cutts, George,	Minneapolis, Minn.
Egan, John Michael,	Osseo, Minn.
Eklund, Elmer Jultus,	Young America, Minn.
Emanuel, Henry J.,	Milnor, N. D.
Estrem, Carl Olaf,	New London, Minn.
<i>A. B.</i> , '01, Luther College.	
Foster, Bainbridge William,	Hector, Minn.
<i>Ph. B.</i> , '00, Hamline University.	
Jennings, George,	Cavalier, N. D.
<i>B. A.</i> , '03, University of North Dakota.	
Jones, Elmer Mendelsohn,	Minneapolis, Minn.
Judson, William E.,	Forman, N. D.
<i>Ph. B.</i> , '99, Hamline University.	
Karn, Bert Ruthvin,	Ortonville, Minn.
Kelsey, Carlton Gale,	Minneapolis, Minn.
<i>A. B.</i> , '04, University of Minnesota.	
Labbitt, Roy Henry,	Detroit, Minn.
Larsen, Oscar O.,	River Falls, Wis.
<i>A. B.</i> , Luther College.	
Lemstrum, Jarl Ferdinand,	Minneapolis, Minn.
<i>Phil. Kand.</i> , University of Helsingfors, Finland.	
Loomis, Earl Alfred,	Owatonna, Minn.
<i>A. B.</i> , <i>University of Minnesota.</i>	
McGroarty, John James,	Rosemount, Minn.
<i>B. A.</i> , '00, St. Thomas College.	
McMillan, Mary Adelia,	St. Peter, Minn.
Maland, Clarence,	Rushford, Minn.
<i>A. B.</i> , '04, University of Minnesota.	
Martin, Thomas Roy,	Mantorville, Minn.
<i>A. B.</i> , '04, University of Minnesota.	
Pederson, Harold,	Grand Forks, N. D.
<i>A. B.</i> , St. Olaf.	
Poppe, Frederick Harold,	Minneapolis, Minn.
<i>A. B.</i> , University of Minnesota.	
Quist, Henry William,	Chisago City, Minn.
Rodgers, Charles LeRoy,	Farmington, Minn.
Rosenthal, Ignatius Paul,	St. Paul, Minn.
Sanborn, Courtland Rockwell,	Faribault, Minn.
Scace, Lee Arbor,	Pringhar, Iowa
Smith, Ernest Vernon,	Crawfordsville, Ind.
Strathern, Moses Lane,	Rich Valley, Minn.
<i>A. B.</i> , '04, University of Minnesota.	
Stevens, Charles S.,	Farmington, Minn.
<i>A. B.</i> , '04, University of Minnesota.	
Strang, David Monticue,	Alexandria, Minn.
<i>R. S.</i> , '01, Carleton College.	

Swanson, Cephas,	Minneapolis, Minn.
A. B., Gustavus Adolphus.	
Varco, A. Raymond,	Austin, Minn.
A. B., '04, University of Minnesota.	
Weyrens, Joseph Peter,	Watkins, Minn.
Ph. G., Northern Indiana School of Pharmacy, B. S., '05, University of Minnesota.	
Wiik, Johan Christian,	Minneapolis, Minn.
Youngs, Alfred Hinks,	Minneapolis, Minn.

FOURTH YEAR—1907-'08—35

Alexander, Ida Mary,	Carver, Minn.
A. B., University of Minnesota.	
Andrews, Roy Newberry,	Mankato, Minn.
Bloom, Charles Joseph,	Clear Lake, Wis.
A. B., '04, Carleton College.	
Bock, Rolland,	St. Paul, Minn.
Phar. C., University of Minnesota.	
Bostrom, August Edward,	Minneapolis, Minn.
B. S., '06, University of Minnesota.	
Boyd, Leon Morelle,	Alexandria, Minn.
Ruckley, John,	Farmington, Minn.
Burns, Herbert Arthur,	Hutchinson, Minn.
Brown, John C.,	Minneapolis, Minn.
A. B., '99, Leland Stanford University.	
Dahleen, Henry,	Granite Falls, Minn.
Engstrom, Fred Alonzo,	Cannon Falls, Minn.
Esser, John,	Austin, Minn.
Eusterman, George Bysshe, ...	Lewiston, Minn.
Fortier, Edward L.,	Little Falls, Minn.
Freedman, Isaac Valera,	Minneapolis, Minn.
Grangaard, Henry Oswald,	Kindred, N. D.
A. B., Luther College.	
Hemingway, Ernest Eugene,	Minneapolis, Minn.
B. A., '98, Ripon, M. A., '03, University of Minnesota, Ph. D., '04, University of Minnesota.	
Hensel, Charles Norton,	St. Paul, Minn.
Hitchings, William Sidney,	Sutherland, Iowa
Johnson, Carl Martin,	Minneapolis, Minn.
B. A., Augsburg.	
Johnston, Edward James,	St. Cloud, Minn.
Lawrence, Edward John,	Marshall, Minn.
Lindberg, Arvid C.,	Harris, Minn.
Maertz, Will Francis,	New Prague, Minn.
Magnusson, Gustaf Alfred,	Harris, Minn.
A. B., University of New Mexico.	
Manley, James Rollin,	Duluth, Minn.
Nelson, Melvin Sylvanius,	Dawson, Minn.
B. S., '06, University of Minnesota.	
Roan, Carl Martin,	Minneapolis
B. A., Augsburg.	
Robertson, Archibald Wright,	Litchfield, Minn.
Ryan, Dennis Edward,	Shakopee, Minn.
A. B., St. Thomas.	
Smith, Clarke S.,	Bozeman, Mont.
Stebbins, Eugene Benson,	Barron, Wis.
Strachauer, Arthur Clarence,	Minneapolis, Minn.
Walker, John Frank,	St. Paul, Minn.
Walker, George Hamilton,	Minneapolis, Minn.
B. S., University of Nebraska.	
Watson, Tolbert,	Cashel, N. D.
B. A., Macalester.	

THIRD YEAR—52.

Anderson, Oscar H.,	Star Prairie, Wis.
Baker, Ernest L.,	Minneapolis
Barney, Leon A.,	Gettysburg, S. D.
Beede, Ethel R.,	Minneapolis

Black, William,	Minneapolis, Minn.
<i>A. B.</i> , '02, Wabash College.	
Blakeley, Clement C.,	Neenah, Wis.
Blegen, Hallward M.,	Minneapolis, Minn.
<i>A. B.</i> , '04, Augsburg College.	
Booren, Clifton A.,	Stillwater, Minn.
<i>B. S.</i> , '07, University of Minnesota.	
Brimmer, Archie E.,	St. Paul, Minn.
<i>B. S.</i> , '07, University of Minnesota.	
Brooks, Charles N.,	Minneapolis, Minn.
Caldwell, James P.,	St. Paul, Minn.
Campbell, Albert A.,	St. Paul, Minn.
Coleman, Fred,	Minneapolis, Minn.
<i>Ph. B.</i> , Hamline University.	
Critchfield, Lyman R.,	Hunter, N. D.
<i>B. S.</i> , '07, University of Minn.	
Delmore, John L.,	Marshfield, Wis.
<i>B. S.</i> , '07, University of Minn.	
Doolittle, Leeroy E.,	Sioux Falls, S. D.
<i>A. B.</i> , University of Minnesota.	
Drake, Charles R.,	Rushford, Minn.
Earl, George A.,	Minneapolis, Minn.
<i>A. B.</i> , University of Minnesota.	
Fiksdal, Mads J.,	Webster, S. D.
Foshager, Henry T.,	Pennock, Minn.
<i>B. S.</i> , '05, St. Olaf's College.	
Gardner, Ray,	Mantorville, Minn.
<i>B. S.</i> , '07, University of Minnesota.	
Glyer, Richard T.,	Superior, Wis.
<i>B. A.</i> , '07, Carroll.	
Griebenow, Frederick,	Alexandria, Minn.
<i>A. B.</i> , '04, University of Minnesota.	
Hayes, Michael F.,	Lanesboro, Minn.
<i>B. S.</i> , '07, University of Minn.	
Healy, Raymond T.,	Minneapolis, Minn.
Johnson, Selmer M.,	New Richland, Minn.
Kellogg, Paul M.,	Red Wing, Minn.
Kurz, John W.,	Annandale, Minn.
Larsen, Martin,	Atwater, Minn.
<i>B. S.</i> , '07, University of Minn.	
Libby, Miss Elva E.,	Spokane, Wash.
<i>A. B.</i> , Washington College.	
McIntyre, Phillip H.,	Litchfield, Minn.
Maxeiner, Stanley R.,	Minneapolis, Minn.
Mendelson, Oscar,	Minneapolis, Minn.
<i>A. B.</i> , '05, University of Minnesota.	
Meyerding, Henry W.,	St. Paul, Minn.
<i>B. S.</i> , '07, University of Minn.	
Milner, Augustus F.,	Minneapolis, Minn.
Mortensen, Nels G.,	St. Paul, Minn.
Murphy, Ignatius J.,	Lakefield, Minn.
<i>B. S.</i> , '07, University of Minn.	
Olson, William P.,	St. Paul, Minn.
Ostergren, Edward W.,	Gladstone, Minn.
Oyen, Martin,	Watson, Minn.
Paulsen, Edward L.,	Hanska, Minn.
<i>B. S.</i> , '07, University of Minn.	
Perry, Clarence G.,	St. Paul, Minn.
<i>B. S.</i> , '07, University of Minn.	
Peterson, Henry F.,	Chisago City, Minn.
<i>A. B.</i> , '02, Gustavus Adolphus College.	
Schmidt, Henry A.,	Westbrook, Minn.
Stadfield, Clayton G.,	St. Paul, Minn.
Stewart, Miss Elsie,	Minneapolis, Minn.
Sundt, Mathias,	Minneapolis, Minn.
<i>A. B.</i> , '06, University of Minnesota.	
Sutton, Charles S.,	Prior Lake, Minn.
<i>A. B.</i> , '06, University of Minnesota.	
Thompson, Herbert H.,	St. Paul, Minn.
<i>B. S.</i> , '07, University of Minnesota.	

Trowbridge, E. H.	Minneapolis, Minn.
Walker, James D.	Moorhead, Minn.
A. B., University of North Dakota.	
Zander, Chas. H.	Rochester, Minn.
Ph. C., '02, University of Minnesota.	

SECOND YEAR—47.

Allen, Charles C., Jr.	Ada, Minn.
B. S., '07, Carleton College.	
Binger, Henry E.	Tulare, S. D.
Brey, Frank	Lafayette, Minn.
Cavanor, Frank T.	Minneapolis, Minn.
A. B., '03, University of Illinois.	
Chernausek, Samuel	Hutchinson, Minn.
A. B., '03, University of Minnesota.	
Christianson, Andrew	St. Paul, Minn.
Cole, Wallace	St. Paul, Minn.
Dickson, Thomas H., Jr.	St. Paul, Minn.
A. B., Macalester.	
*Flynn, Robert E.	Caledonia, Minn.
Forbes, Robert S.	Minneapolis, Minn.
Hagenback, Max A.	St. Paul, Minn.
*Hasty, Miss Ella M.	Minneapolis, Minn.
Hayes, James M.	Millville, Minn.
B. S., '04, Carleton College.	
Heidel, Cecil T.	Sherburn, Minn.
*Hobson, Carl L.	Hampton, Ia.
*Hoff, Alf.	St. Paul, Minn.
*Holland, Angell S.	Benson, Minn.
Johnson, Carl M.	Pelican Rapids, Minn.
Julien, Albert Edward	Braham, Minn.
A. B., '03, Hamline University.	
Kesting, Herman	Boyd, Minn.
**Kjelland, Andrew A.	Rushford, Minn.
Lysne, Henry	Northfield, Minn.
B. S., '06, St. Olaf's.	
McCarten, Robert E.	Fargo, N. Dak.
McCarthy, Richard I.	St. Paul, Minn.
*McEwan, Samuel W.	Alexandria, Minn.
Moore, Chas. Ulysses	Staples, Minn.
A. B., University of Texas.	
*Nordin, Charles G.	St. Paul, Minn.
Ohage, Justus, Jr.	St. Paul, Minn.
Olson, Charles A.	St. Paul, Minn.
*Oppegard, Manfred	Madison, Minn.
Papez, James W.	Hector, Minn.
Piper, Monte C.	Mankato, Minn.
Preine, Irving A.	Minneapolis, Minn.
Satersmoen, Theodore	Lac qui Parle, Minn.
Schneider, Edwin H.	St. Paul, Minn.
Schrader, Herman F.	St. Paul, Minn.
A. B., '02, A. M., '03, University of Minnesota.	
Seham, Max	Minneapolis, Minn.
*Simons, Jalmar H.	Waseca, Minn.
*Smith, Leon G.	Benson, Minn.
*Souba, Frederick J.	Hopkins, Minn.
'Treat, Albert M.	Bloomington Prairie, Minn.
Fyrell, Alfred A.	Waterville, Minn.
Vigeland, Jorg G.	Nielsville, Minn.
E. A., St. Olaf's College.	
Watson, Earl M.	Crawfordsville, Ind.
A. B., '03, Wabash College.	
Wyman, Kate	Northfield, Minn.
A. B., '00, Carleton College.	
*Yoerg, Otto W.	Winthrop, Minn.
Zimmerman, James	Vandalia, Ill.
A. B., Wabash College.	

*Students of combined six-year medical course, B. S., M. D.

**Students of combined seven-year medical course, B. A., M. D.

FIRST YEAR—32.

Anderson, Francis W.	Dickinson, N. D.
*Barnard, Elizabeth M.,	Minneapolis, Minn.
*Barron, Moses,	Minneapolis, Minn.
*Berkman, David Mayo,	Rochester, Minn.
Bill, Clayton,	Madelia, Minn.
*Craig, Russell,	Souris, N. D.
*Dedolph, Karl,	Minneapolis, Minn.
*Emert, Harry F.,	Lockport, N. Y.
*Frise, Dudley C.,	Minneapolis, Minn.
<i>Ph. C., University of Minnesota.</i>	
*Fulton, Philip R.,	Minneapolis, Minn.
*Geist, Geo. Arthur,	Minneapolis, Minn.
Giessler, Paul William,	Minneapolis, Minn.
*Hengstler, W. Howard,	Willmar, Minn.
Kelly, Paul Harold,	St. Paul, Minn.
<i>Ph. C., University of Minnesota.</i>	
**Knight, Ralph Thomas,	Minneapolis, Minn.
Kremer, Walter John,	Cold Springs, Minn.
Larkin, Chandler C.,	Minneapolis, Minn.
*Leitch, Archibald,	Minneapolis, Minn.
McLaurin, Archibald A.,	Midland, S. D.
<i>A. B., South Dakota.</i>	
*Madsen, Christenia A.,	Minneapolis, Minn.
Mitchell, Whiting B.,	Chehalis, Wash.
*Nicholson, Murdoch A.,	Wilcox, Ariz.
Rotnem, Thomas Peter,	Madison, Minn.
Rumreich, E. A.,	Pisek, N. D.
Rund, Magnus,	Fosston, Minn.
<i>B. A., North Dakota.</i>	
Spear, Albert Edgar,	Owatonna, Minn.
<i>Ph. B., '05, Hamline University.</i>	
*Strobel, William G.,	Mankato, Minn.
Tallant, Webster,	Minneapolis, Minn.
Thompson, Victor C.,	Preston, Minn.
*Turnacliff, Dale D.,	Waseca, Minn.
Warner, Ohmer Hubert,	St. Paul, Minn.
Ziskin, Thomas,	Chisholm, Minn.
*Students of combined six-year medical course, B. S., M. D.	
**Students of combined seven-year medical course, B. A., M. D.	

SIX YEAR MEDICAL STUDENTS.

SOPHOMORES—28.

Bailey, H. B., Jackson.	Michelson, Henry F., Bismarck, N. D.
Berrisford, Paul, St. Paul.	Morris, Mary, Minneapolis.
Bratrud, Arthur, Warren.	Paulson, Carl W., Minneapolis.
Carroll, William C., St. Paul.	Peppard, Thomas Albert, Minneapolis.
Dorge, Richard L., Minneapolis.	Pollock, Lee W., Rochester.
Douglass, J. E., Blue Earth.	Satterlund, Victor L., New Richmond.
Frisch, Frank P., Grogan.	Seifert, Otto J., New Ulm.
Gardner, Edwin L., Minneapolis.	Snell, Charles F., Detroit.
Griffin, Patrick J., Shakopee.	Snyder, George W., St. Paul.
Handy, John A., Good Thunder.	Sunwall, James Oscar, Minneapolis.
Haugn, Leslie B., Albert Lea.	Undine, Clyde Albert, Minneapolis.
Kirsch, Ralph L., Crookston.	Weed, Frank E., Conway, N. D.
Klein, Harry, Duluth.	Whittier, Raymond W., Minneapolis.
Lepper, Lawrence E., Minneapolis.	Workman, Warner G., Tracy.

FRESHMEN—45.

Badeaux, George I., Brainerd.	Mariette, Ernest S., Minneapolis.
Bonness, Hazel, Minneapolis.	Moersch, Fred. P., St. Paul.
Bratrud, Edward, Spring Valley.	Morell, Clifford F., Verdale.
Brodie, Walter D., St. Paul.	Nesse, Silas Arthur, Mabel.
Campbell, Lowell M., Minneapolis.	Nordland, Martin, Minneapolis.
Cooley, John Ford, Madelia.	Nuessle, Walter, Springfield.
Davis, Thayer C., Akeley.	Nugent, Earl, Glenwood.
Finley, William F., Ferryville, Wis.	Quinnell, Earle D., Neche, N. D.
Gordon, Frank A., Williston, N. D.	Robilliard, Charles M. Faribault.
Hall, Joseph M., Minneapolis.	Roddis, Louis H., Osakis.
Hening, Robert M., Minneapolis.	Rydell, Charles B., North Branch.
Hilger, Leo A., St. Paul.	Senescall, Cleve R., Ortonville.
Howe, Archibald W., St. Paul.	Sjolas, Amly, Hoffman.
Josewitch, Alexander, Minneapolis.	Smiley, Mervale, Minneapolis.
Karras, Ray W., Hudson, Wis.	Smith, Orrin Kenneth, Minneapolis.
Kleinmann, Francis, Hutchinson.	Steffen, Theodor H., New Ulm.
Kucera, William J., Hutchinson.	Stratte, Joseph J., Dawson.
Langworthy, Effie W., Minneapolis.	Ulsaker, Oscar M., Wahpeton, N. D.
Langworthy, Willis H., Minneapolis.	Warwick, Margaret M., Goodhue.
Larson, Wilmer, St. Paul.	Webb, Roscoe C., Tracy.
McGuire, Lee, St. Paul.	Wohlrabe, Arthur A., Truman.
McIntosh, Harry C., St. Paul.	Woltmann, Henry W., Minneapolis.
McMillan, Ralph, Minneapolis.	

STUDENTS IN THE COLLEGE OF PHYSICIANS AND SUR-
GEONS, MEDICAL DEPARTMENT, HAMLINE UNIVERSITY

ALUMNI CLASS, 1906-7

Martin Aune, Minneapolis	Byron O. Mork, Minnesota
Harry R. Baker, Minneapolis	James Murray, Rochester.
Paul E. Barringer, Minneapolis.	Frank Norman, Minnesota.
Erle B. Crosby, Minneapolis.	J. E. O'Donnell, Minneapolis.
H. C. Erickson, Wisconsin	Albert E. Phillips, Delano.
Rudolph M. Gunderson, Minnesota	Luther A. Rexford, Minneapolis.
Malvin M. Hauge, Minnesota	John O. Taft, Minneapolis.
Thorvald J. Jensen, Amboy.	M. E. Trainor, Wisconsin.
Arthur H. Joistad, St. Paul.	Walter J. Williams, Minneapolis.
Carl H. Laws, St. Paul	

FOURTH YEAR—1907-'08

Grant Stanley Beardsley,	Edward F. Kennedy, Minneapolis.
Yucca, No. Dak.	Stanley E. Kerrick, Minneapolis.
Charles Hall Cawgill, Redwood Falls.	R. J. Kingsley, Anaconda, Mont.
Albert James Clay, Waterville.	John W. Lee, Minneapolis.
Donald Gray Colp, Robbinsdale.	Edward Masone, Minneapolis.
Earl R. Dezell, Sunset, Wash.	Troy S. Miller, Illinois.
William C. Eichler, Ada.	Virgil H. Moats, Ohio.
T. J. Froyland, Minnesota.	Walter P. Nelson, Barnesville.
W. H. G. Gibbs, Selkirk, Man., Canada.	Reinhart G. Olson, Nicollet.
Richard B. Girvin, Mankato.	Arley John Ostrander, Minneapolis.
Henry H. Hall, St. Paul.	Charles H. Patterson, Barnesville.
Roy C. Heron, St. Paul.	Theodore S. Paulson, Dalton.
Marion M. Hursh, Henning.	Edward Schons, St. Paul.
William Howard Hollands, Canada.	George Fred Schmidt, Minneapolis.
Gaston L. Jacquot, Stillwater.	Ray Edward Smith, Minneapolis.
Einer W. Johnson, Minneapolis.	Arthur Richard Soderquist, Lafayette.
Oakford A. Kells, Minnesota	Swan G. Wright, Minneapolis.

THIRD YEAR.

Philip J Brady, Hastings.	Clarence Edgar Lommen, Buxton, N. D.
Richard J. Brady, Hastings.	Edison Orin McCarty, Minneapolis.
Richard R. Cranmer, Beardsley.	Daniel A. MacDonald, Wabasha.
Lewis VanDeboget, Minneapolis.	A. F. Plankers, Minneapolis
Robert Randolph Dickey, Minneapolis.	John Paul Rosenwald, Madison.
Olaf K. Eggen, Roman, No. Dak.	Francis John Schatz, Montgomery.
John James Getz, Minneapolis.	Roy Alvin Schnache, St. Paul.
Fred J. Ghostley, Minneapolis.	George Melville Sewell, Minneapolis.
Mary C. Ghostley, Minneapolis.	Frank Scofield Skemp, Minneapolis.
Seth E. Gilkey, Minneapolis	Hallward J. Thornby, Dawson.
Arthur David Haverstock, Minneapolis.	Henry Landalynn Trankle, Minneapolis.
Joel T. Holcomb, Otisville.	Alfred Lyman Vadheim,
George F. Kaufhold, St. Paul.	Garriston, S. D.
Herbert Henry Leibold, New Ulm.	F. C. Westerman, Montgomery

SECOND YEAR

William Austin Anderson, Hopkins.	Seth Henstis Martin, Alburgh, Vt.
Charles Borglund, Minneapolis.	Axel Sverre Nelson, Fergus Falls.
Elmer Eugene Dady, Wabasha.	James Robert Perkins, Minnesota.
Arnt F. Floew, Minneapolis.	Leon Julien Petit, Minneapolis.
Carl E. Foss, Park River, No. Dak.	O. I. Refsdahl, North Dakota.
Arthur V. Garlock, Wells.	Fred George Russell, Minneapolis.
Agnes Dunnigan Gray, Minneapolis.	Henry Julius Shelver, Sheldon, N. D.
George Luther Johnson, Minnesota.	Edmund C. Stucke, Minneapolis.
James Edward Johnson, St. Paul	Earl B. Weible, Fargo, No. Dak.
Edward R. Kramer, Preston.	Henry Grant Williams, Minneapolis.
George Robert Love, Preston.	John Taylor Williams, Minneapolis.
Elizabeth Aileen Lynch, Hopkins.	Joseph Nichols Woodard, Minneapolis.

FIRST YEAR.

Adams, Harold P., Minneapolis.	Lambert, Marion Jessie, Minneapolis.
Arnson, Julius Ord, Eau Claire, Wis.	Lande, Benjamin, St. Paul.
Baker, Glenn Llewellyn, Minneapolis.	Laurent, Antoine, Minneapolis.
Condit, Sannes Irving, Forest City.	McCarthy, William Reginald,
Connvell, William Bernhardt, Eveleth.	Minneapolis.
Corry, Earl Harrison, Buxton, N. Dak.	McDowell, John Perry, Minneapolis.
Dailey, William John, St. Paul.	May, Clayton Eugene, Minneapolis.
Daskoski, John Lawrence,	Moquin, Marie Antoinette, Dartmouth.
Minnesota City.	O'Brien, Wayne Paul, Minneapolis.
Fox, Edward Francis, St. Paul.	Raiter, Franklin Sol, Minneapolis.
Goodheart, Charles Joseph,	Remington, Paul Archibald,
Fargo, N. Dak.	Walnut Grove.
Hanson, Adolph Melanchthon,	Rutherford, Hillmar Clifford, St. Paul.
Red Wing.	Schumacher, Nicholas William,
Hedenstrom, Louis Henry, St. Paul.	Minneapolis.
Holtan, Theodore, Washburn, N. Dak.	Shalett, Benjamin Joseph, Minneapolis.
James, John Barlow, Mandan, N. Dak.	Shepherd, Foss Randall, Hamline.
Johnson, Norton Theodore, Winthrop.	Spurbeck, Roy George, Two Harbors.
Kelly, John Vincent, St. Paul.	Wildner, Curtis Warde, Minneapolis.
Kennedy, Claude Clement, Minneapolis.	Williams, Hugh Owen, Lake Crystal.
Kennedy, Roy Robert, Minneapolis.	Wilson, Clyde Earl, St. Paul.
Klint, Alfred John, Minneapolis.	Wooster, Arthur Monroe, Minneapolis.
Knaben, Tonnes O., Bowbells, N. Dak.	Ziegler, Edward Jerome, Frazee.
Lackey, Harry Munson, Minneapolis.	Hynes, Edward J., Minneapolis.