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CORNELL UNIVERSITY

REGISTER

1886 - 87



PUBLISHED BY THE UNIVERSITY

ITHACA, N.Y.

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SYRACUSE, N Y

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Buildings

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Morrill Hall and White Hall
McGraw Building
Civil Engineering Building
Sibley College of Mechanical Engineering
Chemical and Physical Building
Sage College for Women
Sage Chapel
Gymnasium and Armory
Cascadilla Place

Museums

Agricultural Museum Museum of Archaeology Architectural Collection Botanical Museum Chemical Museum Museum of Conchology Museum of Conchology Museum of Civil Engineering Museum of Civil Engineering Museum of Entomology Museum of Sibley College Museum of Geology and Paleontology Museum of Veterinary Science Museum of Zoology

Laboratories

Anatomical Laboratory Botanical Laboratory Chemical Laboratory Laboratory of Civil Engineering Entomological Laboratory Geological Laboratory Mechanical Laboratory Physical Laboratory The University Library

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THE CALENDAR.

1886-7.

FALL TERM—1886.

September 14	Tuesday	Entrance Examinations begin.
September 16	Thursday	REGISTRATION of matriculated Stu- dents.
September 17	Friday	Instruction begins.

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September	18	Saturday	Matriculation of new Students.
November	$egin{array}{c} 25 \ 26 \end{array} \}$	Thursday) and Friday >	Thanksgiving Recess.
Deeember	1	Wednesday {	Subjects of theses for advanced de- grees announced.
December	10	Friday	Term Examinations begin.
December	17	Friday	Term ends.

WINTER TERM-1887

January 6	Thursday	REGISTRATION for the Term.
January 7	Friday	Instruction begins.
January 11	Tuesday	Founder's Day
January 14	Friday	Subjects of Theses for Bachelor's degree announced.
March 8	Tuesday	Woodford Orations due.
March 18	Friday	Term Examinations begin.
March 25	Friday	Term ends.
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THE CALENDAR.

April 2	Saturday	REGISTRATION for the Term.
April 4	Monday	Instruction begins.
April 15	Friday	Woodford Prize Competition.
May 2	Monday	Theses for advanced degrees due.
May 13	Friday {	Eighty-six Memorial Prize Com- petition.
May 16	Monday	Commencement Theses due.
May 31	Tuesday	Examinations for Second Degrees.
June 3	Friday	Term Examinations begin.
June 10	Friday	Term Examinations end.
June 12	Sunday	Baccalaureate.
June 13	Monday	Entrance Examinations begin.
June 14	Tuesday	Class Day
June 15	Wednesday	Alumni Day Annual Meeting of the Trustees.
June 16	Thursday	Commencement.
	Summ	ER COURSE.
June 20	Monday {	Summer course in Entomology and General Invertebrate Zo- ology begins.
August 26	Friday	Summer course ends.
	FALL T	ERM—1887–8.
September 23	Friday	Entrance Examinations begin.
September 27	Tuesday	REGISTRATION for the Term.
September 28	Wednesday	Instruction begins.

DIRECTORY

The office of the President is No. 2 Morrill Hall.
The office of the Dean of the Faculty is No. 2 Morrill Hall.
The office of the Registrar is No. 2 Morrill Hall.
The office of the Treasurer is No. 1 Morrill Hall.
The office of the Director of Sibley College is on the second floor of Sibley College.
The office of the Dean of the Department of Civil Engineering is in the Civil Engineering Building, first floor.
The offices of the Military Commandant and of the Professor of Physical Culture are in the Armory

ORGANIZATION AND GOVERNMENT.

THE UNIVERSITY AND THE STATE.

The existence of Cornell University is due to the bounty of the United States and of Ezra Cornell. On the second day of July, 1862, Congress passed an act granting public lands to the several States which should "provide at least one college where the leading object shall be, without excluding other scientific and classical studies, and including military tactics, to teach such branches of learning as are related to agriculture and the mechanic arts." Thirty thousand acres for each of its senators and representatives in Congress were appropriated to every State; and the share of the State of New York was nine hundred and ninety thousand acres in land scrip. On the twenty-seventh of April, 1865, the Legislature of New York incorporated "The Cornell University," appropriating to it the income arising from the sale of this land scrip. The most important conditions were, that Ezra Cornell should give to the University five hundred thousand dollars, that the University should give instruction in branches relating to agriculture, mechanic arts, and military tactics, and that it should receive, without charge for tuition, one student annually from each assembly district. Mr Cornell fulfilled the first requirement of the charter, and made an additional gift of more than two hundred acres of land, with buildings, to be used as a farm in connection with the department of agriculture. The Act of Incorporation satisfies the condition of the congressional grant by providing for instruction in such branches of learning as are related to agriculture and the mechanic arts, and in military tactics, "in order to promote the liberal and practical

education of the industrial classes in the several pursuits and professions of life." And it further declares that "such other branches of science and knowledge may be embraced in the plan of instruction and investigation pertaining to the University, as the trustees may deem useful and proper."

The University, organized in accordance with the requirements of its charter, was opened on the seventh of October, 1868.

TRUSTEES.

The number of trustees, when the Board is full, is twentythree. The eldest male lineal descendant of the Founder is, by the law of the State, a trustee. The President of the University, the Governor of the State of New York, the Lieutenant-Governor, the Speaker of the Assembly, the Superintendent of Public Instruction, the President of the State Agricultural Society, and the Librarian of the Cornell Library, are ex officiis members of the Board.

Of the remaining fifteen, two are elected annually by the trustees and one by the alumni. The term of every trustee not ex officio is five years.

FACULTY

The Faculty consists of professors, acting professors, associate professors, and assistant professors, and is aided by nonresident professors and lecturers, and by instructors, assistants and examiners. It comprises the following special faculties Arts, Literature, Philosophy, Science, Agriculture, Architecture, Chemistry and Physics, Civil Engineering, Mathematics, Mechanical Engineering and the Mechanic Arts, Natural History, and History and Political Science. The several special faculties constitute standing committees to which are referred questions relating to the departments under their control, but their action is subject to the approval of the general faculty

STATE STUDENTS.

The ninth paragraph of the original Act of Incorporation provides for the admission of one student annually from each assembly district without payment of tuition. The number thus received, when all the scholarships are filled, is five hundred and twelve. These State students are to be selected, by yearly competitive examinations, from the various academies and public

schools of the State. It is the duty of the school commissioners of counties and of the boards of education of cities to hold and conduct such examinations, and to award the scholarships. As the law requires the selection of "the best scholar," no distinction of sex is recognized in the competition. For further details regarding this subject, see instructions with regard to Scholarships, under the appropriate head below

OPTIONAL AND SPECIAL STUDENTS.

It was one of the leading objects in founding the University to provide for the wants of those who, though earnest and industrious students, cannot complete a full four-year course. The class distinctions which are in most cases strictly observed elsewhere, are not regarded by the Faculty of the University as any obstacle to recitation and attendance upon lectures with any class which the student is prepared to join. Special students are admitted for a limited period without examination. They must be twenty-one years old, and of approved character and attainments.

GRADUATE STUDENTS.

For purposes of advanced study the University extends its privileges to its own graduates and to graduates of like standing from other colleges and universities, and it confers advanced degrees under conditions described elsewhere. Graduate students who are not candidates for a degree are received in any department, and for any length of time.

SCHOLARSHIPS AND FELLOWSHIPS.

The Scholarships and Fellowships of Cornell University were founded, in the prosperity of the University, in grateful remembrance of financial aid once given in a time of need by its Trustees, the Hon. Ezra Cornell, John McGraw, Esq., the Hon. Henry W Sage, the Hon. Hiram Sibley, and President Andrew D. White. In accordance with their wishes as then expressed, a sum of money (amounting to one hundred and fifty-five thousand dollars) has been permanently set aside to provide encouragement and assistance for students of high character and ability of either sex, in the prosecution of collegiate work, and of advanced study and research after graduation.

There has also been set apart, from the fund contributed by the Hon. Henry W. Sage for the superior education of women,

the sum of fifty thousand dollars for the establishment of similar scholarships and fellowships for women.

Details concerning the number of these fellowships and scholarships, and the manner in which they are awarded, will be found under the appropriate head below

The most effective method of rendering assistance to that large class of gifted and ambitious young persons who lack the means for securing an education, without compromising their selfrespect and independence, or injuring their health by over-exertion, has been for years one of the perplexing problems before educators everywhere. Letters come almost daily to the office of the University from young men and women who are willing to make any possible sacrifice if only the way can be opened by which they can secure the education they so much crave. As a general thing the answers that can be given to such letters are not very encouraging. In offering annually free tuition to more than five hundred holders of State Scholarships, Cornell University is able to help a great many, and by means of her thirty-six University scholarships she renders additional aid to many more. Experience has shown that with very few exceptions these scholarships are taken by students who actually are in need of the pecuniary assistance they afford. The good that is thus being accomplished cannot be estimated. In behalf of those young men and women whom a little assistance will enable to take positions of commanding influence in society, the University would call the attention of philanthropic people to the good which their means can in this way be made to accomplish. The Trustees hold themselves in readiness at all times to receive and carefully administer any endowment that may be offered for this purpose.

SELF-SUPPORT BY STUDENTS.

So numerous are the inquiries addressed to the University by young persons who have received the impression that this institution undertakes to furnish to students without means employment by which they can support themselves wholly or in part, that it is but right to say that Cornell University cannot undertake to furnish employment to any student. Nor can any student be encouraged to come here who is entirely without resources. It is true that many students have aided themselves by their labor while pursuing their studies, and a considerable number are always doing so, but the opportunities for such employ-

• ment are not offered to any large extent by the University, and every student must rely upon his own ability, industry, and perseverance. Skilled labor often secures fair remuneration, but for unskilled labor, such as most students have to offer, the price here is the same as elsewhere.

HIGHER EDUCATION OF WOMEN

By an act of the Trustees, passed in April, 1872, women are admitted to the University on the same terms as men, except that they must be at least seventeen years old. A separate building, the Sage College, has been erected and furnished for their residence. The entrance examinations and all the studies, except military science, are the same for women as for men.

In view of the superior advantages to women students afforded by the Sage College, it has been decided that hereafter all women students of the University shall be required to room and board in Sage College, unless specially excused for due cause shown by the Sage College Committee. This committee is composed of the chairman of the Board of Trustees, the President, and the Treasurer of the University Any women wishing to enter the University, who can assign really valid reasons for residing elsewhere than in Sage College, should send in a request with reasons for it, at the earliest date possible, to the President of the University In order to give Sage College more of the safeguards of a well-ordered home, and to bring its inmates directly under an influence akin to that of the family, the Trustees, in the year 1884-5, established a Principalship, the intention being to have a woman of high character, attainments, and social position living at the college, associating with its students, ready to give suggestions as to their general culture, and counsel in special matters at any moment, and to act toward them at all times as a friend and adviser. Mrs. Agnes M. Derkhiem, formerly of Philadelphia, was called to this position. Special provision has also been made for physical training in the Sage College Gymnasium. The professor, Edward Hitchcock, Jr., M. D., and his assistant in this department, have organized a system of exercises calculated to maintain and develop the physical strength of young women, and at the same time to prevent any of the evils which might arise from exercises that are too violent or too long continued.

The exercises thus provided for are obligatory upon all residents of the college, subject to exceptions in particular cases by the Principal and by Dr. Hitchcock.

Letters of inquiry in regard to rooms and board at Sage College should be addressed to Mr E. P Gilbert, Business Manager of Sage College, Ithaca, N Y

PHYSICAL TRAINING.

For the physical training and development of students there has been provided a Gymnasium, thoroughly equipped with baths, dressing-rooms, and all the apparatus usually found in a well-furnished gymnasium. This is under the charge of an experienced physician, the Professor of Physical Culture and Director of the Gymnasium, who examines every student at his entrance and at stated intervals thereafter, learns the condition of his health, takes his physical measurements, and prescribes such exercises as may be required for his complete and symmetrical bodily development. The gymnasium is also open to all the members of the University for voluntary exercise, but the Professor of Physical Culture or the Instructor in Gymnastics is in constant attendance, and no student is suffered to indulge in hazardous or excessive athletic efforts, or to attempt any feat which in his individual case might be attended with risk. The supplementary gymnasium at the Sage College for the women students is described above. In the physical training of the students the practical instruction in military science is found a valuable aid.

MILITARY SCIENCE.

Pursuant to the act of Congress creating the land grant on which the Cornell University is founded, and the act of the Legislature of the State of New York assigning that land grant, instruction is provided in Tactics and Military Science. Drill and Military Science are "a part of the studies and exercises in all courses of study and in the requirements of all students in the University" during the fall and spring terms of the freshman and sophomore years and the winter term of the senior year Foreigners, laboring students, special students, and those physically unfitted therefor are excused from drill. Students are required to provide themselves with the University uniform, unless excused on account of inability to procure it, and they

are held accountable for loss or injury to the arms and other public property issued to them.

RELIGIOUS SERVICES.

The University, established by a government which recognizes no distinction of religious belief, seeks neither to promote any creed nor to exclude any By the terms of its charter, persons of any religious denomination or of no religious denomination are equally eligible to all offices and appointments, but it is expressly ordered that "at no time shall a majority of the Board of Trustees be of any one religious sect, or of no religious sect." This is understood to imply that, while the University cannot be identified with, or under the control of, any one religious denomination, it must, nevertheless, always be on the side of Christianity In the University Chapel—the gift of the Hon. Henry W Sage—religious services are held, and discourses are delivered by eminent clergymen selected from the various Christian denominations.

CHRISTIAN ASSOCIATION

The Christian Association is an organization of students and

professors for the promotion of their religious culture, and for Christian work in the University Rooms have been fitted up for its use in White Hall, where regular meetings are held. A committee of this Association is in attendance at Association Hall during the first week of every fall term for the purpose of assisting those entering the University with information in regard to rooms, board, times and places of examinations, etc., and in general to afford any assistance in their power which students who are strangers in Ithaca may feel inclined to seek from them.

GENERAL STUDENT ORGANIZATIONS.

The Seabury Guild, the Presbyterian Union, the Methodist Alliance, the several Engineering Associations, the Architectural Association, the History and Political Science Association, the Natural History Society, the Agricultural Association, the Mock Congress, and the Irving Literary Society are organizations of students for mutual assistance and improvement in the several lines indicated in the names of the associations. These all hold regular meetings, and are assisted and directed in their work by members of the Faculty, whenever such assistance is practicable and desirable.

BOARD OF TRUSTEES.

The Hon. ALONZO B. CORNELL,	1	New York City.
The PRESIDENT of the University	,	Ex officio.
His Excellency the Governor of	New York,	"
His Honor the LIEUTENANT-GOVE	CRNOR,	"
The SPEAKER of the Assembly,		"
The SUPERINTENDENT of Public In	nstruction,	"
The PRESIDENT of the State Agri	cultural Society,	"
The LIBRARIAN of the Cornell Lil	orary, .	"
The Hon. Douglas Boardman,	Ithaca.) Term of office
The Hon. HENRY W SAGE,	Ithaca.	expires in
T Dr. Wirm Wirphing Fac	Nour Vork	1997

J DE WITT WARNER, ESQ.,	New YORK.) 1887
The Hon. GEORGE W SCHUYLER,	Ithaca.) Term of office
Alfred S. Barnes, Esq.,	New York.	{ expires in
JAMES F GLUCK, ESq.,	Buffalo.) 1888.
The Hon. HIRAM SIBLEY, The Hon. STEWART L. WOODFORD, His Excellency Governor Joseph B	Rochester, New York. . Foraker,	Term of office expires in 1889.
The Hon. HENRY B. LORD, The Hon. ERASTUS BROOKS,* The Rev George R. VAN DE WATER The Hon. AMASA J PARKER, GEORGE R. WILLIAMS, ESQ., MYNDERSE VAN CLEEF, ESQ.,	Ithaca. New York. Brooklyn. Albany Ithaca. Ithaca.	 Term of office expires in 1890. Term of office expires in 1891.
OFFICERS OF THE BOARD.		
HENRY W SAGE, William R. Humphrey, Emmons L. Williams,		Chairman . Secretar y Treasurer
•		

* Deceased Nov., 1886. Succeeded by Hiram W Sibley, Esq., New York.

EXECUTIVE COMMITTEE.

HENRY W SAGE, Chairman. His Honor, the Lieutenant-Governor, George W Schuyler, The Speaker of the Assembly, Charles M. Tyler, The Superintendent of Public Instruction, Douglas Boardman, Charles K. Adams, Mynderse Van Cleef, Henry B. Lord, George R. Williams,

EMMONS L. WILLIAMS, Secretary

Committee on Buildings and Grounds Trustees SAGE, ADAMS, WILLIAMS.

Committee on Departments of Applied Science Trustees WILLIAMS, LORD, SAGE.

Committee on Departments of Natural History. Trustees VAN CLEEF, BOARDMAN, TYLER.

Committee on Ancient and Modern Languages Trustees Tyler, LORD, VAN CLEEF

Auditing Committee Trustees Lord, WILLIAMS.

Finance Committee Trustees BOARDMAN, LORD, SAGE, WILLIAMS.

Land Committee Trustees SAGE, BOARDMAN, and the Treasurer.

Committee on Sage College Trustees SAGE, ADAMS, and the Treasurer.

OFFICERS OF INSTRUCTION AND ADMINISTRATION.

ARRANGED IN GROUPS, WITH THE EXCEPTION OF THE PRESIDENT, IN THE ORDER OF SENIORITY OF APPOINTMENT.

CHARLES KENDALL ADAMS, LL.D., University Grounds PRESIDENT, and Professor of History.

THE REY WILLIAM DEXTER WILSON, D.D., LL.D., L.H.D., Syracuse EMERITUS Professor of Moral and Intellectual Philosophy. GEORGE CHAPMAN CALDWELL, B.S., Ph.D., University Grounds Professor of Agricultural and Analytical Chemistry. BURT GREEN WILDER, B.S., M.D., Cascadilla Place Professor of Physiology, Comparative Anatomy, and Zoology. University Grounds JAMES LAW, F.R.C V.S., Professor of Veterinary Medicine and Surgery. ALBERT NELSON PRENTISS, M.S., University Grounds Professor of Botany, Horticulture and Arboriculture. JOHN LEWIS MORRIS, A.M., C.E., University Grounds Sibley Professor of Practical Mechanics and Machine Construction.

THOMAS FREDERICK CRANE, A.M., University Grounds Professor of the Romance Languages and Literatures.

CHARLES ASHMEAD SCHAEFFER, A.B., Ph.D., 135 E. Seneca St. DEAN, and Professor of General and Analytical Chemistry, and of Mineralogy. HIRAM CORSON, A.M., LL.D., Cascadilla Cottage Professor of English Literature and Rhetoric. WATERMAN THOMAS HEWETT, A.B., Ph.D., University Grounds Professor of the German Language and Literature. University Grounds ISAAC FLAGG, A.B., Ph.D., Professor of the Greek Language and Literature. CHARLES CHAUNCY SHACKFORD, A.M., Brookline, Mass. EMERITUS Professor of Rhetoric and General Literature. THE REV CHARLES BABCOCK, A.M., University Grounds Professor of Architecture. JAMES EDWARD OLIVER, A.M., University Grounds Professor of Mathematics. WILLIAM ARNOLD ANTHONY, Ph.B., Cascadilla Place Professor of Physics and Experimental Mechanics. ESTEVAN ANTONIO FUERTES, C.E., M.A.S.C.E., University Grounds Professor of Civil Engineering, and Dean of the Department of Civil Engineering. ISAAC PHILLIPS ROBERTS, M.Agr., University Grounds Professor of Agriculture. HORATIO STEVENS WHITE, A.B., In Europe Professor of the German Language and Literature. JOHN HENRY COMSTOCK, B.S., University Grounds Professor of Entomology and General Invertebrate Zoology. SAMUEL GARDNER WILLIAMS, A.B., Ph.D., Corner of Green and Albany Sts. Professor of the Science and the Art of Teaching-HENRY SHALER WILLIAMS, Ph.B., Ph.D., University Grounds Professor of Geology and Palcontology.

WILLIAM GARDNER HALE, A.B., University Grounds Professor of the Latin Language and Literature. THE REV MOSES COIT TYLER, LL.D., L.H.D., University Grounds Professor of American History. ROBERT HENRY THURSTON, M.A., DOC. Eng., University Grounds Director of Sibley College; Professor of Mechanical Engineering. JACOB GOULD SCHURMAN, B.A, D.Sc., University Grounds Susan E. Linn Sage Professor of Christian Ethics and Mental Philosophy. WILLIAM PERCY VAN NESS, 1St Lieut. 1st Art., U. S. A., Mill and Tioga Sts. Professor of Military Science and Tactics. SPENCER BAIRD NEWBURY, E.M., Ph.D., University Grounds Acting Professor of Organic and Applied Chemistry. Edward Hitchcock, Jr., A.M., M D., 100 Cascadilla Acting Professor of Physical Culture, and Director of the Gymnasium. BENJAMIN IDE WHEELER, A.B., Ph.D., University Grounds Acting Professor of Classical Philology and Instructor in Latin and Greek. 142 E. Seneca St. GEORGE WILLIAM HARRIS, Ph.B., Acting Librarian. LUCIEN AUGUSTUS WAIT, A.B., University Grounds Associate Professor of Mathematics. Cortland EDWIN CHASE CLEAVES, B.S., Associate Professor of Freehand Drawing and Mechanical Drawing. HERBERT TUTTLE, A.M, 152 East Seneca St. Associate Professor of the History and Theory of Politics, and of International Law.

INSTRUCTION AND ADMINISTRATION 23

HENRY CARTER ADAMS, Ph.D., University Grounds Associate Professor of Political Economy.

CHARLES LEE CRANDALL, C.E., 100 Hector St. Assistant Professor of Civil Engineering, in charge of 'Road Engineering and Geodesy.

IRVING PORTER CHURCH, C.E., 151 E. Seneca St. Assistant Professor of Civil Engineering, in charge of Applied Mechanics.

WILLIAM RUSSELL DUDLEY, M.S., 108 Cascadilla Assistant Professor of Cryptogamic Botany.

GEORGE WILLIAM JONES, A.M., 17 Factory St. Assistant Professor of Mathematics.

GEORGE SYLVANUS MOLER, A.B., B.M.E.,

156 N Aurora St.

Assistant Professor of Physics.

SIMON HENRY GAGE, B.S., 148 Cascadilla Assistant Professor of Physiology, and Lecturer on Microscopical Technology.

CHARLES FRANCIS OSBORNE, 138 Cascadilla Assistant Professor of Architecture.

CHARLES DAVID MARX, C.E., Professor Wait's Assistant Professor of Civil Engineering, in charge of the Graphics of Engineering.

FRANK HARVEY BAILEY, Passed Assistant Engineer, U.S.N., Cascadilla Place Assistant Professor of Mechanical Engineering; Instructor in Marine Engineering.

WESLEY NEWCOMB, M.D., 26 E. Seneca St. Instructor in Conchology, and Curator of the Newcomb Collection of Shells.

JAMES MCMAHON, A.B., Professor Oliver's Instructor in Mathematics.

PAUL DANIEL BRUN,

169 E. State St.

Instructor in French.

142 Cascadilla FRANK HOWARD MORGAN, S.B., Instructor in Chemistry. WILLIAM COLLIER DOLE, JR., 92 Cascadilla Instructor in Gymnastics. 63 Eddy St. FRANK VAN VLECK, M.E., Instructor in charge of the Mechanical Laboratory, and Assistant to the Director of Sibley College. ERNEST WILSON HUFFCUT, B.S., 112 E. State St. Instructor in Rhetoric and Composition. 67 N Aurora St. CHARLES SMITH PROSSER, M.S., Instructor in Paleontology. FRANK HEYWOOD HODDER, Ph.M., • Professor Oliver's Instructor in History and Political Economy. JAMES OWEN GRIFFIN, 229 E. State St. Instructor in German. 173 Cascadilla BOLTON COIT BROWN, B.P., Instructor in Industrial Art and Drawing.

ARTHUR SAFFORD HATHAWAY, B.S., Instructor in Mathematics	169 E. State St.
ANDREW CURTIS WHITE, Ph.D., Instructor inGreek and Lati	60 E. Mill St.
CHARLES BUNDY WILSON, A.M., Instructor in German.	69 Eddy St.
COURTNEY LANGDON, Instructor in Romance Langue	152 E. Seneca St. ages.
EDWARD EVERETT HALE, JR., A.B., Instructor in English.	152 E. Seneca St.
JAMES FURMAN KEMP, A.B., E.M., Instructor in Geology and Paleon	[Absent on leave]
LOUIS LEAKEY, Instructor in Elocution.	23 Quarry St.
ORRIN LESLIE ELLIOTT, Ph.B., Instructor in English.	173 Cascadilla
DUGALD CALEB JACKSON, B.S., Instructor in Physics.	56 N Geneva St.

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Forest Home EUGENE HENRY PRESWICK, B.S., Instructor in Qualitative Analytical Chemistry. ELBERT WILLIAM ROCKWOOD, B.S., 33 Heustis St. Instructor in General Chemistry, Mineralogy, and Assaying. RUFUS ANDERSON, M.E., Forest Home Instructor in Mechanical Engineering, and Foreman of the Machine Shop. Patten House JAMES WHEAT GRANGER, Instructor in Forging. WILLIAM HENRY WOOD, 72 W Mill St. Instructor in Woodworking. JAMES ELIJAH VANDERHOEF, Sibley College Instructor in Moulding. HERMAN ATKINS MCNEIL, 91 E. Buffalo St. Instructor in Industrial Art. 63 Eddy St. GEORGE LINCOLN BURR, A.B., Instructor in Anglo-Saxon. Alfred Mitton Mosscrop, B.C.E., 249 E. State St. Instructor in Civil Engineering, and Assistant in the Engineering Laboratories. Alfred Sidney Johnson, A.M., Cor Heustis and Dryden Rd. Instructor in Philosophy. EDWARD CHARLES MURPHY, B.C.E., M.S., 156 N Aurora St. Examiner in Mathematics. CHARLES HERBERT THURBER, Ph.B., 63 Eddy St. Registrar, and Fresident's Secretary. 122 Cascadilla CHARLES BAKER MANDEVILLE, B.S., Assistant to the Treasurer. HORACE MACK, 116 Cascadilla Assistant to the Treasurer in the Land Office. EDWIN HAMLIN WOODRUFF, Cor. Mill and Aurora Sts. Chief Cataloguer in the Library. 3

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 BOARDMAN LAMBERT OVIATT, 65 Cascadilla Assistant to the Professor of Freehand Drawing, and Preparator in the Zoölogical Museum.
 WARREN POWERS LAIRD, 56 North Geneva St. Assistant to the Professor of Architecture.
 HERBERT EDWIN BARIGHT, 31 Dryden Rd. Master of the Chime.

SPECIAL LECTURERS FOR THE CURRENT YEAR.

ANDREW DICKSON WHITE, LL.D., University Grounds Lecturer on German History in the Nineteenth Century.

GOLDWIN SMITH, LL.D., L.H.D., Toronto, Canada Lecturer on English Constitutional History.

FRANK B. SANBORN, M.A., Lecturer on Social Science. Concord, Mass.

RODOLFO LANCIANI, LL.D., Rome, Italy Lecturer on Results of Recent Explorations in Rome. Cambridge, England CHARLES WALDSTEIN, Ph.D., Lecturer on Classical Archaology. Brooklyn The HON. SETH LOW, A.M., Lecturer on The Problems of Municipal Government in America. President GEORGE W ATHERTON, LL.D., State College, Pa. Lecturer on The Education of American Farmers. President EDWIN WILLETS, A.M., Agricultural College, Lansing, Mich. Lecturer on Land Tenure and the Limitations of American Agriculture WOODROW WILSON, Ph.D., Bryn Mawr, Pa. Lecturer on Methods of Administration. WASHINGTON GLADDEN, D.D., LL.D., Columbus, O. Lecturer on The Ethical Relations of Capital and Labor. FREDERIC WILLIAM SIMONDS, M.S., Ph.D., University Ave. Lecturer on Economic Geology JAMES JULIUS CHAMBERS, Ph.B., New York City Lecturer on Journalism LAUREN BRIGGS ARNOLD, Rochester Lecturer on Dairy Husbandry. GROVE K. GILBERT, B.S., Washington, D. C. Lecturer on The Field Work of the U.S. Geological Survey. CHARLES EDWARD EMERY, Ph.D., New York City Lecturer on Steam Engineering CHARLES TALBOT PORTER, Esq., New York City Lecturer on Mechanical Engineering. Eckley Brinton Coxe, M.A., E.M., Drifton, Pa. Lecturer on Mining Engineering. JOHN WILMUTH HILL, M.E., Cincinnati, O. Lecturer on Steam for Water Supply.

JAMES M. ALLEN, M.E., Hartford, Conn. Lecturer on Steam Generation. RUDOLF HERING, C.E., Chicago, Ill. Lecturer on Sanitary Engineering. Philadelphia, Pa. HORACE LEE, M.E., Lecturer on Marine Engineering. Lynn, Mass. ELIHU THOMPSON, E.E., Lecturer on Electrical Engineering. CHARLES WILSON COPELAND, M.E., New York City Lecturer on The Progress of Steam Engineering. New York City WILLIAM PETIT TROWBRIDGE, M.A., Lecturer on Mechanics. ALEXANDER GRAHAM BELL, M.A., Washington, D.C. Lecturer on Telephony. THEOBALD SMITH, Ph.B., M.D., Washington, D. C. Lecturer on Pathogenic Bacteria and their Relation to Hygiene.

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INSTRUCTION AND ADMINISTRATION 29

The Rev. CHARLES H. PARKHURST, A.M., D.D., New York City

The Rev. CHARLES H. HALL, A.M., D.D., Brooklyn, N.Y.

The Rev FRANCIS GREENWOOD PEABODY, A.M., D.B., Cambridge, Mass.

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- MATHEMATICS—Professor Oliver, Professors WAIT, Jones, ANTHONY, BABCOCK, FUERTES, MORRIS, and THURSTON.
- THE SIBLEY COLLEGE OF MECHANICAL ENGINEER-ING AND THE MECHANIC ARTS—Professor Thurston, Professors Anthony, Fuertes, Morris, Schaeffer, Oliver, Cleaves, and Bailey
- NATURAL HISTORY—Professor PRENTISS, Professors Com-STOCK, LAW, WILDER, H. S. WILLIAMS, DUDLEY, and GAGE.
- HISTORY AND POLITICAL SCIENCE—Professor Tyler, Professors CRANE, HALE, TUTTLE, WHITE, and H. C. ADAMS.

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MATERIAL EQUIPMENT OF THE UNIVERSITY.

BUILDINGS.

MORRILL HALL AND WHITE HALL.—These two edifices, architecturally alike, are each one hundred and sixty-five feet by fifty, four stories in height, of blue Ithaca stone, with light Medina trimmings. Each building is divided by three halls, running from front to rear. The middle halls contain the larger lecture-rooms, and the other halls the smaller lecture and recitation-rooms. In MORRIL HALL are the offices of the President, the Treasurer, the Dean, and the Registrar of the University; the Faculty-room, architectural rooms, and agricultural museum. In WHITE HALL are the rooms of the literary societies and of the University Christian Association. THE MCGRAW BUILDING.—This building, the gift of the late Mr. John McGraw, of Ithaca, is constructed, like the edifices around it, of dark blue stone, quarried on the University grounds, but with dressings and cornices of Onondaga gray limestone. In its architecture it corresponds with the other buildings. Its length is two hundred feet and its width sixty, while its tower rises to a height of over one hundred and twenty feet. It consists of a main edifice and two wings. The main or central portion of the building comprises one hall one hundred feet long, fifty-six wide, and nineteen in height, and another above it of the same length and breadth, but nearly forty feet high, and containing three galleries with an average height of twelve feet each. In this part of the McGraw building are alcoves and galleries for the Library on the lower floor, and in the galleries on the second floor most of the University collections are arranged. In the north wing is the anatomical lecture-room, with ascending

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seats. Beneath this is the seminary room, and the basement is occupied by the histological laboratory In the south wing are the geological lecture-room and paleontological laboratory, and immediately over them the geological laboratory In the campanile, in the center of the front of the McGraw building—a massive stone tower twenty-two feet square—are placed the great bell of the University, the nine smaller bells of the McGraw chime, and the great University clock. The interior of the Mcgraw building is solidly finished with native woods. Its different parts are separated by walls of brick and doors of iron, rendering them completely fire-proof. The library hall contains shelving for eighty thousand volumes. The galleries of the museum hall are tifteen feet deep, with a total length of six hundred feet.

THE CIVIL ENGINEERING BUILDING is a large structure, three stories high, containing twenty-one rooms, with a floor surface of about eighteen thousand square feet. The western façade of the main building is one hundred and twenty feet long, the northern and southern wings are each one hundred and five feet. The building contains laboratories, museums, and class-rooms. The museums and laboratories are described elsewhere (pp. 39, 40). Room 1 contains the working library of the department—some twelve hundred modern works on civil engineering, classified for ready reference. There are a reading and seminary room for students, two large lecture-rooms, one fifty-two feet long by forty-five feet wide, two large draughting-rooms, fitted with one hundred and fifteen improved iron desks and well lighted by day and by night, a room for meteorological observations, nearly all the instruments in which are self-registering, and several smaller lecture-rooms, store-rooms, etc. A temporary astronomical observatory has been erected directly east of the main building, in which are mounted, on brick piers, an astronomical transit by Troughton and Simms, provided with two collimators, a siderial clock, a four-and-a-half inch Clark equatorial, and an altazimuth reading to seconds by levels and micrometers.

References to the courses in civil engineering may be found in the index.

THE SIBLEY COLLEGE.—The buildings of Sibley College were all erected and presented to the University by the Hon. Hiram Sibley, of Rochester, N Y., who also gave the machinery and

collections with which they are supplied. The main building is of Ithaca stone trimmed with a fine white sandstone, and in its architecture is similar to the other buildings of the University It is one hundred and sixty feet long, forty feet in width, and three stories in height. The workshops are at the sides of a quadrangle, of which the fourth side is formed by the college building proper, they are of brick and one story in height. The main building contains on the first floor two large museums, which are fully described elsewhere (p. 41), a large and welllighted lecture-room, and the private rooms of the professor of practical mechanics. On the second floor are the lecture-room of the professor of mechanical engineering and the director, with its collections of illustrative materials, the drawing-rooms of the upper classes, and the private rooms of the director and professor of mechanical engineering and of the instructor in marine engineering. The third floor is filled with drawing-rooms for the younger classes in freehand drawing and decorative art, and the private rooms of the professor of drawing and his assistants. The workshops consist of a machine shop, a foundry, a blacksmith shop, and a wood-working shop, and include rooms devoted to the storage of tools, to emery grinding, etc. These shops are from forty to sixty feet in length, about forty feet in width, and are lofty and well lighted. It is expected that before the opening of the term in September, 1887, an additional building, one hundred and sixty feet by forty in dimensions, and two stories in height, will be completed. This building with its equipments will add very largely to the facilities for drawing and for shopwork. The tools and machinery are described fully under the head of Sibley College Collections. At the bottom of Fall Creek gorge is the house protecting the turbine which supplies the power demanded for ordinary occasions in driving the machinery of the college and the electric apparatus for lighting the campus and the buildings. This is a plain building of wood, three stories in height, and having floor space sufficient to accommodate classes in the study of hydraulics. THE CHEMICAL AND PHYSICAL BUILDING.—This building, situated on the north side of the quadrangle, was opened for occupancy in September, 1883. It is of red sandstone, about one hundred and forty feet in length, with a width of fifty and seventy feet, and is three stories in height above a well-lighted basement. The building is ornamented with casts and medallions of distin-

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guished scientists. The rooms of the physical department occupy the first floor and the basement. The second and third floors are occupied by the chemical department. The building contains, in addition to the amply-equipped laboratories, two large lecture-rooms, one for chemistry and one for physics, seating about one hundred and seventy students each. A fire-proof onestory annex, built of brick, has been erected north of the chemical and physical building during the past year, for the further extension of the work of the chemical department. This addition is one hundred feet in length by thirty-seven feet in width, and contains the laboratories of organic chemistry and assaying, with the necessary balance rooms and store-room. It is so placed with reference to the main building as to inclose a partly paved court, suitable for experiments in the open air.

THE SAGE COLLEGE FOR WOMEN.—This building is the gift of the Honorable Henry W Sage. It is a home or dormitory for students, not a separate department or school. It is quadrangular in form, one hundred and sixty-eight feet front, forty-one feet deep, and four stories in height. The north wing is eightyfive feet long, and the south wing one hundred and twelve. The building is of brick, with stone trimmings. A gymnasium nearly connects the wings in the rear The rooms for the students are eighteen feet by fourteen, with a low board partition dividing off one part for a sleeping-room. The college will accommodate about one hundred students. Besides the dormitories, dininghall, and parlors, it contains lecture and recitation rooms, a museum, laboratories, with very complete equipments, for students in botany, with green-houses, forcing-houses, and other necessary facilities for the pursuit of floriculture and ornamental gardening. THE SAGE CHAPEL.—This chapel, the gift of the Hon. Henry W Sage, and situated about midway between Morrill Hall and Sage College, is constructed of brick with elaborately carved stone trimmings, and is of the Gothic order of architecture. The auditorium, with a seating capacity of about five hundred persons, has an open-timber roof. One of the most noteworthy features of the room is the number of memorial windows and tablets. Opening into the auditorium is a smaller chapel, so arranged as to be used in connection with it. On the opposite or north side is THE MEMORIAL CHAPEL, constructed in the Gothic style of the second or decorative period. It was erected, as a tablet in its northern end bears witness, to the memory of Ezra
Cornell, John McGraw, and Jennie McGraw-Fiske, and was completed in 1884. The exterior is of red brick with stone trimmings. The interior walls are of Ohio stone and yellow brick. The ceiling is vaulted, with Ohio stone ribs and Caen stone panels. On entering the chapel the eye is at once arrested by the rich memorial windows constructed by Clayton & Bell, of London. They are designed not only to commemorate the connection of Mr Cornell, Mr McGraw, and Mrs. Jennie McGraw-Fiske with this University, but also to associate their names with the names of some of the greatest benefactors in the cause of education. The north window contains the figures of William of Wykeham, John Harvard, and Ezra Cornell, the east window the figures of Jeanne of Navarre, Margaret of Richmond, and Jennie McGraw-Fiske, the west window those of Elihu Yale, Sir Thomas Bodley, and John McGraw Directly beneath the great northern window is a recumbent figure of Ezra Cornell, in white marble, of heroic size, by William W Story, of Rome. A crypt underneath the chapel contains recesses for the remains of the founders of the University THE GYMNASIUM AND ARMORY is situated at the extreme southern side of the campus. The building was completed in the winter of 1883-4. The main portion is of brick, one hundred and fifty feet long, sixty feet wide, and fifty feet high. The Annex, joining the main hall on the south, is a two-storied wooden building, having an area of fifty-two by thirty-eight feet. The main building, with the exception of a small portion that is set apart for an office and military store-room, is used for gymnastics and military drill. Here are to be found the arms and equipments of the cadet corps, and a carefully selected lot of the most improved gymnastic apparatus and appliances for both individual and class work. The hall is heated by steam and lighted by electricity, and, it is believed, gives the largest clear space for floor room of any gymnasium in the country The Annex contains on the lower floor the offices of the Department of Physical Culture, faculty dressing-room, general bath and dressing-rooms, lavatory, closets, and general repair room. The upper floor is entirely given up to a dressing-room, which contains locker accommodations for five hundred students. The steam heating apparatus is all contained in a brick building removed some fifty feet from the other buildings.

CASCADILLA PLACE, situated on the south bank of Cascadilla

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gorge, is built of blue stone, is one hundred and ninety-five feet long by one hundred feet wide, four stories high, and contains about two hundred rooms. It was finished in 1868. University exercises are no longer held there, the rooms being rented to professors and students as living apartments.

MUSEUMS.

The AGRICULTURAL MUSEUM occupies a large room on the first floor of Morrill Hall and four rooms in the basement. It contains (1) THE RAU MODELS, being one hundred and eighty-seven models of plows made at the Royal Agricultural College of Würtemberg, under the direction of Professor Rau, and arranged and classified by him for the Paris Exposition of 1867, (2) Engravings and photographs of cultivated plants and animals obtained at the various agricultural colleges of Europe, (3) The $A \sigma z \sigma \sigma x$ VETERINARY MODELS, being the entire series used at the government veterinary colleges of France and Russia, (4) A collection of the CEREALS OF GREAT BRITAIN, being a duplicate of that in the Royal Museum of Science and Art at Edinburgh, presented by the British government, (5) A collection of agricultural seeds, (6) A large number of models representing a great variety of agricultural implements. The class-room has been provided with a special set of diagrams and other appliances designed to illustrate the subjects of the lectures on agriculture. THE MUSEUM OF ARCHÆOLOGY consists of about four thousand specimens. Of these about fifteen hundred illustrate primitive society in South America and the Pacific Islands, and were collected chiefly by Profs. Hartt, Barnard, Derby, Steere, and Ward. There are a few hundred antiquities from Great Britain, Denmark, France, Switzerland, and Egypt. The most valuable object in the Egyptian collection is a mummy of the XXIII dynasty, taken in 1883 from the necropolis at Thebes, and presented to the University by the Honorable G. P. Pomeroy, American Consul at Cairo. The remainder of the museum is composed of the relics of the Indians and Mound-Builders of North America. THE ARCHITECTURAL COLLECTION contains over two thousand photographic prints, the most of which are of large size, several hundred drawings, and about two hundred models in stone and wood. These are all designed to illustrate the constructive forms and peculiarities of the different styles of architecture. These,

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as well as the White Architectural Library—containing over one thousand volumes—are all freely accessible to the student of architecture.

THE BOTANICAL MUSEUM.—The means of illustrating the instruction in botany include the herbarium, estimated to contain fifteen thousand species, two series of models, the Auzoux and the Brendel, the full set of wall maps of Achille Comte, and the botanical charts of Professor Henslow, a lime lantern with five hundred views, illustrating different departments of botany, twenty compound and dissecting microscopes, a collection of fruits, barks, cones, nuts, seeds, fibers, and various dry and alcoholic specimens, a general collection of economic vegetable products, and above a thousand specimens of the woods of different countries. Besides these, the large conservatories and gardens, and an uncommonly rich native flora afford abundant material for illustration and laboratory work.

• THE CHEMICAL MUSEUM is located in a large room in the eastern end of the Chemical and Physical building, and contains the Silliman collection of minerals, and the collection of applied chemistry The former comprises about three thousand five hundred specimens, many of them of extreme rarity The latter consists of materials and products illustrating many of the applications of chemistry to the arts and manufactures, such as the manufacture of soap, sulphuric acid, soda ash, alum, white lead gunpowder, pottery, porcelain, glass, cement, dyes, pigments, oils, the refining of petroleum, etc., etc. These collections are being constantly and rapidly increased by gifts and purchases. THE MUSEUM OF CONCHOLOGY is included in the general museum in the McGraw building. The museum contains the Newcomb collection of shells, which embraces more than eighty thousand examples of more than twenty thousand varieties, representing at least fifteen thousand species. The collection is systematically classified and exhibited with special reference to making it available for study As many of the specimens are of great rarity and not a few unique, the collection offers unusual facilities for the systematic study of conchology

THE SPECIAL MUSEUMS OF THE CIVIL ENGINEERING DEPARTMENT contain the following collections, which receive regular additions from a yearly appropriation, which is becoming more and more liberal as the large resources of the University become available: 1. The MURET collection of models in descriptive geometry and

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stone-cutting. 2. The DE LAGRAVE general and special models in topography, geognosy, and engineering. 3. The SCHROEDER models in descriptive geometry and stereotomy, with over fifty brass and silk transformable models made in this department after the OLIVIER models. 4. The GRUND collections of bridge and track details, roofs, trusses, and masonry, supplemented by similar models by Schroeder and other makers. 5. A modern railroad bridge of one hundred feet span, the scale being onefourth of the natural size. 6. The DIGEON collection of working models in hydraulic engineering. 7 Working models of water wheels. 8. Several large collections of European and American photographs of engineering works during the process of construction, and many other photographs, blue prints, models, and diagrams. 9. A COMPLETE COLLECTION of instruments of precision, such as a Troughton and Simms astronomical transit, a universal instrument, by the same makers, reading to single seconds, sextants, astronomical clocks, chronographs, a Negus chronometer, two equatorials-the larger having an objective, by Alvan Clark, four and a half inches in diameter—and other instruments, like pier collimators, etc., necessary to the complete equipment of a training observatory 10. A GEODESIC COLLECTION, consisting of a secondary base line apparatus made under the direction of the Coast Survey, and all the portable, astronomical, and field instruments needed for extensive triangulations, including soundingmachines, tachometers, deep-water thermometers, heliotropes, etc. 11. Among the usual field instruments there is nearly every variety of engineers' transits, theodolites, levels, solar and other compasses, omnimeters, and tachometers, with a large number of special instruments, such as planimeters, pantographs, elliptographs, arithmometers, computing machines, altazimuths, sextants, hypsometers, and meteorological instruments of all descriptions. In these museums there are also a large number of steel and iron columns, and beams of various shapes and sections, an extensive collection of every kind of timber joints, and models and specimens of difficult stone cutting made by students of this course. The additions, during the past year, to the equipment of this department have been-a cathetometer, by the Société Genevoise, with two micrometer microscopes and telescopes reading to one-thousandth of a millimeter, and with suitable levels, an accurate level tester, reading to one-half second of arc; a Kew improved pattern magnetometer and dip circle for

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magnetic field work, an 80,000 pounds compression testing machine, devised for experiments on the friction, etc., of bridge rollers, a stereographic model of the Bay of North America, by the U S. C. and G Survey office, Ockerson's device for printing the conventional signs of topography, a Waltham power lathe, with all the stock, tools, and necessary equipment of a shop, for the repair of instruments of precision, a photographic camera, with suitable appliances for use in field topography, and for copying drawings, specimens of fractured materials, etc. Important additional facilities have been added to the hydraulic laboratory, the cement testing machinery, and the astronomical and meteorological observatories.

For references to the details of the Civil Engineering department, see index.

THE MUSEUM OF ENTOMOLOGY AND GENERAL INVERTEBRATE ZOology ---- The entomological cabinet contains, in addition to many exotic insects, specimens of a large proportion of the more common species of the northeastern United States. This collection includes many sets of specimens illustrative of the metamorphoses and habits of insects. The general collection of invertebrates comprises a small but well-selected series of forms representing all of the larger groups. In this collection there is a nearly complete set of the duplicates distributed by the U S. National Museum, many specimens collected on the coast of Brazil by the late Professor C. F Hartt, and specimens from Florida and the West Indies, collected by Dr Wesley Newcomb. The collection includes, moreover, a set of the Auzoux models and of the glass models made by Blaschka. THE MUSEUMS AND COLLECTIONS OF THE SIBLEY COLLEGE OF ME-CHANICAL ENGINEERING AND MECHANIC ARTS are of exceptional extent, value, and interest. The two principal rooms on the first floor of the main building are devoted to the purposes of a museum of illustrative apparatus, machinery, products of the manufacturing industries, and collections exhibiting processes and methods of manufacture, new inventions, the growth of standard forms of motors, and other collections of value in the courses of technical instruction given in the college. In the west museum are placed the Reuleaux collection of models of kinematic devices and movements, which is, so far as known, the only complete collection on this continent, and is one of the very few in the world. Besides these are the Schroeder and other models,

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exhibiting the forms and proportions of parts of machinery, the construction of steam engines and other machines, and methods of making connections. In the east museum are placed a large number of samples of machines constructed by the best makers, to illustrate their special forms and methods of manufacture. Among these are several beautifully-finished samples of steam pumps, "sectioned" to exhibit their internal construction and arrangement, steam-boiler injectors similarly divided, governors for steam engines, water-wheels, and other motors, devices for lubrication, shafting, and pulleys, couplings, and other apparatus for the transmission of power, both by shafting and by wirerope transmission. The lecture-rooms of the Sibley College, each being devoted to a specified line of instruction and list of subjects, are each supplied with a collection of materials, of drawings, and of models and machines, especially adapted to the wants of the lecturer in each subject. Thus, the lecture-room of the instructor in "Materials of Engineering" contains a fine collection of samples of all the metals in common use in the arts, with samples of ores and of special intermediate products, exhibiting the processes of reduction and manufacture. Among these are specimens of the whole range of copper-tin and copper-zinc alloys, and of the "kalchoids" produced by their mixture, such as were the subjects of investigations made by the Committee on Alloys of the U S. Board appointed by President Grant by authority of Congress, in the year 1875. The collection is supplemented by other alloys later produced by the director, and is one which has no known superior, and is perhaps unequaled. The course in machine design is illustrated by the standard forms of parts of machinery The course of instruction in mechanical engineering is illustrated by a fine collection of steam engines of various well-known types, gas and vapor engines, water-wheels, and other motors, models and drawings of every standard or historical form of prime mover, of parts of machines, and of completed machinery The collections of workshop machinery are fully described in that part of this volume which specially treats of the Sibley College, and to which reference may be made for this and other matter of technical detail. THE MUSEUM OF PALEONTOLOGY comprises the following collections 1. The JEWETT COLLECTION, accumulated by the late Col. Jewett when curator of the State Cabinet of Natural History This collection is especially rich in New York fossils, containing

many of the original specimens described in the State reports, and not a few unique specimens. 2. A fair representation of the rich faunas of the cretaceous and tertiary formations along the eastern and southern parts of the Union, and a large number of characteristic English and European fossils. 3. A fine series of English mesozoic fossils, of tertiary fossils from Santo Domingo, of pre-glacial fossils from Sweden, and numerous smaller collections from various typical localities in our own country. 4. The Ward series of casts. 5. The unique collections from Brazil, made by Prof. Hartt and party on the Morgan expedition, containing the original specimens, and a great number of duplicates. Numerous additions have been made during the past year, making the museum more complete in ichthrosauri and other vertebrate remains, in Trenton trilobites, and in the fauna of the Upper Devonian.

THE MUSEUM OF VETERINARY SCIENCE embraces the following collections 1. The Auzoux veterinary models, comprising plastic models of the horse, showing the relative position of over three thousand anatomical parts, models of limbs, sound and with detachable pieces, and their morbid counterparts, illustrating changes in diseases of the bones, joints, muscles, etc., a set of obstetrical models, showing the virgin and gravid uterus in different animals, and the peculiarities of the female pelvis and its joints, models of the gastric cavities of domestic animals, an extensive set of models of jaws, showing the indications of age as well as vicious habits and diseases, models of equine teeth in sections, showing structure and the changes effected by wear 2. Skeletons of the domestic animals, articulated and unarticulated. 3. A collection of diseased bones, illustrating the various constitutional diseases which impair the nutrition of these structures, together with the changes caused by accidental injuries and purely local disease. 4. Skulls of domestic animals, prepared to illustrate the surgical operations demanded in the different genera. 5. Jaws of farm animals, illustrating the growth and wear of the teeth, age, dentinal tumors, caries, etc. 6. A collection of specimens of teratology, consisting of monstrous foals, calves, and pigs. 7 A collection of tumors and morbid growths removed from the different domestic animals. 8. Some hundreds of specimens of parasites from domestic animals. 9. A collection of calculi from the digestive and urinary organs, etc., of farm animals. 10. Foreign bodies taken from various parts of the animal economy. 11. A

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collection of surgical instruments used in veterinary practice. 12. A collection of medicinal agents. 13. In addition, a large number of diagrams, the property of Professor Law, available in illustration of different points in anatomy, physiology, and pathology

THE MUSEUM OF GENERAL ZOOLOGY — The vertebrate collections are as follows About thirty-five hundred examples of about twenty-four hundred species of entire animals in alcohol, nearly half of the specimens being fishes collected in Brazil by the late Prof. C. F Hartt, the remainder include series of named fishes from the Smithsonian Institution and the Museum of Comparative Zoology, representatives of the general North American fauna, and of the local fauna, and many rare forms from various parts of the world, including the following Chimpanzee, orang, cheiromys, dingo, pangolin, sloth, ant-eater, armadillo, ornithorhynchus, echidna, jacana, sphenodon, monitor, heloderma, crocodile, alligator, draco, axolotl, proteus, megalobatrachus, siren, amphinen, pipa, ceratodus, protopterus, flying-fish, polypterus, -calamouchys, thalassophryne. chimæra, cestracion, myxine, bdellostoma, and branchiostoma, about twenty-eight hundred anatomical preparations, including mounted skeletons of man, gorilla, lion, panther, camel, porpoise, manatee, sloth, kangaroo, ostrich, apteryx, alligator, draco, frog, cryptobranchus, necturus, cæcilia, and amia, more than six hundred preparations of the brain, large series of dissections of the lamprey, necturus, and cat, embryos or young of man, ape, leopard, opossum, kangaroo, manatee, dugong, peccary, lama, sea-lion, bat, alligator, necturus, amia, lepidosteus, shark, skate, and domesticated animals, about nine hundred microscopical preparations, chiefly from the cat, frog, and necturus, more than eleven hundred mounted skins, including orang, tiger, cheetah, otter, moose, tragulus, camel, beaver, hyrax, centetes, galeopithecus, armadillo, manatee, porpoise, koala, wombat, kangaroo, echidna, ornithorynchus, emeu, apteryx, boat-bill, penguin, gavial, crocodile, rattlesnake, heloderma, megalobatrachus, ceratodus, cestracion, saw-fish, garpike, polypterus, Besides the papier-mâché models by Auzoux mentioned etc. above there are several Bock-Steger models in plaster, a Buechi model of the brain, and wax models by Weisker as follows the brain cavities, the pelvis, the diaphragm, the development of the frog, trout, and branchiostoma. In the arrangement of the collections reference has been had to the exemplification of zoolog-

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ical and morphological ideas, such as the unity of general structure under diversity of form and mode of life in the branch and within each class, the resemblances between members of different classes, the existence of apparently useless organs, etc. Among special series are placed together the vertebrates inhabiting the neighborhood, all venomous forms, etc.

LABORATORIES.

THE ANATOMICAL LABORATORIES are in the north wing of the McGraw building, second floor and basement. They are furnished with instruments and materials for practical work in anatomy, human and comparative, histology, and elementary physiology Among the appliances recently acquired are an incubator, a first-class microscope with apochromatic objectives and oculars, and apparatus for determining the results of aquatic or combined aquatic and aerial respiration. Students have access to many works of reference and to a standard series of anatomical and microscopical preparations.

THE BOTANICAL LABORATORY is located on the first and second floors of the south wing of Sage College, adjoining the botanical lecture-rooms. The laboratory is very completely supplied with microscopes and all apparatus necessary for investigations in this branch of science. Connected with the laboratory are the greenhouses, which at all seasons of the year furnish ample material for illustration and for laboratory use. THE CHEMICAL LABORATORIES OCCUPY a portion of the second story and the whole of the third story of the physical and chemical building, and also the new chemical annex. On the second floor adjoining the chemical lecture-room is the laboratory for blowpiping and mineralogy, which is equipped with tables covered with porcelain tiles, and will accommodate forty-three students. In the same room is a working collection of minerals comprising all of the more common species. In the third story, occupied by the department of agricultural and analytical chemistry, are two large student laboratories, one of these, for beginners in chemical practice, can accommodate one hundred students, a shaft from the ventilating-fan in the basement conveys a supply of fresh air to the room, the fume and hydrogen sulphide closets are ventilated by means of special flues heated by gas-burners. The laboratory for quantitative chemical work has places for seventy students, each place is supplied with reservoir

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and distilled water, gas, and suction for filtration produced by the air pump in the basement. Tables for distillation, combustion, etc., at each end of the room are supplied with gas and water, and with suction, blast, oxygen and hydrogen from the works in the basement. Steam evaporating and drying closets, and fume closets, are easily accessible from all parts of the room. There are, besides the rooms already described, weighing and reading-rooms, the private laboratories of the professors, and a number of rooms for special experiments.

The new Annex contains the laboratories of organic chemistry and of assaying. The organic laboratory contains slate-topped tables for twenty-four students, and is fitted with all modern appliances for original research in this important field. Adjoining the laboratory are the store-rooms, private laboratory, and the balance and reading-room, where a large part of the chemical section of the University Library, including complete sets of all the important chemical journals, is deposited. The assay laboratory contains six crucible furnaces, one large and two small muffle furnaces, one Fletcher gas cupel furnace, anvil, steel rolls, and the tools used in the various operations of assaying ores of the precious metals. In designing the Chemical Annex the intention has been to concentrate in that building all work involving any risk of fire. With this in view all partitions have been constructed of brick, the tables covered with slate slabs, and the floors laid with asphalt pavement. THE GENERAL CIVIL ENGINEERING LABORATORY OCCUPIES FOOM No. 3 in the engineering building. The laboratory is furnished with machines for tests of materials in tension, compression, flexure, and torsion. It also contains a seconds pendulum, chronograph, models referring to the theory of the arch, thermometer tester, sections of beams and columns, tools, etc., and a small turbine, which furnishes power for the experiments of the laboratory Room No. 4, in the same building, is the hydraulic laboratory, to which water is supplied, either from a large tank on the floor above, or directly from the mains of the University water-works. This laboratory contains various hydraulic machines, all kinds of mouth-pieces, long and short tubes, pipes of various lengths and diameters, bends, valves, accumulators, equalizers, manometers, etc. Its facilities for contributing to the efficiency of teaching hydraulics and for original research are constantly increasing. The first floor of this laboratory contains

two large setting tanks and sifting machines, used in connection with the tests on the strength of hydraulic mortars and cements, which are being conducted here in a systematic and thorough manner, and on a large scale, by the fellows of this department. This room is connected, electrically, with the astronomical observatory and with the chronographs and clocks in room No. 3, and in the department of Physics. It contains several piers, in brick and cement, for the adjustment of instruments and for practice in the observation for magnetic field-work, etc. Arrangements have been made for the swinging of a cold pendulum in the astronomical observatory, and a hot one in the basement of the Physical Laboratory, for the discussion of the field gravimetric work in connection with the Cornell University Surveys.

References to other characteristics of this department will be found in the index.

THE LABORATORY OF ENTOMOLOGY AND GENERAL INVERTEBRATE ZOOLOGY occupies the entire second floor of the north division of White Hall. It is equipped with a set of Auzoux models, microscopes, breeding cages, and other apparatus necessary for practical work in entomology The greater part of the entomological cabinet is kept here for reference. The laboratory is also supplied with a large collection of duplicate specimens of insects, and typical forms of other orders of invertebrates for the use of the students. THE GEOLOGICAL LABORATORIES OCCUPY the entire second floor of the south wing of the McGraw building, and are well furnished with the appliances needful for successful study in paleontology, lithology, practical geology, and the optical study of rocks and minerals. The laboratory on the east side is devoted especially to the collections and other equipments for the study of fossils and the various branches of paleontological science. The west room is devoted to the lithological collection and the equipments for macroscopic and microscopic study of minerals and rocks. Both laboratories are in connection with the main Geological Museum, occupying the central part of the same floor. THE MECHANICAL LABORATORY, which is the department of demonstration and experimental research of Sibley College, and in which not only instruction but investigation is conducted, is located in one of the annexes of Sibley College, in a room sixty feet by forty, of good height, well lighted on all sides, and carefully fitted up for the purpose for which it is designed. It is

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supplied with the apparatus of experimental work in the determination of the power and efficiency of the several motors, including steam engines and the turbine driving the machinery of the establishment, with boiler-testing plant and instruments, and with a number of machines for testing lubricants and the strength of metals. Among these is the "autographic testing machine," which produces an autographic record of the results of the test of any metal which may be placed within its jaws, securing exact measures of the strength, the ductility, the elasticity, the resilience or shock-resisting power, the elastic limit, etc., of the material. The several kinds of dynamometers, lubricant-testing machines, standard pressure-gauges, and other apparatus and instruments of precision employed by the engineer in such researches as he is called upon, in the course of his professional work, to make, are all collected here.

THE PHYSICAL LABORATORY -The rooms of the physical department occupy the first floor and the basement of the chemical and physical building. Piers are provided in several of the rooms for apparatus requiring immovable support, and some of the basement rooms have solid floors of cement, upon any part of which galvanometers, etc., may be used. The lecture-room on the first floor has fixed seats for one hundred and fifty-four students. The arrangements for experimental demonstrations are most complete. Gas, water, steam, oxygen, hydrogen, compressed air, blast, and vacuum cocks are within easy reach of the lecturer, and dynamo and battery currents are always at hand, and under complete control from the lecture-table. A masonry pier, four by twelve feet, permits the use in the lecture-room of apparatus that could otherwise only be used in the laboratory A small turbine on the lecture-table furnishes power for a variety of experiments. Lanterns with the lime or electric light are always in readiness for use when their use can in any way aid a demonstration. Adjacent to the lecture-room are the apparatus rooms, serving also, in part, as laboratories. On the same floor are other aboratory rooms, among which may be mentioned one for photometry, without windows, and painted black throughout. The equipment of the physical department comprises many fine instruments of precision. The standard clock, having Professor Young's gravity escapement, is placed in a room provided with double walls, and actuates two chronographs by which the time observations of the laboratory are recorded. A very per-

fect automatic dividing engine, a large comparator, a standard yard and meter, an electro-calorimeter of a platinum wire resistance in a hard rubber tank, a spectrometer reading to seconds, sets of resistance coils, and galvanometers of various forms are among the instruments. For magnetic and other measurements by the magnetic needle, a special building free from iron has been erected. In this are placed the magnetometers and the instruments for the accurate measurement of currents and potentials. Of the latter is the large tangent galvanometer, constructed at the University, with coils respectively one and six-tenths and two meters in diameter, and giving deflections to ten seconds. Several dynamos of different styles and capacities, ranging from one thousand to ten thousand watts, and a special engine for driving them, having a governor adjusted to control the speed with extreme precision, are included in the equipment. A very valuable adjunct is a well-equipped workshop connected with the department, where a skilled mechanic is constantly employed in making apparatus. Some of the most valuable instruments in the collection have been made in this shop.

THE UNIVERSITY LIBRARY

The Library, including the President White collection, described below, contains about ninety-five thousand seven hundred volumes, besides twenty-six thousand pamphlets. It is made up largely of the following collections, increased by annual additions of from three thousand to five thousand volumes A selection of about five thousand volumes purchased in Europe in 1868, embracing works illustrative of agriculture, the mechanic arts, chemistry, engineering, the natural sciences, physiology, and veterinary surgery, THE ANTHON LIBRARY, of nearly seven thousand volumes, consisting of the collection made by the late Professor Charles Anthon, of Columbia College, in the ancient classical languages and literatures, besides works in history and general literature, THE BOPP LIBRARY, of about twenty-five hundred volumes, relating to the oriental languages and literatures, and comparative philology, being the collection of the late Professor Franz Bopp, of the University of Berlin, THE GOLDWIN SMITH LIBRARY, of thirty-five hundred volumes, comprising chiefly historical works and editions of the English and ancient classics presented to the University in 1869 by Professor Goldwin Smith, and increased during later years by the continued liberality of the

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donor, the publications of the Patent Office of Great Britain, about three thousand volumes, of great importance to the student in technology and to scientific investigators, THE WHITE ARCHI-TECTURAL LIBRARY, a collection of over a thousand volumes relating to architecture and kindred branches of science, given by President White, THE KELLY MATHEMATICAL LIBRARY, comprising eighteen hundred volumes and seven hundred tracts, presented by the late Hon. William Kelly, of Rhinebeck, THE CORNELL AGRICULTURAL LIBRARY, bought by the Hon. Ezra Cornell, chiefly in 1868, THE SPARKS LIBRARY, being the library of Jared Sparks, the late president of Harvard University, consisting of upwards of five thousand volumes and four thousand pamphlets, relating chiefly to the history of America. The MAY COLLECTION, relating to the history of slavery and anti-slavery, the nucleus of which was formed by the gift of the library of the late Rev Samuel J May, of Syracuse, THE SCHUYLER COLLECTION of folklore, Russian history and literature, presented by the Hon. Eugene Schuyler in 1884, THE KING LAW LIBRARY, containing over four thousand volumes of legal works, purchased by the University in 1886. The number of periodicals and transactions, literary and scientific, currently received at the Library is four hundred and thirty-five, and of many of these complete sets are on the shelves. The Library is a circulating one so far as the members of the Faculty are concerned, and a library of reference for students. Undergraduates have free access to a collection of cyclopædias, dictionaries, and works of reference in the various departments of study, but they apply to the librarian for other works desired. Graduate students are admitted to the alcoves. Upon the recommendation of the professor in any department, students of the senior and junior classes, engaged in special work in that department, will be granted access to the shelves for purposes of consultation. Connected with the Library, and intended for use as a study room by advanced students, is the seminary room, containing one hundred and fifty of the principal historical, literary, and philological periodicals, and about two thousand volumes selected with reference to the needs of students engaged in special work. The Library is managed by a body known as the LIBRARY COUNCIL, which consists of seven members, as follows The President of the University and the acting librarian, ex officiis, one Trustee chosen by the Board, and four professors nominated by

the Faculty and confirmed by the Board. The President of the University is *ex officio* chairman of the council. The elected members hold office one year.

By the will of Mrs. Jennie McGraw-Fiske, who died in October, 1881, the Library received a specific bequest and was also made residuary legatee. From this source there has been paid to the University up to the present time about \$700.000, and the income from this fund, known as the McGraw Library Fund, when it becomes available, will be applied to the support and increase of the Library

THE LIBRARY BULLETIN is issued three or four times a year and contains classified lists of recent accessions, and of books in various departments, as well as other bibliographical matter intended to assist students in their use of the Library

THE PRESIDENT WHITE LIBRARY OF HISTORY AND POLITICAL SCI-ENCE.—On the 19th of January, 1887, Ex-President Andrew D. White, in accordance with a purpose long entertained, made a formal proffer of his Library of History and Political Science as a gift to the University On the same day a committee was appointed by the Trustees to confer with Mr. White in regard to the conditions of the transfer of the collection. The preliminary arrangements were satisfactorily made, and this invaluable collection thus at once became available for the purposes of the Univer-A catalogue, already far advanced, will be pushed forward to sity completion with the utmost practicable rapidity, with a view to publication. The collection consists of about 30,000 volumes and 10,000 pamphlets, besides not a few manuscripts of unusual interest and value. In almost all departments it contains works that are rare and valuable, while in one or two its completeness is believed to be unequaled in the United States. It is especially rich in primary sources on the History of Magic and Witchcraft, on the Period of the Reformation, on the French Revolution, and on the Period of the Civil War The principal conditions on which this munificent gift is made are that it shall be placed in an incombustible room where it will be easily accessible to students and historical scholars, that it shall be placed in care of a special attendant, and that a sum of money shall be specially set apart the income of which shall be sufficient to keep the collection supplied with the most important new books.

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THE UNIVERSITY FARM.

The University grounds consist of two hundred and seventy acres of land in one body, of which about one-half is devoted to the constant uses of the agricultural department, for experimental purposes and for the illustration of the principles of agriculture. Nearly all the domestic animals are kept to serve the same ends. Those portions of the farm and stock not used for experiments are managed with a view to their greatest productiveness. Statistics of both experiments and management are kept on such a system as to show at the close of each year the profit or loss not only of the whole farm, but also of each crop and group of animals. The barns are two in number The South Barn (eighty feet long by sixty wide, and three stories high) is devoted largely to the needs of the Horticultural Department. It also affords accommodations for the sheep and young cattle of the farm. The North Barn (one hundred and forty feet in length by one hundred and twenty in width, and three stories in height) is used for experimental purposes and the general needs of practical agri-The large basement contains a covered yard and accomculture. modations for the dairy cows, thirty in number, besides a cellar for roots and a place for cattle-scales, the steam boiler, and the engine. The second floor is largely devoted to accommodations for wagons, carriages, farm implements, and rooms for the purposes of administration. The third story contains the stationary thresher, chaffer, the grain, straw, and hay, as well as the sleeping-room for the workmen. The Dairy House, an independent structure not far from the North Barn, is a wooden building two stories high, and sufficiently capacious for all the purposes of making butter and cheese by the most approved modern methods. The building is constructed with special reference to securing the most even temperature and the most perfect ventilation. Its equipment embraces a steam boiler, an engine, two creamers, and other modern appliances for the manufacture of butter and cheese. The work done by agricultural students in dairy husbandry is under the direct supervision of Professor L. B. Arnold, and proceeds simultaneously with the lectures given by him.

COURSES OF INSTRUCTION.

[THE COURSES ENCLOSED IN BRACKETS ARE NOT GIVEN THIS YEAR, BUT MAY BE EXPECTED NEXT YEAR. THE LETTERS USED AS ABBREVI-ATIONS INDICATE THE DAYS OF THE WEEK, AND THE FIGURES THE HOURS OF THE DAY.]

LANGUAGE, PHILOSOPHY, HISTORY, AND POLITICAL SCIENCE.

COMPARATIVE PHILOLOGY

1. General introduction to the science of language. M., W., 11, third term. Professor WHEELER.

The course will undertake to acquaint the student with the chief principles of the life and growth of language as illustrated by living languages, with the various views concerning the origin of language and the relation of thought to expression, and with the outlines of the science of phonetics. It will review the history and main characteristics of the various branches of the Indo-European family of languages, and discuss their relations. The lectures presuppose no special linguistic training. Open to students of the sophomore, junior, and senior years.

2. Introductory course in Sanskrit. Two hours a week during the entire year. Professor WHEELER.

This course is intended for beginners, and will be adapted to the needs of students of Greek, Latin, or the Germanic languages, who wish a knowledge of the outlines of Sanskrit philology for comparative purposes. The grammar will have especial reference to instruction in the comparative philology of the Indo-European languages, and the work will be based upon Whitney's Sanskrit Grammar, and coupled with exercises in translation from Lanman's Sanskrit Reader

COURSES OF INSTRUCTION.

For statement of courses in comparative philology as applied to Greek, see Greek 31, for Latin, see Latin 26, 27, for the Romance languages, see French 13-15, 16-18, for the Germanic languages, see German 13-15.

GREEK.

FIRST TERM.

1. Xenophon's Symposium. Review of the grammar, with exercises in writing Greek. T., Th., S., 10. Dr. WHITE.

[4. Selections from Xenophon's Economicus. Review, etc.] Nos. 1, 2, 3, and 4, 5, 6 are given in alternate years, forming a pass-course for first and second-year required study

7 Plato's Apology of Socrates. Hadley and Allen's Grammar Weekly exercises in composition. Lectures on methods of classical study T., Th., S., 10. Professor FLAGG.

Nos. 7, 8, 9 form an honor course, open, first, to students who have passed a highly creditable entrance examination in Greek, and have also signified a desire to do advanced work in this subject, secondly, to those who have passed either 1, 2, 3, or 4, 5, 6

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with credit, and desire to do advanced work.

10. Selections from the dialogues of Plato. M., W., F., 10. Professor FLAGG.

[13. Herodotus and narrative portions of Thucydides.]

[16. Lysias and Demosthenes.]

Nos. 10-18, advanced recitation course, open only to students who have completed 7, 8, 9. Voluntary exercises in composition are included. Nos. 10, 11, 12, nos. 13, 14, 15, and nos. 16, 17, 18 occupy successively three years.

19. The Gorgias of Plato (lectures). Introduction to Greek philosophy T., Th., 11. Professor FLAGG.

[22. The speeches of Pericles in Thucydides (lectures). Periclean age.]

[25. Selections from the Attic orators (lectures). Development of oratory]

Nos. 19-27, supplementary lecture course, open to graduates, and to undergraduates who have completed 7, 8, 9. This course is intended to accompany 10-18, but may be taken separately The lectures are not merely exegetical, but adapted to a critical study of the literature in all its bearings. Nos. 19, 20, 21, nos. 22, 23, 24, and nos. 25, 26, 27 occupy successively three years.

COURSES OF INSTRUCTION

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28. The private life of the ancient Greeks, illustrated from the monuments (lectures). The life of the individual in Greek antiquity, its conditions and environment, the land and its physical features, the character of the folk, intellectual and physical, the household and the condition of its members, the house, its architecture and furniture, food and dress, cost of living, professions and crafts, trade and industries, coins, weights, and measures, schools and theaters, wagons and ships, war and munitions, social manners and usages, etc., etc. Each lecture is illustrated by lantern views. W., F., 11. Professor WHEELER.

Open to students of the classics and of history

Greek 28, 29, and Latin 28, 29 are given in alternate years.

[31. Greek grammar. A study of the language from a comparative point of view, and with particular reference to the history of sounds and inflections. M., W., 11 Professor WHEELER.]

Open to students who have completed 7, 8, 9, or 1-6.

34. Greek seminary The critical and linguistic study of portions of Homer's Iliad, the structure and development of the poem, the traditional text in reference to recent criticism, the character of the Homeric language as bearing upon peculiarities

of form and difficulties of interpretation. Interpretation and discussion by members of the seminary W., 2.30-4.30. Professor WHEELER.

[37 Greek seminary Study of the Greek dialects from the inscriptions.]

Nos. 34, 35, 36, and nos. 37, 38, 39 are given in alternate years.

SECOND TERM.

2. Homer's Odyssey (books IX., X.). T., Th., S., 10. Dr. WHITE.

[5. Homer's Odyssey (books XI., XII.)].

8. Homer's Odyssey (books I.-XII.). Recitations and prelections, with translation at sight. Composition. T., Th., S., 10. Professor FLAGG.

11. The Bacchantes of Euripides. M., W., F., 10. Professor FLAGG.

[14. Sophocles, (one play).]

[17 Sophocles, (one play).]

20. The Electra of Sophocles (lectures). Sophoclean tragedy T., Th., 11. Professor FLAGG.

[23. The Agamemnon of Æschylus (lectures). Æschylean tragedy]

[26. The Iphigenia among the Taurians of Euripides (lectures). Euripidean tragedy]

29. Course 28 continued. The private life of the ancient Greeks.

35. Greek seminary Course 34 continued. Iliad continued. Preparation and discussion of papers by members of the seminary [38. Greek seminary Course 37 continued. Greek dialects.]

THIRD TERM.

3. The Prometheus of Æschylus. T., Th., S., 10. Dr WHITE. [6. The Seven against Thebes of Æschylus.]

9. The Persians, Prometheus, and Seven against Thebes of Æschylus. Introduction to the Greek drama. Composition. T., Th., S., 10. Professor FLAGG.

12. The Alcestis of Euripides. M., W., F., 10. Professor FLAGG.

[15. The Acharnians of Aristophanes.]

[18. Theocritus.]

21. The Philoctetes of Sophocles (lectures). Professor FLAGG.

[24. Continuation of course 23.]

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[27 Continuation of course 26.]

36. Greek seminary Course 35 continued.

[39. Greek seminary Course 38 continued.]

LATIN

FIRST TERM.

1. Rapid reading of easy Latin (Nepos). Translation at sight. The writing of Latin. M., W., F., 11. Dr WHITE.

4. Rapid reading of easy Latin (Nepos). Translation at hearing. The writing of Latin. M., F., 10. Dr. WHITE. W., 10. Professor HALE.

The purpose of this course, which is open to students who have given evidence at the entrance examinations of more than average knowledge and ability, is to prepare such students to read ordinary Latin with ease and speed. A methodical study of the structure of the Latin sentence, in connection with grammar, is made in the class-room, and a written exercise in translating at first hearing, with formal questions set for written answers at one point after another in the progress of the sentence, is given weekly by Professor Hale, the aim being to lead

the student to grasp the thought in the order in which the Roman sentence develops it, with the final result of his gaining power to read continuous pages of Latin of moderate difficulty, and understand, without translating, as he reads.

7 The Germania of Tacitus. The Phormio of Terence. Translation at sight. T., Th., S., 8. Professor WHEELER.

Open to students who have completed course 3.

10. The Germania of Tacitus. The Phormio of Terence. Translation at sight. Th., S., 9. Professor WHEELER. T., 9. Professor HALE.

Open to students who have completed course 6.

[13. Practice in speaking and writing Latin. Professor HALE.] This course is open to students who have completed course 3 or course 6, and is especially recommended to those who may be planning to elect Latin later

16. Selections from the republican literature. Plautus. Cruttwell's and Teuffel's histories of Roman literature. M., W., F., 9 Professor HALE

Open to students who have completed course 9 or course 12. Courses 16 and 19 are given in alternate years.

[19. The literature and history of the early empire (to 180 A.D.). Selections from Tacitus, with brief selections from Valerius Maximus, Velleius Paterculus, and Suetonius. Cruttwell's and Teuffel's histories of Roman literature, Capes's Early Empire, and Merivale's History of the Romans. M., W., F., 9. Professor HALE.]

Open to students who have completed course 9 or course 12. Courses 19 and 16 are given in alternate years.

22. Early Latin Allen's Remnants of Early Latin, and inscriptions (partly in facsimile). Lectures. T., Th., 8. Professor HALE.

Open to students who have completed course 9 or course 12.

Course 22 and course 28 are given in alternate years.

[28. The private life of the Romans. A systematic treatment, with illustrations (by lantern views, photographs, etc.) from the remains of ancient art, and in particular from the results of excavations in Pompeii, Herculaneum, and Rome. Lectures. T., Th., 8. Professor HALE.]

Open to students of the classics or of history

Course 28 and course 22 are given in alternate years.

31. Latin seminary Unsettled problems in Latin syntax. 5

Investigations, lectures, and preparation of papers by members of the seminary Th., 2.30-4.30. Professor HALE.

Open to graduates, and, with the consent of the instructor, to undergraduates of special attainments.

[34. Latin seminary The critical study of Livy Th., 2.30– 4.30. Professor HALE.

Open to graduates, and, with the consent of the instructor, to undergraduates of special attainments.]

SECOND TERM.

2. The De Senectute of Cicero. Translation at sight. The writing of Latin. M., W., F., 11. Dr. WHITE.

Open to students who have completed course 1.

5. The De Senectute of Cicero. Translation at hearing. The writing of Latin. M., F., 10. Dr WHITE. W., 10. Professor HALE.

Open to students who have completed course 4 satisfactorily, or course 1 with especial promise.

8. Horace. Selections from the Epodes, Satires, and Odes (book I.). Collateral reading upon the history of Rome during the period covered by the life of Horace. T., Th., S., 8. Pro-fessor WHEELER.

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Open to students who have completed course 7

11. Horace. Selections from the Epodes, Satires, and Odes (book I.). Collateral reading upon the history of Rome during the period covered by the life of Horace. Th., S., 9. Dr. WHEELER. T., 9. Professor HALE.

Open to students who have completed course 10, and, with the consent of the instructors, to those who have completed course 7 with especial success.

[14. Continuation of course 13. Practice in speaking and writing Latin. Professor HALE.]

17 Continuation of course 16. The republican literature. Lucretius. Cruttwell's and Teuffel's histories of Roman literature. M., W., F., 9. Professor HALE.

Courses 17 and 20 are given in alternate years.

[20. Continuation of course 19. The literature and history of the early empire (to 180 A. D.). Juvenal, with brief selections from Persius. Cruttwell's and Teuffel's histories of Roman literature, Capes's Early Empire, and Age of the Antonines, and Merivale's History of the Romans. M., W., F., 9. Professor HALE.]

Courses 20 and 17 are given in alternate years.

23. Part I. The pronunciation of Latin. A study at first hand of the evidences. Lectures, with practical exercises in the reading of Latin prose and poetry of various types.

Part II. Latin grammar A study of the language on the side of syntax. The syntax of early Latin, and its origins. The development of constructions. The syntax of the Ciceronian period. The syntax of the early empire. Lectures. T., Th., 8. Professor HALE.

Course 23 and course 29 are given in alternate years.

[26. Latin grammar A study of the language from a comparative point of view, and with particular reference to the history of sounds and inflections. W., F., 11. Professor WHEELER.

Open to students who have had course 9 or course 12.

[29. Continuation of course 28. The private life of the Romans. T., Th., 8. Professor HALE.]

Course 29 and course 23 are given in alternate years.

32. Latin seminary Unsettled problems in Latin syntax. Investigations, lectures, and preparation of papers by members of the seminary Th., 2.30-4.30. Professor HALE.

Open to graduates, and, with the consent of the instructor, to undergraduates of special attainments.

[35. Latin semmary The critical study of Livy Th., 2.30-4.30. Professor HALE.

Open to graduates, and, with the consent of the instructor, to undergraduates of special attainments.]

THIRD TERM.

3. Livy Translation at sight. The writing of Latin. M., W., F., 11. Dr. WHITE.

Open to students who have completed course 2.

6. Livy Translation at hearing. The writing of Latin. M., F., 10. Dr WHITE. W., 10. Professor HALE.

Open to students who have completed course 5 satisfactorily, or course 2 with especial promise.

 Horace. Selections from the Odes (books II.-IV) and Epistles. Collateral reading upon the history of Rome during the life of Horace. T., Th., S., 8. Professor WHEELER.
 Open to students who have completed course 8.

12. Horace. Selections from the Odes (Books 11-IV) and Epis-

tles. Collateral reading upon the history of Rome during the life of Horace. Th., S., 9. Professor WHEELER. The history of Roman literature. T., 9. Professor HALE.

Open to students who have completed course 11, and, with the consent of the instructors, to those who have completed course 8 with especial success.

[15. Continuation of course 14. Practice in speaking and writing Latin. Professor HALE.]

18. Continuation of course 17 The republican literature. Catullus. Cruttwell's and Teuffel's histories of Roman literature. M., W., F., 9. Professor HALE.

Courses 18 and 21 are given in alternate years.

[21. Continuation of course 20. The literature and history of the early empire (to 180 A. D.) Pliny the Younger, with brief selections from Martial, Aulus Gellius, and Fronto. Cruttwell's and Teuffel's histories of Roman literature, Capes's Early Empire, and Age of the Antonines, and Merivale's History of the Romans. M., W., F., 9. Professor HALE.]

Courses 21 and 18 are given in alternate years.

24. Teachers' seminary. Introductory lectures on the relation of preparatory and university work in Latin, and on the order of arrangement and methods of work in the former. Brief survey of Latin syntax, with reference to the needs of young students at various stages in their preparation. Practical illustrative work in Cæsar and Cicero, conducted by the instructor and by members of the seminary T., Th., 8. Professor HALE.

Courses 24 and 30 are given in alternate years.

[27 Continuation of course 26. Latin grammar. Λ study of the language from a comparative point of view, with especial reference to the history of sounds and inflections. W., F., 11. Professor WHEELER.]

[30. Greek and Roman art. Pottery, coins, engraved gems, painting, sculpture. An introductory course, illustrated with lantern views, photographs, etc. Lectures. T., Th., 8. Pro-fessor HALE.]

Courses 30 and 24 are given in alternate years.

33. Latin seminary The writing of Latin. Th., 2.30-4.30. Professor HALE.

Open to graduates, and, with the consent of the instructor, to undergraduates of special attainments.

[36. Latin seminary The critical study of Livy. Th., 2.30-4.30. Professor HALE.

Open to graduates, and, with the consent of the instructor, to undergraduates of special attainments.]

THE GERMANIC LANGUAGES.

FIRST TERM.

1. Whitney's German Grammar and Reader. Recitations. Daily ex. S. Sec. 1., 11., 111., 8, 9, 10. Mr GRIFFIN. Sec. IV., 11. Mr WILSON. For students in Latin courses. M., W., F Sec. v., vi., 9, 10. Mr Wilson.

4. Goethe's Hermann und Dorothea. Advanced grammar. Re-writing selected stories in German. M., W., F Sec. 1., 8. Mr. WILSON. Sec. II., III., 9, 10. Professor HEWETT.

Course 4 is open only to students who have had courses 1, 2, and 3, or their equivalent.

7 Goethe's Faust. Part First, with lectures. T., Th., 9. Professor HEWETT.

Course 7 is open only to students who have had courses 1 to 6 inclusive, except by special permission of the instructor.

[10. Deutsche Literaturgeschichte. Earliest times to Luther. T., Th., 10. Professor WHITE.]

Course 10 is open only to students who have had courses 1 to 6 or their equivalent, except by special permission of the instructor

13. German seminary Course for teachers. Historical German and special work with advanced pupils. T., Th., 11-1. Professor HEWETT.

Course 13 is for advanced students, and is open only to those who have had at least two years of German.

[16. Goethe's dramas. T., Th., 9. Professor WHITE.]

19. Select readings in German. Biography and history T., Th., 10. Professor HEWETT.

Course 19 is open only to students who have had courses 1 to 6 inclusive.

[24. Middle High German, Old High German, Gothic. Continuous with 25 and 26. Professor WHITE.]

SECOND TERM.

2. Whitney's German Grammar and Reader. Translations from English into German. Recitations. Daily ex. S. Sec. 1., 11., 111., 8, 9, 10. Mr GRIFFIN. Sec. IV., 11. Mr. WILSON. For

students in Latin courses. M., W., F Sec. v., vi., 9, 10. Mr. WILSON.

5. Schiller's Prosa. Exercises in the etymology of German words, and synonyms. Practice in writing German. M., W., F. Sec. I., 8. Mr WILSON. Sec. II., III., 9, 10. Professor HEWETT.

Course 5 is open only to students who have had courses 1 to 4, or their equivalent.

8. Goethe's Faust. The Second Part. T., Th., 9. Professor HEWETT.

Course 8 is open only to students who have had courses 1 to 6, except by special permission of the instructor

[11. Deutsche Literaturgeschichte. Luther to Lessing. T., Th., 10. Professor WHITE.]

14. German seminary Course for teachers. Historical German and special work with advanced pupils. T., Th., 11-1. Professor HEWETT.

Course 14 is for advanced students who have had at least two years of German.

[17 Lessing's dramas. T., Th., 9. Professor WHITE.]

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20. Correspondence between Schiller and Goethe. T., Th., 10. Professor HEWETT

[25. Middle High German, Old High German, Gothic. Professor WHITE.]

THIRD TERM.

3. Goethe's Prosa. Translation at sight. Recitations. Daily ex. S. Sec. I., II., III., 8, 9, 10. Mr. GRIFFIN. IV., 11. Mr. WILSON. For students in Latin Courses. M., W., F Sec. V., VI., 9, 10. Mr WILSON.

6. Götz von Berlichingen, with lectures and papers on the life of Goethe. M., W., F Sec. I., 8. Mr WILSON. Sec. II., III., 9, 10. Professor HEWETT.

Course 6 is open to students who have had courses 1 to 5 inclusive, or their equivalent.

9. Goethe's Poems, including the Xenien and the Westöstlicher Divan. T., Th., 9. Professor HEWETT.

Open to students who have had courses 1 to 6, and to others by permission.

[12. Deutsche Literaturgeschichte. Lessing to Goethe's death. T., Th., 10. Professor WHITE.]

15. German seminary Course for teachers. Historical German, and special work with advanced pupils. T., Th., 11-1. Professor HEWETT.

Course 15 is for advanced students who have had at least two years of German.

[18. Schiller's dramas. T., Th., 9. Professor WHITE.]

21. German literature of the nineteenth century Novels, plays. T., Th., 10. Professor HEWETT.

22. Special course for post-graduate students and teachers. Theories of instruction in the modern languages. Scientific grammar. Class-room methods and exercises. Oral practice in German. One hour a week. S., 8. Professor HEWETT.

23. The language of the Netherlands. German seminary T., Th., 11-1. Through the year Professor HEWETT.

[25. Middle High German, Old High German, Gothic. Professor WHITE.]

ROMANCE LANGUAGES.

FIRST TERM.

1. French grammar Recitations. Daily ex. S. Sec. I., 8, sec. II., 9, sec. III., 10, Mr BRUN, sec. IV., 8, sec. V., 9, Mr LANGDON. Latin courses, sec. I., M., W., F., 8, sec. II., T., Th., S., 8. Mr LAPHAM.

4. Corneille's Horace. Recitations and lectures. M., W Sec. 1., 9, Professor CRANE, sec. 11., 10, Mr LANGDON. French composition. F Sec. 1., 9, sec. 11., 10, Mr LANGDON.

Course 4 is open only to students who have had courses 1, 2, 3.

7 Literature of XVII. century Memoirs of St. Simon, etc. Recitations and lectures. T., Th., 9. Professor CRANE.

Course 7 is open only to students who have had courses 4, 5, 6. 10. Recent French fiction. About. Recitations and lectures. T., Th., 10. Mr. LANGDON.

Course 10 is open only to students who have had courses 4, 5, 6. 13. French philology Old French texts. Recitations and lectures. M., W., 10. Professor CRANE. [Repeated substantially every year]

Course 13 is open only to students who have had courses 4, 5, 6, and have some acquaintance with Latin.

16. Provençal. Bartsch's Chrestomathie Provençale. Recitations and lectures. F., 10. Professor CRANE.

Course 16 is open only to students who have had courses 13, 14, 15.

19. Spanish grammar. Recitations. T., Th., 8. Professor CRANE. [In 1887 Italian grammar will be given.]

22. Selections from Dante. T., Th., 10. Professor CRANE.

Course 22 is open only to students who have had one year of Italian. [In 1887 this course will be replaced by course in advanced Spanish.]

SECOND TERM.

2. French grammar and reading. Labiche's Les Petits Oiseaux. Recitations. Daily ex. S. Sec. 1., 8, sec. 11., 9, sec. 111., 10, Mr. BRUN, sec. IV., 8, sec. V., 9, Mr. LANGDON. Latin courses, sec. 1., M., W., F., 8, sec. 11., T., Th., S., 8. Mr. LAPHAM.

5. Crane's Le Romantisme Français. Recitations and lectures. M., W Sec. I., 9, Professor CRANE, sec. II., 10, Mr LANGDON. French composition, F., sec. I., 9, sec. II., 10, Mr. LANGDON.

Course 5 is open only to students who have had courses 1, 2, 3, 4.

8. Literature of the XVII. century Boileau's Art Poétique. Recitations and lectures. T., Th., 9. Professor CRANE.

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Course 8 is open only to students who have had courses 4, 5, 6, 7

11. Recent French fiction. Daudet. Recitations and lectures. T., Th., 10. Mr LANGDON. [Recent French drama.]

Course 10 is only open to students who have had courses 4, 5, 6. 14. French philology Aucassin et Nicolète. Recitations and lectures. M., W., 10. Professor CRANE. [Repeated substantially every year]

Course 14 is open only to students who have had course 13.

17 Provençal. Bartsch's Chrestomathie Provençale. Recitations and lectures. F., 10. Professor CRANE.

Course 17 is open only to students who have had course 16.

20. Spanish grammar and reading. Recitations. T., Th., 8. Professor CRANE.

Course 20 is open only to students who have had course 19. 23. Selections from Boccaccio. T., Th., 10. Professor CRANE. Course 23 is open only to students who have had course 22.

THIRD TERM.

3. Tableaux de la Révolution Française. Recitations daily ex. S. Sec. 1., 8, sec. 11., 9, sec. 111., 10; Mr. BRUN, sec. 1V., 8;

sec. v., 9, Mr. LANGDON. Latin courses, sec. 1., M., W., F., 8, sec. 11., T., Th., S., 8, Mr. LAPHAM. Students in the technical courses will read Luquiens's French prose of Popular Science.

6. Crane's Le Romantisme Français. Recitations and lectures. M., W Sec. I., 9, Professor CRANE, sec. II., 10, Mr LANGDON. French composition, F., sec. I., 9, sec. II., 10, Mr. LANGDON.

Course 6 is open only to students who have had courses 1, 2, 3, 4, 5.

9. Literature of the XVII. century Molière's Précieuses Ridicules and Femmes Savantes. Lectures. T., Th., 9. Professor CRANE.

Course 9 is open only to students who have had courses 4, 5, 6, 7, 8.

12. Recent French fiction. Coppée. Recitations and lectures. T., Th., 10. Mr. LANGDON.

Course 12 is open only to students who have had courses 4, 5, 6. 15. French philology Chanson de Roland. Recitations and

lectures. M., W., 10. Professor CRANE. [Repeated substantially every year.]

Course 15 is open only to those who have had courses 13, 14.

18. Provençal. Bartsch's Chrestomathie Provençale. Recitations and lectures. F., 10. Professor CRANE.

Course 18 is open only to those who have had courses 16, 17. 21. Spanish reading, Knapp's. Recitations. T., Th., 8. Professor CRANE.

Course 21 is open only to those students who have had courses 19, 20.

24. Selections from Petrarch. T., Th., 10. Professor CRANE.
Course 24 is open only to those students who have had courses
22, 23.

ENGLISH LANGUAGE AND LITERATURE, RHETORIC AND ORATORY

FIRST TERM.

 Rhetoric and composition. Qualities of style clearness, strength, and elegance. Writing of paragraphs and themes.
 Eight sections, two hours each. Mr. HUFFCUT and Mr ELLIOTT,
 Narrative composition. Each essay read and criticised with

its author, by special appointment. Mr HALE.

7 Advanced rhetoric. Argumentative and oratorical themes, and analyses of English and American orations. Each production read and criticised with its author, by special appointment. Professor Corson.

10. Elocution. Vocal gymnastics, exercises in articulation and enunciation, general delivery Three sections, one hour each. M., W., F., 10, 11, 12. Mr LEAKEY

13. Elocution. Gesture, oratorical delivery, dramatic rendering. Mr LEAKEY

16. Text-book English literature. (Minto's Characteristics of English Poets, and Manual of English Prose Literature, supplemented with lectures.) English prose from Mandeville to Cowley, and English poetry from Chaucer to Spenser T., Th., 11. Mr HALE.

19. Anglo-Saxon grammar and the A.-S. version of the Gospel according to St. John, chaps. 1.-x. Corson's Hand-book of A.S. and Early English. T., Th., 11. Mr BURR.

22. Lectures on English literature of the XIX. century, including readings. M., W., F., 10. Professor Corson.

25. English literature. A general survey of the language and literature of the XII. and XIII. centuries. Lectures on Piers Plowman, Wycliffe, Chaucer, and the subsequent literature to Spenser, inclusive. Readings by the class, from Chaucer and Piers Plowman. T., Th., 10. Professor Corson.

SECOND TERM.

2. Qualities of style, continued. Diction. Methods for construction of paragraphs and themes. Essay writing. Continuation of course 1. Mr HUFFCUT and Mr. ELLIOTT.

5. Descriptive composition. Continuation of course 4, and conducted in the same manner Mr. HALE.

8. Advanced rhetoric. Continuation of course 7, and conducted in the same manner Professor Corson.

11. Elocution. Continuation of course 10. Three sections, one hour each. M., W., F., 10, 11, 12. Mr LEAKEY

14. Elocution. Continuation of course 13. Mr. LEAKEY

17 Text-book English literature. Continuation of course 16. The Elizabethan dramatists, and the transition to the school of Pope, and English prose from Dryden to De Quincey Mr. HALE.

20. Anglo-Saxon version of the Gospel according to St. John,

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chaps. XI.-XXI., and selections from the Homilies of Ælfric. Corson's Hand-book of A. S. and E. E. Continuation of course 19. T., Th., 11 Mr BURR.

23. Lectures on English literature of the XIX. century, including readings. Continuation of course 22. M., W., F., 10. Professor Corson.

26. Lectures on the Shakespearian drama. Continuation of course 25. T., Th., 10. Professor Corson.

THIRD TERM.

3. Figurative language. Kinds of composition Narration and description. Essay writing. Continuation of course 2. Mr. HUFFCUT and Mr. ELLIOTT.

6. Miscellaneous themes. Continuation of course 5, and conducted in the same manner Mr HALE.

9. Advanced rhetoric. Continuation of course 8, and conducted in the same manner Professor Corson.

12. Elocution. Continuation of course 11. Three sections, one hour each. M., W., F., 10, 11, 12. Mr. LEAKEY

15. Elocution. Action, expression, gesture, as applied to formal delivery Continuation of course 14. Mr LEAKEY

18. Text-book English literature. Continuation of course 17 Lectures on the English novelists, and a detailed study of the styles of De Quincey, Macaulay, Carlyle, etc. Mr HALE.

 Selections from King Alfred's A.-S. version of the history of Paulus Orosius, and Boethius de Consolatione Philosophiæ, and from the A.-S. Chronicle. Corson's Hand-book of A.-S. and E. E. Continuation of course 20. T., Th., 11. Mr BURR. 24. Lectures on English literature from Milton to Cowper, including the drama of the Restoration and the subsequent drama to Sheridan. Continuation of course 23. M., W., F., 10. Professor Corson.

27 Lectures on the Shakespearian drama. Continuation of course 26. T., Th., 10. Professor Corson.

A syllabus of the lectures embraced in courses 24, 25, 26, 27, presents an analysis of each lecture, designates the best editions of an author's works, or parts of them, and guides the student to such sources, philological, historical, biographical, critical, etc., as enable him to read to the best advantage. A new and much enlarged edition is in preparation, in which will be included courses 22 and 23.

About one hundred and eighty lectures are given, in the six courses, during the year.

The English language subsequent to Chaucer, is treated in the lectures on the literature. Special lectures are, however, given on Elizabethan English.

The text-book study of English literature, in the sophomore year (courses 16, 17, 18) is required of all students taking the lectures in the junior year (courses 22, 23, 24).

PHILOSOPHY

FIRST TERM.

1. Physiological introduction to psychology See course 2 of physiology and vertebrate zoology

Course 1 is required of all sophomores in arts, philosophy, science, and letters. It must precede course 2.

[4. History of philosophy A. Greek. Lectures. M., W., F., 12. Professor Schurman.]

Open to all who have taken courses 2 and 3.

Courses 4, 5, 6 alternate with courses 10, 11, 12.

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[7 Select works of Plato and Aristotle. M., W., F., 10. Mr. JOHNSON.]

Open only to those who take courses 4, 5, 6, to which courses 7, 8, 9 are complementary

Courses 7, 8, 9 are given in the same years as courses 4, 5, 6. 10. Metaphysics. A theory of knowing and being, developed in connection with a historico-critical examination of systems from Locke to Hume. One hour a week is given to discussion, with Berkeley's Principles of Human Knowledge as a startingpoint. Lectures, M., W., 12, discussions, F., 12. Professor SCHURMAN.

Open to all who have taken courses 2 and 3.

Courses 10, 11, 12 and courses 4, 5, 6 are given in alternate years.

13. Locke's Essay concerning Human Understanding. M., W., F., 10. Mr JOHNSON.

Open only to those who take courses 10, 11, 12, to which courses 13, 14, 15 are complementary.

16. Ethics. A classification of facts and an outline of theory, with special attention to intuitionism and utilitarianism. Lectures. T., Th., 12. Professor SCHURMAN.

Open to all who have taken courses 2 and 3, but it should also be accompanied by courses 4, 5, 6.

19. Philosophical seminary. Post-Kantian German philosophy. Th., 2.30-4.30. Professor Schurman.

Courses 19, 20, 21 are open to seniors and graduates who have taken courses 2, 3, 4, 5, 6, 10, 11, 12, 16, 17, 18, and to no others, except by special permission of the professor

22. Advanced psychology or logic. T., Th. Mr JOHNSON.

Open only to those who have taken courses 2, 3, 10, 11, 12, 16, 17, 18.

SECOND_TERM.

2. Psychology Recitations and lectures. T., Th., S. Sec. I., 10, sec. II., 11. M., W., F. Sec. III., 11. Mr. JOHNSON.

Course 2 is required of all sophomores in arts, philosophy, science, and letters. None of the elective courses can be taken until it is completed.

[5. History of philosophy *B*. Greek and mediæval. Continuation of course 4. Lectures. M., W., F., 12. Professor SCHURMAN.]

[8. Select works of Plato and Aristotle. Continuation of course 7 M., W., F., 10. Mr. JOHNSON.]

11. Metaphysics. Continuation of course 10 with examination of theories from Reid and Kant to Hamilton, Comte, and Mill. Discussions, starting from Kant's Critique. Lectures, M., W., 12, discussions, F., 12. Professor SCHURMAN.

14. Hume's Treatise on Human Nature. Continuation of course 13. M., W., F., 10. Mr. Johnson.

17 Ethics. Continuation of course 16, with further examination of ethical theories. Lectures and discussions. T., Th., 12. Professor Schurman.

20. Philosophical seminary Post-Kantian German philosophy Continuation of course 19. Th., 2.30-4.30. Professor SCHURMAN

THIRD TERM.

3. Logic. Recitations and lectures. T., Th., S. Sec. I., 10, sec. II., 11. M., W., F Sec. III., 11. Mr. JOHNSON.

Course 3 is required of all sophomores in arts, philosophy, science, and letters. None of the electives courses can be taken until it is completed.

[6. History of philosophy C. Mediæval and early modern. Continuation of course 5. Lectures. M., W., F., 12. Professor SCHURMAN.]

[9. Select works of Descartes or Spinoza. Continuation of course 8. M., W., F., 11. Mr JOHNSON.]

12. Metaphysics. Continuation of course 11, with special reference to contemporary thought. Discussions starting from Spencer's First Principles. Lectures, M., W., 12, discussions, · F., 12. Professor SCHURMAN.

15. Hamilton's Metaphysics and Mill's Examination. Continuation of course 14. M., W., F., 10. Mr Johnson.

18. Ethics. Continuation of course 17, with detailed examination of evolutionary ethics (Darwin's, Spencer's). Lectures and discussions. T., Th., 12. Professor SCHURMAN.

21. Philosophical seminary Post-Kantian German philosophy Continuation of course 20. Th., 2.30-4.30. Professor Schurman.

THE SCIENCE AND THE ART OF TEACHING.

[Tnese courses are open to Juniors, Seniors, and Graduates.]

FIRST TERM.

1. The science of education. Philosophic basis. Aims, methods, means, etc. Lectures. M., W., F., 2.30. Professor S. G. WILLIAMS.

6. Seminary Discussions and essays on topics connected with course 1. Th., 2.30. Professor S. G. WILLIAMS.

Course 6 is open only to those who take or have taken course 1.

SECOND TERM.

2. School instruction. Application of methods to various branches. Recitations. Art of questioning and examining. Illustration and exposition, etc. Lectures. M., W., F., 2.30. Professor S. G. WILLIAMS.

Course 2 is a continuation of course 1, and is open only to those who have taken course 1, except by special permission of the professor

7 Seminary Discussion of topics presented by course 2 and reports on visits to schools. Th., 3.30. Professor S. G. WILL-IAMS.

Course 7 is open only to those who take or have taken course 2.

4. History of education in various ages and countries. Lectures. T., Th., 2.30. Professor S. G. WILLIAMS.

THIRD TERM.

3. Organization and management of schools. Classification. Courses of study Supervision. School buildings and appliances. School hygiene. School economy, etc. Lectures. M., W., F., 2.30. Professor S. G. WILLIAMS.

Course 3, which is intended especially for those who expect to have charge of schools, is open only to those who have taken course 1, except by special permission of the professor

5. Comparative education. Theories of writers on education. Eminent educators, etc. Lectures. T., Th., 2.30. Professor S. G. WILLIAMS.

Course 5 is a continuation of course 4, and is open only to those who have taken course 4

8. Seminary Discussion of topics suggested by course 3. Th., 3.30. Professor S. G. WILLIAMS.

Course 8 is open only to those who take or have taken course 3.

HISTORY AND POLITICAL SCIENCE.

FIRST TERM.

1. Grecian history Recitations and lectures. T., Th. Sec. 1., 9, sec. 11., 11. Dr WHITE.

4. English political and social history Recitations and lectures. T., Th., 12. Mr HODDER.

Courses 4, 5, 6 are designed for sophomores who desire to make a special study of history

7 The development of the English constitution. Lectures. M., W., 2.30. Associate Professor TUTTLE.

Course 7 is open only to students who have had courses 4, 5, 6.

8. Prehistoric America and the history of American discovery and colonization. Lectures. M., W., F., 8. Professor Tyler.

11. History of the constitution of the United States, and the elements of constitutional law Lectures. T., Th., S., 8. Professor TYLER.

Course 11 is especially designed for those who have had courses 8, 9, and 10. After the present year courses 8 and 11 will be open only to those who have taken or are taking courses 4, 5, and 6.

14. American historical seminary Junior section, T., 3.30, senior section, F., 3.30, graduate section, T., 4.30-6. Professor TYLER.

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[18. Theories and methods of the English government. Lectures. M., W., 3.30. President ADAMS.

Course 18 will not be given in 1886-87, but may be expected in 1887-88. It is open only to those who take or have taken history 4, 5, 6.]

19. Systematic politics. Lectures. M., W., F., 10. Associate Professor TUTTLE.

20. Elementary political economy Recitations. M., W., F., 12. Mr HODDER.

17 General historical and political seminary Th., 2.30-4.30. Associate Professor TUTTLE and Mr. HODDER.

Course 17 is for advanced students, and is open only to those who have had courses 1 to 10 inclusive, or their equivalent.

33. General history of Europe from 476 to 1453. Lectures and recitations. M., W., F., 11. Mr. HODDER.

Course 33 is open to sophomores, juniors, and seniors, but is especially recommended to juniors.

36. The rise and development of Prussia. Lectures. M., W., 3.30. President ADAMS.

Course 36 is open only to those who have had courses 1, 2, 3, and may profitably be taken in connection with courses 33, 34, 35. Probably will not be given in 1887-88.

SECOND TERM.

2. Roman history Recitations and lectures. T., Th., sec. 1., 9, sec. 11., 11. Dr WHITE.

5. English political and social history Continuation of course 4. Recitations and lectures. T., Th., 12. Mr. HODDER.

9. American colonial institutions and ideas. Continuation of course 8. Letures. M., W., F., 8. Professor Tyler.

12. Presidential administrations from Washington to Monroe. Lectures. T., Th., S., 8. Professor TYLER.

Course 12 is designed for those who have had courses 8, 9, 10, 11.

15. American historical seminary Junior section, T., 3.30, senior section, F., 3.30, graduate section, T., 4.30-6. Professor TYLER.

[22. The English government since the Napoleonic wars. Lectures. M., W., 3.30. President ADAMS.

Course 19 is a continuation of course 18, and will not be given in 1886-87, but may be expected in 1887-88.]
23. International law Lectures. M., W., F., 10. Associate Professor TUTTLE.

30. European history in the eighteenth century Lectures. M., W., 2.30. Associate Professor TUTTLE.

25. Unsettled problems in political economy Lectures. М.,
W., F., 12. Associate Professor H. C. Adams and Mr Hodder. Course 25 will be taken during the first half of the term by Mr Hodder, afterwards by Associate Professor Adams.

21. General historical and political seminary Th., 2.30-4.30. Associate Professor TUTTLE and Mr. HODDER.

Course 21 is open only to those who have had courses 1 to 10 inclusive, or their equivalent.

37 The rise and development of Prussia. Lectures. M., W., 3.30. President ADAMS.

Course 37 is a continuation of course 36 and probably will not be given in 1887–88.

34. General history of Europe from 1453 to 1648. Lectures and recitations. Continuation of course 33. M., W., F., 11. Mr HODDER.

26. The development of economic theories. Study of special topics under the direction of Associate Professor ADAMS.

Course 26 is designed for advanced students who will be admitted on special application to the instructor.

THIRD TERM.

3. Roman history Continuation of course 2. Recitations and lectures. T., Th. Sec. 1., 9, sec. 11., 11 Dr WHITE.

6. English political and social history Continuation of course 5. Recitations and lectures. T., Th., 12. Mr HODDER.

35. General history of Europe, from 1648 to 1789. Lectures and recitations. Continuation of course 35. M., W., F., 11. Mr HODDER.

10. The American Revolution. Lectures. M., W., F., S. Professor Tyler.

Course 10 is designed for those who have had courses 8, 9.

13. History of anti-slavery and of the civil service in America. Lectures. T., Th., S., S. Professor TYLER.

Course 13 is designed particularly for those who have had courses 8, 9, 10, 11, 12. Other students can take it only with the special permission of the professor, will not be given in 1888. 16. American historical seminary Junior section, T., 3.30. Professor Tyler. 6

27 Unsettled problems in political economy Lectures. M., W., F., 12. Associate Professor H. C. ADAMS.

Course 27 is designed especially for those who have taken courses 20 and 25, and is open to no others except with special permission of the professor

28. The science of finance. Lectures. M., W., 2.30. Associate Professor H. C. ADAMS.

Course 28 is open only to those who have had courses 20 and 25, or their equivalent.

29. Social science. Lectures on social problems, including pauperism, crime, inebriety, insanity, and illiteracy T., Th., F., 2.30. Mr SANBORN.

Course 29 is supplemented by visits, under charge of the instructor, to the various public institutions in Central New York, nearly the whole range of charitable, reformatory, and punitory effort being represented at such institutions within a short distance of Ithaca.

31. General historical and political seminary Th., 2.30-4.30. President ADAMS and Mr HODDER.

Course 31 is open only to those who have had courses 1 to 10 inclusive, or their equivalent.

38. The rise and development of Prussia. Lectures. M., W., 3.30. President ADAMS.

Course 38 is a continuation of course 37 and will probably not be given in 1887-88.

39. The government of cities. Lectures. T., 11. Mr. HODDER.

[41. General history of Europe from 1789 to 1871. Lectures. M., W., 3.30. President ADAMS.

Course 41 will not be given in 1886–87, but may be expected in 1887–88.]

[40. Presidential administrations from John Quincy Adams to Lincoln. Lectures. T., Th., S., 8. Professor TYLER.

Course 40 is designed for those who have had courses 8, 9, 10, 11, 12. It will not be given in 1887, but may be expected in 1888.]

BIBLIOGRAPHY

FIRST TERM.

General bibliography, manuscripts and printed books, systems of classification, bibliographical aids. Lectures. T., 2.30. Mr HARRIS.

COURSES OF INSTRUCTION.

GENERAL SCIENCE.

MATHEMATICS AND ASTRONOMY

FIRST TERM.

1. Solid geometry and conic sections. Sec. 1., T., Th., S., 8. Associate Professor WAIT. Sec. II., M., W., F., 9. Assistant Professor Jones. Sec. III., daily ex. S., 10. Assistant Professor Jones. Secs. IV., V., VI., daily ex. S., 8, 9, 10. Mr. McMahon. Secs. VII., VIII., IX., daily ex. S., 8, 9, 10. Mr. HATHAWAY

4. Geometric problems. S., 8-10, two hours. Assistant Professor Jones.

Course 4 is supplementary to course 1

7 Analytic geometry Daily ex. S., sec. 1., 8. Assistant Professor Jones. Sec. 11., 111., 9, 10. Associate Professor WAIT.

Course 7 is open only to students who have had courses 1, 2, and 3.

22. Projective geometry Three times a week. Assistant Professor Jones.

In 1886 the course is open only to those who have had the first part of the subject. After 1886 the course begins in the fall term, and is open to those who have had courses 1, 2, and 3.

25. Junior general review Once a week. Associate Professor WAIT.

28. Modern methods in algebra and analytic geometry, or advanced calculus, three times a week. Mr McMаном

Course 28 is open only to students who have had courses 1, 2, 3, 7, 8, 9, and, preferably, 5 and 14.

31. Rational mechanics. Twice a week. Associate Professor WAIT.

Course 31 is open only to students who have had courses 1, 2, 3, 7, 8, 9, and, preferably, 5 and 14.

- 34. Differential equations. Daily ex. S. Professor OLIVER.
 Course 34 is open only to students who have had courses 1, 2,
 3, 7, 8, 9, and, preferably, 5 and 14.
 - 37 Senior general review Once a week. Professor OLIVER.
 - 40. Finite differences. Daily ex. S. Professor OLIVER.

43. Theory of functions. Three times a week. Professor OLIVER.

Course 43 is open only to students who have had courses 1, 2, 3, 7, 8, 9, 14, and preferably, 28-36.

46. Theory of numbers. Twice a week. Mr HATHAWAY

Course 46 is open only to students who have had courses 1, 2, and 3.

58. Mathematical normal seminary. Once a week.

Course 58 is open only to students who have had courses 1, 2, 3, 7, 8, 9.

61. Mathematical essays. Once a week. Professor OLIVER.

SECOND TERM.

2. Algebra. Sec. I., T., Th., S., 8. Associate Professor WAIT. Sec. II., M., W., F., 9. Assistant Professor Jones. Sec. III., daily ex. S., 10. Assistant Professor Jones. Secs. IV., V., VI., daily ex. S., 8, 9, 10. Mr McMahon. Secs. VII., VIII., IX., daily ex. S., 8, 9, 10. Mr HATHAWAY

5. Algebraic problems. S., 8-10, two hours. Assistant Professor JONES.

Course 5 is supplementary to course 2.

8. Calculus. Daily ex. S. Sec. 1., 8. Assistant Professor JONES. Sec. 11., 11. Associate Professor WAIT.

11. Calculus. Daily ex. S., 9. Associate Professor WAIT. Course 11 is a brief course covering the elements of both the differential and the integral calculus.

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Courses 8 and 11 are open only to students who have had courses 1, 2, 3, and 7

14. Determinants and theory of equations. Three times a week. Associate Professor WAIT.

17 Descriptive astronomy M., W., F., 9. Professor OLIVER. Course 17 is open only to students who have had courses 1, 2, and 3, and three courses in physics.

20. Astronomical problems. Twice a week. Professor OLIVER. Course 20 is supplementary to course 17

23. Projective geometry Three times a week. Assistant Professor JONES. A continuation of course 22, after 1886.

26. Junior general review Once a week. Associate Professor WAIT.

29. Modern methods in algebra and analytic geometry, or advanced calculus. Three times a week. Mr McMahon. A continuation of course 28.

32. Rational mechanics. Twice a week. Associate Professor WAIT. A continuation of course 31.

35. Differential equations. Daily ex. S. Professor OLIVER. A continuation of course 34.

38. Senior general review Once a week. Professor OLIVER. 41. Quaternions and Grassmann's Ausdehnungslehre, or spherical harmonics. Three times a week. Professor OLIVER.

44. Theory of functions. Three times a week. Professor OLIVER. A continuation of course 43.

47 Theory of numbers. Twice a week. Mr Натнаway A continuation of course 46.

59. Mathematical normal seminary Once a week.

Course 59 is open to students who have had courses 1, 2, 3, 7, 8, 9.

62. Mathematical essays. Once a week. Professor OLIVER.

THIRD TERM.

3. Trigonometry Sec. I., T., Th., S., 8. Associate Professor WAIT. Sec. II., M., W., F., 9. Assistant Professor Jones. Sec. III., daily ex. S., 10. Assistant Professor Jones. Secs. IV., V., VI., daily ex. S., 8, 9, 10. Mr. McMahon. Secs. VII., VIII., IX., daily ex. S., 8, 9, 10. Mr HATHAWAY

Course 3 is open only to students who have had courses 1

and 2.

6. Trigonometric problems. S., 8-10, two hours. Assistant Professor Jones.

Course 6 is supplementary to course 3.

9. Calculus, daily ex. S. Sec. 1., 8. Assistant Professor JONES. Sec. 11., 9, 111., 11. Associate Professor WAIT.

Course 9 is open only to students who have had courses 1, 2, 3, 7, and 8.

18. Physical astronomy M., W., F., 9. Professor OLIVER. Course 18 is open only to students who have had courses 1, 2,

3, 17, and three courses in physics.

21. Astronomical problems. Twice a week. Professor OLIVER. Course 21 is supplementary to courses 17 and 18.

24. Probabilities and insurance. Three times a week. Assistant Professor JONES.

27 Junior general review Once a week. Associate Professor WAIT.

30. Modern methods in algebra and analytic geometry, or advanced calculus. Three times a week. Mr. McMahon. A continuation of courses 28 and 29.

33. Rational mechanics. Twice a week. Associate Professor WAIT. A continuation of courses 31 and 32.

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36. Definite integrals. Three times a week after 1885-86. Professor OLIVER.

Course 36 is open only to students who have had courses 1, 2, 3, 7, 8, 9, and, preferably, 5, 14, 34, and 35.

39. Senior general review Once a week after 1885–86. Professor OLIVER.

42. Quaternions and Grassmann's Ausdehnungslehre, or spherical harmonics. Three times a week. Professor OLIVER. A continuation of course 41.

45. Theory of functions. Three times a week. Professor OLIVER. A continuation of courses 43 and 44.

48. Theory of numbers. Twice a week. Mr. HATHAWAY A continuation of courses 46 and 47

60. Mathematical normal seminary Once a week.

Course 60 is open only to students who have had courses 1, 2, 3, 7, 8, 9.

63. Mathematical essays. Once a week. Professor OLIVER.

66. Special work toward theses. Twice a week. Professor OLIVER.

PHYSICS.

FIRST TERM.

1. Mechanics and heat. Two lectures a week. T., Th., 12. Professor ANTHONY One recitation on Friday or Saturday by the class in sections, at hours to be arranged. Professor AN-THONY and Assistant Professor MOLER.

Course 1 requires a knowledge of plane trigonometry

4. Physical experiments. Theory and methods of physical measurements. Three hours selected by the students from afternoons ex. S., 2-6. Assistant Professor MOLER and Mr. JACKSON.

Course 4 extends through the year, and includes laboratory experiments illustrating general laws in all branches of physics, and instruction in the adjustment and use of instruments of precision for measurements in mechanics, heat, light, and electricity It is open only to students who have passed satisfactorily in courses 1, 2, and 3. All students desiring this course are strongly advised to prepare themselves by first taking courses in analytical geometry and calculus. Each student usually devotes to the course two afternoons each week, and pursues it in such order as the appointments of the laboratory may require.

7 Electrical measurements. Tests of electrical instruments

and determination of constants. One hour, a lecture. W., 12. Professor ANTHONY, and five hours' laboratory work selected by the student from afternoons ex. S., 2-6. Professor ANTHONY and Mr. JACKSON.

Course 7 is designed for students proposing to take degrees in electrical or mechanical engineering, but is open to any who have pursued satisfactorily courses 4, 5, 6, with the preparation advised under 4.

10. Special reading and laboratory work under the direction of the professor of physics.

Course 10 continues throughout the year and is open to students who have completed courses 4, 5, and 6.

13. Advanced laboratory work for graduate students. Hours to suit individual students. Professor ANTHONY, Assistant Professor MOLER, and Mr JACKSON.

17 Determination of constants of electrical instruments. Lectures. W., 12. Professor ANTHONY

SECOND TERM.

2. Electricity and magnetism. Lectures and recitations. Lectures, T., Th., 12, recitations on F or S. Professor ANTHONY

Course 2 is open only to those students who have pursued course 1.

5. A continuation of course 4.

8. Experimental study of dynamo machines, including tests of efficiency One hour, lecture, and four hours' laboratory work. This is a continuation of course 7, and the remark given under that head applies here.

11. A continuation of course 10.

14. Courses for graduate students, in continuation of course 13.

18. Theory of dynamo machines. Lectures. W., 12. Continuation of course 17

THIRD TERM.

3. Acoustics and optics. Lectures and recitations, as given under 1.

Students are admitted after pursuing courses 1 and 2.

6. A continuation of courses 4 and 5.

9. Electric lighting. Photometric and electrical tests of electric lamps. Testing of telegraph lines and cables. This is a continuation of courses 7 and 8, and is subject to the same remark.
 12. A continuation of courses 10 and 11.

15. Courses for graduate students, in continuation of course 14. 16. Practical photography [counting one hour a week]. Assistant Professor MOLER.

This course is open to students in architecture and in natural history, and to other students whose elective course requires it.

19. Electric lighting line and cable tests. Lectures. W., 12. Continuation of course 18.

CHEMISTRY, MINERALOGY, AND METALLURGY

FIRST TERM. .

2. Inorganic chemistry (a). Lectures. M., W., F., 12. Professor Schaeffer.

3. Inorganic chemistry Review Three or four sections, one hour per week each. Professor SCHAEFFER.

4. Agricultural chemistry Daily ex. S., 9. Professor CALD-WELL.

Course 4 is open only to those who have had course 1 or 2.

8. Introductory practice. Laboratory work. Daily ex. S., 9-5. Professor CALDWELL and Mr. PRESWICK.

11. Qualitative analysis. Laboratory work. Daily ex. S., 9-5. Professor CALDWELL and Mr PRESWICK.

Course 11 is open only to those who have had either course 1, 2, or 8, or an equivalent.

14. Qualitative analysis. Recitations. Three to five sections, one hour per week each. Professor CALDWELL.

Course 14 is open only to those taking course 11.

18. Mineralogy Lectures and laboratory work, with special reference to crystallography and the more important metallic ores. Three hours per week. Professor NEWBURY

Course 18 is open only to those who have had course 17

20. Chemical philosophy Lectures and recitations. T., Th., 11. Professor NEWBURY

Course 20 is open only to those who have had courses 2 and 6. 23. Quantitative analysis. Laboratory work. Daily ex. S., 9-5. Professor CALDWELL and Mr. MORGAN.

Course 23 is open only to those who have had the required amount of qualitative analysis.

26. German chemical journals. Readings. T., Th., 11. Professor CALDWELL.

Course 26 is open only to those who have had courses 4, 5, and 6, in German.

29. Quantitative methods. Lectures. W., 4.30. Professor CALDWELL.

Course 29 is open only to those taking course 23.

37 Organic chemistry Laboratory work. Daily ex. S., 9-5. Professor NEWBURY

Course 37 is open only to those who have had course 19, and at least three terms of work in quantitative analysis.

SECOND TERM.

2. Inorganic chemistry (a). Lectures. M., W., F., 12. Professor Schaeffer.

Course 2 is not open to students in the freshman year, excepting in the course in chemistry and the medical preparatory course.

1. Inorganic chemistry (b). Lectures and recitations. T., Th., S., 10. Professor SCHAEFFER.

3. Inorganic chemistry Review Three or four sections, one hour per week each. Professor SCHAEFFER.

Course 3 is open only to students taking course 2.

5. Agricultural chemistry Daily ex. W., F., S., 9. Professor CALDWELL.

Course 5 is open only to those who have had course 4.

9. Introductory practice. Laboratory work. Daily ex. S.,

9-5. Professor CALDWELL and Mr PRESWICK.

12. Qualitative analysis. Laboratory work. Daily ex. S., 9-5. Professor CALDWELL and Mr. PRESWICK.

Course 12 is open only to those who have had courses 1. 2, or 8, or an equivalent.

15. Qualitative analysis. Recitations. Three to five sections, one hour per week each. Professor CALDWELL.

Course 15 is open only to those taking course 12.

21. Chemical philosophy Lectures and recitations. T., Th., 11. Professor NEWBURY

Course 21 is open only to those who have had course 20.

24. Quantitative analysis. Laboratory work. Daily ex. S., 9-5. Professor CALDWELL and Mr. MORGAN.

Course 24 is open only to those who have had the required amount of qualitative analysis.

27 German chemical journals. Readings. T., 11. Professor CALDWELL.

Course 27 is open only to those who have had course 26.

30. Quantitative methods. Lectures. W., 4.30. Professor CALDWELL.

Course 30 is open only to those taking course 24.

32. Metallurgy Lectures on fuels, ores, and the methods of extracting metals. T., Th., 9. Professor SCHAEFFER.

Course 32 is open only to those who have had courses 1 or 2. [33. Assaying. Laboratory work. Daily ex. S., 2-5. Professor Schaeffer and Mr Rockwood.]

Course 33 is open only to those who have had courses 1 or 2, 17, 18, and at least one term of qualitative analysis.

35. Applied chemistry Lectures. T., Th., 11. Professor NEWBURY

Course 35 is open only to those who have had course 34.

38. Organic chemistry Laboratory work. Daily ex. S., 9-5. **Professor Newbury**

Course 38 is open only to those who have had course 19, and at least three terms of work in quantitative analysis.

40. Advanced mineralogy and crystallography Two hours per week. Professor Newbury

Course 40 is open only to those who have had course 18.

THIRD TERM.

1. Inorganic chemistry (b). Lectures and recitations. T., Th., S., 10. Professor Schaeffer.

7 Agricultural chemistry T., Th., 9. Professor CALDWELL. Course 7 is open to those who have had course 5.

10. Introductory practice. Laboratory work. Daily ex. S., 9-5. Professor CALDWELL and Mr PRESWICK.

13. Qualitative analysis. Laboratory work. Daily ex. S., 9-5. **Professor CALDWELL and Mr. PRESWICK.**

Course 13 is open only to those who have had courses 1, 2, 8, or 10, or an equivalent.

16. Qualitative analysis. Recitations. Three to five sections, one hour per week each. Professor CALDWELL.

Course 16 is open only to those taking course 13.

17 Blowpipe analysis. Laboratory work. Daily ex. S., 2-5. **Professor** Newbury

Course 17 is open only to those who have had either course 1 or 2.

22. Chemical philosophy Lectures and recitations. T., Th., 11. Professor Newbury

Course 22 is open only to those who have had course 21.

25. Quantitative analysis. Laboratory work. Daily ex. S., 9-5. Professor CALDWELL and Mr. MORGAN.

Course 25 is open only to those who have had the required **amount** of qualitative analysis.

28. German chemical journals. Readings. T., Th., 11. Professor CALDWELL.

Course 28 is open only to those who have had course 27

31. Quantitative methods. Lectures. W., 4.30. Professor CALDWELL.

Course 31 is open only to those taking course 25.

36. Organic chemistry Introductory laboratory practice. Daily ex. S., 2-5. Professor NEWBURY

39. Organic chemistry Laboratory work. Daily ex. S., 9-5. Professor Newbury

Course 39 is open only to those who have had course 19, and at least three terms of work in quantitative analysis.

BOTANY, HORTICULTURE, AND ARBORICULTURE.

FIRST TERM.

[The figures following the name of a course indicate the minimum number of hours per week.]

3. Compositæ and gramineæ, 3. Lectures. F., 10. Professor PRENTISS. Laboratory work by appointment. Assistant Professor DUDLEY

Course 3 is open only to those who have taken courses 1 and 2, or their equivalent. The course in microscopical methods is also desirable as a preparation for this course. Courses 1, 2, and 3 constitute an essential preparation for the subsequent courses of instruction offered by this department.

10. Fungi, 4. Lectures. T., Th., 10. Laboratory work by appointment. Assistant Professor DUDLEY

Course 6 is a desirable preparation for course 10.

13. Principles of plant-culture, 2. Lectures. M., W., 10. Professor PRENTISS.

Course 13 consists of a course of lectures based upon the science of botany and plant physiology, particular attention being given to the principles and theories of horticulture. In addition to the lectures, seminary or experimental work is required of each student on some specially assigned subject.

14. Practical horticulture, 2. Garden and green-house work by appointment. Professor PRENTISS.

15. Special study of phænogams, 3. Laboratory and field work by appointment. Professor PRENTISS.

16. Special study of cryptogams, 3 Laboratory and field work by appointment. Assistant Professor DUDLEY.

12. Arboriculture and forestry, 2. Lectures. M., W., 10; first part of term. Seminary by appointment. Professor PREN-TISS.

Course 12 is not given in 1886-87, but may be expected in 1887-88.

SECOND TERM.

4. Systematic and economic botany, 3. Lectures. M., W., F., 10. Professor PRENTISS.

Course 4 is not given in 1886–87, but may be expected in 1887–88.

5. Physiology of plants, 3. Lectures. M., W., F., 10. Professor PRENTISS.

7 Experimental plant physiology, 2. Laboratory work by appointment. Professor PRENTISS.

6. Histology of plants, 3. Lectures. T., Th., 10, first part of term. Laboratory work by appointment. Assistant Professor DUDLEY

17 Special laboratory work in phænogams by appointment, 3. Professor PRENTISS.

18. Special laboratory work in cryptogams by appointment,
 3. Assistant Professor DUDLEY

THIRD TERM.

1. Botany, introductory and general course, 3. Lectures. M., W., F., 11. Professor PRENTISS.

Course 1 is required of all students as a preparation for any of the subsequent courses.

2. Laboratory work, introductory course. Two hours per week by appointment. Assistant Professor DUDLEY

Course 2 is supplementary to course 1. Courses 1 and 2 constitute a necessary preparation for course 3.

8. Ferns, 2. Lectures. T., Th., 10, first part of term. Laboratory work by appointment. Assistant Professor DUDLEY

9. Mosses, 2. Lectures. T., Th., 10, first part of term. Laboratory work by appointment. Assistant Professor DUDLEY.

Course 9 is not given in 1886–87, but may be expected in 1887–88.

11. Woody plants, 2. Field and laboratory work by appointment. Professor PRENTISS.

19. Practical horticulture, 2. Garden and green-house work by appointment. Professor PRENTISS.

20. Special study of phænogams, 3. Laboratory work by appointment. Professor PRENTISS.

21. Special study of cryptogams, 3. Laboratory work by appointment. Assistant Professor DUDLEY

22. Field work and the preparation of an herbarium, 3. Laboratory and field work and lectures by appointment. Assistant Professor DUDLEY

Course 22 is open only to those who have taken courses 1 and 2, or their equivalent.

Laboratory work is held to be of paramount importance in the instruction as given in this department. The work varies somewhat with the needs of the student, the thoroughness of his preparation, and the purposes he has in view. To those who are sufficiently prepared many lines of special study and investigation are open. The general equipment of the laboratory and its available material enable the department to offer desirable opportunities for work of this character.

ENTOMOLOGY AND GENERAL INVERTEBRATE ZOOLOGY

FIRST TERM.

1 Invertebrate zoology Lecture course. M., W., 11. Professor Сомsтоск.

2. Invertebrate zoology General laboratory course. Sec. 1., T., 2.30-5, sec. 11., Th., 2.30-5. Professor Сомзтоск.

Course 2 is open only to those taking course 1. In this course the students dissect some of the more important typical animals described in course 1.

3. Invertebrate zoology Special laboratory course. Daily ex. S., 8-5. Professor Сомзтоск.

4. Entomology Laboratory work, insect anatomy, and the study of the life-history of insects. Daily ex. S., 8-5. Pro-fessor Comstock.

THIRD TERM.

5. Entomology. Lectures on the characteristics of the orders, sub-orders, and more important families, with special reference

to those of economic importance. T., Th., 9. Professor Сомsтоск.

6. Entomology Laboratory work. Daily ex. S., 8-5. Professor Сомsтоск.

Course 6 is open only to those who take or have taken course 5.

7 Invertebrate zoology Laboratory work. Daily ex. S., 8-5. Professor Сомsтоск.

8. Apiculture. Lectures and practical work in apiary T., Th., 2.30. Professor Сомsтоск.

SUMMER VACATION-

9. Summer course in entomology and general invertebrate zoology Lectures, M., W., F., 9, field work, T., Th., 8.30-1, laboratory work, daily ex. S., 8-5. Professor Comstock.

The laboratory and field work is arranged with reference to the needs and attainments of each student. After completing an elementary course in either general zoology or entomology the student may select some subject in systematic zoology, economic entomology, or insect anatomy, for special investigation. It is planned to have the work of each student, as far as possible, an original investigation. The chief object of the course is to give training in methods of natural history work. Any one not already a member of the University desiring to join this class should make application to Professor Comstock as early as June 10th.

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PHYSIOLOGY AND VERTEBRATE ZOOLOGY

FIRST TERM.

1. Hygiene. Six lectures upon the personal care of health, and upon emergencies. First three weeks of the term. M., W., 12. Professor WILDER.

2. Physiology Twenty-four lectures and twelve demonstrations and practicums. T., Th., S., 11. Professor WILDER.

Course 2 is designed especially for sophomores. The lectures treat chiefly of the histological structure of the body, the phenomena of nervous and muscular action, the vaso-motor system, and the structure and functions of the brain. At the practicums the students dissect cats (including the brain), and the hearts and eyes of sheep. At the demonstrations each examines about fifty standard preparations of the tissues, including living amœba, cilia, and blood in circulation.

3. Anatomical methods. Twelve lectures. T., 4.30. Laboratory work. Daily, 8-6. Assistant Professor GAGE.

Course 3 is open to sophomores, juniors, and seniors who have taken freehand drawing.

4. Human or comparative anatomy Advanced laboratory work.

Course 4 is open only to those who have taken courses 2 and 3

5. Morphology of the brain, human or comparative anatomy Laboratory work. Daily, 8-6. Professor WILDER.

Course 5 is open only to those who have taken courses 2, 3, and 12.

6. Vertebrate histology Laboratory work. Daily, 8-6. Assistant Professor GAGE.

Course 6 is open only to those who have taken courses 2 and 8. Course 3 is also desirable in preparation for this course.

SECOND TERM.

7 Vertebrate zoology Twenty lectures, M., W., 11, ten practicums, T., 2.30. Professor WILDER.

Course 7 is designed especially for sophomores and, except in special cases, is open only to those who have taken course 2. Invertebrate zoology is a desirable preparation. Among the animals examined at the practicums are branchiostoma, necturus, lamprey, shark, and alligator

8. Microscopical methods. Twelve lectures. T., 4.30. Laboratory work. Daily, 8-6. Assistant Professor GAGE.

Course 8 is designed especially for those who have taken courses 2 and 3.

9. Human or comparative anatomy Advanced laboratory work.

Course 9 is open only to those who have taken courses 2 and 3.

10. Morphology of the brain, human or comparative anatomy Laboratory work. Daily, 8-6. Professor WILDER.

Course 10 is open only to those who have taken courses 2, 3, and 12.

11. Vertebrate histology Laboratory work. Daily, 8-6. Assistant Professor GAGE.

Course 11 is open only to those who have taken courses 2 and 8. Course 3 is also desirable in preparation for this course.

THIRD TERM.

12. Morphology of the brain. Eighteen lectures. T., Th., 2.30. Laboratory work. Daily, 8-6. Professor WILDER.

Course 12 is open only to those who have taken courses 2 and 3. Course 7 is a desirable preparation.

13. Experimental physiology Five lectures. T., 4.30. Laboratory work. Daily, 8-6. Assistant Professor GAGE.

Course 13 is open only to those who have taken courses 2 and 3.

14. Formation and care of a museum of vertebrates. Four lectures. M., 2.30. Laboratory work. Professor WILDER.

Course 14 is open only to those who have taken courses 2, 3, and 7

15. Human or comparative anatomy. Advanced laboratory work.

Course 15 is open only to those who have taken courses 2 and 3. 16. Morphology of the brain, human or comparative anatomy Laboratory work. Daily, 8-6. Professor WILDER.

Course 16 is open only to those who have taken courses 2, 3, and 12.

17 Vertebrate histology Laboratory work. Daily, 8-6. Assistant Professor GAGE.

Course 17 is open only to those who have taken courses 2 and 8. Course 3 is also desirable in preparation for this course.

[18. The methods and elements of embryology Ten lectures. Laboratory work.

Course 18 is open only to those who have taken courses 2, 3, and 8. This course will not be given until 1887-88.]

Whenever laboratory work is mentioned in a course it forms an essential part of that course.

The laboratory practice varies with the needs of the student and the extent of his preparation. Usually the preliminary work includes the study of the skeleton, the dissection of muscles and nerves, the methods of microscopic manipulation, the examination of the brain, heart, and other viscera of the cat, and the performance of physiological experiments. The advanced work -varies according to the purposes of the student. There are special facilities for the study of the brain, heart, and other soft parts.

GEOLOGY AND PALEONTOLOGY

FIRST TERM.

1. Geology (a), physical. Lectures on the general principles of geology, including physiography, and structural and dynamical geology M., W., F., 9. Professor HENRY S. WILLIAMS.

4. Paleontology Laboratory and field practice. Three hours or more. Daily, 9-5. Professor WILLIAMS and Mr. PROSSER.

7 Lithology Introductory study of rocks and optical mineralogy Laboratory work, three hours per week. Mr. KEMP.

SECOND TERM.

2. Geology (b), systematic. The classification of rock-masses, stratigraphical, lithological and paleontological. Lectures. M., W., F., 9. Professor WILLIAMS.

5. Paleontology The identification of fossils. Laboratory work and lectures on the hard parts of invertebrates. Three hours or more. Daily ex. S., 9-5. Mr PROSSER.

8. Lithology Laboratory work. Daily, 9-5. Professor WILL-IAMS and Mr SIMONDS.

THIRD TERM.

3. Geology (c), economic. Lectures and demonstrations on the geology of ores, ore deposits, and valuable rock materials. T., Th., 9. Mr SIMONDS.

10. Survey methods. Lectures and demonstrations on methods of making, recording and interpreting geological observations. F., 12. Professor WILLIAMS.

6. Paleontology Collecting and identifying fossils. Field and laboratory work by appointment. Professor WILLIAMS and Mr. PROSSER.

9. Petrography Advanced work in microscopical study of rocks. Laboratory work. Daily ex. S., 9-5. Mr. KEMP.

11. Historical paleontology Lectures illustrating the problems in the history of organisms. M., W., 9. Professor WILL-IAMS.

12. Laboratory and field work for advanced students, by appointment, and original investigation under the direction of the department.

APPLIED SCIENCE AND THE ARTS.

AGRICULTURE.

FIRST TERM.

1. Applied agriculture. The preparation of soils, general management of stock, farm buildings, farm-yard manures, commercial fertilizers, conveyances. Lectures. Daily ex. S., 11. Professor ROBERTS.

7

90 COURSES OF INSTRUCTION.

4. Agriculture. Field work. T., Th., 2-4. Professor Rob-ERTS.

SECOND TERM.

2. Applied agriculture. Farm accounts, principles of stockbreeding, races and breeds, breeding, feeding, and management of cattle, dairy husbandry, sheep husbandry Lectures. Daily ex. S., 11. Professor ROBERTS.

5. Agriculture. Field work. T., Th., 2-4. Professor Rob-ERTS.

THIRD TERM.

3. Applied agriculture. The horse, farm drainage, farm implements and machinery, grains, grasses, and weeds, business customs, rights, and privileges, forms of contracts, relations of employers and laborers. Lectures. Daily ex. S., 11. Professor ROBERTS.

6. Agriculture. Field work. T., Th., 2-4. Professor Rob-ERTS.

[For agricultural chemistry see Chemistry, courses 4 and 5, for horticulture and arboriculture see Botany, courses 12 and 13; for economic entomology see Entomology, courses 4, 5, and 6.]

VETERINARY SCIENCE.

FIRST TERM.

1. The anatomy, physiology and hygiene of farm animals, data for determining age, principles of breeding, of shoeing, etc. Lectures. Daily ex. S., 8. Professor L_{AW} .

Clinical demonstrations as opportunity offers. Professor LAW

SECOND TERM.

2. Zymotic, parasitic, dietetic, and constitutional diseases of domestic animals. Veterinary sanitary science and police, prevention of animal plagues by legislative and individual action. Lectures. Daily ex. S., 8. Professor LAW

Clinical demonstrations as opportunity offers. Professor LAW.

THIRD TERM.

3. General diseases of the different systems of organs in the domestic animals. Lectures. Daily ex. S., 8. Professor LAW. Clinical demonstrations as opportunity offers. Professor LAW

COURSES OF INSTRUCTION.

ARCHITECTURE.

FIRST TERM.

3. Building materials and construction. Lectures. T., Th., 11. Professor Osborne.

7 The elements of house-planning. Lectures. M., W., 2.30. Drafting, nine hours per week. Assistant Professor OSBORNE.

12. Mechanics. Strength of materials. Lectures. M., W., F., 12. Exercises in problems, six hours per week. Professor Вавсоск.

15. History of Egyptian, Greek, and Roman architecture. Lectures. M., W., F., 9. Professor BABCOCK.

18. Renaissance architecture. Lectures. T., Th., 12, W., 11. Professor BABCOCK.

24. Designing. Occasional lectures, and twenty-one hours per week of drawing. Professor OSBORNE.

SECOND TERM.

1. Linear drawing. Lectures. M., 2-2.30. Drafting. M., 2.30-4. Assistant Professor Osborne.

4. Building construction. Lectures. M., W., 10. Drafting, twelve hours per week. Assistant Professor OSBORNE.

8. Problems in design. Lectures. W., 2.30. Drafting, six hours per week. Assistant Professor OSBORNE.

10. Elements of design. Th., 2.30. Assistant Professor Os-BORNE.

13. Mechanics. Trusses. Lectures. T., Th., 12, and six hours per week of exercises in problems. Professor BABCOCK.

16. Romanesque architecture. Lectures. Daily ex. S., 11. Professor BABCOCK.

19. Modern architecture. Lectures. M., W., F., 9. Professor BABCOCK.

21. Decoration. Lectures. T., Th., 9. Professor BABCOCK.

25. Senior designing. Occasional lectures, and twenty-one hours per week of drawing. Professor OSBORNE.

THIRD TERM.

5. Building construction. Lectures. M., W., 10. Drafting, six hours per week. Assistant Professor OSBORNE.

9. Problems in design. Lectures. W., 2.30. Drafting, six hours per week. Assistant Professor OSBORNE.

11. Design-sketching. Th., 2.30. Assistant Professor Os-BORNE.

20. Acoustics, etc. Lectures. M., W., F., 11. Professor BABCOCK. Specifications. Lectures. T., Th., 11. Assistant Professor Osborne.

14. Mechanics. Arches. Lectures. T., Th., 12. Exercises in problems, six hours per week. Professor BABCOCK.

6. Shades, shadows, and perspective. Lectures. T., Th., 9. Drawing, six hours per week. Professor BABCOCK.

17 Gothic architecture. Lectures. M., W., F., 9, and six hours per week of drawing. Professor BABCOCK.

22. Decoration. Six hours per week of practical exercises. Professor CLEAVES.

23. Modeling. Four hours per week. Mr. BROWN.

26. Senior designing. Occasional lectures, and twenty-one hours per week of drawing. Professor OSBORNE.

The drawing-rooms are open daily ex. S., 9-5, and S., 9-1.

CIVIL ENGINEERING

UNDERGRADUATE COURSES.

FIRST TERM.

3. Descriptive geometry Recitations and lectures. M., T., W., Th. Sec. I., 8, sec. II., 9, sec. III., 10. Assistant Professor MARX. Sec. IV., 9, sec. V., 10. Instructor Mosscrop Drawing, M., W., F., 11-1. Assistant Professors CRANDALL and MARX.

8. Mechanics of engineering. Recitation and lectures. Daily, ex. S. Sec. I., 8, sec. II., 9. Assistant Professor Сниксн.

22. Civil engineering. Lectures and reading. M., W., F., 10. Professor FUERTES.

11. Shades, shadows, perspective, and tinting. Lectures and drawing. Daily ex. S., 11-1. Instructor Mosscrop.

28. Bridge designing. Lectures and drawing. T., Th., 8-11. Assistant Professor CRANDALL.

19. Spherical astronomy Lectures, recitations, and instrumental work. Daily ex. S., 11. Professor FUERTES.

19 (a). Observatory work, two nights per week. Professor FUERTES and Instructor Mosscrop.

21. Stereotomy and theory of the arch. Lectures and drawing. M., W., F., 8-10. Assistant Professor CRANDALL.

23. Hydraulics. Lectures and recitations. Daily ex. S., 12. Assistant Professor Church.

32. Laboratory work in civil engineering. (a) Adjustment and manipulation of instruments of precision, (b) elementary experiments and tests, (c) original research. Daily, 9-6, throughout the year. Professor FUERTES, Assistant Professors CRANDALL, CHURCH, and MARX, and Instructor Mosscrop.

GRADUATE COURSES.*

[Only graduates of this University, or of other institutions, whose requirements for the first degree in Civil Engineering are equivalent to those of this University are admitted to the studies of these courses. Nearly all the work required of the students is original research, occupying no more of the time of the professors than is required for consultation, general supervision, and lectures intended to direct the main lines of their reading or investigations. After "Registration" for graduate work the registration will not be changed during the year, nor will students be permitted to carry on simultaneously the studies of two distinct branches of engineering.]

38. Wood and stone bridges. Lectures and drawing. 3, II. Assistant Professor CRANDALL.

39 (a). Bridge details and designing. Drawing. 3, II. Assistant Professor CRANDALL.

40. Engineering architecture. Lectures and drawing. 3, II. Assistant Professor MARX.

32. Laboratory investigation. (See Course 32, above).

40 (a). Elective. 6, II., 3, III., 4, IV., 4, V., 2 or 3, VI.

41. Economics of railway location. Lectures and reading. 3, III. Assistant Professor CRANDALL.

42. Railway projects. Consultation and drawing. 3, III. Assistant Professor CRANDALL.

44. Structure and efficiency of locomotive engines. 3, III. Instruction given at Sibley College of Mechanical Engineering.

*The Arabic figures after the various subjects of study indicate the number of University exercises per week allowed to them, at hours to be assigned by the head of the department at the beginning of each term. The Roman numerals refer to the graduate courses in Civil Engineering detailed under the head of "Courses of Instruction." Letters in brackets indicate that the subject to which they refer extends through two or more terms. Elective studies may be chosen by the students, with the approval of the head of the department, from the courses in Literature, History, and Political Science, or from any of the professional or technical courses of the University

45. Advanced economic geology 3, III., IV., V., VI. Instruction given in the geological department.

46. Water collection and distribution. Lectures. 5, IV., V Professor FUERTES.

47 Special chemical laboratory work. 3, IV Instruction given in the chemical department.

48. Advanced study of the laws of motion of water Lectures and investigation. 3, V Assistant Professor Сниксн.

49. Advanced astronomical observatory work. 5, IV Professor FUERTES and Instructor MOSSCROP.

50 (a). Gravimetric, magnetic, and geodetic field work. 3, IV Professor FUERTES and Instructor MOSSCROP.

52 (a). Political economy (see course 20, p. 72).

SECOND TERM.

UNDERGRADUATE COURSES.

1. Linear drawing. T., Th., 10–1 Assistant Professor CRAN-DALL.

4. Pen topography T., Th., 8-11. Instructor Mosscrop.
17 Technical reading, in French and Spanish, at hours to be arranged. M., W., F., Professor FUERTES. In German, M., W., F., 9. Assistant Professor MARX.

9. Mechanics of engineering. Recitations and lectures. Daily ex. S. Sec. 1., 10, sec. 11., 11. Assistant Professor Church.

13. Lettering. Round writing. M., W., F., 11-1. Instructor MOSSCROP.

5 (a). Detail drawing from measurements, and elementary designing. M., W., F., 11-1. Assistant Professor MARX.

5 (b). Designs in engineering architecture. Lectures and drawing. T., 8, T., Th., 11-1. Assistant Professor MARX.

6. Geometrical and map lettering. M., W., F., 10. Assistant Professor MARX.

35. Higher Geodesy Lectures and recitations. Daily ex. S., 9. Assistant Professor CRANDALL.

18. Stone cutting and masonry designs. Lectures, recitations, and original problems. Daily, 10-12. Professor FUERTES.

30. Hydraulic motors. Lectures. T., Th., 8. Assistant Professor Сниксн.

31. Railway economics. Lectures. M., W., F., 8. Assistant Professor CRANDALL.

33. Municipal and sanitary engineering. Lectures. M., W., F., 12. Professor FUERTES.

GRADUATE COURSES.

53. Iron bridges. Lectures and drawing. 3, II. Assistant Professor CRANDALL.

39 (b). Bridge details and designs. Drawing and consultation. 3, ii. Assistant Professor CRANDALL and Mr MOSSCROP.

54. Hoisting and pumping machinery 3, II., III., IV., V Instruction given at the Sibley College of Mechanical Engineering.

55. Details and designs of cranes, pumps, etc. 2, II., III., IV., V Instruction given at the Sibley College of Mechanical Engineering.

56. Hydraulic laboratory investigations. 4, II., IV., V Professor Fuertes and Assistant Professor Сниксн. 4, III.

40 (b). Elective. 4, II., 3, IV, 3, V (See 40 a)

57 Economics of railway construction. Lectures and reading.

3, II. Assistant Professors CRANDALL and MARX.

58. Projects and designs of track details and accessory works. Reading and drawing. 3, III. Assistant Professor CRANDALL and Instructor Mosscrop.

59. Special types of locomotives and railway machinery 3, II. Instruction given at the Sibley College of Mechanical Engineering.

60. Electrical laboratory work. 4, III. Given in the department of physics.

61. Sewerage of towns and cities. Lectures. 3, IV Professor FUERTES.

62. Designs of water supply and sewerage systems. Consultation and drawing. 3, IV Professor FUERTES and Assistant Professor MARX.

63. River studies and improvements, and canal construction. Lectures and reading. 5, V Professor FUERTES.

64. Study of special hydraulic problems. Reading and consultation. 2, V Assistant Professor CHURCH.

65. Advanced geodesy Reading and consultation. 3, VI. Assistant Professor CRANDALL.

66. Systematic and applied botany and forestry 3, VI. Instruction given in the botanical department.

52 (b). Political economy See courses 25, 26, page 73.

67 Special cartography. Drawing and stereotopography 3, VI. Assistant Professor Сниксн.

68. Metallurgy 2, VI. Instruction given in the chemical department.

69. Special investigations in the physical or civil engineering laboratories. (See 50 a.)

THIRD TERM.

UNDERGRADUATE COURSES.

2. Descriptive geometry, freshmen. Recitations. M., W., F. Sec. I., 8, sec. II., 9, sec. III., 10, sec. IV., 12, Assistant Professor MARX. Sec. V., 10, Assistant Professor CRANDALL. Sec. VI., 11, sec. VII., 12, Instructor Mosscrop. Drawing. T., Th., 11-1. Assistant Professor MARX and Instructor Mosscrop.

14. Land surveying. Lectures, recitations, and field work. M., W., F., 8-11. Professor FUERTES and Instructor Mosscrop.

10. Mechanics of engineering. Recitations and lectures. Daily ex. S. Sec. 1., 11, sec. 11., 12. Assistant Professor Сниксн.

16. Railway office practice. Drawing and office records. Daily ex S., 10. Instructor Mosscrop

15. Railroad surveying. Lectures, recitations, and field work. Daily ex. S., 8-10. Assistant Professor CRANDALL.

7 Colored topography, brush and stump work. T., Th., 8-11. Assistant Professor MARX.

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25. Topographical practice in "The Cornell University Surveys of Central New York;" juniors. Field work, two weeks, office work, one week. Professor FUERTES, Assistant Professors CRANDALL and CHURCH, and Instructor Mosscrop.

27 Bridge stresses, juniors. Recitations and lectures. Daily ex. S., 11. Assistant Professor CRANDALL.

29. Engineering economics. Lectures. T., Th., 10. Professor FUERTES.

24. Hydrographic mapping and cartography M., T., W., Th., 8-10. Assistant Professor Сниксн.

26. Astronomical, geodesic, hydrographic, magnetic, and gravimetric practice in "The Cornell University Surveys of Central New York;" seniors. Field work, two weeks, office work, one week. Professor FUERTES, Assistant Professors CRANDALL and CHURCH, and Instructor Mosscrop.

34. Voluntary discussions on professional topics by professors and students, and voluntary attendance upon the professional lectures of non-resident professors.

36. Hydraulic engineering. Lectures. Daily ex. S., 11. Professor FUERTES.

37 Preparation of theses for graduation.

GRADUATE COURSES.

70. Bridge contracts. Lectures and reading. 3, II. Assistant Professor CRANDALL.

71 Bridge superintendence and construction. Lectures and excursions to bridge works. 3, II. Assistant Professor CRANDALL.

72. Special types of trusses, and swing and pivot bridges. Reading and drawing. 3, II. Assistant Professor CRANDALL and Instructor Mosscrop

38 (b). Bridge designing. Drawing and consultation. 3, II. Assistant Professor CRANDALL.

73. Railway maintenance and administration. Lectures and reading. 5, III. Assistant Professor CRANDALL.

74. Railway contracts, and specifications for railroad construction. Lectures and reading. 3, III. Professor FUERTES and Assistant Professors CRANDALL and MARX.

75. Contracts and specifications for locomotives and railway machinery 3, III. Instruction given at the Sibley College of Mechanical Engineering.

76. Engineering jurisprudence. Lectures and reading. 3, III. Professor FUERTES. This course is common to courses II., III., IV., V., and deals mainly with corporate rights, questions of easements and servitudes, and riparian problems, and it attempts to perfect a compilation of the fundamental principles of internal and international legislation on "ways of communication" and public works, with a comparative study of the laws of Holland, England, France, Italy, and Spain upon irrigation.

77 Drainage and improvement of lands. Lectures and reading. 3, IV Professor FUERTES.

78. Designs of sewers. Consultation and drawing. 2, IV Assistant Professor MARX.

79. Sewer estimates of cost, specifications, contracts, and construction. Lectures, consultation, and reading. 3, IV Assistant Professor MARX.

80. Sanitary and municipal legislation. Lectures and reading. 2, IV Professor FUERTES.

81. Coast and harbor improvements. Lectures and reading. 5, V Professor FUERTES.

82. Harbor and river estimates and contracts. Consultation, reading, and drawing. 3, V Professor FUERTES and Assistant. Professor MARX.

83. Administration and management of public works. Lectures and reading. 3, V Professor FUERTES.

84. Geodetic surveys and geographical explorations. Lectures and reading. 3, VI. Assistant Professor CRANDALL.

52 (c). Political economy See course 28, page 74.

85. Meteorology Lectures, reading, and discussion of observations. 2, VI. Professor FUERTES.

86. Preparation of an original thesis. 6, II., 5, III., 4, IV., 6, V., 4, VI.

MECHANICAL ENGINEERING AND THE MECHANIC ARTS.

FIRST TERM.

1. Kinematics and mechanism. Recitations and lectures. M., W., F., 10. Mr. VAN VLECK.

4. Machine designing. Recitations and lectures. W., F., 9. Assistant Professor BAILEY

6. Shopwork. Woodworking. Daily Use of tools. 10-12, 12-2, 2-4. Professor MORRIS and Mr. WOOD.

9. Shopwork. Moulding, use of tools. Daily, 10-12, 2-4. Professor Morris and Mr VANDERHOEF

12. Shopwork. Forging, use of tools. Daily, 10-12, 2-4. Professor Morris and Mr GRANGER.

15. Shopwork. Machinists' work, use of tools. Daily, 10-12, 2-4. Professor Morris and Mr Anderson.

18. Drawing. Freehand. Daily, 11-1, 2-4. Professor CLEAVES and Messrs. BROWN, MCNEIL, and OVIATT.

21. Drawing. Mechanical (special). Daily, 8-1. Professor MORRIS.

24. Drawing. Mechanical (machine design). M., T., Th., 8-11. Assistant Professor BAILEY

27 Drawing. Mechanical (mechanism). T., Th., 9-12. Mr. VAN VLECK.

30. Steam engine and other motors. Thermo-dynamics and theory of steam and other heat engines. Lectures. Daily, 10. Professor THURSTON.

33. Mechanical laboratory Lectures and demonstrations. Daily 2-4, S. 8-1. Assistant Professor BAILEY and Mr. VAN VLECK. 36. Essays and discussions. Mechanical Engineering Association. F., 2.30-4.

SECOND TERM.

2. Materials of engineering. Recitations and lectures. M., W., F., 9. Mr. VAN VLECK.

5. Machine designing. Recitations and lectures. M., W., 9. Assistant Professor BAILEY.

7 Shopwork. Woodworking, carpentry and joining. Daily, 10-12, 12-2, 2-4. Professor MORRIS and Mr. WOOD.

10. Shopwork. Moulding. Daily, 10-12, 2-4. Professor Mor-RIS and Mr. VANDERHOEF.

13. Shopwork. Forging. Daily, 10-12, 2-4. Professor Mor-RIS and Mr GRANGER.

16. Shopwork. Machinists' work. Daily, 10-12, 2-4. Professor Morris and Mr. Anderson.

19. Drawing. Freehand. Daily, 11-1, 2-4. Professor CLEAVES and Messrs. BROWN, MCNEIL, and OVIATT.

22. Drawing. Mechanical (special). Daily, 8-1. Professor MORRIS.

25. Drawing. Mechanical (machine design). T., Th., 10-12. Assistant Professor BAILEY

28. Drawing. Mechanical (use of instruments). F., S., 11-1. Professors CLEAVES and BAILEY.

29. Drawing. Mechanical (mechanism). M., T., Th., 11-1. Mr. VAN VLECK.

31. Steam engine. history, structure, and operation. Daily, 10. Professor THURSTON.

34. Mechanical laboratory Lectures and experimental demonstration. Daily, 2-4, S., 8-1, and as assigned. Professor BAILEY and Mr. VAN VLECK.

37 Papers and discussions. F., 2.30-4. M. E. Association.

THIRD TERM.

3. Machine designing. Recitations and lectures. M., W., F., 9-11, T., Th., 10. Assistant Professor BAILEY

8. Shopwork. Woodworking, pattern-making. Daily, 10-12, 12-2, 2-4. Professor MORRIS and Mr WOOD.

11. Shopwork. Moulding, and handling castings. Daily, 8-10, 10-12, 2-4. Professor MORRIS and Mr. VANDERHOEF.

14. Shopwork. Forging, tool-making. Daily, 8-10, 10-12, 2-4. Professor MORRIS and Mr. GRANGER.

17 Shopwork. Machinists' work, fitting and construction. Daily, 8-10, 10-12, 2-4. Professor MORRIS and Mr. ANDERSON.

20. Drawing. Freehand, designing, modeling. Daily, 11-1, 2-4. Professor CLEAVES and Messrs. BROWN and MONEIL.

23. Drawing Mechanical (special). Daily, 8-1. Professor MORRIS.

26. Drawing. Mechanical (machine design). M., W., F., 9-12. Assistant Professor BAILEY

28. Drawing. Mechanical (office work, etc.). M., W., F., 9-12. Professor CLEAVES and Mr. VAN VLECK.

32. Steam generation, steam boilers, and various motors. M., W., F., 10. Professor THURSTON.

35. Mechanical laboratory. Lectures and experimental demonstration. Daily, 2-4, S., 8-1., and as assigned. Professor BAILEY and Mr. VAN VLECK.

38. Papers and discussions. F., 2.30-4. Mechanical Engineering Association.

39. Advanced work, as assigned. Steam engine. Professor THURSTON. Marine engineering. Assistant Professor BAILEY. Laboratory work. Mr VAN VLECK.

MILITARY SCIENCE AND TACTICS.

FIRST TERM.

1. Infantry drill. School of the soldier. School of the company M., W., F., 4.30. Lieutenant VAN NESS.

3. Artillery drill. School of the soldier dismounted. M., W., F., 4.30. Lieutenant VAN NESS.

SECOND TERM.

5. Military science. Lectures. T., Th., 12. Lieutenant VAN NESS.

THIRD TERM.

2. Infantry drill. School of the battalion. M., W., F., 4.30. Lieutenant VAN NESS.

4. Artillery drill. School of the battery dismounted, for selected detachments. M., W., F., 4.30. Lieutenant VAN NESS.

Students in courses 3 and 4 are selected by the commandant. from those reasonably proficient in courses 1 and 2.

COURSES OF STUDY.

I. THE GENERAL COURSES FOR UNDER-GRADUATE STUDENTS.

The special requirements of each of the general courses will be seen below

In the course of their elective work, which covers a small part of the sophomore year, nearly the whole of the junior year, and the entire senior year, students are urgently advised to proceed upon a carefully formed and clearly defined plan, and to aim at the attainment of special proficiency in certain lines of work. The members of the Faculty will be glad to give advice and assistance in the forming of such plans. The elective hours of the sophomore year should be used with reference to the special lines of study which the student designs to pursue during the junior and senior years. For example, students who intend to make a specialty of Greek should add to the required work the elective hours which are open to sophomores, students of history and political science should take English or mediæval history, candidates for the degree of Bachelor of Arts or Bachelor of Philosophy, who desire to make a specialty of science, should take physics, students of all courses who desire to pursue advanced mathematics should take analytical geometry and calculus, students desiring to take a complete course in natural history, with a view to teaching it or with the intention of the ultimate study of medicine, should elect freehand drawing, invertebrate zoology, vertebrate zoology, and botany

Students who shall devote at least five hours continuously during the last two years, with marked success, to any single subject, will receive mention of that fact in the diploma and on the Commencement programme.

COURSES OF STUDY.

THE COURSE LEADING TO THE DEGREE OF BACH-ELOR OF ARTS.

Freshman Year	1st Term.	2d Term.	3d Term.
Latin	3*	3.	3
Greek	3	. 3	3
Mathematics	3	3	. 3
French	3	3	3
English	2	. 2.	· 2
Greek history	2 Roman	history 2	2
	16	16	16
Military drill	2 Physic	al training 2 Military	drill 2
Hygiene	6 lecture	S.	
Sophomore Year	1st Term.	2d Term.	3d Term.
Latin	3	3	3
Greek	3	3	3
German	3	3	3
English	1	1	1
Physiology	3 Psycho	logy 3 Logic	3

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	13	13 13	
Military drill	2 Physica	al training 2 Militar	ry drill 2
Electives	2-5 each	term.	
Junior Year	1st Term.	2d Term.	3d Term.
Themes	2	2	. 2
The remainin	g work of the	junior year, and all	l the work of
the senior year,	is elective.		

THE COURSE LEADING TO THE DEGREE OF BACH-ELOR OF PHILOSOPHY

Freshman Yea	ar 1st Term.	2d Term.	3d Term.
Latin	3	. 3	3
German	3	3	3
Mathematic	s 3	3	3
French	3	3	3
English	2	2	. 2
Greek histo	ry. 2 Roman	history 2	2
	16	16	16

*The figures indicate the number of University exercises per week.

Military drill	2 Physic	al training 2	Military	drill	2
Hygiene	6 lectures	5.			
Sophomore Year	1st Term.	2d Ter	m.	3 d	Term.
Latin	3	. 3		• •	3
French .	3	. 3		••	3
German	3	3		• •	3
English	1	1			1
Physiology	3 Psycho	ology. 3	Logic		. 3
					10
	13	13			13
Military drill	2 Physic	al training 2	Military	drill	. 2
Electives	2-5 each	term.			
Junior Year.	1st Term.	2d Ter	m.	3 d	Term.
Themes	2	2	••••	•	. 2
The remaining	work of the	junior voor	and all	the w	ork of

The remaining work of the junior year, and all the work of the senior year, is elective.

THE COURSE LEADING TO THE DEGREE OF BACH-ELOR OF SCIENCE, OR TO THE DEGREE OF BACHELOR OF LETTERS.

Students who, after completing the first two years of this course, shall devote at least nine hours continuously during the last two years to scientific subjects, will receive the degree of Bachelor of Science, and those who shall devote at least nine hours to literary, historical, and philosophical subjects will receive the degree of Bachelor of Letters.

Freshman Year.	1st Term.	2d Term.	3d Term.
Mathematics	5	5	5
French \ 5 or German \ 3 or	$ \begin{array}{c} 3 \\ 5 \\ 5 \end{array} $ 8	8	8
English	. 2 .	2	2
	15	15	15
Military drill	2 Physic	cal training 2 Milit	ary drill 2
Hygiene .	6 lecture	es.	•
Sophomore Year	1st Term.	2d Term.	3d Term.
French or Ger	. 3	3	3
English	. 1 .	1	. 1
Physics	3.	. 3	3
Chemistry .	3	3 Bota	ny3
Physiology	. 3 Psycho	ology . 3 Logie	c 3
			10
	13	13	13

Military drill	2 Physica	l training 2 Milita	ary drill	2
Electives	. 2–5		-	
Junior Year	1st Term.	2d Term.	3 d	l Term.
Themes	. 2.	2		2

The remaining work of the junior year, and all the work of the senior year, is elective.

II. THE GENERAL COURSES FOR GRADUATE STUDENTS.

Students are admitted to graduate study after having taken a baccalaureate degree in this University, or on presenting a diploma giving evidence that an equivalent degree has been taken elsewhere.

Courses of graduate study leading to advanced degrees are provided in the following departments Ancient Classical Languages and Literatures, Modern European Languages and Literatures, Comparative Philology, History and Political Science, Philosophy, Mathematics, Chemistry and Physics, Natural History, The Science and Art of Teaching, Civil Engineering, Mechanical Engineering, and Agriculture.

The graduate courses in Civil and Mechanical Engineering are fully described elsewhere in the Register

In the list of Courses of Instruction courses will be found designated as specially adapted to the wants of graduate students.

Among the special advantages offered to graduate students in this University may be mentioned the following

1. The greater part of such work is carried on in laboratories and seminaries, in which the student, with the aid and under the intimate personal guidance and direction of the professor, is encouraged in the prosecution of original investigation of an advanced nature. In all the graduate work the aim is to surround the student with an atmosphere of earnest devotion to the cause of the advancement of knowledge and to excite a true scholarly spirit.

2. Graduate students who are not candidates for a degree, as well as those who are, are required to work under the general direction of a committee of the Faculty, appointed for the special purpose of supervising and directing their work. All graduate students are at liberty to attend any of the exercises of the University, but under the guidance of the appropriate committee

every such student must take an amount of work not less than the minimum required of undergraduates during the senior year.

3. Graduate students have access to the alcoves of the library, as well as to the special collections in the seminary rooms, and thus have exceptional opportunities for prosecuting advanced work.

4. Eight Fellowships, with stipends of four hundred dollars each, are annually given to such graduate students as may be selected by the Faculty for the superiority of their scholarships.
5. Tuition is free. The only payments required of graduate students by the University are those for materials actually con-

sumed in the laboratories.

THE TECHNICAL COURSES.

THE COURSE IN AGRICULTURE.

Leading to the degree of Bachelor of Science in Agriculture.Freshman Year1st Term.2d Term.3d Term.Mathematics555

French or Gen	r 5		5	,)	5
English	2		2	2	2
Freehand dra	wing 3		۰ ر	}	3
				-	
	15		15)	15
Military drill	2	Physical	training 2	2 Military	drill 2
Hygiene	6	lectures.			
Sophomore Year	· lst 7	l'erm.	2d Te	rm.	3d Term.
$\mathbf{English}$	1		1	•	1
Physics	3		<u>ب</u>		3
Invertebrate 2	zool. 3	Vertebrat	te zool. 3	B Botany	3
Physiology	3	Psycholog	gy g	B Logic	3
Anatomical m	eth-	Microscop	oical	<u> </u>	
ods	1	-	methods 1	L	
Anat. Lab.	2	Micr. Lab). 2	2	
		Chemistry	7	B Chemist	try 3
	—	•		-	
	13		16		13
Military drill	2	Physical ·	training 2	Military	drill 2
Electives	2-5		2		2-5
Junior Year	lst I	lerm.	2d Te	rm.	3d Term.
Themes	2	•	• • 4	2	2
8				•	

COURSES OF STUDY.

The remaining work of the junior year, and all the work of the senior year, is elective, with the condition that at least twelve hours must be devoted continuously to studies specially relating to agriculture or horticulture, a list of which is given below (the studies being arranged somewhat in the general order in which they should be taken)

Agricultural chemistry lectures, laboratory work in qualitative and quantitative analysis.

Botany compositæ and gramineæ arboriculture and landscape gardening, vegetable physiology, vegetable histology, fungi and algae, and systematic and applied botany

Geology, economic lectures.

Entomology lectures and laboratory practice.

Horticulture lectures and field work.

Veterinary studies anatomy and physiology, pathology, sanitary science, parasites, medicine and surgery

Agriculture lectures and field work.

Land surveying.

THE COURSE IN ARCHITECTURE.

Leading to the degree of Bachelor of Science in Architecture.

FRESHMAN YEAR.

FALL TERM. — French or German, 5, rhetoric, 2, algebra, 5, freehand drawing, 3, military drill, 2, hygiene, six lectures.

WINTER TERM. — French or German, 5, rhetoric, 2, Trigonometry, 5, freehand drawing, 3, linear drawing, 2.

SPRING TERM.— French or German, 5, analytical geometry, 5, descriptive geometry, text and drawing, 4, botany, 3, military drill, 2.

SOPHOMORE YEAR.

FALL TERM. — Building materials and construction, 2, composition, 1, calculus, 5, descriptive geometry, text and drawing, 6, experimental mechanics and heat, 3, military drill, 2.

WINTER TERM. — Construction, 3, composition, 1, economic geology, 3, drawing, 3, electricity and magnetism, 3, chemistry, lectures, 3.

SPRING TERM. — Construction, 3, composition, 1, drawing, 1, acoustics and optics, 3, chemistry, lectures, 3, blowpipe analysis and determinative mineralogy, 2, shades, shadows, and perspective, 3, military drill, 2.

JUNIOR YEAR.

FALL TERM. — Mechanics, strength of materials, 5, drawing, 3,
Egyptian, Greek, and Roman architecture, 3, designing, 4.
WINTER TERM. — Mechanics, trusses, 5; Romanesque architecture, 5, designing, 3, decoration, 2.

SPRING TERM. — Mechanics, arches, 3, decoration, 3, Gothic architecture, 5, designing, 4, modeling, 2.

SENIOR YEAR.

FALL TERM.—Renaissance architecture, 3, designing, 9, stereotomy, 3.

WINTER TERM. — Modern architecture, 3, designing, 7, stereotomy applied to stone-cutting, 5, military science, 2.

SPRING TERM. — Acoustics, ventilation, warming, professional practice, measuring, contracts, specifications, etc., 5, designing, 5, photography, 2, thesis, 4.

SPECIAL COURSE IN ARCHITECTURE.

FIRST YEAR.

FALL TERM. - Building materials and construction, Egyptian,

Greek, and Roman architecture, mechanics, designing, drawing.

WINTER TERM. — Romanesque architecture, construction, mechanics, designing.

SPRING TERM.—Gothic architecture, construction, mechanics, designing, shades, shadows, and perspective.

SECOND YEAR.

FALL TERM — Renaissance architecture, designing, freehand drawing.

WINTER TERM.—Modern architecture, decoration, designing, geology

SPRING TERM. — Acoustics, etc., designing, decoration, photography, modeling

THE COURSE IN CHEMISTRY

Leading to the degree of Bachelor of Science in Chemistry The first two years of the course are the same as in the course in Science, as described on page 103.

Candidates for the degree of Bachelor of Science in Chemistry must devote to Chemistry not less than seven hours continuously in the sophomore year, and not less than twelve hours continuously in the junior and senior years, out of the eighteen which they are at liberty to take.

THE COURSES IN CIVIL ENGINEERING.

I.

A four years course leading to the degree of Civil Engineer.

FRESHMAN YEAR.

FALL TERM. — French or German, 5, rhetoric, 2, algebra, 5,
freehand drawing, 3, military drill, 2, hygiene, six lectures.
WINTER TERM.— French or German, 5, rhetoric, 2, trigonometry, 5, lettering, 2, linear drawing, 2.

SPRING TERM.— French or German, 5, analytical geometry, 5; descriptive geometry and drawing, 4, rhetoric, 2, military drill, 2.

SOPHOMORE YEAR.

FALL TERM.— Calculus, 5, descriptive geometry and drawing, 6, experimental mechanics and heat, 3, rhetoric, 2, military drill, 2.

WINTER TERM. — Calculus, 5, lettering, 1, geology, 3, pen topography, 2, electricity and magnetism, 3, chemistry, 3. Spring Term. — Land surveying, 4, acoustics and optics, 3,

chemistry, 3, botany, 3, blowpipe analysis, 1, colored topography, 3, military drill, 2.

JUNIOR YEAR.

FALL TERM.—Mechanics of engineering, 5, civil engineering, 3, shades, shadows, perspective and tinting, 4, physical laboratory work, 3, mineralogy, 2.

WINTER TERM.— Mechanics of engineering, 5, designs of engineering structures, 2, technical readings in foreign languages, 3, physical laboratory work, 3, metallurgy, 2, detail drawing and elementary designing, 2.

SPRING TERM.— Mechanics of engineering, 4, railroad surveying, 4, bridge stresses, 4, railway office practice, 2; topographical practice, two weeks, and office practice, one week, 3.

SENIOR YEAR.

FALL TERM.— Hydraulics, 5, spherical astronomy, 5, practical astronomy, night observations, 2, bridge designing, 2, stereotomy and theory of the arch, 3.

WINTER TERM. — Hydraulic motors, 2, higher geodesy, 5, municipal and sanitary engineering, 2, stone cutting, and orig-
inal problems and practice, 5, railway economics, 2, military science, 2.

SPRING TELM.— Engineering economics, 2, hydraulic engineering, 4, chart-making and mapping, 3, astronomical, geodetic and hydrographic practice, two weeks, office work, one week, 3, preparation of thesis, 4.

The civil engineering laboratory as well as the chemical, mechanical and physical laboratories are open throughout the year for students having the necessary preparation.

II.

GRADUATE COURSE IN BRIDGE ENGINEERING.

FALL TERM.—Wood and stone bridges, 3, bridge details and design, 3, engineering architecture, 3, laboratory investigations of materials of construction, 3, elective, 6.

WINTER TERM. — Iron bridges, 3, bridge details and design, 3, hoisting and pumping machinery, 3, designs and details of cranes, pumps, etc., 2, hydraulic laboratory investigations, 4, elective, 4. SPRING TERM. — Bridge contracts and specifications, 3, bridge superintendence and construction, 3, special types of trusses, swing and pivot bridges, 3, bridge designing, 3, thesis, 6.

III.

GRADUATE COURSE IN RAILROAD ENGINEERING.

FALL TERM. — Economics of railway location, 3, railway projects, 3, structure and efficiency of locomotive engines and railway machinery, 3, advanced general and economic geology, 3; laboratory investigations of materials of construction, 3, elective, 3.

WINTER TERM. — Economics of railway construction, 3, projects and designs of track details and accessory works, 3, special types of railway machinery and locomotives, 3, hoisting and pumping machinery, 3; designs of details of cranes, pumps, etc., 2, electrical laboratory practice, 4.

SPRING TERM. — Railway maintenance and management, 5; contracts and specifications for railroad construction, 3, contracts and specifications for railroad machinery, 3, railway jurisprudence, 3, projects and thesis, 5.

IV.

GRADUATE COURSE IN SANITARY ENGINEERING.

FALL TERM.—Advanced general and economic geology, 3, laboratory investigations of materials of construction, 3, water collection and distribution, 5, special chemical laboratory practice, 3, elective, 4.

WINTER TERM.—Sewerage of cities and towns, 3, designs of water supply systems, 3, hoisting and pumping machinery, 3, designs and details of cranes and pumps, 2, hydraulic laboratory investigations, 4, elective, 3.

SPRING TERM.—Drainage and improvement of lands, 3, sewerage and water-supply designs, 3, estimates, specifications and contracts, 3, administration and management of public works, 3, sanitary and municipal legislation, 2, projects and thesis, 4.

V

GRADUATE COURSE IN HYDRAULIC ENGINEERING.

FALL TERM.—Advanced general and economic geology, 3, laboratory investigations of materials of construction, 3, water collection and distribution, 5, motion of water in natural and artificial channels, 3, elective, 4.

WINTER TERM.—Construction of canals and improvement of rivers, 5, hoisting and pumping machinery, 3, designs and details of cranes, pumps, etc., 2, hydraulic laboratory investigations, 4, study of hydraulic problems, 2, elective, 3.

SPRING TERM.—Coast and harbor improvements, 5, estimates, specifications, and contracts, 3, administration and management of public works, 3, projects and thesis, 6.

VI.

GRADUATE COURSE IN GEODETIC ENGINEERING.

FALL TERM.—Advanced general and economic geology, 3, advanced astronomical practice, 5, geodetic field and laboratory work, 3, mineralogy, 3, political economy, 2, elective, 2 or 3.

WINTER TERM.—Advanced geodesy, 3, systematic and applied botany, 3, political economy, 3, special cartography, 3, metallurgy, 2, physical laboratory practice, 4.

SPRING TERM.—Geodetic practice, 6, political economy, 3, magnetic laboratory practice, 3, meteorology, 2, thesis, 4.

For additional information, see index, or apply to the President of the University, or the Dean of the department.

COURSES OF STUDY.

COURSES IN MECHANICAL ENGINEERING.

Leading to the degree of Mechanical Engineer.

FRESHMAN YEAR.

FALL TERM.—French or German,* 5, algebra, 5, rhetoric, 2,
freehand drawing, 3, shopwork,† 2, hygiene, six lectures, drill, 2.
WINTER TERM.—French or German, 5, trigonometry, 5, rhetoric, 2, freehand drawing and machine sketching, 3, instrumental drawing, 2, shopwork, 2.

SPRING TERM.—French or German, 5, analytical geometry, 5, descriptive geometry, 4, rhetoric, 2, shopwork, 3, drill, 2.

SOPHOMORE YEAR.

FALL TERM.—Calculus, 5, descriptive geometry, 6, experimental mechanics and heat, 3, shopwork, 3, drill, 2.

WINTER TERM.—Calculus, 5, electricity and magnetism, 3, chemistry, lectures, 3, mechanical drawing and machine sketching, 3, shopwork, 3.

SPRING TERM.—Calculus, 5, acoustics and optics, 3, drawing, 3, chemistry, lectures, 3, shopwork, 3, drill, 2.

JUNIOR YEAR.

FALL TERM.—Mechanics of engineering, 5, kinematics, 3, drawing, 2, physical laboratory, 3, chemistry, laboratory, 3, shopwork, 3.

WINTER TERM.—Mechanics of engineering, 5, materials of engineering and mechanical laboratory work, 3, physical laboratory, 3, chemistry, laboratory, 3, machine design and drawing, 2; shopwork, 3.

SPRING TERM.—Mechanics of engineering, 5, physical laboratory, 3, chemical laboratory, 3, drawing, 2, machine design, 3, shopwork, 3.

SENIOR YEAR.

FALL TERM.—Steam engine and other motors, 5, physical laboratory, 3, mechanical laboratory, 2, drawing, 3, machine design, 3, shopwork, 3.

* Choice to meet approval of the head of the department; the same to hold of all elections. Students will report to the Director for instructions. † Number received limited by capacity of the shops; at present, to 50 at one time. Students are advised and encouraged to take shop practice in vacation. Three hours in the shop, or two and a half in the laboratory or drawing-room count as one on the schedule.

WINTER TERM.—Steam engine and motors, 5; physical laboratory, 3, mechanical laboratory, 2, drawing, 3; shopwork, 3; elective, 3 to 6.

SPRING TERM.—Thesis, drawing, mechanical laboratory investigations, shopwork (time divided optionally, but subject to approval of the head of the department),* 15, elective, 3 to 6.

COURSE IN ELECTRICAL ENGINEERING.

The freshman, sophomore, and junior years are identical with the regular course in Mechanical Engineering.

SENIOR YEAR.

FALL TERM.—Physics, lectures and laboratory work (testing of instruments and determination of constants), 6, steam engine and other motors, 5, mechanical laboratory, 2, drawing, 3, machine design, 3.

WINTER TERM.—.Physics, lectures and laboratory work (dynamo machines and electric motors, tests of efficiency), 5, steam engine and motors, 5, mechanical laboratory, 2, drawing, 3; military science, 2.

SPRING TERM.—Physics, lectures and laboratory work, photometry, efficiency tests of electric lamps, tests of telegraph instruments, lines, and cables, 5, thesis (laboratory work, reading, etc., in connection with preparation of thesis), 12. In connection with the laboratory work of the senior year, lectures are given upon the construction and methods of testing the various instruments for electrical measurements, upon the conditions that must be observed to reduce errors in measurement to a minimum, upon the construction of dynamo machines and the erection and maintenance of electric lighting plants, including precautions against fire, and upon the construction of telegraph and telephone lines and cables, with the methods of testing and locating faults.

The diploma presented to graduates in this course may bear the statement that such students have given special attention to the electrical branch, or pursued this special course.

* This term is devoted largely to the preparation of a thesis, which must be approved by the Director and by the committee on theses.

COURSES OF STUDY.

GRADUATE COURSES.

MARINE ENGINEERING.

ONE YEAR.

FALL TERM.—Structure and efficiency of marine engines and machinery, 3, experimental work in mechanical laboratory, 3; contracts and specifications, 3, chemistry or physics, laboratory work, 3, electives, 3 to 6, to be chosen from the following *

Mathematics, 5, history, 3, languages, 2, natural history, 6, literature, 3, civil engineering, 2, astronomy, 5, architecture, 3; special work in science, 5.

WINTER TERM.—Naval architecture resistance and speed of vessels, as effected by size, form, material of surfaces, and power, 3, mechanical laboratory, investigations, 3, chemical or physical laboratory work, 3, contracts and specifications, 3, electives, 6 to 9, to be chosen from the following

Mathematics, 5, history, 3, languages, 2, literature, 3, military science, 2, astronomy, 3, political economy, 3, architecture, 3, civil engineering, 5; rivers and harbors, 3, special scientific work, 5, constitution of the United States, twelve lectures. SPRING TERM.—Designs of marine machinery, etc., 3, investigations in mechanical laboratory, 3, chemical or physical laboratory work, 3, preparation of reports on thesis, 3, electives, 6 to 9, to be chosen from the following

Mathematics, 5, literature, 3, architecture, 5, civil engineering, 3, natural history, 3, political economy, 5, special scientific work, 5.

STEAM ENGINEERING.

ONE YEAR.

FALL TERM.— Structure and efficiency of steam boilers, 3, experimental work, 3, contracts and specifications, 3, chemistry or physics, laboratory work, 3, electives, 6 to 9, as in marine engineering.

WINTER TERM.— Structure and efficiency of steam engines, 3, investigation in the mechanical laboratory, 3, chemical or physical laboratory work, 3, contracts and specifications, 3, electives, 6 to 9, as in marine engineering.

SPRING TERM.— Designing steam engines and boilers, 3, experimental investigation, 3, chemical or physical laboratory

* All electives subject to the approval of the Director

work, 3, preparation of reports or thesis, 3, electives, 6 to 9, as in marine engineering.

RAILWAY MACHINERY

ONE YEAR.

FALL TERM.—Structure and efficiency of locomotive engines, and railway machinery, 3, civil engineering, 3, experimental work, 3, contracts and specifications, 3, chemistry or physics, laboratory work, 3, electives, 3 to 6, as in marine engineering.

WINTER TERM.— Study of special types of locomotive engines and railway machinery, their structure and proportions, 3, civil engineering, 3, laboratory investigation, 3, chemical or physical laboratory work, 3, contracts and specifications, 3, electives, 3 to 6, as in marine engineering.

SPRING TERM.—Designing railway machinery and apparatus, 3, civil engineering, 3, experimental investigation, 3, chemical or physical laboratory work, 3, electives, 6 to 9, as in marine engineering.

ELECTRICAL ENGINEERING.

ONE YEAR.

FALL TERM.— Structure and theory of electrical apparatus and machinery, 3, experimental work in laboratory, 5, contracts and specifications, 3, electives, 4 to 6, as in other graduate courses.

WINTER TERM. — Construction, erection, and management of lines and plant, 3, laboratory, 5, contracts and specifications, 3, electives, 4 to 6, as in other graduate courses.

SPRING TERM. — Designing dynamo-electric machinery and establishments, 5, experimental work, 3, preparation of reports or thesis, 3, electives, 4 to 6, as in other graduate courses.

Choice of elective studies, as well as of the special courses of engineering, is subject to the approval of the Director.

COURSE IN INDUSTRIAL ART*

FOUR YEARS.

FRESHMAN YEAR.

FALL TERM. — French or German, †5, algebra, 5, rhetoric, 2, outline drawing, 3, hygiene, six lectures, drill, 2.

^{*} Not a course leading to a degree; but elective purely

[†] Choice to meet approval of the Director.

WINTER TERM.—French or German, 5, trigonometry, 5; rhetoric, 2; outline and ornamental drawing, 3, instrumental drawing, 2.

SPRING TERM.— Drawing, from casts and figures, 2, analytical geometry, 5, descriptive geometry, 4, botany, 3, theory of color, 1, drill, 2.

SOPHOMORE YEAR.

FALL TERM.— Calculus, 5, descriptive geometry, 6, experimental mechanics and heat, 3, composition, 1, studies in anatomy, 1, drill, 2.

WINTER TERM.— Cast and figure drawing, 4, electricity and magnetism, 3, chemistry, lectures, 3, elementary coloring, 1, principles of design, 3, shades and shadows, 3.

SPRING TERM. — Plant forms, 2, coloring, 3, modeling and potter's wheel, 3, acoustics and optics, 3, freehand drawing, 3, chemistry, lectures, 3, drill, 2.

JUNIOR YEAR.

FALL TERM.—Æsthetics, 2, drawing, 4, moulding and model-

ing, 4, geology, 3, physiology, 3, coloring and designing, 1.

WINTER TERM. — History of fine arts, 1, coloring, 4, psychology, 3, descriptive astronomy, 3, drawing from casts, 4. Spring Term.—Woodworking, 2, photography, 2, history of art, 2, building materials and construction, 3, logic, 3, drawing from nature, decoration and coloring, 4.

SENIOR YEAR.

FALL TERM.—Stereotomy, 3, English literature, 3, history of industrial arts, 2, modeling in clay, 2, wood-carving, 2, design-ing in color, 3.

WINTER TERM.—History of art, 3, coloring from nature, 2, etching, 3, designing, 5, military science, 2.

SPRING TERM.—Designing in form and color, 4, working stone, 2; painting from nature, 3, graduating work and thesis.

A TWO-YEARS COURSE PREPARATORY TO THE STUDY OF MEDICINE.

Not leading to a Degree.

FRESHMAN YEAR.

FALL TERM.—French, 5, freehand drawing, 3, experimental mechanics and heat, 3, chemistry, 3, physiology, 3, military drill, 2; hygiene, six lectures.

WINTER TERM.—French, 5, electricity and magnetism, 3; chemistry, 3, vertebrate zoology, lectures and practicums, 3; psychology, 3.

SPRING TERM.—French, 5, acoustics and optics, 3, organic chemistry, laboratory work, 3, botany, lectures, 3, laboratory work, 2, military drill, 2.

SOPHOMORE YEAR.

FALL TERM.—German, 5, chemistry, laboratory work, 3, invertebrate zoology, lectures and practicums, 3, anatomy, physiology and hygiene of the domesticated animals, 5, anatomical methods, 1, laboratory work, 2, military drill, 2.

WINTER TERM.—German, 5, vegetable physiology, 3, veterinary pathology, parasites, and sanitary science, 5, microscopical methods, 1, vertebrate histology, laboratory work, 2, vegetable histology, lectures and laboratory work, 3.

SPRING TERM.—German, 5, medical chemistry, 3, comparative anatomy of the brain, 2, anatomy, laboratory work, 2, veterinary medicine and surgery, 5, experimental physiology (five lectures and laboratory work) and museum methods (four lectures), 1. military drill, 2.

Upon the completion of this course, or its equivalent, the student is entitled to a certificate countersigned by the professor of physiology This certificate usually enables the holder to abridge the time required for graduation in medicine.

ADDITIONAL INFORMATION IN REGARD TO THE TECHNICAL COURSES.

I.

AGRICULTURE.

All students are required to work five hours each week for one year, under the direct supervision of the Professor of Agriculture, in the farm workshop, in the barns, or in the fields. Nearly as much time is spent in the fields and barns under the Professors of Veterinary Science, Botany and Horticulture, Geology, and Entomology Students receive no pay for this or any other educational work. The field-work supplements the lectures and recitations in such a way that the application and value of the principles taught may be thoroughly understood and remembered by the student.

Students in the four years course are presumed at the time of their admission to be fairly familiar with all of the rudimentary operations of the farm. If they are not, they can acquire this knowledge and practice either at the University farm, or under the eye of some good farmer, during their first summer vacation. Visits are made from time to time to the best farms and herds

in New York and Canada, in order that the students may have opportunities for a wide range of study and comparison, and may come into direct contact and relations with the best class of farmers. These visits give the students the best of opportunities for studying the results of science and practice combined.

SPECIAL COURSE.

There are a large number of farmers' sons who would be glad to spend one or two years at the University pursuing studies in applied agriculture, of whom the four years course demands too much in the way of preparation, as well as of time and expense. To accommodate this class a special course has been provided, the only requirements of which are that students must possess a fair knowledge of English, and must select at least three-fourths of their studies in subjects pertaining to agriculture, as elsewhere prescribed. The student is able, even in one year, to attend the courses of lectures given by the Professor of Agriculture, the Professor of Veterinary Science, the Professor of Agricultural Chemistry, the Professor of Botany, and the Professor of Entomology, and he may thus gain a systematic and practical knowledge of those branches that will be of most service to him. Special students, during the time they are in the University, enjoy equal advantages in all respects with students who are studying for a degree.

II.

ARCHITECTURE.

The instruction is given by means of lectures and practical exercises. Its object is not merely to develop the artistic powers of the student, but to lay that foundation of knowledge without which there can be no true art. Drawing is taught during the first two years, and afterward thoroughly used and applied in mechanics, stereotomy, and designing.

Architectural mechanics occupies a part of each term for one year. The lectures are each supplemented by at least two hours

of work on problems. In developing the subjects and in solving problems, analytical methods are used; but for practical use special attention is paid to the application of graphical statics.

The study of the history of architecture and the development of the various styles runs through five terms. The lectures are illustrated by photographs, engravings, drawings, casts, and models.

Proper attention is paid to acoustics, ventilation, heating, decoration, contracts, and specifications. The whole ground of education in architecture, practical, scientific, historical, and æsthetic, is covered as completely as is practicable in a four year course.

For collections and equipments, see "Material Equipment."

III.

CHEMISTRY

Descriptive and Theoretical Chemistry.—The instruction begins with lectures on inorganic chemistry and continues through two terms. Three lectures a week are given on the theoretical prin-

ciples and the general study of the chemistry of inorganic bodies.

For laboratory instruction in this branch of the subject a course of introductory practice is given. This consists in the performance by the student of a series of experiments illustrating the more important general principles of the science. The details of the manipulation of each experiment are carefully described, but the results to be obtained are not given. For the better cultivation of the student's powers of observation he is required to observe and describe these results for himself, and trace their connection with the principles which they are intended to illustrate.

The instruction in theoretical chemistry is continued by lectures and recitations in chemical philosophy, and also by the study of organic chemistry in connection with laboratory work.

Analytical Chemistry.—The course in elementary qualitative analysis occupies about two terms of seven to ten hours a week of actual practice, the work in the laboratory being supplemented by lectures and recitations. It is the purpose of this class-room work—of which practice in writing chemical equations explanatory of the operations and reactions of the actual analytical work forms an important feature—to give the student some acquaintance with the chemical principles upon which that work is based,

so that he may carry it out more intelligently and successfully than if he blindly followed the directions in the text-book.

The course in elementary quantitative analysis for all students extends through at least one term of ten hours of actual practice, and comprises a small number of simple gravimetric and volumetric determinations, together with some required study of the chemistry of the operations involved. Beyond this the work of each student is adapted to the special purpose for which this quantitative practice is taken. To those intending to study medicine, practice is given in the examination of urine, milk, of water used for drinking, in the separation of poisons from animal matter, and their identification, and in the assay of medicinal preparations. The agricultural student takes up the analysis of fertilizing and feeding materials, and foods. The student in mechanical engineering, if he can give more time to chemical practice than is allotted in his course, may work on the analysis of iron and steel, and of other materials used in the mechanic arts. The special chemical student, besides taking all this work, is drilled also in the methods of analysis of ores, the useful metals in their commercial condition—especially iron and steel—of alloys, and of gaseous mixtures, in the use of the polariscope and spectroscope, so far as they can be profitably applied in chemical analysis, the analysis of technical products, the examination of articles of food for adulteration, etc.

Lectures are given on the recent literature of chemical analysis, and readings are held in German chemical journals, for the purpose of giving the students such a familiarity with technical German that they can with facility consult the abundant and important literature of the subject in that language.

Organic Chemistry.—The elements of organic chemistry are taught by a course of laboratory practice with frequent recitations, by which the student is trained not only to recognize, but also to prepare and purify, the typical members of most of the series of organic compounds. In this course the work is arranged in accordance with the well-known text-book of Professor Remsen. After its completion students are given further practice in following out reactions of special theoretical interest, in the course of which constant reference is made to the original memoirs, published in the leading German and French periodicals. As soon as the necessary proficiency in manipulation and theoretical knowledge is attained, the student is given every en-

COURSES OF STUDY.

couragement to devote himself to original investigation, for which organic chemistry offers an especially promising field.

A special laboratory of organic chemistry has just been completed, and equipped at great expense with an unusually complete stock of materials and apparatus. It is believed that this laboratory is excelled in convenience and facilities by no other in this country

Blowpipe Analysis and Mineralogy.—A course of instruction in qualitative blowpipe analysis and determinative mineralogy is given during one term. This is designed to enable the student to avail himself of the simple and effective means afforded by the blowpipe in determining the nature of minerals and unknown chemical substances.

The work in determinative mineralogy comprises the identification of minerals by observation of their physical properties and blowpipe reactions, and constitutes a necessary preparation for the study of systematic mineralogy and lithology This course is followed by one term of the study of systematic mineralogy, comprising lectures, conferences, and the study of specimens. The subject of crystallography forms an important part of this course, and includes lectures illustrated by a complete set of glass models, as well as laboratory practice in the identification of crystalline forms, from blocks and actual specimens. Exceptional advantages for the study of mineralogy are offered by the well-known Silliman collection of minerals, which is accessible to students at all times. A complete and carefully selected students' collection affords abundant material for work in determinative mineralogy Special attention is given to the more important metallic ores as a preparation for the study of economic geology and metallurgy Students who have completed the above course are prepared to take up the work of lithology, petrography, and advanced crystallography, for which abundant facilities are offered by the department of geology Assaying.—In alternate years, or each year if necessary, a thorough course in assaying is given. Students are required to determine the value of gold, silver, and other metals contained in ores sufficient in number to make them familiar with the most approved methods in use in the West and in European mining regions. The assay of gold and silver bullion, as practiced in the national mints, forms a part of the course. The assay laboratory

in the new building is equipped with every requisite for work in this branch, such as furnaces, tools, balances, etc.

Metallurgy.—During the winter term of the junior year two lectures a week are devoted to metallurgy These lectures are intended to give the students in the technical courses a general idea of fuels, ores, and the most important methods of extracting the metals which are especially used in construction, the metallurgy of iron naturally claiming the most attention.

For description of the chemical laboratories, museum and equipment, see pp. 35. 39, and 45.

IV

CIVIL ENGINEERING

The instruction is given by means of lectures and recitations, supplemented by drafting, and field and laboratory work. The field work embraces the usual operations and the more recent methods of land, railroad, and subterranean surveying, together with hydrography and geodetic practice, and since 1874 the department of Civil Engineering has been engaged in the surveys of the hydrographic basin of central New York, as a contribution to the geodetic surveys of the United States Government.

Laboratory work is provided in chemistry, mineralogy, metallurgy, geology, physics, and civil engineering.

The students of this department receive instruction in an extended course of mechanics, as applied to civil engineering, and their professional preparation comprises the following subjects The location and construction of railroads, canals, and waterworks, the construction of foundations, in water and on land, and of superstructures and tunnels, the surveys, improvements, and defenses of coasts, harbors, rivers, and lakes, the determination of astronomical coordinates, the application of mechanics, graphical statics, and descriptive geometry to the construction of the various kinds of right and oblique arch bridges, roofs, trusses, and suspension bridges, the design, construction, and application of wind and hydraulic motors, air and heat engines, and pneumatic works, the drainage of towns and the reclaiming of lands, the preparation of plans and specifications, and the proper selection and tests of the materials used in construction. As a part of their instruction, students have frequent practice in the preparation of papers on subjects of professional importance.

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An elementary course of lectures is given in engineering and mining economy, finance and jurisprudence, and the same subjects are treated more in detail in the graduate courses. These courses were established several years ago, to meet the growing demand for special training in the various fields of the civil engineering profession, and have been recently arranged in a more convenient form, as the result of experience with students during the past five years.

The graduate courses, open to graduates of this or similar institutions, offer lines of continuous study in professional specialties, alternating with a limited number of elective studies in literature, history, or science, or with the studies of other professional schools, but the choice of elective studies must meet the approval of the head of the department. Nearly all of the work required of graduate students in this department is of the nature of original research. Lectures are given for the purpose of directing the courses of study and investigation.

The courses of instruction have been planned with a view to laying a substantial foundation for the technical and general knowledge needed by engineering practitioners, so that graduates may become professional experts in course of time, and that, guided by their theoretical knowledge and as much of engineering practice as can be taught in schools, they may develop into useful investigators and constructors. This department aims to make its graduates cultured and well-balanced professional men, trained to meet the actual demands of American engineering science and practice. The advanced mathematics, graphics, field operations, and economics of civil engineering are each in charge of educated and experienced engineers, whose duties are to watch closely and promote the progress of their specialties, and by constant study and consultation contribute towards securing a proper balance between the various studies which enter into the education of a civil engineer. The special library of the department possesses many valuable sets of the transactions of learned societies, and works of reference, among them the extensive publications recently presented to the department by the French Government and, in addition to the systematic acquisition of modern books on engineering subjects, the resources of the general library of the University are available for the purposes of this department.

The courses in descriptive geometry of this department are

taken by all the students in the courses in architecture, in civil, electrical, and mechanical engineering, and in mathematics, and may be elected by students of some of the general and scientific courses. The theory of the arch as applied to stone cutting, with its corresponding laboratory work, is given to students in architecture and civil engineering. Land surveying is obligatory for the civil engineers and may be elected by students of various other courses. The entire course in mechanics, hydraulics, and water motors is taken by the civil engineers and students in electrical and mechanical engineering have the first three terms, or the mechanics of engineering of solids. The higher mathematical studies of this department may be elected by candidates for the second degree in various other courses, with the approval of the Faculty

The engineering laboratories contain many machines, models, and appliances for engineering investigations, which are supplemented by large collections of apparatus in the special and general laboratories of other departments.

Students of this department have free access to all the museums and laboratories of the University

For the special laboratory and museum, see "Material Equipment," pp. 39, 46, and 47

For the course in Civil Engineering, and the graduate courses of this department, see pp. 108, 109.

V

THE SIBLEY COLLEGE OF MECHANICAL ENGI-NEERING AND THE MECHANIC ARTS.

This college has been founded and endowed by the liberal gifts of the Hon. Hiram Sibley, of Rochester, N Y., who in the year 1870 gave about thirty thousand dollars for the erection of a suitable building for the department of mechanic arts. He also gave ten thousand dollars for increasing its equipment of tools, machines, etc., and afterward made a further gift of fifty thousand dollars for the endowment of the Sibley professorship of practical mechanics and machine construction. During the years 1883 to 1887 he gave more than seventy-five thousand dollars for the purchase of models, the extension of the present Sibley building, and the building and equipping of a complete set of workshops. The total amount thus presented to Cornell University is nearly one hundred and fifty thousand dollars.

COURSES OF STUDY

SIBLEY COLLEGE is the School of Mechanical Engineering and of Mechanic Arts, of Cornell University The college is divided into three principal departments, each of which is presided over by a professor skilled in the subject, instruction in which is directly conducted by him and his assistants. These departments are Mechanical Engineering, including a Mechanical Laboratory, in which experimental work and investigations are conducted, a department of Mechanic Arts, or shopwork, and a department of Drawing and Machine Design. The first-named is presided over by the Director, who is also the Professor of Mechanical Engineering.

For a description of the buildings, workshops, laboratories, and museums, see "Material Equipment," pp. 34, 41, 42, and 47

I DEPARTMENT OF MECHANICAL ENGINEERING.

Sibley College, founded as a college of the Mechanic Arts, is intended by the Trustees of the University to be made not only a school of arts and trades, but a college of mechanical engineering, in which schools of the mechanic arts and of the various branches of mechanical engineering shall be developed, as rapidly and extensively as the means placed at the disposal of the Trustees of the University, and a demand for advanced and complete courses of instruction, shall allow The Department of Mechanical Engineering is divided into two principal sections: that of Theoretical Engineering and that of Experimental Engineering, or the Mechanical Laboratory (1) Section of Theoretical Engineering — The lecture - room course of instruction consists of the study, by text-book and lecture, of the materials used in mechanical engineering-especially of steel and iron-the valuable qualities of these materials being exhibited in the mechanical laboratory by the use of the various kinds of testing machines, as well as by examination of specimens of all the most familiar grades, of which samples are seen in the cases of the museums and lecture-rooms. The theory of strength of materials is here applied, and the effects of modifying conditions—such as variation of temperature, frequency and period of strain, method of application of stress—are illustrated. This course of study is followed, or accompanied, by instruction in the science of pure mechanism or kinematics, which traces motions of connected parts, without reference to the causes of such motion, or to the work done, or the energy

transmitted. This study is conducted largely in the drawingrooms, where the successive positions of moving parts can be laid down on paper It is illustrated, in some directions, by the set of kinematic models known as the Reuleaux models, a complete collection of which is found in the museums of Sibley College.

The study of Machine Design succeeds that of pure mechanism, just described, and includes the determination of the general dimensions, and of the forms and proportions of the principal parts of machinery, both as fixed by the strength of material, by the form of the members designed, and by the method of connection to adjacent parts of the construction. This study also is largely conducted in the drawing-rooms, and is directed by an instructor familiar, practically as well as theoretically, with the designing and proportioning of machinery The study of mathematical principles, and of the strength of materials, as applied in this portion of the work, is pursued, at an earlier period of the course, in the several other departments of the University to which such work properly belongs. The closing work of the course consists of the study, by textbook and lecture, of the theory of the steam engine and other motors, including both the mechanical and the thermodynamic principles, and an examination of the structure of that class of machinery, this course of instruction being followed, as far as may be found practicable, by exercises in designing and proportioning such engines. The last term of the regular four-year course is devoted largely to the preparation of a graduating thesis, in which the student is expected to exhibit something of the working power and the knowledge gained during his course. This thesis may be either a treatise upon some subject having professional interest which has not been hitherto fully treated, or an account of some new and useful form of machine devised by the writer, of which he will present the theory and method of design, or it may be an account of some original design of works fitted for manufacturing specified products, or an investigation having direct and practical bearing upon problems of importance arising in the course of professional work. Of these several kinds of theses, the last two named are given, as a rule, highest value. The thesis is rejected and the student is not given his diploma, should his production not give evidence of his having profited, to a very creditable extent, by the opportunities

that have been offered him. A graduating piece is demanded, also, of each student, both in the drawing-room and the workshop, which shall show proficiency in those departments.

(2) Section of Experimental Engineering, or Mechanical Laboratory Instruction ——The work in this department will be conducted by an instructor familiar with its apparatus and with the best methods of work, and who will plan a systematic course of instruction that is intended to give the student not only skill in the use of apparatus of exact measurement, but to teach him also the best methods of research, and to give him a good idea of the most effective methods of planning and of prosecuting investigations, with a view to securing fruitfulness of result with minimum expenditure of time and money

The Mechanical Laboratory makes use of several kinds of testing machines for tests of beams, for rapid work in tests by tension, for slower but more precise work in determining, especially, the elastic properties, and the modulus of elasticity, of materials, and an "autographic recording testing machine," used in making special investigations of the properties of the materials used in construction. A machine for testing the strength and ductility of fibrous materials completes the list of testing machines. Other machines are used, in the course of laboratory instruction, for determining the value of lubricants, their endurance under work, and their coefficients of friction. Dynamometers are brought into use in measuring the power of primemovers and the work done in driving machinery Steam-engine indicators, of which all the most familiar kinds are represented in the collections, are applied to testing steam engines and other heat motors, and steam gauges, counters, and other minor kinds of testing apparatus, and instruments of exact measurement, are made in various ways to illustrate the course of instruction in this line of work. The test trials of steam boilers, and the testing of other apparatus and machines, to determine their capacity, efficiency, and adaptation to their intended purposes of application, form part of this course, and the needed apparatus is provided as required.

II. DEPARTMENT OF MECHANIC ARTS. OR SHOPWORK.

The aim of the instruction in this, the department of Practical Mechanics and Machine Construction, is to make the student, as far as time will permit, acquainted with the most approved meth-

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• ods of construction and inspection of machinery Students are required, usually, to devote nine hours per week to work in the shops, or about thirty days during each year, and are allowed as much more time as can be given without detriment to their regular work.

(1) Section of Woodworking and Pattern-making — This course begins with a series of exercises in woodworking, each of which is intended to give the student familiarity with a certain application of a certain tool, and the course of exercises, as a whole, is expected to enable the industrious, conscientious, and paustaking student to easily and exactly perform any ordinary operation familiar to the carpenter, the joiner, and the pattern-maker Time permitting, these prescribed exercises are followed by practice in making members of structures, joints, and of small complete structures, and of patterns, their core-boxes, and other constructions in wood. Particular attention will be paid to the details of pattern-making.

(2) Section of Blacksmithing, Moulding, and Foundrywork — These courses are expected not only to give the student a knowledge of the methods of the blacksmith and the moulder, but to teach him also how to use the tools and to give him that manual skill in the handling of machinery which will permit him to enter the machine shop, and there quickly to acquire familiarity and skill in the manipulation of the metals, and in the management of both hand and machine tools, as used in the working of such metals. The methods of instruction in these departments are similar to those of section 1, and the time devoted to this work is extended throughout the sophomore and part of the junior years. The beginning of this course is devoted to manual training, and to teaching the use of tools. the latter part to construction. (3) Section of Ironworking -- The instruction in the machine shop, as in the foundry, and the blacksmith shop, is intended to be carried on in substantially the same manner as in the woodworking course, beginning by a series of graded exercises, which will give the student familiarity with the tools of the craft and with the operations for the performance of which they are particularly designed, and concluding by practice in the construction of parts of machinery, and, time permitting, in the building of complete machines which may have a market value.

Collections and Tools .- The woodworking shop is supplied

COURSES OF STUDY

with all needed hand and power tools, work-benches, and accessories sufficient for sections of classes up to fifty or more in number, should it be found advisable to work so many together

The machine shop is supplied with lathes of various kinds, planers, grinding, drilling, and shaping machines, a universal milling machine, fitted for cutting plane, bevel, and spiral gears, spiral cutters and twist drills, with additional tools and attachments for graduating scales and circles and for working various forms and shapes.

In addition to the usual hand and lathe tools there are instruments of the greatest accuracy, consisting of standard surfaceplates, straight-edges and squares of various sizes, a standard measuring machine reading to the ten-thousandth of an inch, a universal grinding machine for producing true cylindrical and conical forms, and a set of Bett's standard gauges.

The smithy contains ten forges of the most approved pattern, and corresponding outfits of smith's tools. The instruction embraces forging, welding, tempering, etc.

The foundry is equipped for giving thorough instruction in

loam and sand moulding, and the casting of iron and brass. The cupola for melting iron is a Colliau's improved, with a capacity of one ton per hour There are also a crucible furnace for melting brass, a core oven, a rattler, and the other usual foundry appliances.

III. DEPARTMENT OF INDUSTRIAL DRAWING AND ART.

(1) Section of Freehand Drawing and Art — Instruction in this department begins with Freehand Drawing, which is taught by means of lectures and general exercises from the blackboard from flat copies, and from models. The work embraces a thorough training of the hand and eye in outline drawing, elementary perspective, model and object drawing, drawing from casts, and sketching from nature.

The effort is not to make mere copyists, but to render the student familiar with the fundamental principles underlying this art, and to enable him to represent any object correctly and rapidly. The course is largely industrial, and the exercises are arranged as far as possible with special reference to the drawing required in the work of the different departments.

The course in freehand drawing is followed, where time per-

mits, by instruction in industrial art, in designing for textiles and ceramics, in modeling, and in other advanced studies introductory to the study of fine art.

All students in the departments of Agriculture, Architecture, Civil Engineering, Electrical Engineering, Mechanical Engineering and Mechanic Arts, and Natural History devote two hours a day to freehand drawing during the first two terms of the freshman year, and students in Architecture, in addition, two hours a day during one term of the junior year.

The department has a large collection of studies of natural and conventional forms, both shaded and in outline, of geometrical models, and of papier-mâché and plaster casts, including a number of antique busts, casts of parts of the human figure, studies from nature, and examples of historical ornament. Additions are made as required.

(2) Section of Mechanical Drawing — The course of instruction in Mechanical Drawing is progressive, from geometrical drawing to designing of machinery and making complete working drawings. The aim is to familiarize the student with the methods

adopted in the best drawing offices of the country This end is furthered by working drawings and blue prints from our own most prominent engine and machine builders, whose practice is thus at once shown in the clearest way Several hundred drawings selected from the best technical schools abroad also aid in this work.

The course begins with freehand drawing, as above, and in the latter part of this work considerable time is expected to be given to the sketching of parts of machines and of trains of mechanism, and later, of working machines. The use of drawing instruments is next taught, and, after the student has acquired some knowledge of descriptive geometry and the allied branches, the methods of work in the drawing-rooms of workshops and manufacturing establishments are learned. Line drawing, tracing and blue printing, the conventional colors, geometrical constructions, projections, and other important details of the draughtsman's work, are practiced until the student has acquired some proficiency

The advanced instruction given the upper classes includes the tracing of curves and cams, the study of kinematics on the draw-ing-boards, tracing the motions of detail-mechanism, and the kinematic relations of connected parts. This part of the work is

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accompanied by lecture-room instruction and the study of the text-book, the instructors in the drawing-rooms being assisted by the lecture-room instructor, who is a specialist in this branch. The concluding part of the course embraces a similar method of teaching machine design, the lecture-room and drawing-room work being correlated in the same manner as in kinematics or mechanism. In this work the form of each piece is carefully determined and its proportions calculated, and the member sketched by hand before it is laid down on the drawing-board. The course concludes, when time allows, by the designing of complete machines, as of the steam engine or other motor or of some important special type of machine.

ELECTRICAL ENGINEERING

The course of study for the first three years is the same as that of Mechanical Engineering, comprising drawing, mathematics, mechanics, mechanism, machine design, the elementary study of physics, and preliminary practice in the use of electrical and other instruments. The special work of the fourth year comprises the study of prime-movers, the theory and construction of dynamo machines, the study of the problems involved in the distribution of the electric light and the electrical transmission of power, besides practice in every variety of electrical measurement and testing, as applied to the erection and maintenance of electric lighting plants and telephone and telegraph lines and cables, and to the purposes of investigation. The greater part of the third term of the fourth year is given to the experiments and investigations incident to the preparation of the thesis, which must be of a nature to show that the student is able to apply the knowledge he has acquired to the solution of some scientific or practical problem. Equipment.—The Physical Department possesses a very extensive collection of electrical apparatus. Among the instruments are several galvanometers of high and low resistance, several sets of resistance coils, several forms of current and potential instruments used for commercial purposes, the Kew magnetometer and dip-circle and other instruments for the determination of magnetic elements, quadrant electrometers of the White and Elliott patterns, besides condensers, keys, bridges, and other accessory apparatus. The large tangent galvanometer provides for the measurement of currents from a fraction of an ampère to 250

ampères. The magnetic observatory is a special building erected at some distance from all other buildings, and entirely free from iron. It is proposed to construct, as a companion to the large tangent galvanometer, a standard instrument for the measurement of potentials with the same precision that the large galvanometer measures currents. When this instrument is completed it is believed that the equipment for exact electrical measurements here cannot be excelled, if it can be equaled, elsewhere in the world.

Seven dynamos, ranging from one to twenty are lights each, and illustrating the work of a number of makers of high reputation, are in use for experimental work. Three of these are mounted on Professor Brackett's dynamometer cradles, for measuring the power absorbed, or transmitted if the machine is used as a motor For dynamo tests a resistance of naked German silver wire has been provided, which is arrranged in about one hundred sections capable of combination in all possible ways. Combined in series they furnish a resistance of 2,200 ohms, capable of carrying four, ampères. It is expected that other dynamos

by well-known makers will be added to this plant

When the dynamos are used for testing or experimental purposes they are driven by a steam engine constructed expressly for the purpose, with a governor that controls the speed with extreme precision.

A graduate course is arranged for students in Mechanical Engineering who desire further instruction in this special line of work.

MARINE ENGINEERING

At the request of the University an officer of the engineer corps of the United States Navy has been detailed for the purpose of giving instruction in Marine Engineering. Special work in this subject may therefore be taken by such students as desire it. This instruction is given in a graduate or fifth-year course, after the student shall have completed the regular course in Mechanical Engineering or obtained its equivalent elsewhere.

Such work will include the methods of determining the power necessary to secure a desired speed of ship, and the design of the machinery to supply and use that power, both in general plan and in detail. Students taking this work will be instructed as to the relative advantages of various types of machinery, the causes of deterioration, and how to prevent it. The question of

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high steam pressures and rates of expansion is thoroughly discussed, and the limitations both from a thermodynamic and commercial point of view are explained.

MINING ENGINEERING.

Although Mining Engineering has not been formally established, the main instruction required by the mining engineer is now given, as follows the professor of civil engineering and his associates pay especial attention to the needs of those intending to connect themselves with the mining industries, giving lectures on tunneling and on the theory and practice of such constructions as are common to the professions of civil and mining engineer, the professor of mechanical engineering and his associates pursue a like course, giving instruction in mining machinery, the professors of general chemistry and mineralogy, and of analytical chemistry, give instruction in metallurgy, assaying, chemical analysis, and cognate subjects, the professors of geology and paleontology give instruction in the theory and classification of ores, and in those branches relating to chemical geology

The formation of a more complete scheme and the introduction of special collections may be expected when the senior schools shall have been so completely established and so well equipped as no longer to draw heavily on the general fund.

STEAM ENGINEERING

Special instruction in Steam Engineering is provided for advanced students and educated practicing engineers who have pursued the course of study in the school of mechanical engineering or its equivalent, and who are thus fitted to profit by instruction in this line of special professional work. The course of instruction is an extension of the work of the senior year in mechanical engineering, and includes the study of steam engines and boilers and their accessory apparatus, for the purpose of learning the theory and practice of engineering as applied to this class of motors. Included in the course is a considerable amount of laboratory work in the trials of engines and boilers to determine their efficiency, their power, and the relative commercial standing of the various types, as adapted to stationary, marine, or locomotive practice.

For the course of instruction, see page 113.

RAILROAD MACHINERY

This is a graduate department and is intended to prepare the same class of students as the schools already described, for special work in railroad shops, and especially in the division of the organization of railways placed in charge of superintendents of motive power, and of master mechanics. All students taking this and the preceding courses should have the same preparation as is required in the course in Marine Engineering.

For the course of instruction, see page 114.

LYCEUM AND NON-RESIDENT LECTURERS.

A room for a lyceum is fitted up for the use of students enrolled in Sibley College, in which weekly debates are carried on.

Supplementing the regular course of instruction, a series of lectures will be delivered from time to time by the most distinguished men of the profession. For a partial list of non-resident lecturers for the present year, see page 28-29.

Persons desiring more detailed information in regard to any subject connected with Sibley College, should address THE DI-RECTOR OF SIBLEY COLLEGE.

PRIZES AND HONORS.

PRIZES.

1 THE WOODFORD PRIZE.

The Woodford Prize, founded by the Hon. Stewart Lyndon Woodford, and consisting of a gold medal of the value of one hundred dollars, will be given annually for the best English oration, both matter and manner being taken into account.

The prize will not be conferred unless the successful competi

tor completes his course and takes his degree at the commencemen next following the contest.

The subjects of the orations may be selected by the competitors, but in each case the approval of the professor of rhetoric must be obtained.

II. THE '86 MEMORIAL PRIZE.

A public oratorical contest of speakers appointed from the junior class will be held in May, and the successful competitors will receive mention on the commencement programme

III. THE HORACE K. WHITE PRIZES.

Established by Horace K. White, Esq., of Syracuse. To the most meritorious student in Veterinary Science, *Twenty Dollars*, to the second in merit, *Ten Dollars*.

IV SIBLEY PRIZES IN MECHANIC ARTS.

Under the gift of the Hon. Hiram Sibley, made in 1884, the sum of \$100.00 will be annually awarded to those students in the Sibley College who shall in the opinion of the Faculty of that institution show the greatest merit in their college work.

HONORS.

I. HONORS AT GRADUATION FOR GENERAL EXCELLENCE.

Honors will be granted at graduation to students whose general average in the studies required in their course is honorable.* These honors will be known as *honors for general excellence*, and will be recorded upon the commencement programme, and in the Register of the year following.

Honors for general excellence will be conferred only on students who have spent at least three years at the University

II. HONORS FOR DISTINGUISHED EXCELLENCE IN SPECIAL SUBJECTS

Honors will be granted (subject to conditions stated below) for distinguished excellence in any of the following subjects. history, political science, French, German, Greek, Latin, mathematics.

Students who desire to be admitted as candidates for these honors must give notice in writing to the Registrar within fourteen days after the day of registration of the spring term. The special examinations for honors will be held in May

These special examinations will be of two kinds in certain departments there will be but a single examination, which will be open to seniors and graduates, in certain other departments there will be, in addition to this, another examination preliminary to the final one, to be known as the mid-course examination, and to be open to sophomores and juniors, and to seniors who intend to be candidates for final honors after graduation.

Graduates of other colleges studying in Cornell University may, by vote of the Faculty, be admitted to become candidates for these honors.

GENERAL REQUIREMENTS.

In order to become a candidate for these honors, the student must satisfy the following requirements

^{*} In the usage of the University, the word "honorable" denotes the highest grade of standing; the word "creditable" denotes the next lower grade.

1. He must have completed all the studies required in his course up to the beginning of the term in which the special ex-aminations are held.

2. At the beginning of the term in which the special examinations are held, his average for his entire work in the studies of his course, exclusive of those in the department in which he seeks for honors, must be creditable.

3. His average for his entire work in the department in which he seeks for honors, up to the beginning of the term in which the special examinations are held, must be honorable.

4. If the department be one in which a mid-course examination is given, the applicant for final honors must have won the mid-course honors.

The candidate must pass with distinguished excellence a special examination upon subjects to be announced in advance, and present any thesis or undergo any other test that may be required of him.

Honors in special subjects will not be granted to a student whose work is unsatisfactory in any of the studies of his course during the term in which the special examinations are held. Nor will they be granted to any but registered students who are pursuing the number of studies required for the term.

The special requirements will be as follows

MID-COURSE HONORS.

History, Political Science.—The candidate must have passed, with an honorable average, the required work in Grecian, Roman, and English history, and must pass, with distinguished excellence, a special examination upon a subject to be announced in advance.

The subject for 1887 is either of the following, at the option of the candidate

(a) In Modern European History The Reformation in England.

(b) In Mediæval History The Holy Roman Empire.

French, German.—The candidate must have passed, with an honorable average, the required work of the freshman and sophomore years, and must also pass, with distinguished excellence, a special examination upon the following subjects

- (a) Translation at sight from French or German.
- (b) Translation from English into French or German.
- (c) Translation from specified French or German authors.

The subjects for 1887 are, in French Corneille, Polyeucte, Racine, Phèdre, Molière, Le Misanthrope; Bossuet, Oraisons funèbres. In German, 1887 Lessing's Emilia Galotti; Goethe's Iphigenie; Schiller's Geschichte des Abfalls der Niederlande (Viertes Buch und Beilagen), in 1888 Goethe's Zahme Xenien, Schiller's Balladen, Heine's Prosa (Buchheim edition).

Greek.—The candidate must have completed courses 7, 8, 9, and courses 10, 11, 12, together with 19, 20, 21, or the corresponding courses for one year that is to say, he must have been a member of the "honor-section," and of the "advanced class," for one year each, and must have taken in addition two hours of elective Greek during one year. He must also pass, with distinguished excellence, a special examination in translation at sight from Greek into English, and from English into Greek.

Latin.—The candidate must have passed, with an honorable average, the required work of the freshman and sophomore years, together with the courses in Grecian and Roman history, and must also pass, with distinguished excellence, a special examination upon the following subjects

(a) Translation at sight from the easier Latin authors.

(b) Translation from English into Latin.

(c) Translation of passages from specified parts of Latin literature, as follows In 1887—Virgil's Aeneid, Books IX. and X. ' Livy, Book XXII.

Mathematics.—The candidate must have passed, with an honorable average, in the work of courses 1, 2, 3, 7, 8, 9, 11. He must also pass, with distinguished excellence, a special examination upon the following subjects

(a) The solving of geometric problems.

(b) Algebra, including the theory of equations and the elements of determinants.

(c) Plane trigonometry

Candidates for mid-course honors are advised to take courses 4, 5, 6.

FINAL HONORS.

History, Political Science.—The candidate must be in full and regular standing in one of the general courses, must have taken, with an honorable average, an amount of elective work in history and political science equivalent to five hours a week through two years, and must have won mid-course honors. He must also 10

write a satisfactory thesis upon a subject specified in advance, and pass, with distinguished excellence, a special examination upon that subject.

The subject for 1887 is either of the following, at the option of the candidate

(a) In American History The causes, conduct, and consequences of the War of 1812.

(b) In Modern European History The political development of Germany in the nineteenth century.

For 1888

(a) In American History England's commercial restrictions upon the colonies prior to the Stamp Act.

(b) In Modern European History The building up of the absolute monarchy in France.

(c) In English History The constitutional issues involved in the English Revolution of 1688.

(d) In Political Economy The financial and economical reforms of Alexander Hamilton.

(e) In International Law The Alabama Question in its historical and legal aspects.

French, German.—The candidate must have won mid-course honors, and have passed, with an honorable average. an amount of elective work of the junior and senior years equivalent to five hours a week through two years, he must also present a satisfactory thesis, and must pass, with distinguished excellence, an examination upon the following subjects

(a) Translation at sight from French or German.

- (b) Translation from English into French or German.
- (c) The political and literary history of some specified period.
- (d) Certain specified works of that period.

The subjects for 1887 are, in French The political and literary history of France under the Restoration, 1814-1830, and selections from the works of the following writers Chateaubriand, Mme. de Staël, Nodier, Stendhal, and Lamartine The subject of the thesis required is a study of the literature of the above period with special reference to the domestic influences which resulted in the French Romantic School.

In German the subjects for 1887 are Political and literary history of Germany from the death of Frederick the Great to 1848 and the following authors Brandes (romantische Schule in Deutschland), Heine (romantische Schule), Novalis (Schriften),

Tieck, and Schlegel (selections). The subject of the thesis required is the relations of Heine to the Romantic School.

For 1888: The literary and political history of Germany in the period of the reformation, and the following authors Hans Sachs (selections), Braut, Fischart, and Murner The subject of the thesis required may be the sources of the modern High German language, and Luther's services in connection therewith, or the literary influences of England in Germany in the Sixteenth century

Greek, Latin.—The candidate must have won mid-course honors, must have passed, with an honorable average, in five hours a week of elective work for each of the junior and senior years, and must also pass, with distinguished excellence, a special examination upon the following subjects

(a) Translation at sight from the more difficult Greek or Latin authors.

(b) Translation from English into Greek or Latin.

(c) Translation from specified Greek or Latin authors (with commentary upon the questions of history, archæology, grammar, and etymology involved).

For final honors, 1887, in Greek Sophocles's Oedipus Tyrannus, Demosthenes's De Corona, in Latin Plautus's Rudens, Terrence's Andria, Cicero, fourteenth Philippic.

Mathematics.—The candidate must have won mid-course honors, and must have passed, with an honorable average, in the work of courses 26-36 inclusive. He must also pass, with distinguished excellence, an examination in special work in analytic geometry and calculus equivalent to two hours a week for three terms, and must present a satisfactory thesis.

UNIVERSITY SCHOLARSHIPS AND FELLOWSHIPS.

SCHOLARSHIPS.

Pursuant to the action of the Trustees, described on page 13, there will annually be thrown open to competition for all members of the freshman class, at a special examination held directly after the September entrance examinations, six scholarships, of the value of two hundred dollars each, and three of the same value for women only The total number of scholarships on both these foundations will therefore be thirty-six. Each of these scholarships will be continued for four years, provided the student maintains throughout his course the same high standing with which he enters, and the total amount received by each successful competitor will thus be eight hundred dollars. Students of high ability from the State of New York will have the additional advantage of being able to secure State scholarships, as there is nothing in the University statutes preventing a student from holding both a State scholarship and a University scholarship. The rules laid down by the Trustees and Faculty provide that the name of every successful competitor for these scholarships shall be inserted in the annual Register of the University, together with the name of the school at which he or she was fitted for college, and the name of the principal of the school, and that these names shall remain in the Register as long as he or she retains the scholarship.

It has also been thought best to give the scholarships to the candidates passing the best examination, regard being had to ability alone. It is believed that in this way only can the bestowal of the scholarships be put on the proper footing,—that is,

as an award to merit and not as a gift to poverty, but the experience of Trustees and Faculty leads them to believe that a system based on merit alone will inure mainly to the benefit of students of small means; since it is a well-known fact that in all the colleges of this country the great majority of the best scholars come, not from the wealthy class, but from those whose circumstances have forced them to feel the need of thrift and energy

Of the University scholarships, not less than two, and not more than three, as the Faculty may determine, are awarded to students of either sex entering the freshman class, in any course, who, while maintaining a good standing in the other studies required for admission to the Arts course, pass the best examination in the Latin and Greek required for admission to that course, and the remainder—that is to say, not more than four and not less than three of the said University scholarships—are awarded to those students entering any course in the University, who, while maintaining a good standing in the other studies required for admission to the course, and especially in English grammar, pass the best examination in the various branches of mathematics required for entrance, namely, in arithmetic, alge bra, and geometry Candidates entering the courses leading to the degree of Bachelor of Arts or Bachelor of Philosophy must pass their examination in all subjects required for admission to those courses. But neither the French nor the German required for admission to certain courses will be absolutely required of the candidate until the beginning of the academic year 1886–87, though in any case where two candidates are of equal merit in other respects, the one passing the entrance examination in French or German will have the preference. Of the Sage scholarships for women, one is awarded on the basis of an examination in Latin and Greek, as in the case of the University scholarships, and the remaining two are awarded on the same basis as the other University scholarships, as above described.

Samples of examination papers given to applicants for scholarships will be found in the appropriate place below

In case a student who has been appointed to any scholarship shall forfeit it by reason of bad conduct or insufficient progress in the studies of his course, or any other cause, the scholarship may be awarded for the remainder of the four years to another student in the same class.

The scholarships are paid at the office of the Treasurer of the University in six equal payments, on November 1, December 1, February 15, March 15, May 1, and June 1.

FELLOWSHIPS.

The Fellowships, eight in number, are known as the Cornell Fellowship, the McGraw Fellowship, the Sage Fellowship, the Schuyler Fellowship, the Sibley Fellowship, the Goldwin Smith Fellowship, the Erastus Brooks Fellowship, and the President White Fellowship. Each of these yields to the successful candidate the sum of four hundred dollars for one year, or, in cases of remarkable merit, for two years.

They are intended to offer to young men and young women of exceptional ability and decided purposes the opportunity for advanced study of a high character.

The holders must have taken a baccalaureate degree and will ordinarily be recent graduates of this or of other institutions; but it is hoped that in occasional cases they will be students who have been for some years graduated, and who, whether as teachers or as professional workers, have felt the need of larger opportunities than they have yet enjoyed. And, similarly, it is believed that holders of these fellowships who are preparing themselves for any profession to which the work of the University leads will bring to that profession, in consequence of advanced study and research, a range and grasp in their chosen subjects which will lead them to exceptional usefulness and success. The Fellows are required to reside at the University, and to engage in work leading to a higher degree, with the immediate supervision and assistance of the professors concerned in their respective specialties, and, as the most conspicuous members of the student body, and representatives of the most advanced instruction given, they are expected, by high character and high intellectual aims, to exert an influence upon the entire life of the University The application of the candidate for a fellowship should contain a full statement of the branches of study he intends to carry on, if appointed, and if he has produced any literary or scientific work that could be put in evidence for him, a copy should accompany his application. Those candidates who are graduates of other colleges or universities than Cornell should submit recommendations from the instructors best acquainted with their

ability and attainments in the specialties they desire to pursue. It should be borne in mind by such applicants that information cannot be too exact or full in the case of students not personally known to the appointing body The list of applicants is large, and the Faculty desires to be aided in every way in making its selections.

In exceptional instances, a competitive examination may be resorted to as a means of discriminating among several candidates.

The appointments are made in part or wholly at the close of the academic year, shortly before Commencement. The applications should be given or sent to the President or Registrar, and candidates will do well to make such applications in time to enable the Faculty to obtain any additional information that may be desired.

Payments on Fellowships are made at the same time and place as the payments on Scholarships.

STATE SCHOLARSHIPS.

By the Laws of the State of New York, Chapter 585, §9, and Chapter 654, §1, the School Commissioners and city Boards of Education of the State of New York are obliged to hold a competitive examination in each year, in each county or city in the State, for the purpose of selecting scholars for the Free Scholarships in Cornell University

The law thus imposing a duty on the School Commissioners and city Boards of Education is understood to *confer a right* upon every student who is qualified to enter the examination and desires to obtain the scholarship, to have such an examination held, and it is believed that any such candidate for the scholarship can enforce his right, if need be, by an appeal to the proper State authorities.

For the guidance of candidates desiring to avail themselves of State Scholarships, a pamphlet will be ready about May 1, for distribution to all who may apply for it.

ADMISSION AND CLASSIFICATION.

CONDITIONS OF ADMISSION

Candidates must be at least sixteen years of age, or, if women, seventeen. They must be provided with credentials from their last instructor, or from the institution with which they were last connected, giving satisfactory evidence of good moral character. Candidates for admission must present their credentials and obtain permits for examination at the Registrar's office The re-

sults of the examinations may be ascertained from the Regist rar.

ENTRANCE EXAMINATIONS.

Examinations in all the subjects required for admission to the University are held twice in the year, as follows 1. In June, at the end of the spring term, 2. in September, at the beginning of the fall term. The days will be found indicated in the calendar. Special examinations of candidates for admission can be held at other times only by permission of the Faculty

I. THE PRIMARY OR ENGLISH ENTRANCE EXAMINATIONS.

All candidates for admission, except those provided with certificates or diplomas as specified below, are examined as follows: 1. In English Grammar, Whitney's Essentials of English Grammar is the standard. A short composition is required as a test of the candidate's knowledge of spelling, punctuation, the use of capitals, and elementary English construction

If the candidate prefers, the subject for this composition will be assigned by the examiner from one of the books named below, and the knowledge of the subject matter shown will be duly regarded

Shakespeare's Merchant of Venice, Scott's Lady of In 1887
the Lake, Hawthorne's Twice-Told Tales, Lowell's Vision of Sir Launfal.

2. In *Geography*, political and physical, as much as is contained in Harper's School Geography or in Warren's Common School Geography.

3. In *Physiology*, as presented in Martin's Briefer Course, exclusive of the nervous system and the names of bones and muscles.

4. In Arithmetic, including the metric system of weights and measures, as much as is contained in the larger text-books.

5. In *Plane Geometry*; an much as is contained in the first five books of Chauvenet's Treatise on Elementary Geometry, or in the first five books of Wentworth's Elements of Plane and Solid Geometry, or in the first six books of Newcomb's Elements of Geometry, or in the first six books of Hamblin Smith's Elements of Geometry

6. In Algebra, through quadratic equations, and including radicals and the theory of exponents, as much as is contained in those parts of Oliver, Wait, and Jones's Treatise on Algebra that are indicated below, with the corresponding examples at the ends of the several chapters chapter I, II, III, chapter IV, except theorems 4, 5, 6, chapter V, except §§ 3, 5, and notes 3, 4, of problem 2, chapter VII, § 11, chapter VIII, §§ 1, 2, the first three pages of § 8, and § 9, chapter XI, except § 9, problem 9 of § 12, and §§ 13, 17, 18. In Arithmetic, and in the fundamental operations of Algebra, such as multiplication and division, the management of brackets, the solving of numerical and literal equations of the first and second degrees, the combining and simplifying of fractions and radicals, the interpretation and use of negative quantities, and of 0 and ∞ , the putting of problems into equations—the student should have distinct notions of the meaning and the reason of all that he does, and be able to state them clearly in his own language, he should also be able to perform all these operations, even when somewhat complex, with rapidity, accuracy, and neatness, and to solve practical problems readily and completely. In his preparatory study he is advised to solve a great many problems, and to state and explain the reasons for the steps taken. In Geometry he should learn the definitions accurately, whether in the language of the text-book or not, and in proving a theorem or solving a problem he should be able to prove every

statement made, and to go back step by step till he rests upon the primary definitions and axioms. He should be able to apply the principles of geometry to practical and numerical examples, to construct his diagrams readily with rule and compass, and to find for himself the solutions of simple problems and the demonstrations of simple theorems. Besides oral recitation, he is advised to write out his demonstrations, having equal regard to the matter and to the form of his statements; and when written he should carefully study them to make sure, first, that he has a complete chain of argument, and secondly, that it is so arranged that without defect or redundance one step follows as a logical consequence of another

These examinations are held in the following order

First Day.—9A. M., Arithmetic, 11 A. M., Geography, 3 р. м., English Grammar.

Second Day.—9 л. м., Plane Geometry, 11:30 л. м., Physiology, 2:30 р м., Algebra.

In place of these examinations certain certificates or diplomas are received, as follows

 Certificates issued by the Regents of the University of the State of New York are accepted in place of the examinations in English Grammar, Geography, and Arithmetic.
 Certificates issued by the Superintendent of Public Instruction of the State of New York, and Diplomas issued by those academies and high schools of the State of New York whose requirements for graduation have been approved by the Faculty. and whose course of study requires Physiology and Plane Geometry, are accepted in place of the examinations in all the subjects named above except Algebra.
 Diplomas issued by the Regents to graduates from the high schools and academies of the State of New York and Diplomas issued by the State Normal Schools are accepted in place of the examinations in all the subjects named above.

Optional students and students in Agriculture are admitted to the University upon passing the English Entrance or Primary Examinations.

II. Advanced Examinations for Admission to the Various Courses.

For admission to the regular courses of study, examinations in addition to the Primary or English Entrance Examinations are required, as follows

To the Course leading to the Degree of Bachelor of Arts

1 In *Greek*, candidates are expected to have read at least one hundred pages of Attic prose and three books of Homer, they are admitted provisionally to course 1 or course 4 (see page 54) without examination, full admission to be determined by the examination at the end of the first term. Admission to course 7 is determined by the examination for scholarships at the beginning of the term.

2. In Latin, candidates are examined (1) in the following authors, with questions on subject-matter, constructions, and the formation and inflection of words Cæsar, four books of the Gallic war, Virgil, the Eclogues and six books of the Æneid, with the prosody, Cicero, six Orations, including the four against Catiline, (2) in the translation at sight of passages of average difficulty from Cæsar and Cicero, and (3) in the translation into Latin of a piece of connected English based upon the principles and vocabulary contained in the first forty lessons of Allen's Introduction to Latin Composition. Teachers who are preparing students in Latin for the University should aim to fit them to be admitted to course 4 (see page 56). The Professor of Latin will be glad to be of assistance, whether by correspondence or by personal interview, to any one who may desire to consult him upon methods of work in teaching the language. The hours after 11 o'clock on Saturday can be counted upon for any engagement that may be made by letter 3. In Grecian and Roman History, and the outlines of ancient geography Fyffe's Primer of Greece, Creighton's Primer of Rome, and Tozer's Primer of Classical Geography will indicate the amount and method of study desired.

To the Course leading to the Degree of Bachelor of Philosophy

In addition to the Primary Examinations, as follows 1. In *French*, or *German*, or *Mathematics*, as below 2. In *Latin*, as above. 3. In *Grecian* and *Roman History*, as above.

To the Course leading to the Degree of Bachelor of Science or Bachelor of Letters

In addition to the Primary Examinations, an examination in any one of the following subjects

1. In French, the principles of French Grammar, the translation of French at sight, the translation of English into French, and the equivalent of two of Bôcher's modern French plays and Crane and Brun's Tableaux de la Révolution Française.

2. In German, the whole of Whitney's German Grammar, the translation of German at sight, the translation of English into German, and one hundred pages of Whitney's Reader, including two of the longer prose extracts or an equivalent.

3. In *Mathematics*, Solid Geometry and Conic Sections, as much as is contained in Newcomb's Elements of Geometry; Advanced Algebra, as much as is contained in those parts of Oliver, Wait, and Jones's Treatise on Algebra that are read at the University (a list is sent on application), and Trigonometry, Plane and Spherical, as much as is contained in the unstarred portions of Oliver, Wait, and Jones's Treatise on Trigonometry.

To the Courses in Engineering and Architecture .

In Mathematics, Solid Geometry and Conic Sections, as above.

To the Two-Year Course Preparatory to the Study of Medicine

In addition to the Primary Examinations, as follows 1. In Plane Trigonometry. 2. In Latin, four books of Cæsar's Commentaries or an equivalent, with a good knowledge of the grammar. 3. In Greek, so much as will enable the student to recog-

nize, analyze, and form scientific terms.

These additional examinations are held on the *third day of* examinations as follows:

Third Day.—8 A. M., Solid Geometry, 8 A. M., French, 9 A. M., Greek, 10:30 A. M., German, 10:30 A. M., Advanced Algebra; 2:30 P. M., Latin, 2:30 P. M., Trigonometry

The examination in Grecian and Roman History is held at 8 л. м. on the second day of the examinations.

Certificates and Diplomas issued by the Regents of the University of the State of New York are accepted in place of the examinations in Latin, Greek, and Greek and Roman History

As a summary of the Requirements for admission to the several courses the following table may be of use to preparatory students. Subjects required are indicated by R in the squares belonging to them

	Arts.	Philosophy.	Science.	Letters.	Agriculture.	Architeeture.	Chemistry.	Civil Eng.	Mech. Eng.	Elect. Eng.	Med. Prep.
Arithmetic	R	R	R	R	R	R	R	R	R	R	R
Geography	R	R	R	R	R	R	R	R	R	R	R
Grammar	R	R	R	R	R	R	R	R	R	R	R
Physiology	R	R	R	R	R	R	R	R	R	R	R
Elementary Algebra.	R	R	R	R	R	R	R	R	R	R	R
Plane Geometry	R	R	R	R	R	R	R	R	R	R	R
Greek	R	••									R
Latin .	R	R		···. Ľ							R
German		r or ghei	r or ghei	r or ghei			ghei	-			
French		itics	inch tica	itics			nch , high				
(Higher Algebra.		Fre or ema	Fre or	Fre or			Free	-	.		
* { Solid Geometry		her ath	her nan ath	ther ath		R	her	R		R	
Trigonometry		Eit Jern	Eit	Eit lern			Eit		.		D
Greek & Rom. History.	R	R									R

SPECIAL STUDENTS.

Any person at least twenty-one years of age, and having satisfactory attainments, may be admitted by vote of the Faculty, without examination, as a Special Student, on the recommendation of the professor in charge of any department in which he is to take a large part of his work. Such students cannot be candidates for a degree, and their admission must be renewed every year.

Special students in Agriculture are admitted at the age of eighteen years, on the recommendation of the Professor of Agriculture.

Special students in Architecture must have served for at least one year as draughtsmen in an architect's office, and must be proficient in geometry, plane and solid, and in algebra so far as to be able to solve cubic equations. They will be admitted only at the beginning of the Fall Term, and must take a prescribed, not optional, course, for which see page 107.

^{*} When the term "higher mathematics" is used, these three subjects are meant.

ADMISSION AND CLASSIFICATION

OPTIONAL STUDENTS.

Students who do not intend to complete any one of the fouryear courses and graduate, are registered as "optional" in one of the four annual classes, but any student who has been registered as optional will be permitted to register in any one of the regular courses, upon completing the work required for the standing which he proposes to take in that course.

ADMISSION TO ADVANCED STANDING

I. ON EXAMINATION On presenting evidence of good character, or, in case he comes from another college or university, a letter of honorable dismissal, a candidate may be admitted to any class at the beginning of any term not later than the first of the senior year, provided he appears, on examination, to be well versed in the following subjects

a. In the studies required for admission^{*} to the freshman class of the course which he proposes to enter But diplomas and certificates will be received for certain of these studies, as stated on page 146.

b. In all the studies already required of the class to which admission is sought, or in accepted equivalents therefor

In a subject in which examinations are held only at stated times the candidate may, at the option of the department concerned, be required to wait until the first regularly recurring examination.

II. WITHOUT FULL EXAMINATION. Graduates of other colleges and universities, and undergraduates of such institutions who present letters of honorable dismissal, may be admitted provisionally to such standing and upon such terms as the Faculty may deem equitable in each case, regard being had to the applicant's previous course of study, and to the evidence of proficiency exhibited. Every such candidate is required at the time of making his application to forward to the Dean of the Faculty, along with a catalogue of the institution in which he has studied, a careful statement, duly certified, of the studies which he has pursued, and the degree of proficiency attained therein.

A student who has thus been admitted provisionally to a class, may, after residence of at least one term, be granted full and regular standing in that class, if, having taken the regular studies of the time, he give proof, by passing the regular term examina-

tions with a record as high as is required for graduation, that he is able to go on satisfactorily with the class to which he has thus been temporarily assigned. Should he be unable to pass these examinations, special examinations may then be held, and he shall take the position and rank to which he may thereby be found entitled.

ADMISSION TO RESIDENT GRADUATE STUDY

Students are admitted to graduate study after having taken a baccalaureate degree in the University, or on presenting the diploma of an equivalent degree conferred elsewhere. For a fuller account of the advantages offered to graduate students, see page 104.

RESIDENCE AND GRADUATION.

REGISTRATION EACH TERM.

At the beginning of every term each student must obtain a Certificate of Registration before joining any class or attending any lectures, and no student, atter naving once been admitted to the University, will be allowed to register after the close of Registration Day, except by special permission of the Faculty

RECORD OF WORK.

At the end of each term, credit is given only for work regularly chosen and recorded in the beginning of that term.

EXERCISES OF THE TERM.

In the general courses, students of the sophomore year may take from fourteen to eighteen hours, of the junior, from twelve to eighteen, of the senior, from ten to eighteen. But no student will be graduated until he has passed successfully examinations in work which, including all the required work of his course, shall amount to an aggregate of fifteen hours a week during the whole of four years.

In the technical courses, the number of hours required each term may be seen in the detailed statements of those courses.

In all courses, two hours and a half of laboratory work, and, in the technical courses, three hours of drafting or shop-work, are regarded as the equivalent of one recitation.

The regular examinations in all studies are held at the end of each term. Failure at examination entails forfeiture of position in the class, or exclusion from the course, or, in some cases, from the University

RULES FOR THE GUIDANCE OF STUDENTS.

The rules of the Faculty in regard to students are printed under the title, "Rules for the Guidance of Students," and every student is furnished with a copy at the beginning of his course, and is thereafter supposed to be acquainted with the regulations of the University

PAYMENTS TO THE UNIVERSITY

The fee for tuition is \$25 a term, payable within ten days after registration.

A fee of \$5, to cover expenses of graduation, degrees, etc., is charged to each person taking the baccalaureate[•] degree. This fee must be paid before the degree is conferred.

The fee charged for an advanced degree is \$10, and it must in all cases be paid before the degree is conferred.

Tuition is free to students with State Scholarships, to resident graduates, to students pursuing the prescribed course in Agriculture, and intending to complete that course, and to special students in Agriculture. Every person taking laboratory work in chemistry, physics, zoology, or entomology, must deposit with the Treasurer security for the materials to be used in the laboratory Supplies in the chemical and physical departments are furnished at New York list prices. Students residing in the University buildings must pay their room-bills one term in advance. All the members of the University are held responsible for any injury done by them to its property

EXPENSES OF RESIDENCE.

The following is a fair estimate of the yearly expenses Tuition, \$25 a term. - - - \$75.00 Room, board, lights, fuel, and laundry, about - 200.00 Text-books, etc., about - - 25.00

Total, - - - - - \$300.00

The additional expenses of a student depend so largely upon his personal tastes that it is difficult to give an estimate.

The expense of living in Ithaca varies, for board, room, fuel, and lights, from 33 to 7a week. By the formation of clubs, students may reduce their expenses to 3.00 or sometimes even to 2.50 a week for room and board.

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The cost for board, rent of furnished room, fuel, and lights at the Sage College, which is exclusively for women, varies from \$5 to \$6.50 a week. A student occupying alone one of the best rooms pays \$6.50 a week. If two occupy such a room together, the price is \$5.75. Those occupying less desirable rooms, with two in a room, pay \$5 a week each. The entire building is warmed by steam, and, in most cases, the sleeping apartment is separate from the study

GRADUATION

All the courses leading to the degree of Bachelor and to the corresponding degrees of Civil Engineer and Mechanical Engineer require four years for their completion, and no student is allowed to graduate in less than four years of actual residence (except in case of admission to advanced standing, as elsewhere provided for), without special permission of the Faculty, which permission will not be granted until the applicant has been in the University at least one year, nor will it be granted after the first term of the year in which he proposes to graduate.

GRADUATION THESIS.

A Graduation Thesis is required of every student. This thesis must represent some phase of the student's principal line of work during the later years of his course. The subject of the thesis must receive the approval of the professor in charge of the study to which it appertains, and with such approval must be left with the Dean or Registrar not later than noon of the second Friday of the second term. In order to be acceptable, the thesis must have the character of a scholarly dissertation on the subject chosen, and if finally accepted by the Faculty, it will entitle the writer to a credit of two hours a week for the second and third terms. The merit of the thesis will be judged not only from a technical point of view, but also from the point of view of its literary workmanship, and its merits, as judged from these two points of view, will be taken into account in determining the standing of the student for graduation.

THE FIRST DEGREES.

IN THE GENERAL COURSES.

The degrees of Bachelor of Arts, Bachelor of Philosophy, Bachelor of Science, and Bachelor of Letters, are conferred after the satisfactory completion of the respective courses.

Students in the Course in Philosophy who in the last two years elect continuously not less than nine hours of studies in History and Political Science will receive the degree of Bachelor of Philosophy in History and Political Science.

Students in the Course in Science who in their sophomore year elect Freehand Drawing, Invertebrate and Vertebrate Zoology, and Botany, and who in the last two years elect continuously not less than nine hours in Natural History, and pass an examination before the beginning of the senior year in Latin equivalent to four books of Cæsar's Commentaries, and in Greek sufficient to show ability to recognize, analyze, and form scientific technical terms, will receive the degree of Bachelor of Science in Natural History

IN THE TECHNICAL COURSES.

The degrees of Bachelor of Science in Agriculture, Bachelor of Science in Architecture, Bachelor of Science in Chemistry, Bachelor of Science in Electrical Engineering, and the corresponding degrees of Civil Engineer and Mechanical Engineer, are conferred after the satisfactory completion of the respective courses.

ADVANCED DEGREES.

Courses of graduate study leading to advanced degrees are provided in the following departments Ancient Classical Languages and Literatures, Modern European Languages and Literatures, Comparative Philology, History and Political Science, Philosophy, Mathematics, Chemistry and Physics, Natural History, Civil Engineering, Mechanical Engineering, and Agriculture.

Candidates for advanced degrees must present themselves for examination in one major and two minor subjects, which must have been determined upon, with the approval of a committee of the Faculty, as early as November 1 of the year in which the degree is expected to be given, if it be the Master's degree, or of the year preceding that in which the degree is expected to be given, if it be the Doctor's degree. The subject of the thesis required must be announced to the Faculty as early as December 1 of the year in which the degree is expected to be given, and the paper in its completed form must be presented as early as May 1.

In case of special distinction attained in the thesis and in the

final examination by the candidate for the degree of Master of Arts or Doctor of Philosophy, the degree of merit will be indicated in the diploma by one of the terms ('um Laude, Magna cum Laude, Summa cum Laude.

In case of special distinction attained in the thesis and in the final examination by the candidate for the degree of Master of Science, Master of Civil or Mechanical Engineering, or Doctor of Science, the degree of merit will be indicated in the diploma by one of the terms With Distinction, With High Distinction, With the Highest Distinction.

Successful candidates for the degree of Doctor must print their theses and deposit ten copies in the Library Successful candidates for the degree of Master must deposit one copy

The special requirements for these degrees will be as follows

THE DEGREES OF MASTER OF ARTS, OF SCIENCE, OF CIVIL ENGI-NEERING, OF MECHANICAL ENGINEERING.

The degree of Master of Arts or Master of Science is conferred on those who have taken the corresponding baccalaureate degree here, or at some other college or university where the requirements for that degree are equal to those of this University, on the following conditions

Candidates must spend at least one year at the University in pursuance of an accepted course of study

The degree of Master of Science is conferred on graduates in Philosophy on the same conditions as on graduates in Science.

The degree of Master of Civil Engineering, Master of Mechanical Engineering, or Master of Science in Agriculture is conferred on candidates who have received the corresponding first degree, upon presenting a satisfactory thesis and passing the required examinations as above, (1) after one year of resident study, or (2) after two years of professional practice and study *in absentia*.

THE DEGREES OF DOCTOR OF PHILOSOPHY AND DOCTOR OF SCIENCE.

The degree of Doctor of Philosophy is conferred on graduates of this University, and of other universities and colleges whose requirements for the baccalaureate degree are equal to those of this University, on the following conditions

1. In order to become a candidate the applicant must have, over and above what is required for graduation in the course in Philosophy, a knowledge of Greek equal to that required for admission to the course in Arts.

2. The candidate must spend at least two years at the University pursuing a course of study marked out by the Faculty.

3. He must present a thesis of such a character as shall display power of original and independent investigation, and must pass the requisite examinations.

The degree of Doctor of Science is conferred on graduates of this University, and of other universities and colleges whose requirements for the baccalaureate degree are equal to those of this University, on the following conditions

1. In order to become a candidate the applicant must have a knowledge of Latin and Greek at least equal to that required for graduation with the degree of Bachelor of Science in Natural History, a knowledge of French and German equal to that required for graduation in Science, a knowledge of mathematics, of science, of literature, and of philosophy equal to that required for graduation in Philosophy

2. The candidate must spend at least three years, two of them at this University, in the study of three approved subjects within the departments of Chemistry and Physics, Mathematics, and Natural History

3. He must present a thesis of such a character as shall display power of original and independent investigation, and must pass the requisite examinations.

SPECIAL ANNOUNCEMENTS.

I. THE LAW SCHOOL.
CORPS OF INSTRUCTION

Resident Faculty.

CHARLES KENDALL ADAMS, LL.D.,
President.

The HON DOUGLAS BOARDMAN,
Dean.

HARRY BURNS HUTCHINS, Ph.B.,
Secretary, and Professor of Law.

CHARLES A. COLLIN, A.M.,
Professor of Law.

FRANCIS M. BURDICK, A.M.,
Professor of Law.

MOSES COIT TYLER, LL.D., Professor of American Constitutional History and Law.

HERBERT TUTTLE, A.M., Professor of International Law and of English Constitutional History.

II. NON-RESIDENT LECTURERS FOR 1887-88.*

The HON. FRANCIS M. FINCH, LL.D., Judge of the New York Court of Appeals.

The HON. DANIEL H. CHAMBERLAIN, of Neter York City.

WILLIAM F COGSWELL, LL.D., of Rochester.

THEODORE BACON, A.M., of Rochester.

* It is the purpose to provide for at least six courses of lectures each year by eminent specialists in the profession, each course to consist of from four to ten lectures, according to the nature of the subject on which the lectures are given. At the date of this announcement only four non-resident lectures have been appointed.

SPECIAL ANNOUNCEMENTS. 159

MATERIAL EQUIPMENT.

For the purposes of the Law School ample accommodations have been provided in Morrill Hall. Besides a sufficient number of lecture rooms, and rooms for moot courts, there are offices for the several professors, and a large room for the Law Library The books in the collection number between 5,000 and 6,000 volumes, all of which will be immediately accessible to students of the school. The General Library of the university consists of more than 62,000 volumes, besides the 30,000 volumes constituting the President White Library of History and Political Science, recently presented to the University

PLAN OF ()RGANIZATION.

In the organization of the Law School the purpose has been to secure as Dean of the School a jurist of acknowledged eminence, a Resident Faculty of Professors selected not only on account of their legal attainments, but also by reason of their skill as teachers, and a corps of Non-Resident Lecturers who should bring to the lecture room the experience of distinguished service

at the bar and on the bench.

The members of the resident Faculty will devote themselves regularly to the work of daily instruction. This will be carried on partly by lectures, but chiefly by recitations, examinations and the study of leading cases in accordance with the manner that has recently proved so successful in the best schools of the United States and of England.

COURSE OF INSTRUCTION.

The course of instruction extends through two years of nine months each. Members of the Senior class will be permitted and encouraged to review the work of the Junior year with the Junior class, but the members of the Junior class will not be permitted to attend the lectures given to the Seniors, except in the case of non-resident lecturers, whose lectures will be open to all. An effort will be made by the resident Faculty not only to teach with especial thoroughness the elements of the law, but also to give such practical instruction in methods of procedure as will qualify the student at once after graduation to enter upon the regular work of the profession. To this end the moot courts, organized under the immediate direction of the profess-

ors, will give especial attention to the drawing of the various forms of legal papers, as well as to the proper application of legal principles and judicial decisions.

Special facilities are offered to students desiring to supplement their studies in law with studies in history and political science. The instruction given in the President White School of History and Political Science may be taken as elective work by students in the Law School. These courses embrace instruction in the various branches of constitutional and political history, as well as in the history of political and municipal institutions. To students who have already taken a baccalaureate degree, the master's degree may be given on recommendation of the Faculty of History and Political Science, on condition of the applicant's having taken five hours of work per week during two years, in addition to the work of the Law School. To students who have not a baccalaureate degree the degree of LL.B., cum *laude*, will be given on condition of successfully completing three hours per week during two years in the School of History and Political Science in addition to the work of the Law School.

TERMS OF ADMISSION.

Applicants for admission to the Law School must be at least eighteen years of age and must have had a preliminary education equal to that required for registration as a student of law under the laws of New York and the rules of the Court of Appeals. This requirement consists of a thorough knowledge of "arithmetic, English grammar, geography, orthography, American and English history, and English composition." The Regents' diploma required by the laws of New York for registration will be accepted in place of an examination for admission. The diploma of any college or university, the Regents' academic diploma, or the certificate of graduation at a reputable academy, will be received in place of an examination for admission. Applicants from other Law Schools, and students who have already in part completed their studies in a private office, will be admitted to such standing as may be justified by the results of an examination. The regular examination of students for admission in the Fall of 1887 will take place on Friday and Saturday, the 23d and 24th of September Students desiring admission at other times must make special arrangements for examination with the Secretary of the Law Faculty, but no student will be

admitted after the beginning of the term, unless, on examination, he shall show that in addition to the requirements for admission he has an amount of legal knowledge equivalent to what he might reasonably have been expected to acquire had he joined the class at the beginning of the year.

TERMS OF GRADUATION.

Students who have received the full course of instruction, will, on passing the regular examinations, be admitted to the degree of Bachelor of Laws. Students admitted to advanced standing are entitled to all the privileges of the class of •which they become members.

FEES AND EXPENSES.

The fees to the University and the expenses of living are the same as those of all other students, and will be found described elsewhere in the Register.

ANNOUNCEMENT.

An announcement giving full information as to the courses of study and conditions of admission and graduation will be sent on application to the Secretary of the Law Faculty

II. THE PRESIDENT WHITE SCHOOL OF HISTORY AND POLITICAL SCIENCE.

By action of the Trustees taken January 19, 1887, the various courses heretofore given in the several branches of history, political economy, social science, and international law were consolidated into an administrative unit, and to the consolidated department was given the name of THE PRESIDENT WHITE SCHOOL OF HISTORY AND POLITICAL SCIENCE.

At the same meeting provision was also made that after the present year full courses of instruction shall be given in the History of Political Ideas and Methods, in the History of Municipal Institutions, in the History of Modern Diplomacy, and in the History of Industrial, Charitable, and Penal Institutions. These

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SPECIAL ANNOUNCEMENTS.

courses will be especially adapted to the needs of graduate students, and may be regarded as supplementing the courses already provided for and described in the preceding "Courses of Instruction."

Students desiring to devote themselves especially to studies in history and political science should elect one or more of the elementary courses in history in the sophomore year. These studies should be followed in the junior year with the courses of lectures on general history and political economy In the senior year the appropriate work consists of one, or at most two, of the seminaries and the special courses above indicated, while graduate students and fellows will carry on studies of the same general character under the more personal guidance of the professors in charge.

Graduate students from other colleges and universities will be allowed to select their courses at will, subject only to the approval of the special committee of the Faculty appointed to superintend and direct the work. The instruction given in the school is carefully adapted to the most thorough and systematic training of those who desire to fit themselves for the work of teaching history; as well as for those who intend to devote themselves to journalism or the profession of the law No separate matriculation will be required of students desiring to avail themselves of the advantages offered by the President White School of History and Political Science. The studies here offered may be taken by students of either of the general courses, and the degree conferred will be determined by the course in which the candidate is registered. The studies offered by the school are thus made available to candidates for the degree of Bachelor of Arts, Bachelor of Philosophy, Bachelor of Science, and Bachelor of Letters. To students successfully completing graduate courses, the appropriate degrees will be given in accordance with the terms elsewhere described in the register

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III. THE SCHOOL OF PHARMACY

On the 7th of March, 1887, the Trustees of Cornell University established a School of Pharmacy, to be open for the admission of students at the beginning of the fall term of the present year The object of the establishment of such a school is to provide a

kind of instruction of which there seems to be a distinct need in this State, namely, in the sciences of chemistry and botany applied to pharmacy It is intended that the course of study in these branches shall take equal rank, in point of thoroughness and scientific character, with the other courses in the University, and that the training given shall be such as to prepare students for positions of responsibility as dispensing or manufacturing pharmacists.

With these objects in view, a course of study has been laid out, extending over two full college years, and including, in addition to the studies usually taught in colleges of pharmacy, thorough courses of practical laboratory work in analytical and pharmaceutical chemistry, toxicology, and microscopic botany It is believed that students who shall complete this course of study will be prepared to assume duties beyond the ordinary routine work of the pharmacist, and in the practice of this profession will bring to bear resources which are not at the command of those whose knowledge is wholly derived from business experience.

In providing a department of this character, the Trustees of this University have merely followed an example already offered in the leading countries of Europe, where the necessity of a thorough scientific training as a preparation for the practice of pharmacy has long been recognized. In England. France, and Germany, and also in other countries, a course of study similar to that offered at this University is required by law, for the protection of the public, as an essential condition of admission to dispensing practice. It is believed that the establishment of this school will aid, in some degree, in raising the standard of pharmaceutical education in this country

The general character of the course, and the conditions of admission and graduation, are as follows

1. All candidates for admission must be eighteen years of age. All candidates will be required to pass the regular English examinations, as given on page 144, with the addition of German to the extent stated on page 148. Instead of German, Latin to the amount of one year's study will be received. Candidates who may be unable to comply with the requirement in regard to German may be provisionally admitted, and required to pursue that study in the University, in addition to the regular work of the course. Candidates who bring trustworthy evidence of hav-

ing been engaged in the business of pharmacy for at least two years, may be admitted as special students, and not as candidates for a degree, without examination.

2. The course of study extends over two full college years, and comprises lectures, recitations, and laboratory practice in the following subjects General and inorganic chemistry, botany and pharmacognosy, quantitative analysis, materia medica, pharmaceutical chemistry, quantitative analysis, organic chemistry, toxicology, practical pharmacy

3. On the satisfactory completion of the required course of study, and of a certain term of service under the supervision of some competent druggist, the student will receive the degree of Graduate in Pharmacy The student will then be admitted by the State Board of Pharmacy to the regular examination held by said board as a test of proficiency, and after satisfactorily passing this examination will receive from the State Board a license entitling him to admission to practice as a dispensing pharmacist.

A pamphlet giving full information as to the courses of study and conditions of admission and graduation will be furnished on application to the Treasurer of the University

IV. THE SCIENCE AND ART OF TEACHING

Believing that a need exists for more thoroughly equipped teachers in our higher educational institutions, the University has made recent provisions for supplying this want, both by the establishment of a professorship of the Science and Art of Teaching, and by such additions to some of the chief lines of university study as seem best adapted to fit students to teach them successfully The lectures of the Professor of Teaching include courses on the General Theory of Education, its Aims, its Psychological Conditions, and its Means, on the Nature and Methods of Instruction fitted for Different Ages and Destinations, on the Organization and Management of Schools, including an account of the modes of organization which prevail in our own and other countries, with their tendencies and results, and on the History of Education, with a discussion of the theories of famous writers on education. The lectures are supplemented by conferences for

the discussion of educational topics, for the special investigation of important educational questions, and for reports on visits to schools.

Arrangements have also been made in several departments of the University, by special classes and by seminaries, to give extended instruction to those who intend to teach, in the best methods of presenting the branches of study to which these departments are devoted.

Certificates of scholarly fitness to teach will be given to such graduates as have successfully followed certain designated courses of the Professor of Teaching, and have attained such marked success in the lines of study to which they intend to devote themselves, and which will be designated in the certificate of proficiency, as bids fair to make them successful teachers.

FELLOWS FOR 1886-7

THE CORNELL FELLOWSHIP,*

Ernest George Merritt, M.E., *Electrical Engineering* Stephen Ryder, B.S., *Electrical Engineering*

THE MCGRAW FELLOWSHIP,

Charles Benjamin Wing, C.E., Civil Engineering

THE SAGE FELLOWSHIP,

Rollin Arthur Harris, Ph.B., Mathematics THE SCHUYLER FELLOWSHIP, William Lochhead, A.B., (McGill University) Geology and Mineralogy THE SIBLEY FELLOWSHIP, Albert William Smith, M.Mech.Eng., Mechanical Engineering THE GOLDWIN SMITH FELLOWSHIP, Herbert Elmer Mills, A.B., (Rochester University) History and Political Science THE PRESIDENT WHITE FELLOWSHIP, Henry Elijah Summers, B.S., Anatomy THE ERASTUS BROOKS FELLOWSHIP, Ludlow Eliakim Lapham, A.B., Romance Languages

* Mr. Merritt resigned, and Mr. Ryder was elected to succeed him.

OTHER RESIDENT GRADUATES.

Entomology Atkinson, George Ford, Ph.B., Architecture Bailey, Howard, A.B., University of Rochester. Electrical Engineering Barton, Philip Price, Ph.B., Mechanical Engineering Berger, John Jacob, C.E., Rensselaer Polytechnic Institute. Literature Capen, Annie, A.B., Smith College. Carpenter, Rolla Clinton, M.S., C.E., Mechanical Engineering University of Michigan. Mathematics Cottin, Edward Samuel, A.B., Clark University.

De Forest, Harry Pelouze, B.S.,	Anatomy							
Dunham, Andrew Ellsworth, B.S.,	Natural Science							
Eastman, Maria Rebecca, Smith College.	Classical Philology							
Gerrish, William Blanchard, A.B., Oberlin College.	Civil Engineering							
Hammon, William Henry, A.B., A.M., I Allegheny College	Physics and Mathematics							
Harris, Gilbert Dennison, Ph.B., G	eology and Paleontology							
Hull, Charles Henry, Ph.B., Hist	ory and Political Science							
Hungerford, Charlotte, A.B.,	History and Literature							
Smith College.								
Jacks, Janet, B.S., University of the Pa	History and Literature cific.							
Knickerbacker, John, C.E.,	Mechanical Engineering							
Larrison, Eleanor Rose, A.B.,	Literature							
Smith College.								
Linthicum, Cadwallader Edwards, A.B.,	Mathematics							
Yale University								

Electrical Engineering Lundy, Ayres Derby, A.B., College of New Jersey. Literature Meyer, Rachel, Ph.B., Mathematics Murphy, Edward Charles, B.C.E., M.S., Page, William Henry, B.C.E., Assaying Modern Languages Petit, Amelie Veronique, Ph.M., Syracuse University Mathematics Powell, Harry Wheeler, B.S., College of the City of New York. Sanderson, Edwin Nash, C.E., Mechanical Engineering Rensselaer Polytechnic Institute. Simonds, Frederic William, M.S., Ph.D., Invertebrate Zoology History Smith, Jeannie Azilla, B.S., **Mathematics** Studley, Duane, B.S., Chemistry and Physics Twombly, Sidney Smith, B.S., Maine State College. Mathematics White, Benjamin Franklin, Ph.B.,

University of North Carolina.

Wightman, Edward Daniel, B.S.,

Mathematics

UNDERGRADUATES.

SCHOLARSHIPS FOR 1884-8.

UNIVERSITY SCHOLARSHIPS.

THE CORNELL SCHOLARSHIP,

Lyman Austin Best, Course in Science

Hornell Free Academy-D. L. Freeborn, A.B., LL.B., Principal.

THE H. B. LORD SCHOLARSHIP,

Willard Clark Fisher, Course in Arts

Onondaga Academy-O. W Sturdevant, A.M., Principal.

THE MCGRAW SCHOLARSHIP,

Alvah Deyo Hasbrouck, Course in Civil Engineering

J. R. Leslie, A.M., Private School, Poughkeepsie.

THE SAGE SCHOLARSHIP,

Ransford Stevens Miller, Jr., Course in Arts Ithaca High School-D. O. Barto, Principal.

THE SIBLEY SCHOLARSHIP,

Andrew Spencer, Course in Philosophy Cooperstown Union School-J. G. Wight, A.M., Principal.

THE PRESIDENT WHITE SCHOLARSHIP,

George Arlin Ruyter, Course in Philosophy Self Prepared.

SAGE SCHOLARSHIPS FOR WOMEN

Mary Margaretta Wardwell, Buffalo High School—H. P Emerson, A.M., Principal.

Agnes Adelaide Rogers, Course in Letters Rochester Free Academy-Z. P. Taylor, A.B., Principal.

Mary Anna Widman, Freeport (Ill.) High School—A. W. Greene, B.C.E., Principal. 12

SCHOLARSHIPS FOR 1885-9.

UNIVERSITY SCHOLARSHIPS

THE CORNELL SCHOLARSHIP,

Anson Marston, Course in Civil Engineering West Rockford High School, Rockford, Ill.-W W. Stetson, Principal.

THE H. B. LORD SCHOLARSHIP, Vojta Frank Mashek, Course in Arts Markham Academy, Milwaukee, Wis.—Albert Markham, A M.. Principal.

THE MCGRAW SCHOLARSHIP,

Henry Clay Stanclift, Course in Philosophy

Spencer Union School-A. B. Davis, Ph.B., Principal.

THE SAGE SCHOLARSHIP,

Susan Caroline Strong, Course in Arts Owego Free Academy.—H. A. Balcam, Ph.D., Principal.

THE SIBLEY SCHOLARSHIP,

George Leonard Teeple, Course in Mechanical Engineering Academic Department State Normal, Whitewater, Wis.-Miss Kate N. T. Tupper, B.S., Principal.

THE PRESIDENT WHITE SCHOLARSHIP,

Frederick Eugene Turneaure, Course in ('ivil Engineering Freeport (Ill.) High School—A. W Greene, B C.E., Principal.

SAGE SCHOLARSHIPS FOR WOMEN.

Annie Elizabeth Morse, Course in Arts

Worcester, Mass., High School-Alfred S. Roe, A.M., Principal.

Lizzie Harwood Boynton, Lockport Union School—Asher B. Evans, A.M., Principal. Mila Frances Tupper, State Normal, Whitewater, Wis.—T. B. Pray. A.M., Principal.

SCHOLARSHIPS FOR 1886-90.

UNIVERSITY SCHOLARSHIPS.

THE CORNELL SCHOLARSHIP,

Joseph Harrison Root, Course in Civil Engineering Port Byron Academy-A. W. Morehouse, A.M., Principal.

THE H. B. LORD SCHOLARSHIP,

Kennedy Furlong Rubert, Course in Arts Owego Free Academy-J. F Tuthill, A.B., Principal.

THE MCGRAW SCHOLARSHIP,

John Ford, Course in Arts

Medina Free Academy-C. E. Allen, Principal.

THE SAGE SCHOLARSHIP,

Frank Cary Caldwell, Course in Arts

Cascadilla School, Ithaca, N.Y.-L. A. Wait, A.B., Principal.

THE SIBLEY SCHOLARSHIP,

John Eckert Greenawalt, Course in Electrical Engineering Columbia High School, Columbia, Pa.-Miss Lilian Welsh, Principal. Special Preparation in Cascadilla School.

THE PRESIDENT WHITE SCHOLARSHIP,

Floyd Lucian Robinson, Course in Architecture Cooperstown Union School-J. G. Wight, A.M., Principal. Special Preparation in Cascadilla School.

SAGE SCHOLARSHIPS FOR WOMEN.

Mary Bartlett Hill, Course in Arts

Jamestown Union School-R. R. Rogers, A.M., Principal.

Course in Architecture Ida May Hill, Central Grammar School, Brooklyn, N.Y.-R. F. Leighton, Ph.D., Principal.

Anna Helene Palmié, Course in Science

Packer Collegiate Institute, Brooklyn, N.Y.-Truman J Backus, LL.D., Principal.

SENIORS.

Allendorf, Elbert James, Bellinger, Lyle Fred, Benham, Anna Louise, Bodine, Donaldson, Bristol, Caroline Louise, Browning, Charles, Jr., Carnaghan, Edwin Dixon, Casey, George Whitman, Chrisman, Francis Leon, Cohn, Morris, Jr., Cole, Byron Gray, Coley. Harrison, Colnon, Redmond Stephen, Cornell, Ezra, Covell, Grant. Coville, Frederic Vernon, Crane, William Foster Day, Curtis, Charles William, Dennis, John Bartlett, Dibble, Arthur Jackson, Dimon, Henry Goldsmith, Elliott, Elias Leavenworth, Elliott, William Swan, Fisher, George Egbert, Flint, Rufus, Franklin, Frank George, Gardiner, Charles Gibson, Gifford, Arthur Warner, Gilliland, Allen Bertram, Gillis, William Davis, Goodkind, Martin Henry, Grant, Arthur Hastings, Gray, William Emery, Greenawalt, William Eckert, Gregor, Frances, Gunner, Daniel Webster, Hart, Emmet Ellsworth, Hebard, Fred Whitmore,

Poughkeepsie, Philosophy Ilion, Civil Engineering Philosophy Cortland, Ithaca, Philosophy Boynton, Edward Carlisle, Jr., Newburgh, Mechanical Eng. West Sand Lake, Philosophy Chutham, Mechanical Eng. Buchanan, Alexander Watson, Troy, Mo., Mechanical Eng. Hoboken, N. J., Elect. Eng. Architecture Auburn, Harrisburg, Pa., Philosophy Letters Cobbleskill, Ithaca. Science New Woodstock, Letters Potsdam, Civil Eng. Ithaca, Elect. Eng. Springfield, Pa., Mech. Eng. Oxford, Arts Brick Church, N. J., Elect. Eng. Civil Eng. Washington, D. C., Optional Gardiner, Me., Franklin, Letters Civil Eng. Riverhead, Science Glenora, Wellsville, O., Elect. Eng. Westerlo, Arts Mech. Eng. Rivas, Nicaragua, Plover, Wis., Letters Philosophy Washington, Ind., Architecture Little Utica, Philosophy Van Wert, O., Mech. Eng. Kinsman, O., New York City, Letters New York City, Philosophy Mech. Eng. Williamsport, Pa., Civil Eng. Silver Spring, Pa., Ahnapee, Wis., Letters Schaghticoke, Civil Eng. Little Valley, Civil Eng. Philosophy Angola,

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Hebbard, William Sterling, Hedden, Edward, Himes, Albert James, Hoffeld, Henry Rudolph, Hopkinson, Charles William, Horr, Charles William, Jr., Ihlder, Johann Diedrich, Keating, Langford Spencer, Kelsey, Sidney Eugene, Kuykendall, Benjamin, Jr., Lawrence, Theodore Finch, Lorber, Lewis James Edward Joseph, Ithaca, Lovell, Herbert Marlow, McAllister, Charles Albert, McCargo, Grant, McEbright, Carita, Maguire, James Patrick, Marshall, George Montanye, Meehan, John William, Meloy, Fredrika Williams, Miller, George Congdon, Moore, Veranus Alva, Morrison, William Zalmon, Norton, Albert Julius, Norton, George Harvey, Otis, Lois Macy, Oviatt, Bordman Lambert, Oviatt, David Brainerd, Palmer, Herbert Rodman, Richards, George Blackwell, Roberts, Perry Buchanan, Romer, William Johnston, Russell, James Earl, Rutherford, Robert Elmer, Ryan, Harris Joseph, Saal, George Frederick, St. John, Richard Collier, Sargent, Erle Hoxsie, Selmser, Kate Eveline, Smith, Harry Ezra, Smith, Milton,

Architecture Rochester, Civil Engineering Ithaca, Civil Engineering Oswego, Civil Engineering Lancaster, Architecture Cleveland, O., Letters Wellington, O., Bremerhaven, Ger., Elect. Eng. Letters Buffalo, Stockholm Depot, Civil Eng. Philosophy Towanda, Pa., C'hester, Civil Engineering Letters Arts Ithaca, Mech. Eng. City Island, Science Pittsburgh, Pa., Arts Akron, Ohio, Architecture Chateaugay, ____ Philosophy Towanda, Pa., Civil Eng. Fairport, Philosophy Portville, Letters Elmira, Science Parish, Arts Brockwayville, Pa., Architecture Utica, Civil Eng. East Pembroke, Science Sherwood, Science Shushan, Shushan, Mechanical Eng. Cleveland, O., Elect. Eng. Letters Leavenworth, Kansas, Ithaca, Letters Ithaca, Philosophy Hamden, Arts Binghamton, Letters Halifax, Pa., Elect. Eng. Cleveland, O., Letters St. Catharine's, Canada, Civ Eng. $Medina, O_{.,}$ Science Waterloo, Letters Pike, Mechanical Eng. Ellenville, Philosophy

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Sterling, Guy, Sternberger, Edwin, Stewart, Neil, Jr., Taylor, John Waring, Thomas, Mary Wright, Thomson, Fred William, Thomson, John Fuller, Tyler, Edward Gilbert, Vedder, Herman Klock, Warner, Albert Rollin, Weber, George Frederick, White, Horace, Wilbur, Royal Edwards, Wilkinson, Theodore Kirkland, Williams, Chauncey Grant, Wright, Ellsworth David,

Gambier, O., New York City, York, Corinth, Miss., Chicago, Ill., Alexandria Bay, Alexandria Bay, Ithaca, St. Johnsville, Wellington, O., Lysander, Syracuse, Carthage, Syracuse. Ithaca, Ithaca,

Civil Eng. Letters Civil Eng. Letters Arts Philosophy Letters Agriculture Civil Eng. Letters Science Letters Philosophy Chemistry Civil Engineering Arts

JUNIORS.

Science

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Acker, Charles Ernest, Aldrich, Byron Seymour, Andrews, Frank Mills, Barnes, Edward Bradford, Barnum, Merritt Wright, Barros, Bento de, Barton, Lyman Guy, Beardsley, Jessie May, Beardsley, Lewis Aurelius, Beauchamp, Howard Carter, Becker, Charton Lansing, Benson, Orville, Best, Lyman Austin, Bissell, George Welton, Blood, Charles Hazen, Bostwick, William Herbert, Boult, Ella Maud, Brace, James Frederick, Brill, Gerow Dodge, Broadwell, Frank Adoniram, Brooks, Harry Niemeyer, Burnett, Archie Collamer,

Bourbon, Ind., Optional Port Byron, Architecture Des Moines, Ia., Letters Corning, Science Chappaqua, Agriculture S. Paulo, Bruzil, **Optional** Willsborough, Letters Ithaca, Philosophy Ithaca, Letters Baldwinsville, Civil Eng. Philadelphia, Pa., Civil Eng Sharon, Conn., Science Hornellsville, Mechanical Eng. Poughkeepsie, Philosophy Ithaca, Letters Ithaca, Letters Medina, Ohio, Letters Leavenworth, Kansas, Agriculture Poughquag, Civil Eng. Morrisonville, Mech. Eng. Portsmouth, N H., Letters Waterloo,

Chamberlain, Joseph Redington, Kanona, Clancy, John Scott, Cooling, William Lowrey, Crossman, George Seth, Crossman, Stephen Henry, Cutter, William Parker, Dillenbeck, Clark, Disney, Irvin Porter, Dix, Charles Billings, Dolson, Edward, Donaldson, George, Duffies, Edward John, Edwards, James Harvey, Eldredge, Alfred Henry, Emmons, Charles Morton, Epps, Orlo, Etnyre, Samuel Longfellow, Farrington, William Sherman, Fisher, Henry Wright, Fisher, Willard Clark, Fitch, Winchester, Foster, Lottie, Fowler, Charles Sumner, France, Gertrude Gladys, Fullerton, George Humphry, Gilman, Frank Gaylord, Glasser, Charles Harry, Glover, John Irving, Green, Charles Newton, Groves, Albert Bartleton, Hall, Halliette Deraxa Ellis, Hamilton, Millard Caldwell, Hampton, Willis Herbert, Hasbrouck, Alvah Deyo, Hegewald, Arthur Frederick, Heller, David Neish, Heller, Michel Burt, Hislop, James, Hopkins, Jesse James, Ickelheimer, Henry Rubens, Johnson, Ernest Edgar,

Science Civil Eng. Hornellsville, Civil Eng. Wilmington, Del., Agriculture Brushton, Agriculture Ithaca, Chemistry Washington, D.C., Civil Eng. Palatine Bridge, Baltimore, Md., Elect. Eng Glens Falls, Mechanical Eng. Bath, Letters Science Gilbertsville, Civil Eng. Markeson, Wis., Oxford, Civil Engineering Watertown, Mechanical Eng. Huron, Civil Engineering Architecture Oneonta, Civil Eng. Oregon, Ill., Jacksonville, Civil Eng. Dymond City, N C., Elect. Eng Westerlo, Arts Optional Jefferson, Ohio, Philosophy Ithaca, Gouverneur, Arts Skaneateles, Arts Springfield, Ohio, Arts Sherburne, Letters Mineville, Mechanical Eng. New Orleans, La., Architecture Batavia, Civil Engineering Rome, Architecture Philosophy Ithaca, Omaha, Neb., Mechanical Eng. Dansville, Electrical Eng Highlands, Civil Engineering New Albany, Ind., Mech. Eng. Elmira, Letters Elmira, Letters Strasburg, Canada, Civil Eng. Churchville, Mechanical Eng. New York City, Letters Avondale, Ohio, Philosophy

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Parker, Lee Hamilton, Parshall, Charles Henry, Parsons, Charles Lathrop, Peet, Earl Silas, Pratt, Henry Valentine, Price, Clifton, Psotta, Louis Frederic, Rackemann, William Frederic, Rae, William, Reed, William Ebenezer, Riggs, Herman Clarence, Roess, Gustav Frederic, Rosegrant, Clark Ames, Rumsey, Eugene Aertsin, Russell, Frank Downing, Schlosser, Fred Grant, Scott, Claude Rufus, Seeber, De Elton Van Camp, Shepard, George Chapman, Shinaman, Charles Edward, Smith, Charles Mortimer, Smith, Hoxie Wilber, Snyder, Harry, Stanclift, Henry Clay, Stephens, George Washington, Stern, Leon, Sternberg, Robert Eldredge, Stewart, Clinton Brown, Stone, James Stoddard, Storrs, Frances, Strong, Susan Caroline, Tarbell, Ed, Taylor, Perry Post, Teeple, George Leonard, Thistlethwaite, Charles Jeremiah, Macedon, Treman, Charles Edward, Tupper, Mila Frances, Turneaure, Frederick Eugene, Upp, John Winter, Vickers, Albert, Vreeland, Charles Musk,

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Berry, Emma Louise, Binkley, Charles Frederick, Blauvelt, George Alanson, Bliss, George Spencer, Bode, Christian John, Boothby, Huldah Ellen, Bourne, Bentley Silas, Bradley, Harry Merritte, Brodhead, George Livingston, Brooks, Frank Elbert, Broughton, Henry Primm, Brown, Frank Horton, Brown, Mabel Preston, Brown, Wallace Nelson, Bush, Emma, Bush, Frank Jackson, Bush, Frederick Morrison, Caldwell, Frank Cary, Callan, Frank Hiram, Calvert, William Belle, Carpenter, Benjamin, Chamberlain, George Ray, Chamberlain, William Henry, Chapman, Newton David, Chester, Louis, Chillingworth, Charles Curtis, Clark, Charles Jay. Clark, Tracy Earl, Clephane, Lewis Painter, Clisdell, Percy Alfred, Cochrane, Hayward, Cole, Ray Nall, Conable, George Willard, Cook, Charles Chauvan, Cooley, Thomas Hewitt, Corlett, Thomas Gardiner, Cornell, Charles Lorin, Cowles, Joseph Walker, Crissey, Howard Barna, Crist. Arthur, Crouch, Nelson Seymour,

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Cruikshank, John. Optional Worcester, Mass., Cutting, Maria Eliza, Dalton, William, Mechanical Eng. Utica, South Egremont, Mass., M. Eng. Dalzell. Chester Goodale, Optional Danziger, Henry, Jr., Syracuse, Datcher, Jane Elleanor, Science Washington, D.C., Fort Jackson, Mech. Eng. Davis, Francis Daniel, Huntington, Ind., Optional Day, Robert Jacob, Crown Point, Deane, John Pitt, Arts Deuchler, Charles Henry, Arts Lyons, Science Devendorf, Irvin Snell, St. Johnsville, Rushville, Ind., Civil Eng. Dill, William, Architecture Fairport, Dobbin, Clarence Ephraim, Civil Eng. Franklin, N J., Dodd, Franklin Marcus Grant, Civil Eng. Drake, David Clarence, Southampton, Elect. Eng. Dunn, Thomas Chace, Providence, R. L. Optional Ellenville, Dutcher, George Lorin, Science Dygert, Bertha Eugenia, Phænix, Optional Titusville, Pa., Eaton, Henry Morris, Ehle, Louis Carl, Fort Plain, Letters New York City, Philosophy Eidlitz, Ernest Frederick, Optional Ithaca, Ellis, Edith Anna, Optional Ellis, Joseph William, Havana, Buffalo, Arts Ely, Fred William, Eschweiler, Alexander Chadbourne, Milwaukee, Wis., Architecture Chicago, Ill., Electrical Eng. Etheridge, Charles Locke, Huntington, Ind., Ewing, John Jackson, Elect. Eng. Architecture Malone, Fallows, Edward Thomas, Plainview, Minn., Mech. Eng. Felton, Ralph Potter, Philadelphia, Pa., Mech. Eng. Fergusson, Henry Alexander, Architecture Finder, Anthony Philip, Troy, Mech. Eng. Scranton, Pa., Fisher, Elbert Curtis, Fisher, Frederick George, Science Scranton, Pa., Fitz Gerald, William Gerald, Optional Fort Edward, Flack, John Edward, Lansingburgh, Mech. Eng. Optional Frankfort, Folts, Harry Gardner, Medina, Arts Ford, John, Mech. Eng. Ashtabula, Ohio, Ford, Paul Cooley, Jr., Halifax, Pa., Mech. Eng. Fortenbaugh, Samuel, Foskett, Harry Silas, Medina, Ohio, Optional Brooklyn, Mechanical Eng. Fragner, Albert,

Optional Carthage,

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Freeman, Frank Lovwell, Frost, Frank Leslie, Gasche, Ford Guy, Gay, Vivien, Genung, Nelson Howard, Gibb, Arthur Norman, Gifford, Herman Lincoln, Gifford, Robert Ladd, Gilbert, Emma Large, Gilchrist, Colin Bell, Gladden, George, Gleason, Hiram Ernest, Golden, Harry Eysaman, Goodwin, Frank Fairfield, Gorman, James Maurice, Graves, William Hagerman Gray, Henry Carpenter, Greenawalt, John Eckert, Gregg, Cecil Dudley, Griffin, Edwin Milton, Griffith, Charles Bower, Grover, Wilfred, Hagerman, Percy, Harris, Benjamin Marvin, Has Brouck, Howard, Hawley, Charles Gilbert, Healy, Louis Watres, Hepp, Gustus Brinton, Herron, William Henry Kerr, Herschel, Arthur Hobart, Hesse, Henry Albert, Higgins, Wilson Freeman, Hill, Ida May, Hill, Mary Bartlett, Hillebrand, Henry Thomas, Hinde, John Kelly, Hitchcock, Embury Asbury, Hitt, Samuel Edward, Hobson, Frank, Holmes, Theodore Sherry, Holt, Byron Webber, 13

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Poughkeepsie, Optional Brooklyn, Civil Engineering Civil Engineering Buffalo, Buffalo, Optional Addison, Optional Port Henry, Mech. Eng. Chemistry Buffalo, Mech. Eng. Williamsport, Pa., Chemistry Orient, Lockport, Mechanical Eng.

SPECIAL STUDENTS.

Barnes, Earl, Bartholomew, Daniel Page, Cary, Margaret Lovell, Chapman, Henry Otis, Chipman, Charles Clarence, Connor, Peter James, Corbett, Lee Cleveland, Daniell, William, Darling, Edward, Farmer, Myron Gardner, Gage, Jane Amy, Hamme, John Bernard, Hammond, Eugene Hubert, Havens, Charles Harrison. Heisler, Charles Louis, Heriot, John Charles Alison, Hitchcock, Jane Elizabeth, Hopkins, Eugene Lester, Hudson, Walter Cheney, Ittner, William Butts, Jones, Albert, Laird, Warren Powers, Lewis, James Scott,

History Ithaca, Dryden, Architecture Meadville, Pa., Mod. Languages Architecture Addison, Hope Valley, R. I., Architecture Hamilton, Ohio, Mech. Eng. Watkins, Agriculture Calumet, Mich., Mech. Eng. New York City, Mech. Eng. Architecture Gouverneur, East Saginaw, Mich., Mod. Lang. Architecture York, Pa., Architecture Kingston, Mass., Agriculture Benton Centre, Wapekoneta, Ohio, Mech. Eng. Architecture Georgeville, Can., Hist. and Lit. Amherst, Mass., Topeka, Kan., Architecture Architecture Auburn, Architecture St. Louis, Mo., Mech. Eng. Camlachie, Can., Architecture Ithaca, Denver, Col., Entomology, summer course Portland, Me., Literature Architecture New York City, Agriculture Rossville, Md., Scottsville, Agriculture

Lilly, Stella Lucinda, McComb, James Jennings, Jr., Mace, Charles Ross, McVean, Russell,

Architecture Seville, Ohio, Martin, Clarence Augustine, Architecture Pittsburgh, Pa., Orth, Alexander Beatty, Ithaca, Chemistry Platt, Chester Childs, Architecture Buffalo, Porter, Edna, Agriculture Potter, Edward Walden, Buffalo, Houghton, Mich., Mech. Eng. Rawlins, Samuel Vivian, Worcester, Mass., Hist. and Lit. Rogers, Sarah Elizabeth, Rosewarn, Gwinear, England, Scadden, Thomas, Electrical Eng. Shaw, Albert Morton, Coesse, Ind., Entomology, summer course Smith, Charles Melvin Woodruff, Cortland, Mechanical Eng. Snaith, Isabella Wilson, Architecture Ithaca, Vogel, Albert Frederick, Milwaukee, Wis., Architecture Wales, Alma Elizabeth, Corry, Pa.. Chemistry Wegener, Henry Frederick, M.D., Denver, Col., Entomology, summer course Wells, Ida, Amsterdam, Literature Frederica, Del., Lit. and Hist. Whitaker, Sarah Elizabeth, Menomonee, Wis., Wilson, Thomas Blair, Jr., History

Young, Lester James,

Oswego, Ill., Architecture

SUMMARY

Fellows,	9
Other Graduate Students,	32
Seniors,	97
Juniors,	145
Sophomores,	178
Freshmen,	323
Special Students,	45
Total in the University,	829

192

CATALOGUE OF STUDENTS.

SUMMARY BY	Y CO	URS	SES.	UNDERGRADUATES.						
			Seniors	. Juniors.	Sopho- mores.	Fresh-	ĩo	al.		
Arts			8	9	9	19	2.90	45		
Philosophy.		-	16	14	18	11		58		
Science			8	11	18	19		57		
Letters			20	30	21	11		82		
Agriculture			1	7	9	16		3 3		
Architecture			6	13	7	19		45		
Civil Engineering			19	24	23	46	1	12		
Electrical Engineer	ing		7	7	17	28		59		
Mechanical Engine	ering		10	17	28	54]	.09		
Chemistry	0		1	1	3	2		7		
Medical Preparator	у				1	2		3		
Optional	•		1	12	24	96]	33		
Total			97	145	178	323		743		
SUMMARY BY RESIDENCES.										
New York		497	· N	orth Card	olina.			3		
Pennsvlyania.	•	54	Te Te	exas.	,			3		
Ohio.		53	Ca	alifornia,				2		
Illinois.		27	· v	irginia, '				2^{\cdot}		
Massachusetts.	•	24	M	innesota,				2		
Indiana,		15	5 N	ebraska,				2		
New Jersey,		13	B Te	ennesee,				2		
Wisconsin,		13	8 A	labama,				1		
District of Columbi	a,	13	\mathbf{F}	lorida,				1		
Missouri,	·	Q) K	entucky,				· 1		
Connecticut,		8	8 M	lississippi	,			1		
Michigan, .		8	8 O	regon,				1		
Maine,		($\mathbf{S} = \mathbf{S}$	outh Car	olina,			1		
Colorado,		Ę	5 D	akota,				1		
Delaware,		ļ	5 U	Ttah,				1		
Iowa,		ł	5 V	Vashingto	on Terr	itory,	•	1		
Louisiana,		ļ	5 C	anada,			•	9		
Maryland,			5 E	ngland,			•	2		
Vermont,		ļ	5 G	ermany,			•	2		
Georgia, .		4	4 J	apan,			•	2		
Kansas,		4	4 B	Brazil,				2		
Rhode Island, .		4	4 C	uba, .				1		
New Hampshire,			3 N	Vicaragua	') •		•	1		
				Total	, •		•	82 9		

JUNE 17, 1886.

I. THESES OF CANDIDATES FOR A BACCALAUREATE DEGREE.

THESES PRESENTED TO THE PUBLIC.

Oration—Emilio Castelar, ELIAS DAVID ABINUN DE LIMA, New York City **Disguisition**—Is Hawthorne a True Delineator of Puritan New-England, ANNA MARIA PADDOCK, Auburn *Essay—The Theory of Evolution in Harmony with the Belief in God and Immortality, STANLEY STONER, Griggsville, Ill. **Dissertation**—The French Literature of the Second Empire, HENRY CHARLES CHARPIOT, Denver, Col. Essay-Victor Hugo as a Poet, HELEN KITTREDGE, Boston, Mass. Oration—The Emancipation of Italy, JOSEPH MACAUSLIN ROMNEY, Salt Lake City, Utah THESES RECEIVING HONORABLE MENTION. The Early History of Tracery, Ennis RAYMOND AUSTIN, Owasco Fungi Injurious to Vegetation, THOMAS LAFAYETTE BRUNK, Ottawa, Ill. Arbitration vs. Industrial Reprisals in Labor Disputes, JOHN ROBB CALDER, Alexandria, Pa.

* Excused from speaking.

The Rise and Decline of Byzantine Architecture, JESSIE JANE CASSIDY, Brooklyn The Hamilton Group as Represented in the Cayuga Lake ADDISON LUZERNE COVILLE, Oxford Section, The Historical Development of the Republican Party, FREDD HALL DUNHAM, Johnsonsburg A Determination of the Laws of Variation of Resistance with Temperature in Aluminum Bronze, GEORGE BROWN DUSINBERRE, Geneva BOYD EHLE, Fort Plain A Study in Railway Economics, Agricultural Rent, CHARLES HENRY HULL, Ithaca Prison Labor, GEORGE MCCANN, Elmira The Mechanical Equivalent of Light, ERNEST GEORGE MERRITT, Indianapolis, Ind. STEPHEN RYDER, Carmel. Immigration, Its Evils and their Remedies, ALGERNON SIDNEY NORTON, Cortland Biological Analysis of Springs near Ithaca, OTIS EZRA PEARCE, North Hannibal Federal Aid to Internal Improvements, CHARLES WELLINGTON RANSOM, Ellenburg Re-location of the Delaware, Lackawanna, and Western Railroad at Ithaca, FRANK WILLIAM SHEPARD, Medina, O. Secularization in Education, EVA ANNA SMITH, West Winfield The Epithelium of the Mouth-cavity and (Esophagus of Amphibia, HENRY ELIJAH SUMMERS, Rochester The Storm which Threatens India, HOBART CHATFIELD TAYLOR, Chicago, Ill. Friction Rollers, CHARLES BENJAMIN WING, Willow Brook II. THESES OF CANDIDATES FOR ADVANCED DEGREES.

In Botany—History and Biology of the Pear Blight, JOSEPH CHARLES ARTHUR, B.S., M.S. In Natural Science—The Geology and Vein Structure of Southwestern Colorado, THEODORE BRYANT COMSTOCK, B.S.

In Greek Philology—Variations from Rhetorical Symmetry in the Orations of Lysias,

RUTH BARKER FRANKLIN, A.B. (Smith Col.)

- In Classical Literature—A Discussion of the Constructions found in General Conditions in the Latin Literature before Varro, ALICE GODDARD, A.B.
- In Electrical Engineering—Electro-motors, and the Electrical Transmission of Power,

HENRY HUMPHREY, A.B. (Ohio Univ.)

In Mathematics—The Fundamental Properties of the Conic Treated by Modern Geometric Methods,

HIRAM JOHN MESSENGER, JR., Lit.B.

 In Natural Science—A Study of the Fossil Faunas of the Middle and Upper Devonian along the Unadilla River, N. Y.,
 CHARLES SMITH PROSSER, B.S.
 In Civil Engineering—Discussion of the Trapezoidal Formula for the Calculation of Pressures in High Ma-

sonry Dams, IRA ALEXANDER SHALER, B.C.E. In Mechanical Engineering—The Fly-wheel Governor,

ALBERT WILLIAM SMITH, B.M.E. In Electrical Engineering—The Construction and Performance of Incandescent Lamps, WILLIAM SAVAGE TURNER, B.S. (Knox Col.) In Modern Languages—The Syntax of the Middle High German Popular Epics, and of Modern German, CHARLES BUNDY WILSON, A.B.

III. PRIZES AWARDED.

THE WOODFORD PRIZE IN ORATORY TO ELIAS DAVID ABINUN DE LIMA.

THE JUNIOR PRIZES IN ORATORY.

The first to The second to

HORACE WHITE GEORGE MONTANYE MARSHALL

THE SIBLEY PRIZES IN MECHANIC ARTS.

The first to The second to The third to The fourth to The fifth to

GRANT COVELL GEORGE WELTON BISSELL CHARLES BROWNING, JR. JESSE JAMES HOPKINS ALFRED HENRY ELDREDGE

IV HONORS.

HONORS FOR GENERAL EXCELLENCE.

ENNIS RAYMOND AUSTIN, CHARLES HINCKLEY BAKER, PHILIP PRICE BARTON, JESSIE JANE CASSIDY, Addison Luzerne Coville, George Brown Dusinberre, Boyd Ehle, Fay Martin Fitts, Herbert Hume Gadsby, Gilbert Dennison Harris, Abraham Lincoln Hawley, Charles Henry Hull, Abraham Loeser, Ernest George Merritt,

RACHEL MEYER, ALLYN AUGUSTUS PACKARD, ANNA MARIA PADDOCK, OTIS EZRA PEARCE, CHARLES WELLINGTON RANSOM, JOSEPH MACAUSLIN ROMNEY, STEPHEN RYDER, FRANK WILLIAM SHEPARD, EVA ANNA SMITH, STANLEY STONER, HENRY ELIJAH SUMMERS, CHARLES HERBERT THURBER, CHARLES DAVID WHITE, CHARLES BENJAMIN WING.

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SPECIAL FINAL HONORS.

HENRY CHARLES CHARPIOT, French. HENRY ELIJAH SUMMERS, Entomology.

Special Mid-Course Honors.

ELBERT JAMES ALLENDORF, French. LYMAN AUSTIN BEST, Mathematics. ALVAH DEYO HAS BROUCK, Mathematics. HERBERT MARLOW LOVELL, History. ALBERT ELBRACHT METZGER, German. MARY ANNA WIDMAN, Mathematics. ROYAL EDWARDS WILBUR, History. ELLSWORTH DAVID WRIGHT, Mathematics.

V. DEGREES CONFERRED.

BACHELORS OF ARTS.

HOWARD, FRANK THURBER, CALDER, JOHN ROBB, NORTON, ALGERNON SIDNEY, EMORY, ARTHUR THEODORE, PERKINS, ALBERTUS DELOS, ·GADSBY, HERBERT HUME, WHITE, WILLIAM WILSON.

> BACHELOR OF LITERATURE. PADDOCK, ANNA MARIA.

BACHELORS OF PHILOSOPHY

In Philosophy.

CAHILL, ROSE HANNAH, HARRIS, GILBERT DENNISON, HUGILL, WILLIAM EDGAR, MEYER, RACHEL,

RIDER, ORA PUTNAM, RUSSELL, ISAAC HOWARD, SWEET, JOSEPH FERRIS, THURBER, CHARLES HERBERT, WHEELER, AMOS.

In History and Political Science.

DOUD, ELI HORACE, BARTON, PHILIP PRICE, BEARDSLEY, HARRY MERCHANT, HULL, CHARLES HENRY

BACHELORS OF SCIENCE.

In Science and Letters.

BARNEY, WILLIAM GRANT, CAROLAN, HERBERT, CHAPMAN, ERNEST ALBERT. CHARPIOT, HENRY CHARLES, CURTIS, ANNIE NEALE, DUNHAM, ANDREW ELLSWORTH, DUNHAM, FREDD HALL, ELTINGE, MAURICE WURTS, FITTS, FAY MARTIN, GRAY, MACOMB BYRON, KITTREDGE, HELEN, LIMA, ELIAS DAVID ABINUN DE, LOESER, ABRAHAM, MCCANN, GEORGE, FRANCIS, CHARLES SPENCER (1877)

NOURSE, SARAH CORNELIA, RANSOM, CHARLES WELLINGTON, ROMNEY, JOSEPH MAC AUSLIN, RUNNER, EMMA AVALYN, SACKETT, JOHN THOMPSON, SAGE, ADOLPHUS HIRAM, SCHLESINGER, MARK MAYER, SEYMOUR, JOHN PLINY, SMITH, EVA ANNA, SMITH, EDWARD LEROY, STONER, STANLEY, STORY, CHARLES BUTTS, TAYLOR, HOBART CHATFIELD WOOD, PHŒBE JANE,

In Science. Ryder, Stephen.

In Mathematics.

WIGHTMAN, EDWARD DANIEL.

In Natural History.

COVILLE, ADDISON LUZERNE, PEARCE, OTIS EZRA, SUMMERS, HENRY ELIJAH, WHITE, CHARLES DAVID.

In Agriculture. Brunk, Thomas Lafayette.

In Architecture.

AUSTIN, ENNIS RAYMOND, CASSIDY, JESSIE JANE, COX, WILLIAM STAKELY, Nettleton, James Burritt, Packard, Allyn Augustus, Pierce, George Henry

In Electrical Engineering.

FRENCH, ELDON LEWIS,

UPTON, WALLACE LINCOLN.

TRENCH, LILDUN LIEWIS, UPIUN, WALLAU

CIVIL ENGINEERS.

BAKER, CHARLES HINCKLEY, BAKER HOWARD WINFIELD, EHLE, BOYD, HAWLEY, ABRAHAM LINCOLN, INGALLS, OWEN LOVEJOY, Olin, Franklin Walter, Rutledge, Arthur, Shepard, Frank William, Towl, Forrest Milton, Wing, Charles Benjamin.

MECHANICAL ENGINEERS.

In Electrical Engineering.

DUSINBERRE, GEORGE BROWN, MERRITT, ERNEST GEORGE, RAICHLE, FRANK GODFREY.

In Mechanical Engineering.

DARLINGTON, WILLIAM, NEF, JOHN JACOB, DAY, WILLIAM ASHER, PATTERSON, WEBSTER, RILEY, WILLIAM HERMON.

> MASTERS OF SCIENCE. HUMPHREY, HENRY, A.B. (Ohio Univ.), PROSSER, CHARLES SMITH, B.S., TURNER, WILLIAM SAVAGE, B.S. (Knox, Col.).

MASTERS OF ARTS.

FRANKLIN, RUTH BARKER, A.B. (Smith, Col.), GODDARD, ALICE, A.B., WILSON, CHARLES BUNDY, A.B.

> MASTER OF CIVIL ENGINEERING. SHALER, IRA ALEXANDER, B.C.E.

MASTER OF MECHANICAL ENGINEERING. Smith, Albert William, B.M.E.

DOCTORS OF SCIENCE.

ARTHUR, JOSEPH CHARLES, B.S., M.S. (IOWA Agr. Col.), Comstock, Theodore Bryant, Agr.B., B.S.

> DOCTOR OF PHILOSOPHY MESSENGER, HIRAM JOHN, Lit.B.

CERTIFICATES.

In the Medical Preparatory Course.

HALL, FANNY SARAH CROSSETT,

HAMANT, IRVING LOUIS.

In Military Science.

BARNEY, WILLIAM GRANT, CHARPIOT, HENRY CHARLES, DUSINBERRE, GEORGE BROWN, STONER, STANLEY,

SUMMERS, HENRY ELIJAH, SACKETT, JOHN THOMPSON, TAYLOR, HOBART CHATFIELD, TOWL, FORREST MILTON,

WING, CHARLES BENJAMIN.

ASSOCIATE ALUMNI.

By the Charter of the University the graduates are entitled to elect one of the Board of Trustees each year At a meeting called for the purpose, and held on Wednesday, June 26th, 1872, the day preceding the Annual Commencement, representatives of all the classes that had graduated being present, the following organization was effected.

ARTICLES OF ASSOCIATION ADOPTED JUNE 26, 1872.

Amended June, 1873.

1. The Alumni of Cornell University hereby constitute themselves an association to be known by the name of the Associate Alumni of Cornell University

II. The object of this association is declared to be to promote in every proper way the interest of the University, and to foster among the graduates a sentiment of regard for each other, and attachment to their Alma Mater.

III. All graduates of this University, who, by their diplomas, are entitled electors of the University, are members of this association. All members of the Faculty of this University are honorary members of this association.

IV The officers of this association shall consist of a president, and one vice-president from each graduating class, a corresponding secretary, a recording secretary and treasurer.

V This association shall meet annually on the day preceding Commencement, at ten o'clock in the forenoon,

VI. Any proposition to alter or amend these articles of association must be made at a regular meeting and have the assent of two-thirds of the members present.

By an amendment to the charter of the University, passed May 15, 1883, permitting members of the Alumni not present in

person to vote by written ballot at the annual election of Trustees, the Treasurer is required to keep "a registry of the signature and address of each alumnus." It is therefore important that each alumnus keep the Treasurer informed of his full address (in cities, street and number) and notify him immediately of any change.

Officers for 1886-87

President—HENRY ALTMAN, '73, Buffalo. Corresponding Secretary—C. H. ESTY, '76, Ithaca. Recording Secretary—G. W HARRIS, '73, Ithaca. Treasurer—H. M. HIBBARD, '74, Ithaca. Executive Committee—C. H. ESTY, G. W. HARRIS, H. M. HIB-BARD, ex officio; R. H. TREMAN, '78, F M. LEARY, '82.

OFFICERS OF LOCAL ALUMNI ASSOCIATIONS.

CENTRAL NEW YORK ASSOCIATION.

President-Hamilton S. White.

Vice-President—S. F Belknap. Secretary—C. C. Chase. Treasurer—W. K. Pierce.

CHICAGO ASSOCIATION.

President-D. F Flannery

Secretary-C. S. Harmon, First National Bank Building, Chicago, 111.

ITHACA ASSOCIATION.

President—C. E. Van Cleef. Vice-President—William R. Dudley Secretary—D. F Van Vleet. Treasurer—Wm. Hazlitt Smith. Members of Executive Committee — Above-named officers, ex officio., G W Harris, J S. Waterman.

MINNESOTA ASSOCIATION.

President—W. O. Bates, '75. Vice-President—E. H. Morse, '79. Secretary—E. H Crooker, '83, 319 Nicollet Ave., Minneapolis. Treasurer—F. C. Lawrence, '81. Directors—J H. Skinner, '81, C. H. Dubois, 72; C. S. Leeds, '80 14

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ASSOCIATE ALUMNI.

NEW ENGLAND ASSOCIATION.

President—Charles B. Wheelock. Vice-President—Miss Robina S. Smith. Secretary and Treasurer—Miss Edith W Bradford, 375 Harvard Street, Cambridge, Mass. Executive Committee—Frank W Proctor, Miss Alla W Foster, and the above officers.

NORTHWESTERN ASSOCIATION.

President-P H. Perkins. Vice-President-D. R. Martin. Secretary-H. B. Seely, Opera House Building, Chicago, Ill. Treasurer-A. W Bulkley

NORTHEASTERN PENNSYLVANIA ASSOCIATION.

President—R. B. Howland. Vice-Presidents—M. G. Peters, T. J. McConnon, J. L. Stone. Secretary—H. M. Streeter. Cor Secretary and Treasurer—F. L. Brown.

Executive Committee—R.[•] B. 'Howland,' R. H. Patterson, F L. Brown, J L. Stone.

PHILADELPHIA ASSOCIATION.

President—Charles Barclay, '76.
Vice-Presidents—A. J Loos, '77, M. R. Conable, '76.
Corresponding Secretary—J L. Knapp, '80.
Recording Secretary—G. B. Davidson, '84.
Treasurer—J M. Dodge, '72.
Executive Committee—M. M. Garver, '76, E. M: Howard, '73,
'W C. Russell, Jr., '80, W H. Smith.

WASHINGTON ASSOCIATION.

President—Thomas Hampson.

Vice-Presidents-D. E. Salmon, H. W Spofford, and L. O. Howard.

Secretary and Treasurer—Percy E. Clarke, Room 44, U S. Patent Office.

Members of Executive Committee — Above-named officers, ex officio.

Other associations have not reported their officers.

EXAMINATION PAPERS.

ENTRANCE EXAMINATIONS.

ARITHMETIC.

 Add 1 of 2 of 28 34 to 3391 44 to 3105.

 When it is noon at St. Paul (long. 93° 5' w.), it is at Bangor 1^{hr} 37^{min} 12^{sec} P.M., what is the longitude at Bangor?

 Multiply 3.145 by 4.297

4. If 8 horses in 30 days eat $3\frac{1}{2}$ tons of hay, how long will $4\frac{9}{10}$ tons last 10 horses, 15 cows and 7 sheep, each cow eating $\frac{4}{10}$ as much as a horse, and each sheep eating $\frac{1}{2}$ as much as a cow?

5. In what time at 6 per cent. will \$240 amount to \$720?

-6. A debt is to be paid $\frac{1}{8}$ down, $\frac{1}{4}$ in 6 months, $\frac{1}{8}$ in 8 months, and the balance in a year, if the payments be all converted into one, what is the equated time of payment?

7. Find the cube root of 1729 to four decimal places.

ENGLISH GRAMMAR.

I.

1. Write a simple, declarative, transitive sentence. Change this sentence so that it shall be:

a. Progressive. b. Emphatic. c. Interrogative. d. Contingent (subjunctive). e. Exclamatory. f. Passive.

2. Rewrite the following sentences, expanding the italicized words (1) into phrases, (2) into clauses: a. The evil days approach swiftly. b. A beautiful thing is a lasting joy

3. Use as the subject of a sentence *a*. An infinitive. *b*. A pronominal adjective. *c*. A verbal noun. *d*. A clause.

4. Mention three methods of distinguishing gender and give examples of each.

5. Inflect fully the following words sheep, scissors, that, thou, what, child, woman.

6. a. Copy the following extract with proper capitalization, punctuation, and orthography

> glance an eye of pitty on his lossess that have of late so huddled on his back enow to press a royal merchant down and pluck commiseration of his state from brassy bosums and rough hearts of flint from stubborn turks and tarters never trained to offises of tender curtesy

b. Turn the above into ordinary prose.

II.

Justify or correct the following sentences

1. A keen eye and a graphic pen see and set down for us the characteristic details.

2. When perspective was first discovered everybody amused themselves with it.

3. I am one of those who cannot describe what I do not see.

4. The electric light with powerful reflectors are the means to be employed.

5. He told the coachman that he would be the death of him if he did not take care what he was about and mind what he said.

6. He had reason to believe that the offense was not an oversight but premeditated, and for inferring that the offender was malicious and a coward.

III.

Write a composition of at least twenty sentences on any one of the following subjects

"Incidents of my journey to Ithaca," "History of a day in the last vacation," or any subject assigned by the examiner from the books announced in the University Register for 1886.

GEOGRAPHY

1. Give the boundaries of your State, with sketch map, locating three chief cities, and the main rivers.

2. What countries would be crossed by a direct line from London to Borneo?

3. Name the divisions of South America, in the order of their appearance around the coast margin.

4. Name five chief political States of Europe, stating where they touch each other.

5. Bound three States of the United States, all of the adjacent States of which are different.

6. Name those States which are touched by the Mississippi River.

7 What are the chief ports on the British coast?

8. Define Latitude, Longitude, Meridian, Zone, and give illustrations of each.

8. On sailing from San Francisco to Victoria, Australia, what islands might be touched on the direct course.

10. Define, geographically, Cape Hatteras, Cuba, Madagascar, Calcutta, Greenland, and Sahara.

PHYSIOLOGY

What kinds of food can be digested in the small intestine?
 Give a list of the digestive juices, and state what kind or kinds of foods each can digest and the exact changes produced in each kind of food by the digestion.

3. Give a diagram of the left side of the heart and its vessels, name all the parts and indicate by arrows the direction of the blood current.

4. Describe the act of inspiration, give a diagram of the thorax, as if the ventral wall were removed, and show the position of the diaphragm at the end of inspiration.

5. What respiratory changes occur in the blood during its passage through the vessels of the lungs?

PLANE GEOMETRY

1. If a perpendicular to a straight line be drawn at its middle point

(a) Every point in the perpendicular is equally distant from the extremities of the line.

(b) Every point without the perpendicular is unequally distant from the extremities of the line.

2. Given two sides of a triangle and an angle opposite one of them, construct the triangle. Eight cases.

3. Divide a given straight line internally in extreme and mean ratio.

4. Construct a polygon similar to a given polygon P and equivalent to a given polygon Q.

5. The circumferences of two circles are to each other as their radii, and their areas are as the squares of their radii.

6. If ABC be an equilateral triangle, and if BD, CD bisect the angles B_1 , C_2 , the lines DE_2 , DF parallel to AB_2 , AC_2 , divide BC into three equal parts.

ELEMENTARY ALGEBRA.

- 1. Divide $\frac{a^3 a^3b + ab^3}{a^3 + b^3}$ by $\frac{a}{a + b^3}$
- 2. Find the fourth root of

 $16a^{4} - 96a^{3}x + 216a^{2}x^{3} - 216ax^{3} + 81x^{4}$

- 3. Find the square root of $49 + 12 \sqrt{5}$.
- 4. Find the highest common divisor of $x^{2} + 11x + 30$, $2x^{3} + 21x + 54$, $9x^{3} + 53x^{2} - 9x - 18$.
- 5. Find the values of x, y, z from the equations

$$y+z=2yz, x+z=3xz, x+y=4xy.$$

6. Find the values of x from the equation

$$\sqrt{x+12} + \sqrt[4]{x+12} = 6$$

The plate of a looking-glass is 18 inches by 12, it has a plain frame of uniform width whose surface equals that of the glass, find the width of the frame.

SOLID GEOMETRY AND CONIC SECTIONS.

1. The sum of any two face angles of a triedral angle is greater than the third.

2. Any two rectangular parallelopipeds are to each other as the products of their three dimensions.

3. If the base of a cone be a circle, every section parallel to the base is a circle.

4. The area of a zone is equal to the product of its altitude into the circumference of a great circle.

5. Determine the locus of the centers of sections of a sphere made by planes through a given straight line.

6. The semi-transverse axis of an ellipse is a mean proportional between the distance from the center to the foot of the tangent and the distance from the center to the foot of the ordinate of the point of contact.

7 If a point be within an hyperbola, the difference of its focal lines is greater than the transverse axis if a point be without, the difference is less than the transverse axis.

HIGHER ALGEBRA.

1. The continued product of three numbers in arithmetic progression is 640 and the third is four times the first, what are the numbers?

2. What is the present value of three annual payments of \$1000 each to be made in 1, 2, and 3 years, interest being compounded at 5 per cent. a year?

3. Expand $(a + \sqrt[4]{a^2-1})^6 + (a - \sqrt[4]{a^2-1})^6$ and arrange the result to descending powers of a.

- 4. Given $\log 2 = .30103$, find $\log \sqrt{.125}$.
- 5. Resolve into partial fractions

$$\frac{2x-3}{(x-2)(x-3)^2}$$

6. If a and b be substituted for x in the expression

 $x^{n} + px^{n-1} + qx^{n-2} + + ux + v$, and if when a is put for x the result is positive, and when b is put for x the result is negative, then between a and b there is at least one real root of the equation

 $x^{n} + px^{n-1} + qx^{n-2}$ + ux + v = 0.

7. Given the equation $x^4 + 3x^3 - 5x^2 - 28x - 28 = 0$, find a com-

mensurable root and divide out the corresponding factor, find an incommensurable root of the depressed equation correct to two decimal places, and divide out the corresponding factor, solve the resulting quadratic equation.

TRIGONOMETRY

1. Write and prove the values of all functions of $\frac{1}{2}\pi + \theta$ in terms of functions of θ , when θ is an angle in the second quadrant.

2. Construct the angles whose sine is $-\frac{2}{3}$, whose cosine is $\frac{1}{4}\sqrt{3}$, whose tangent is -1.

3. Prove that $2\sin^2\frac{1}{2}\theta = 1 - \cos\theta$.

4. Show how to solve a plane triangle, having given two sides and an angle opposite one of them. Write and prove the formulæ, and exhibit the special cases by diagram.

5. Given a=25.3, b=136, $C=98^{\circ}15'$ Solve the triangle, using logarithms.

6. In a spherical triangle ABC, $a=100^{\circ}$, $b=90^{\circ}$, $B=80^{\circ}$; write and prove all the formulæ necessary for the solution.

7 In an oblique spherical triangle prove that

$$\cos \frac{1}{2} B = A / \frac{\sin s \cdot \sin (s-b)}{\sin c \cdot \sin a}.$$

EXAMINATION PAPERS.

FRENCH.

I.

Translate into French the following sentences:

1. If you see my sister, do not forget to tell her what I have told you, but do not show her the letter, I shall send it to her to-morrow

2. My friend, I ask you to accompany me to-morrow to the country; promise it to me.

3. It was this river on whose banks the Romans gained their first victories.

4. Alexander said one day to Diogenes "I see that you want many things, I should be glad to assist you, ask of me anything you like."

5. Spring and autumn are two fine seasons, the former gives us flowers and the latter fruits.

6. I shall depart in a fortnight for America, the journey will be effected in twelve days. I shall stay a week in New York, and expect to be back to England in half a year.

7 Did it often rain when you were in Switzerland? No, but it used to snow very often.

8. What will you have, wine or water? I will take a glass of water, I never drink wine.

9. My brother's books are on the table. Where are yours and your sister's?

10. The room in which I live is eight feet high and fourteen wide. How large is yours?

11. Should my friend bring me my hat, tell him to put it in my room, and call on my mother, who wants to see him.

12. The letters which I wrote were sent to the post-office an hour ago.

II.

Translate

Le jour où elle devait paraître au tribunal, elle s'était habillée avec simplicité, mais avec une sorte de soin et d'élégance. Sa robe était blanche et ses cheveux descendaient sur ses épaules. Toutes les femmes de la chambrée se pressaient autour d'elle en pleurant et prenaient sa main pour la baiser, elle rencontra sur son passage M. Beugnot, et en souvenir de quelques controverses politiques "Adieu, monsieur, faisons la paix, il est temps," dit-elle, en lui serrant la main, et comme il avait les larmes aux yeux, elle ajouta "du courage."

Elle avait été plusieurs fois interrogée, par forme d'instruction préalable. A l'audience du tribunal, elle fut traitée avec dureté; on lui adressa des questions outrageantes, le bulletin du tribunal abrége ainsi le compte rendu de l'audience.

"L'accusée a dit pour sa défense qu'elle n'avait jamais eu de correspondances avec Brissot, Pétion, ni Gorsas, qu'elle avait toujours estimé Brissot et ses dignes amis, parce qu'ils avaient du talent et de la bonne foi. Elle a ensuite fait lecture d'un aperçu sommaire de sa conduite politique. Comme cet écrit respirait le fédéralisme d'un bout à l'autre, le président en a interrompu la lecture en observant à l'accusée qu'elle ne pouvait abuser de la parole pour faire l'éloge du crime, c'est-à-dire de Brissot et consorts.

Elle se tourna vers l'auditoire, disant "Je demande acte de la violence que l'on me fait." Le peuple, c'est-à-dire les assistants dont la salle avait été remplie, cria "A bas les traîtres! Vive la république!"—L'arrêt fut prononcé.

Le lendemain elle fut conduite à l'échafaud. Son courage ne l'avait point abandonnée, son visage était sans pâleur et souvent un sourire passait sur ses lèvres. Elle avait près d'elle un condamné pour fabrication de faux assignats, il était abattu et troublé. Elle tâchait de lui rendre quelque fermeté. Sur l'échafaud il parut désirer d'être le premier à passer sous le couteau. "Passez avant moi," dit elle, "je saurai attendre." Et regardant une grande statue de la liberté qu'on avait érigée sur cette place, elle disait "O liberté! que de crimes ils commettent en ton nom!" Ce furent ses dernières paroles. Trois jours après, aux abords d'un village près Rouen, fut trouvé un cadavre gisant sur la route c'était Roland, il s'était percé avec une canne à épée. Le conventionnel Legendre vint constater l'identité. Il avait écrit, avant de se tuer, quelques lignes "Puissent mes concitoyens prendre des sentiments plus humains! Le sang qui coule par torrents dans ma patrie me dicte cet avis. L'indignation m'a fait quitter ma retraite au moment où j'ai appris qu'on avait égorgé ma femme. Je n'a pas voulu rester plus longtemps sur une terre souillée de crimes!"

Le représentant en mission qui annonçait cette nouvelle à la Convention proposait de placer sur la sépulture de Roland un poteau infamant.—*Tableaux de la Révolution Française*.

III.

Translate at sight

Charles VII *fit* deux choses qui affermirent et régulerisérent les conquêtes de ses prédécesseurs. Il *rendit* la taille et l'armée permanentes.

Par l'armée permanente, le roi eut désormais entre les mains une force tout à lui, et toujours disponible pour *réduire* les nobles. Auparavant, l'armée était la réunion des seigneurs, *venus* à l'appel du roi, pour servir durant un temps assez courtdéterminé par la loi féodale.

Ce temps expiré, les seigneurs se séparaient, rentraient chez eux, l'armée était dissoute. Et puis, naturellement, cette armée de l'esprit féodal n'était pas très-maniable. Supposez que le roi voulut soumettre un de ses grands vassaux révolté, il arrivait d'abord que tous les petits seigneurs dépendant de ce grand vassal, au lieu de se rendre a l'armée du roi, allaient au contraire composer l'armée du grand vassal, et soutenir la révolte. Ceux mêmes qui venaient au roi ne se souciaient pas, pour la plupart, de lui donner un triomphe complet, ils craignaient de trop vaincre sentant bien qu'il y avait entre eux et le vassal communauté d'intérêts. Ainsi l'armée féodale n'était ni commode ni sûre pour les rois, tandisque l'armée permanente, composée d'hommes qui se destinaient à vivre de la solde du roi, qui étaient sortis de leur foyer et de leur famille pour toujours, n'avait d'autre intérêt que du maître qui payait.

-LACOMBE, Petite Histoire.

L'homme n'est qu'un roseau, le plus faible de la nature, mais c'est un roseau pensant. Il ne *faut* pas que l'univers entier s'arme pour l'écraser. Une vapeur, une goutte d'eau suffit pour le tuer. Mais quand l'univers l'écraserait, l'homme serait encore plus noble que ce qui le tue, parce qu'il *sait* qu'il meurt, et l'avantage que l'univers a sur lui, l'univers n'en sait rien. -Pascal.

Give the first pers. sing. of indic. pres., imperfect preterite, conditional and imperfect of subjunctive of verbs in italics.

GERMAN

Translate

*

*

*

(a)

Im Herbste kamen immer Holzhauer und fällten einige der grössten Bäume, das geschah jedes Jahr, und der junge Tannenbaum, der nun ganz gut gewachsen war, schauderte dabei; denn die grossen, prächtigen Bäume fielen mit Kna-

5 cken und Krachen zur Erde, die Zweige wurden ihnen abgehauen, die Bäume sahen ganz nackt, lang und schmal aus; sie waren fast nicht mehr zu erkennen. Aber dann wurden sie auf Wagen gelegt, und Pferde zogen sie davon, aus dem Walde hinaus.

10 Wo sollten sie hin? Was stand ihnen bevor?

Im Frühjahr, als die Schwalben und Störche kamen, fragte der Baum sie "Wisst ihr nicht, wohin sie geführt wurden? Seid ihr ihnen nicht begegnet?"

Die Schwalben wussten nichts, aber der Storch sah nach-15 denklich aus, nickte mit dem Kopfe und sagte: "Ja, ich glaube wohl! Mir begegneten viele neue Schiffe, als ich aus Aegypten flog, auf den Schiffen waren prächtige Mastbäume, ich darf annehmen, dass sie es waren, sie hatten Tannen-Geruch, ich kann vielmals grüssen, die prangen, die ²⁰ prangen!"

"O, wäre ich doch auch gross genug, um über das Meer hin fahren zu können! Wie ist denn eigentlich dieses Meer, und wie sieht es aus?"

"Ja, das zu erklären, ist zu weitläufig," sagte der Storch, ²⁵ und damit ging er fort.

"Freue dich deiner Jugend!" sagten die Sonnenstrahlen, "freue dich deines frischen Wachsthums, des jungen Lebens, das in dir ist!"

Und der Wind küsste den Baum, und der Thau weinte 30 Thränen über ihn, aber das verstand der Tannenbaum nicht.

(b)

Wenn unsere Beschreibung bisher nur den Begriff von einem engen, ja beinahe ängstlichen Zustande gegeben hat, so wird sie einen noch sonderbarern Eindruck machen, wenn wir ferner erzählen, wie diese gedrängte Lustbarkeit durch 35 eine Art von kleinem, meist scherzhaftem, oft aber nur allzuernstlichem Kriege in Bewegung gesetzt wird.

Wahrscheinlich hat einmal zufällig eine Schöne ihren vorbeigehenden guten Freund, um sich ihm unter der Menge und Maske bemerklich zu machen, mit verzuckerten Körnern 40 angeworfen, da denn nichts natürlicher ist, als dass der Getroffene sich umkehre, und die lose Freundin entdecke, dieses ist nun ein allgemeiner Gebrauch, und man sieht oft nach einem Wurfe ein Paar freundliche Gesichter sich einander begegnen. Allein man ist theils zu haushälterisch, um wirk-

45 liches Zuckerwerk zu verschwenden, theils hat der Missbrauch desselben einen grössern und wohlfeilern Vorrath nöthig gemacht. Es ist nun ein eigenes Gewerbe, Gypszeltlein, durch den Trichter gemacht, die den Schein von Dragéen haben, in grossen Körben zum Verkauf mitten durch 50 die Menge zu tragen.

Niemand ist vor einem Angriff sicher, jedermann ist im Vertheidigungsstande, und so entsteht aus Muthwillen oder Nothwendigkeit, bald hier bald da, ein Zweikampf, ein Scharmützel oder eine Schlacht. Fussgänger, Kutschenfahrer, Zu-55 schauer aus Fenstern, von Gerüsten oder Stühlen, greifen einander wechselsweise an, und vertheidigen sich wechselsweise.

(c).

Translate at sight

Einem Bauersmanne wurde zur Nacht sein schönstes Pferd aus dem Stalle gestohlen. Er reiste fünfzehn Stunden weit auf einen Pferdemarkt, ein anderes zu kaufen.

Aber sieh,—unter den feilen Pferden auf dem Markt erblickteer auch sein Pferd. Er ergriff es sogleich bei dem Zügel und schrie laut "Der Gaul ist mein! Vor drei Tagen wurde er mir gestohlen."

Der Mann, der das Pferd feil hatte, sagte sehr höflich "Ihr seid unrecht daran, lieber Freund. Ich habe das Ross schon über ein Jahr. Es ist nicht Euer Ross, es sieht ihm nur gleich."

Der Bauer hielt dem Pferde geschwind mit beiden Händen die Augen zu und rief "Nun, wenn Ihr den Gaul schon langehabt, so sagt, auf welchem Auge ist er blind?"

Der Mann, der das Pferd wirklich gestohlen, aber noch nicht so genau betrachtet hatte, erschrak. Weil er indess doch etwas sagen musste, so sagte er aufs Gerathewohl "Auf dem linken Auge."

"Ihr habt es nicht getroffen," sagte der Bauer, "auf dem linken Auge ist das Thier nicht blind."

"Ach," rief jetzt der Mann, "ich habe mich nur versprochen!" Auf dem rechten Auge ist es blind."

Nun deckte der Bauer die Augen des Pferdes wieder auf und rief "Jetzt is es klar, dass Du ein Dieb und ein Lügner bist. Da seht alle her, der Gaul ist gar nicht blind. Ich fragte nur so, um den Diebstahl an den Tag zu bringen."

Die Leute, die umherstanden, lachten, klatschten in die Hände und riefen "Ertappt, ertappt!" Der Rossdieb musste das Pferd wieder zurückgeben und wurde zur verdienten Strafe gezogen.

II.

Give the nominative and genitive singular, and nominative plural, with the proper definite article prefixed, of Herbste (1), Jahr (2), Erde (5), Schiffen (17), Sonnenstrahlen (26), Art (35), Maske (38), Körnern (39), Wurfe (43), Körben (49).

Decline in full der grössten Bäume (2), unsere Beschreibung (31), freundliche Gesichter (43).

Give the principal parts of kamen (1), geschah (2), gewachsen (3), zogen (8), stand (10), gesetzt (3 \ddot{o}), angeworfen (40), entdecke (41), sieht (42), tragen (50).

Conjugate sich umkehre (41), in the indicative preterit, wurden --gelegt (8-9), in the subjunctive perfect.

Explain the syntax of Jahr (2), ihnen (5), hin (22), wäre (21), Lebens (27), um (38), entdecke (41), Gesichter (43), zu (44), nöthig (47).

Account for the position of war (3), wurden (12), hat (37), angeworfen (40), umkehre (41), Missbrauch (45), gemacht (48).

Compare the following words in German high, near, much, brave, false, raw.

III.

Translate into German

The old letter-carrier came at eight o'clock this morning and brought me five long letters.

He might have had great honor, had he been faithful.

I really do not know who is right, you or I.

You can have as much of it as you will. I have not wished to reserve anything for myself.

Henry says that he has had nothing to do with it.

Write a brief letter in German, describing any city with which you are familiar

LATIN

Translate (at sight)

"Quid ergo mei consilii est? Facere, quod nostri maiores nequaquam pari bello Cimbrorum Teutonumque fecerunt, qui in oppida compulsi ac simili inopia subacti eorum corporibus, qui aetate inutiles ad bellum videbantur, vitam toleraverunt neque se hostibus tradiderunt. Cuius rei si exemplum non haberemus, tamen libertatis causa institui et posteris prodi pulcherrimum iudicarem. Nam quid illi simile bello fuit? Depopulata Gallia . Gimbri magnaque illata calamitate finibus quidem nostris ali-

quando excesserunt atque alias terras petierunt; iura, leges, agros, libertatem nobis reliquerunt; Romani vero quid petunt aliud, aut quid volunt, nisi invidia adducti, quos fama nobiles potentesque bello cognoverunt, horum in agris civitatibusque considere atque his aeternam iniungere servitutem? Neque enim ulla alia condicione bella gesserunt. Quod si ea, quae in longinquis nationibus geruntur, ignoratis, respicite finitimam Galliam, quae in provinciam redacta, iure et legibus commutatis, securibussubiecta perpetua premitur servitute."

-CAESAR, B. G., VII, 77.

Decline the phrases pari bello, ulla alia condicione.

Give the principal parts (in both voices, if both exist), of compulsi, tradiderunt, excesserunt, considere, redacta, premitur. Write a synopsis, in both voices, of the last two in the second person singular.

Compare pulcherrimum, adducti, potentes.

What is the meaning of the mood and tense of haberemus, ignoratis?

What is the meaning of the case of consilii, corporibus, aetate,

finibus, invidia, bello (before cognoverunt)?

Explain the composition of *invidia*, *servitutem*, *nationibus*, giving prefix (if any), root, and suffix or suffixes taken on in the growth of the word, with the meaning of each of these parts.

Translate (at sight)

Maximas tibi, Pansa, gratias omnes et habere et agere debemus, qui cum hodierno die senatum te habiturum non arbitraremur, ut M. Bruti, praestantissimi civis, litteras accepisti, ne minimam quidem moram interposuisti quin quam primum maximo gaudio et gratulatione frueremur Cum factum tuum gratum omnibus debet esse, tum vero oratio, qua recitatis litteris usus es declarasti enim verum esse id, quod ego semper sensi, neminem alterius, qui suae confideret, virtute invidere. Itaque mihi, qui plurimis officiis sum cum Bruto et maxima familiaritate coniunctus, minus multa de illo dicenda sunt, quas enim ipse mihi partis sumpseram, eos praecepit oratio tua. Sed mihi, patres conscripti, necessitatem attulit paulo plura dicendi sententia eius, qui rogatus est ante me, a quo ita saepe dissentio, ut iam verear ne, id quod fieri minime debet, minuere amicitiam nostram videatur perpetua dissensio.

-CICERO, Phil. 10, 1.

Translate into Latin

Nero, selecting from his army seven thousand of the best soldiers, and one thousand cavalry, left his camp so quietly that Hannibal knew nothing of his departure. Near Sena he found his colleague Livius, and in the night entered his camp, that his arrival might not be known to the Carthaginians. Hasdrubal, when he heard the trumpet sound twice from the Roman camp and saw the increased numbers, was no longer ignorant that both consuls were before him.

-LEIGHTON'S History of Rome, p. 151.

GREEK.

I.

GRAMMAR AND PRESCRIBED TRANSLATION.

Α. Ουτω δ' ἐχόντων εἰκὸς τοῖς μὲν πολεμίοις ἐναντίους εἶναι τοὺς θεούς, ἡμĩν δὲ συμμάχους, οϊπερ ἰκανοί εἰσι καὶ τοὺς μεγάλους ταχὺ μικροὺς ποιεῖν καὶ τοὺς μικρούς, κἂν ἐν δεινοῖς ὦσι, σώζειν εἰπετῶς, ὅταν βούλωνται. ἔπειτα δέ, ἀναμνήσω γὰρ ὑμᾶς καὶ τοὺς τῶν προγόνων τῶν ἡμετέρων κινδινους, ἕνα εἰδῆτε, • ἀς ἀγαθοῖς τε ὑμῖν προσήκει εἶναι σώζονταί τε σὺν τοῖς ὑεοῖς καὶ ἐκ πάνυ δεινῶν οἱ ἀγαθοί. ἐλθόντων μὲν γὰρ Περσῶν καὶ τῶν σὺν αὐτοῖς παμπληθεϊ στολω ὡς ἀφανιοιντων αῦθις τὰς ᾿Αθήνας, ὑποστῆναι αὐτοἰς ᾿Αθηναῖοι τολμήσαντες ἐνίκησαν αὐτούς. ΝΕΝ., Αnab., ΠΙ, 2, 10.

Explain the apparent exception in $\delta \pi \epsilon \rho$ to the general rule for accent. —Explain the datives $\dot{\alpha} \gamma \alpha \theta \delta \delta \tau \delta \lambda \omega$, and the subjunctive $\beta \delta \delta \lambda \omega \tau \alpha \iota$.—Where is $\dot{\alpha} \varphi \alpha \nu \iota \delta \delta \tau \tau \omega \nu$ formed ?—Show how the form is produced.

B. Κέκλυτε νῦν καὶ ἐμεῖο μάλιστα γὰρ αλγος ἰκάνει ὑυμὸν ἐμόν φρονέω δὲ διακρινθήμεναι ηδη ᾿Αργείους καὶ Τρῶας, ἐπεὶ κακὰ πολλὰ πέποσθε εἵνεκ' ἐμῆς ἕριδος καὶ ᾿Αλεξάνδρου ἕνεκ' ἀρχῆς. 100 ἡμέων δ' ὑπποτέρω θάνατος καὶ μοῖρα τέτυκται τεὑναίη αλλοι δὲ διακρινθεῖτε τάχιστα Πiad, III.

Give the Attic form of $\delta \iota \alpha \varkappa \rho \iota \nu \theta \eta \mu \varepsilon \nu \alpha \iota$ and $\pi \varepsilon \pi \sigma \sigma \theta \varepsilon$.—Show by what processes the present-stem of $\pi \varepsilon \pi \sigma \sigma \theta \varepsilon$ and $\tau \varepsilon \tau \upsilon \varkappa \tau \alpha \iota$ is formed from the theme or verb-stem.—Give the principal parts of $\pi \varepsilon \pi \sigma \sigma \theta \varepsilon$ and $\tau \varepsilon \theta \nu \alpha i \eta$.—Scan l. 101.

II.

TRANSLATION AT SIGHT AND COMPOSITION.

C. Μείνας δε ό Κύρος μετριον χρόνον αυτού σύν τώ στρατεύματι καί δηλώσας ότι ετοιμοί είσι μάχεσθαι εί τις έξέρχοιτο, ώς ουδείς αντεξήει, απήγαγεν οσον έδόκει καλώς έχειν και έστρατοπεδεύσατο. φυλακάς δε καταστησα μενος και σκοπούς προπεμψας, στας είς το μέσον συνεκάλεσε τους έαυτου στρατιώτας καί έλεξε τοιάδε. Άνδρες Πέρσαι, πρώτον μέν τους θεούς έγω επαινω όσον δύναμαι, και ύμεις δε πάντες, οίμαι νίκης τε γαρ τετυχίκαμεν και σωτηρίας.

XEN., Cyrop., IV, I.

The principal words needed in translating what follows may be found above in passage (C).

They would not have met with victory, if they had come forth then. For Cyrus was remaining there with his whole army, and showed that he was ready to fight.

SCHOLARSHIP EXAMINATIONS.

ARITHMETIC.

1. (a) Define a compound fraction, a complex fraction, a continued fraction, an approximate value of a fraction, the greatest common measure of two or more numbers.

(b) Explain, giving the reasoning how to simplify a compound fraction, how to find the greatest common measure of two numbers whose factors are not known.

(c) Simplify, and reduce to lowest terms, the expression

$$\frac{303\frac{2}{5}}{310\frac{3}{7}} \times \left(\frac{1}{4\frac{1}{1\frac{1}{3}}} + \frac{1\frac{2}{8}}{3\frac{1}{8}}\right)$$

(d) Express this result also as a continued fraction, and give its approximate values.

2. (a) Explain and demonstrate the method of checking addition, multiplication, division, etc., by casting out the nines, the elevens.

(b) Compute the square of the sum of the cubes of the first twelve prime numbers, and check all the work by casting out the nines.
3. Explain the decimal system of notation.

What is the value of a unit in the first, second, or third place to left or right of the decimal point, when the unit of measure is (a) The meter? (b) the gram? (c) the foot? (d) the pound avoirdupois?

4. A rectangular box, open at the top, has the outside dimensions $1.5 \times 1 \times 0.6$ meters, and is made of boards 3 centimeters thick and weighing 0.8 grams to the cubic centimeter What weight can the box carry, when floating in still water?

5. Find the face, and the present worth, of a note at 2 months that would realize \$4500 when discounted at bank, interest being 6 per cent. per annum.

6. A note for \$1000. dated Jan. 1, 1881, and bearing interest at 6 per cent., is endorsed with three payments of \$80 each made on Jan. 1 of 1882, 1883, and 1884 What is due on the note at settlement, Oct. 1, 1884, by the Merchants' Rule, and what, by the United States' Rule?

Explain the difference of the two results.

7 A note for \$1000, with interest at 7 per cent. payable annually, has run 3 years, but no interest has been paid. What is now the amount of the note (a) at simple interest, (b) at annual interest, (c) at compound interest?

8. In what ratio is an income from 4 per cent. stocks increased or diminished by selling them at $87\frac{1}{2}$ and buying 5 per cent. stocks at 105, the brokerage on buying and on selling being, each, $\frac{1}{4}$ of 1 per cent.?

9. Compute, to 3 decimals, the sixth root of the product

 $9.999 \times .0375 \times [\frac{1}{2} - (\frac{1}{2}, \frac{1}{3}) \times (\frac{1}{2}, \frac{1}{3}, \frac{1}{4}) - \text{etc.}],$ carrying all the work far enough to make the root accurate to within .0005. Abridged multiplication is preferred.

10. An alloy, formed without shrinkage or expansion from two metals whose specific gravities are 8.29 and 10.35, has a specific gravity of 9.87 How many grams of each metal in a kilogram of the alloy?

11 If Greenwich time be $5^{h} 8^{m} 12^{sec}$ later than Washington time, what is the difference in time between Washington and a point 87° 35' W of Greenwich?

12. A and B can do a piece of work in 6 days, A and C, in 7 days, B and C in 8 days. In what time can all three do it working together, and in what time can each one do it alone?

PLANE GEOMETRY

1. Show how to divide a given straight line into two parts so that the difference of their squares shall be equal to a given square. Make the process complete and purely geometrical.

2. A lotus-plant, growing from the bottom of a pool, has its tip a inches above the water When forced by the wind it is submerged at a distance of b inches measured along the surface. Find the depth of the water

3. The sides of a triangle are 5, 12, 13 feet. Find the length of the projection of the side 5 on the side 13, the perpendicular on the side 13 from the opposite angle and the area of the triangle.

4. From a given external point, to draw a pair of tangents to a given circle. Construct carefully and explain fully

5. The diagonals of a regular pentagon divide each other in extreme and mean ratio.

6. In any triangle the bisectors of the internal and external vertical angles divide the base internally and externally in the

ratio of the other two sides.

7 From (6), show how to construct a triangle, having given its base, the ratio of its two other sides, and its area.

8. Of all n-sided polygons inscribed in a given circle, the one that is regular has the greatest area.

9. Given the base and the vertical angle of a triangle, find the locus of its vertex also, the locus of its center of gravity, *i. e.*, of the intersection of its medial lines.

10. If three circles mutually intersect, the three chords of intersection meet at a point.

Show also what this becomes when any of its circles have *contact* instead of intersection.

11. A quadrilateral is inscribed in a circle, one side is a diameler, the other sides are a, b, c units in length. Show that the length of the diameter is given by the cubic equation

 $x^{3} - (a^{2} + b^{2} + c^{2})x - 2abc = 0.$

12. The sides of a triangle are a, b, c units in length. The bisector of angle (!) is drawn, and is terminated by the opposite side c. Show that the square of its length is

$$ab \left[\frac{c^2}{(a+b)^2} \right]$$

ALGEBRA.

1. Prove that multiplication is commutative and associative *i. e.*, that the product ab=ba, and the product (ab)c=a(bc), whatever the numbers a, b, c may be.

2. Reduce to its lowest terms the fraction

$$\frac{x^{b} + a^{2}x^{4} + bx^{3} + a^{2}x^{2} + a^{4}x + a^{2}b}{x^{4} + a^{2}x^{3} + 3bx^{2} + 2a^{2}bx + 2b^{2}}$$

3. Resolve into their prime factors

$$(x^{2} + y^{2} - z^{2} - u^{2})^{2} - 4(xy \pm zu)^{2}$$

$$x^{6} \pm (a^{6} - a^{3}b^{3})x^{3}y^{3} - a^{9}b^{3}y^{6}$$

4. A vessel A, whose capacity is a, is filled with a mixture of wine and water Another vessel B, whose capacity is b, is half filled with wine only B is filled from A, and then A is filled from B. A now contains r times as much wine as water What was the proportion of wine to water in A at first?

5. The equation $x^2 + x + 1 = x^2 + x - 1$ is not satisfied by any value of x, real or imaginary, but the equation obtained by squaring both members is satisfied by two values of x. Explain how this is possible and find these two values of x.

6. Rationalize the equations $x^{\frac{1}{2}} + y^{\frac{1}{2}} + z^{\frac{1}{2}} = 0$, $x^{\frac{2}{3}} + x^{\frac{1}{3}} - 1 = 0$.

7 Given
$$(a + \sqrt{b})^{\frac{1}{n}} = x + \sqrt{y}$$
, wherein a, b, x, y are rational,

and \sqrt{b} , $\sqrt[4]{y}$ are irrational prove that $(a - \sqrt{b})^{\frac{1}{n}} = x - \sqrt{y}$. 8. If α , β be roots of the equation $x^2 + px + q = 0$, form the equation whose roots are $\frac{1}{\alpha^2}$, $\frac{1}{\beta^2}$.

9. Prove that for real values of x the expression $\frac{x^2 - 4x - 11}{x - 6}$

cannot be made to assume any value lying between 6 and 10, but may take any other real value whatever

10. Find the three values of the cube root of unity (one real and two imaginary).

11. What are eggs a dozen when p eggs more in q cents worth lowers the price r cents a dozen?

12. Eliminate x, y from the two equations

$$\frac{x^3}{y^3} - \frac{y^3}{x^3} \equiv a, \qquad \frac{x^2}{y^2} + \frac{y^2}{x^2} = b,$$

and give the relation bewteen a and b in its simplest form.

LATIN.

Translate TRANSLATION AT SIGHT, GRAMMAR.

His rebus cognitis Caesar Labienum cum cohortibus sex subsidio laborantibus mittit, imperat, si sustinere non posset, deductis cohortibus eruptione pugnaret id nisi necessario ne faciat. Ipse adit reliquos, cohortatur ne labori succumbant, omnium superiorum dimicationum fructum in eo die atque hora docet consistere. Interiores desperatis campestribus locis propter magnitudinem munitionum loca praerupta ex ascensu temptant, huc ea, quae paraverant, conferunt, multitudine telorum ex turribus propugnantes deturbant, aggere et cratibus fossas explent, falcibus vallum ac loricam rescindunt.

Mittit primo Brutum adulescentem cum cohortibus Caesar, post cum aliis C. Fabium legatum, postremo ipse, cum vehementius pugnarent, integros subsidio adducit.

- CAESAR, B. G., VII, 86, 87

Write (in both voices, where both exist) the principal parts of *cognitis, succumbant, docet, praerupta*. Inflect the last two in the imperfect subjunctive. Write (in both voices) the terminations of the present subjunctive and the future indicative for each conjugation. Write (in both voices) the synopsis of *docet* in the third person singular.

Decline the phrases his rebus cognitis, eo die atque hora.

Compare superiorum, vehementius.

Explain the formation of *subsidio*, *munitionum*, giving clearly the meaning of each part (prefix, if existing, root, formative suffix or suffixes).

What is the meaning of the mood and tense of cognitis, pugnaret, adit? of the case of subsidio. eruptione, aggere? Translate

Quapropter desinant aliquando dicere male aliquem locutum esse, si qui vere ac libere locutus sit, desinant suam causam cum Chrysogono communicare, desinant, si ille laesus sit, de se aliquid detractum arbitrari, videant ne turpe miserumque sit eos qui equestrem splendorem pati non potuerunt, servi nequissimi dominationem ferre posse. Quae quidem dominatio, iudices, in aliis rebus antea versabatur, nunc vero quam viam munitet, quod iter adfectet, videtis. —CICERO, Rosc. Am., 48.

Translate

VIRGIL.

D. Quin age, si quid habes, in me mora non erit ulla, Nec quemquam fugio tantum, vicine Palaemon,

Sensibus haec imis, res est non parva, reponas. P Dicite, quandoquidem in molli consedimus herba. Et nune omnis ager, nune omnis parturit arbos, Nunc frondent silvae, nunc formosissimus annus. Incipe, Damoeta, tu deinde sequere, Menalca. Alternis dicetis, amant alterna Camenae. —Ecl. III, 52-59. Account for the occurrence of Greek names in the Eclogues. What difference between *Camenae* and the commoner Greek word? **Translate**

Ecce deus ramum Lethaeo rore madentem Vique soporatum Stygia super utraque quassat Tempora, cunctantique natantia lumina solvit. Vix primos inopina quies laxaverat artus, Et super incumbens, cum puppis parte revulsa Cumque gubernaclo, liquidas proiecit in undas Praecipitem, ac socios nequicquam saepe vocantem Ipse volans tenues se sustulit ales ad auras. Currit iter tutum non setius aequore classis, Promissisque patris Neptuni interrita fertur — AEN.V. 854-863.

Write out the last three verses, indicating feet and cassuras, and marking the quantity of each syllable.

Translate

CICERO.

Principio, ut Ca ilina paucis ante diebus erupit ex urbe, cum sceleris sui socios, huiusce nefarii belli acerrimos duces Romae reliquisset, semper vigilavi et providi. Quirites, quemadmodum in tantis et tam absconditis insidiis salvi esse possemus.

Nam tum, cum ex urbe Catilinam eiciebam (non enim iam vereor huius verbi invidiam, cum illa magis sit timenda, quod vivus exierit), sed tum, cum illum exterminari volebam, ant reliquam coniuratorum manum simul exituram aut cos, qui restitissent, infirmos sine illo ac debiles fore putabam.

- CAT III. 1 and 2.

TRANSLATION INTO LATIN.

Translate

Captain Orme, who was one of the General's aides-de-camp, and, being grievously wounded, was brought off with him, and continued with him to his death, which happened in a few days, told me that he was totally silent all the first day, and at night only said, "who would have thought it?" That he was silent again the following day, saying only at last, "we shall better know how to deal with them another time," and died in a few minutes after -BENJAMIN FRANKLIN'S AUTOBIOGRAPHY, Chap. X.

GREEK.

GRAMMAR AND PRESCRIBED TRANSLATION

I.

Λ. Καὶ εἰς μὲν τὴν ὑστεραίαν συχ ἦκεν [ό Τισσαφέρνης]. ῶσῦ οἰ Ἐλληνες ἐφρόντιζον τῆ δὲ τρίτῃ ὅκων Ἐλεγεν, ὅτι διαπεπραγμενος ὅκοι παρά βασιλέως δοῦὴναι αὐτῷ σώζειν τοῦς Ἐλληνας, καίπερ πάνυ πολλῶν ἀντιλεγόντων, ὡς οῦκ ἄξιον εἴη βασιλεῖ ἀφείναι τοῦς ἐφ ἑαυτὺν στρατευσαμένους

XEN., Anab., II, 3. 25.

Point out the exceptions occurring in this passage to the general rule for the accentuation of verbs.—Where formed (tense, mood, voice), and from what verbs, are δούηναι and αφείναι?—Give their principal parts.—What does ωστε express, and what construction does it regularly take?—Explain the reason for the optative είη. **B.** Ω πόποι, η δη παιδιν ξοικοτες ανοράασηε νηπιάχοις, οίς οὕ τι μέλει πολεμήμα έργα πη δη συνθεσίαι τε καὶ ὅρκια βήσεται ημιν; ἐν πυρὶ δη βουλαί τε γενοίατο μήδεά τ' ἀνδρῶν 340 σπονδαί τ' ἀκρητοι καὶ δεξιαί, ης ἐπέπιθμεν αυτως γάρ ρ' ἐπέεσσ' ἐριδαίνομεν, οὐδέ τι μῆχος εὐρέμεναι δυνάμεσμα, πολὺν χρόνον ἐνμαδ' ἐοντες. Πiad, II.

Give the Attic form of $\gamma \epsilon \nu o i \alpha \tau o$, $\check{\alpha} \varkappa \rho \eta \tau o i$, $\check{\epsilon} \pi \epsilon \pi i \vartheta \mu \epsilon \nu$, $\epsilon \dot{\upsilon} \rho \dot{\epsilon} - \mu \epsilon \nu \alpha i$.—Show by what processes the present-stem of the three verbs just mentioned is formed from the theme or verb-stem.—Scan 1. 339, and explain the last dactyl in it.

II.

TRANSLATION AT SIGHT AND COMPOSITION.

C. Έπειδη δε η μεν νίκη σύν Ανησιλάω εγένετο, τετρωμένος δ' αυτός προσηνέχθη πρός την φάλαγγα, προσελάσαντές τινες των ίππέων λέγουσιν αυτώ ότι των πολεμίων όγδοήκοντα σύν τοις ὅπλοις ύπό τω ναώ (temple) είσι, και ήρώτων τι χρη ποιείν ό δε, καίπερ πολλά τραύματα έχων πάντοσε και παντοίοις ὅπλοις, ὅμως ούκ επελάθετο τοῦ θείου (religion), ἀλλ ξάν τε ἀπιέναι ὅποι βούλοιντο ἐκέλευε και ἀδικεῖν ούκ εία, και προπέμψαι ἐπέταξε τους ἀμφ αὐτόν ίππεὶς ἕστε ἐν τῷ ἀσφαλεῖ ἐνένοντο.

XEN., Ages., II, 13.

The principal words needed in translating what follows may be found above in passage (C).

D. If you had asked more $(\pi\lambda\epsilon i\omega)$ about Agesilaus, I should have said he was a man dear to the gods. For victory was always with him, yet $([\mu\epsilon\nu]] = \delta\epsilon$ he used it moderately $(\mu\epsilon\tau\rho i\omega s)$, in order that neither himself nor his soldiers might do wrong.

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