THE
RICE INSTITUTE

HOUSTON TEXAS

PRELIMINARY ANNOUNCEMENTS FOR THE ACADEMIC YEAR BEGINNING SEPTEMBER TWENTIETH NINETEEN HUNDRED AND SIXTEEN

THE RICE INSTITUTE

A UNIVERSITY OF

LIBERAL AND TECHNICAL
LEARNING

FOUNDED IN THE CITY OF HOUSTON TEXAS
BY WILLIAM MARSH RICE
AND DEDICATED BY HIM TO THE
ADVANCEMENT OF LETTERS
SCIENCE AND ART

OPENED FOR THE RECEPTION OF
STUDENTS IN THE AUTUMN OF
NINETEEN HUNDRED
AND TWELVE

EDGAR ODELL LOVETT : PRESIDENT


THE·DE VINNE·PRESS

CALENDAR

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1916

September 20–23 .	Entrance Examinations
September 22–23 .	Registration
September 25 . .	Lectures begin
November 30 . .	Thanksgiving Day
December 21 . .	Autumn term ends

1917

January 3 . . .	Winter term begins
February 22 . . .	Washington's Birthday
March 2	Texas Independence Day
March 16 . . .	Winter term ends
March 19 . . .	Spring term begins
April 21	San Jacinto Day
June 8	Spring term ends
June 9–11 . . .	Second Annual Commencement

THE RICE INSTITUTE

THE RICE INSTITUTE

THE NAME

THE new institution bears the name of the founder, the late William Marsh Rice. It aspires to university standing of the highest grade. Dedicated to the advancement of literature, science, and art, the educational programme of liberal and technical learning now being developed may justify the designation "Institute" as representing the functions of a teaching university and, at least in some of its departments, those of the more recent research institutions established in this country and abroad.

BRIEF HISTORICAL SKETCH

It is now rather more than twenty years since several public-spirited citizens of the community asked Mr. Rice to bear the expense of building a new public high school for the city of Houston. This direct gift to the city's welfare Mr. Rice was unwilling to make, but a few months later, taking into his confidence a half-dozen friends, he made known to them his desire to found a much larger educational enterprise for the permanent

benefit of the city and State of his adoption. These gentlemen were organized into a Board of Trustees for the new foundation, which was incorporated in 1891 under a broad charter granting the trustees large freedom in the future organization of a non-political and non-sectarian institution to be dedicated to the advancement of letters, science, and art. As a nucleus for an endowment fund, Mr. Rice at this time made over an interest-bearing note of two hundred thousand dollars to the original Board of Trustees, consisting of himself, the late Messrs. E. Raphael, F. A. Rice, and A. S. Richardson, and Messrs. James Addison Baker, James Everett McAshan, and Cesar Maurice Lombardi. Under the terms of the charter, the board is a self-perpetuating body of seven members elected for life: vacancies since its organization have been filled by the election of Messrs. William Marsh Rice, Jr., Benjamin Botts Rice, Edgar Odell Lovett, and John Thaddeus Scott.

It was the unalterable will of the founder that the development of the work which he had conceived should progress no further during his lifetime. However, in the remaining days of his life he increased the endowment fund from time to time by transferring to the trustees the titles to certain of his properties, and in the end made the new foundation his residuary legatee. Upon the termination of the long years of litigation which followed Mr. Rice's death in 1900, the Board of Trustees found the Institute in possession of an estate whose present value is conservatively estimated at approximately ten million dollars, divided by the provisions of the founder's will into almost equal parts, available for equipment and en-

dowment respectively. It may be remarked in passing that it is the determined policy of the trustees to build and maintain the institution out of the income, thus preserving intact the principal not only of the endowment fund but also that of the equipment fund. While proceeding to convert the non-productive properties of the estate into income-bearing investments, the trustees called Mr. Edgar Odell Lovett, a professor in Princeton University, to assist them in developing the founder's far-reaching plans. Before taking up his residence in Houston, the future president visited the leading educational and scientific establishments of the world, returning in the summer of 1909 from a year's journey of study that extended from England to Japan. About this time negotiations were completed by which the Institute secured a campus of three hundred acres situated on the extension of Houston's main thoroughfare, three miles from the center of the city—a tract of ground universally regarded as the most appropriate within the vicinity of the city.

Another early decision of the trustees of the Institute was the determination that the new university should be housed in noble architecture worthy of the founder's high aims; and upon this idea they entered with no lower ambition than to establish on the campus of the Institute a group of buildings conspicuous alike for their beauty and for their utility, which should stand not only as a worthy monument to the founder's philanthropy, but also as a distinct contribution to the architecture of our country. With this end in view they determined to commit to Messrs. Cram, Goodhue, and Ferguson, of Boston and New York, the task of designing a general architectural

plan to embody in the course of future years the realization of the educational programme which had been adopted for the Institute. Such a general plan, the work of Mr. Ralph Adams Cram, L.H.D., exhibiting in itself many attractive elements of the architecture of Italy, France, and Spain, was accepted by the board in the spring of 1910. Immediately thereafter plans and specifications for an administration building were prepared, and in the following July the contract for its construction was awarded; three months later the erection of a mechanical laboratory and power-house was begun, and by the next autumn the construction of two wings of the first residential hall for men was well under way. In the preparation of preliminary plans for its initial building operations the Institute enjoyed the coöperation of an advisory committee consisting of Professor Ames, director of the physical laboratory of Johns Hopkins University; Professor Conklin, director of the biological laboratory of Princeton University; Professor Richards, chairman of the department of chemistry, Harvard University; and Professor Stratton, director of the National Bureau of Standards. In 1911, on the seventy-fifth anniversary of Texas Independence, the corner-stone of the administration building was laid by the trustees. This building, the mechanical laboratory of the engineering quadrangle, the power-house, and the first two wings of the residential hall for men were ready for occupancy at the beginning of the first academic year in the fall of 1912. The third wing of the residential hall, begun in 1913, was occupied by students in the autumn of 1914; while the construction of the physics laboratories and lecture amphitheater, be-

gun also in 1913, was completed in the summer of 1914 from plans prepared by Messrs. Cram and Ferguson under the direction of Mr. H. A. Wilson, D.Sc., F.R.S., resident professor of physics in the Institute. In January, 1916, ground was broken for the first wing of the second residential group for men; the construction of this wing is to be completed by September 1st, 1916. The building schedule for the near future includes also special laboratories for instruction and investigation in chemistry and biology, and in the applications of these sciences to the arts of industry and commerce.

The actual work of instruction of the first academic year began on the 23d day of September, 1912, the anniversary of the death of the founder. In the presence of the trustees of the Institute, members of the teaching staff, and representative citizens of the community, the first class of students was received in the faculty chamber of the administration building with appropriate ceremonies on September 26th. The scholastic work of the first academic year was limited to a single class of freshmen of a standard of preparation as high as the best public and private high schools were capable of producing.

In the early autumn of 1912 an academic festival in observance of the formal opening of the Institute was held under most favorable conditions of weather, most generous coöperation of the community and commonwealth, and the heartening encouragement of several hundred scholars and scientists who came to Houston to assist in the launching of the new university. Chief among these distinguished representatives of life and

learning were the twelve foreign savants who had consented to participate in the inaugural programme by preparing series of lectures in the liberal humanities of philosophy, history, letters, and art, and in the fundamental sciences of mathematics, physics, chemistry, and biology. A complete account of the proceedings occupying the four days devoted to this celebration has been embodied in publications issued in commemoration of that occasion. In the latter appear in full the inaugural lectures of Professor Rafael Altamira y Crevea, of Madrid, Spain; Professor Emile Borel, of Paris, France; Senator Benedetto Croce, of Naples, Italy; Professor Hugo de Vries, of Amsterdam, Holland; Professor Sir Henry Jones, of Glasgow, Scotland; Privy Councilor Baron Dairoku Kikuchi, of Tokyo, Japan; Professor John William Mackail, of London, England; Privy Councilor Professor Wilhelm Ostwald, of Gross-Bothen, Germany; the late Professor Henri Poincaré, of Paris, France; Professor Sir William Ramsay, of London, England; Professor Senator Vito Volterra, of Rome, Italy; Professor Carl Størmer, of Christiania, Norway. There appear also reproductions of responses from American and foreign universities and scientific societies to the invitation of the Institute; the addresses of Governor Colquitt, Chief Justice Brown of Texas, Bishop Gailor of Tennessee, the inaugural poem of Dr. Henry van Dyke of Princeton, and the dedicatory sermon by Dr. Charles F. Aked of San Francisco; together with the addresses delivered by the presidents or other official representatives of Amsterdam, Glasgow, London, Oviedo, Paris, Rome, Baylor,

Chicago, Columbia, Lehigh, Princeton, Texas, Vanderbilt, and Virginia universities; and a variety of other literary and artistic performances which are not easily classified in a brief résumé.

THE FACULTY

For the staff of the Institute the best available instructors are being sought in the hope of assembling in Houston a group of scientists and scholars through whose productive work the new university may come into a place of importance among the established institutions of the country. Of those selected for positions on the staff it is possible to announce at this time the following appointments, the names appearing in alphabetical order:

Philip Hechman Arbuckle, B.A. (Chicago), of Georgetown, Texas; Director of Athletics in Southwestern University; Instructor in Physical Education and Director of Athletics.

Stockton Axson, M.A. (Wesleyan), Litt.D. (Pittsburgh), L.H.D. (Wesleyan), of Princeton, New Jersey; formerly of the University of Vermont and of Adelphi College; Professor of English Literature in Princeton University; Professor of English Literature.

Thomas Frederic Blanchard, Litt.B. (California), M.A. (Yale), of Berkeley, California; formerly California Alumni Fellow and Assistant in Rhetoric at Yale University; Instructor in English at the University of California; Assistant Professor of English.

Thomas Lindsey Blayney, M.A. (Centre), Ph.D. (Heidelberg), of Danville, Kentucky; Professor of European Literature and the History of European Art in Central University of Kentucky; Professor of German.

Robert Granville Caldwell, B.A. (Wooster), Ph.D. (Princeton), of Wooster, Ohio; formerly Fellow of Princeton University; Professor of Economics in the College of Wooster; Assistant Professor of History.

Percy John Daniell, M.A. (Cambridge), of Liverpool, England; Senior Wrangler and Rayleigh Prizeman of the University of Cambridge; formerly Lecturer in Mathematics at the University of Liverpool; Research Associate of the Rice Institute; Assistant Professor of Applied Mathematics.

Nicholas Diamant, B.A. (Robert), M.Sc. in E.E. (Union), of Schenectady, New York; formerly Instructor in Hydraulics and Mathematics at Union College; Fellow in Physics at the Rice Institute; Instructor in Engineering.

Griffith Conrad Evans, Ph.D. (Harvard), of Boston, Massachusetts; formerly Instructor in Mathematics at Harvard University; Sheldon Fellow of Harvard University at the University of Rome; Assistant Professor of Pure Mathematics.

Gerald Fogarty Galloway, B.Sc. in E.E. (Colorado), of Lincoln, Nebraska; formerly with the Engineering Department of the Chicago, Burlington & Quincy Railroad; Instructor in Engineering.

Clyde Chew Glascock, Ph.D. (Johns Hopkins), of New Haven, Connecticut; formerly Fellow of Johns Hopkins University; Assistant Professor of German in

Yale University; Assistant Professor of Modern Languages.

William Caspar Graustein, M.A. (Harvard), Ph.D. (Bonn), of Cambridge, Massachusetts; formerly Sheldon Fellow of Harvard University; Instructor in Mathematics at Harvard University; Instructor in Mathematics.

Albert Léon Guérard, B.A. (Paris), Agrégé de l'Université de France, of Palo Alto, California; formerly Junior Professor of French Literature and Examiner in History, State Normal School, Paris; later Instructor in the Romanic Languages at Williams College; Associate Professor of French in the Leland Stanford Junior University; Professor of French.

Claude William Heaps, B.Sc. (Northwestern), Ph.D. (Princeton), of Columbia, Missouri; formerly Class of 1860 Experimental Science Fellow of Princeton University; Instructor in Physics at the University of Missouri; Instructor in Physics.

Arthur Romaine Hitch, B.A., M.Sc. (Washington College), Ph.D. (Cornell), of Syracuse, New York; formerly Assistant Instructor in Chemistry at Cornell University; Research Chemist for the Solvay Company; Instructor in Chemistry.

Arthur Llewelyn Hughes, B.A. (Cambridge), D.Sc. (Liverpool), of Cambridge, England; Research Scholar of Emmanuel College, MacKinnon Student of the Royal Society of London, Assistant Demonstrator in Physics at the Cavendish Laboratory of Cambridge University; Assistant Professor of Physics.

Herbert Kay Humphrey, B.Sc. in E.E. (Illinois), M.Sc. in E.E. (Union), of Schenectady, New York;

Assistant Consulting Engineer of the General Electric Company; Instructor in Electrical Engineering.

Julian Sorell Huxley, B.A. (Oxford), of Oxford, England; Newdigate Prizeman of the University of Oxford; formerly Lecturer in Biology in Balliol College, and Intercollegiate Lecturer in Oxford University; Research Associate of the Rice Institute; Assistant Professor of Biology.

Francis Keally, B.A. (Carnegie), B.Sc. in Arch. (Pennsylvania), of Pittsburgh, Pennsylvania; Instructor in Architectural Drawing.

Roy Petran Lingle, Litt.B. (Princeton), of Philadelphia, Pennsylvania; Master in English at the Episcopal Academy of Philadelphia; Instructor in English.

Edgar Odell Lovett, Ph.D. (Virginia and Leipsic), LL.D. (Drake and Tulane), of Houston, Texas; formerly Professor of Mathematics in Princeton University, and later Head of the Department of Astronomy in the same institution; President of the Institute; Professor of Mathematics.

John Thomas McCants, M.A. (Virginia and Yale), of Houston, Texas; formerly Scholar at the University of Virginia, and University Fellow at Yale University; Secretary to the President; Instructor in English.

Hugh Miller, C.E. (Princeton), of Potsdam, New York; Professor of Civil and Sanitary Engineering at the Clarkson College of Technology; Lecturer in Civil Engineering.

Hermann Joseph Muller, Ph.D. (Columbia), of New York City; Assistant Instructor in Biology at Columbia University; Instructor in Biology.

Joseph Horace Pound, B.Sc. in M.E. (Missouri), of Pittsburgh, Pennsylvania; Instructor in the School of the Westinghouse Machine Company; Instructor in Mechanical Engineering.

Herbert Nelson Roe, B.A. (Colorado), of Chicago, Illinois; Director of Physical Education in the Public Schools of Rock Island, Illinois; Instructor in Physical Education.

John Clark Tidden, of Philadelphia, Pennsylvania; Fellow and Traveling Scholar of the Pennsylvania Academy of Fine Arts; Instructor in Architectural Drawing.

Radoslav Andrea Tsanoff, B.A. (Oberlin), Ph.D. (Cornell), of Worcester, Massachusetts; formerly Sage Fellow of Cornell University; Instructor in Philosophy at Clark University; Assistant Professor of Philosophy.

William John Van Sicklen, M.A. (Stanford), of Palo Alto, California; Acting Instructor in Chemistry at Stanford University; Instructor in Chemistry.

Charles Frederick Ward, M.A. (Toronto), Ph.D. (Chicago), of Calgary, Canada; Associate Professor of French and German in Calgary College; Instructor in French.

William Ward Watkin, B.Sc. in Arch. (Pennsylvania), M.A.I.A., of Houston, Texas; formerly Scholar in Architecture in the University of Pennsylvania; local representative of Messrs. Cram and Ferguson, the supervising architects of the Institute; Instructor in Architecture.

Rolf Felix Weber, Ph.D. (Berlin), of Berlin, Germany; Lecturer and Instructor at the University of Pennsylvania; Instructor in German.

Harry Boyer Weiser, M.A. (Ohio State), Ph.D. (Cor-

nell), of Memphis, Tennessee; formerly Assistant Instructor in Chemistry at Cornell University; Assistant Professor of Chemistry in the University of Tennessee; Instructor in Chemistry.

Harold Albert Wilson, F.R.S., M.A. (Cambridge), D.Sc. (London), of Montreal, Canada; Fellow of Trinity College, Cambridge University; formerly Professor in King's College, London; Research Professor of Physics in McGill University; Professor of Physics.

ASSISTANTS AND FELLOWS

Walter Lynn Cheney, B.A. (Oberlin), M.A. (Nebraska), of Lincoln, Nebraska; Graduate Assistant in Physics at the University of Nebraska; Fellow in Physics.

Alfred Alexander Dixon, B.Sc. (Guilford), M.A. (Haverford), of Guilford, North Carolina; Professor of Physics in Guilford College; Fellow in Physics.

Denton Loring Geyer, M.A. (Wisconsin), Ph.D. (Illinois), of Roswell, New Mexico; formerly Fellow and Assistant in Philosophy at the University of Illinois; Assistant in Philosophy and Education.

Walter Winfield Marshall, B.A. (Ohio State), of Columbus, Ohio; formerly Assistant Entomologist to Texas Experiment Station; Graduate Student Ohio State University; Fellow in Biology.

Samuel G. McCann, B.A. (Wooster), of Dresden, Ohio; Principal of the High School at Navarre, Ohio; Fellow in History.

Jacob L. Sherrick, B.Sc. (Penna. State), of Pittsburgh, Pennsylvania; Assistant Chemist in the United States Bureau of Mines; Fellow in Chemistry.

William James Sidis, B.A. (Harvard), of Cambridge, Massachusetts; Graduate Student of Harvard University; Fellow in Mathematics.

Arthur S. Winsor, B.A. (Mt. Allison), of Woodstock, New Brunswick; Fellow in Mathematics.

FELLOWSHIPS

WHILE seeking to develop its students in character, in culture, and in citizenship, the Rice Institute will reserve for scholarship its highest rewards and in particular for evidences of creative capacity in productive scholarship. To encourage this devotion to learning a series of undergraduate scholarships and graduate fellowships will be devised to be awarded preferably to those students who have been in residence at the Institute for at least one year. Moreover, the varied opportunities for self-help in a growing institution in a large city should aid in enabling any young man of determination to earn his education in a thoroughly democratic college community. There may thus be realized the founder's desire that the advantages of his philanthropy should be brought within the reach of the promising student of slender means.

Furthermore, the Institute would interpret in a very large way its dedication to the advancement of letters, science, and art. It would not only look to the employment

of these disciplines in the development of the life of the individual and in that of the race, but it would also play its part in the progress and enlargement of human knowledge by the contributions of its own resident professors and scholars. Accordingly there should always be associated with the staff of the Institute a group of advanced students in training for careers both as teachers and researchers: with this end in view, graduate fellowships will be awarded from time to time to degree-bearing students of the Institute or other educational foundations of similar standing.

REQUIREMENTS FOR ADMISSION

Candidates for admission to the Institute who present satisfactory testimonials as to their character will be accepted either upon successful examination in the entrance subjects or by certificate of graduation from an accredited public or private high school. The standard requirements for matriculation are determined by the system of units given below. A unit represents a course of study pursued five hours a week for an academic year. Fourteen such units are required for entrance in full standing to the freshman class of the Institute. A candidate offering twelve units may be accepted with conditions, but all deficiencies must be removed, in accordance with regulations published elsewhere in this announcement, before the student will be recognized as a candidate for any degree.

From the following list every candidate will be required to present three units in English, two and one-half

units in mathematics, two units in history, and three units in one foreign language or two units in each of two modern languages. For the present, in the case of mature candidates whose preparation has not been adequate, compliance with the requirements in foreign languages may be temporarily deferred. No student will be admitted to a special schedule who has not satisfied in full the requirements for admission to the freshman class.

LIST OF SUBJECTS WITH VALUES IN UNITS

Botany 1; Chemistry 1; English (Reading and Practice 2, Study and Practice 1); French (Elementary 2, Intermediate 1); German (Elementary 2, Intermediate 1); Greek (Grammar and Elementary Prose Composition 1, Xenophon 1, Homer—*Iliad,* Books I–III 1); History (Ancient 1, Mediæval and Modern 1, English 1, American 1); Latin (Grammar, Elementary Prose Composition and Cæsar 2, Cicero 1, Virgil 1); Mathematics (Algebra 1½, Plane Geometry 1, Solid Geometry ½, Trigonometry ½); Spanish (Elementary 2, Intermediate 1); Physics 1; Physical Geography ½; Physiology ½; Zoölogy 1. Substitutes for certain of these subjects may be considered in individual cases.

The terms of admission to the Institute are based on the recommendations of the Carnegie Foundation for the Advancement of Teaching as expressed in the Documents of the College Entrance Examination Board. Complete

information with respect to further details of these requirements will be forwarded by the Institute to any candidate upon receipt of a request addressed to the University Office of the Institute.

EXPENSES

THE opportunities for study and research offered by the Rice Institute are open without tuition both to young men and to young women. A small deposit will be required to cover possible breakage in the laboratories and losses from the libraries; the balance from this contingent fee is, of course, returnable at the close of the session.

ARRANGEMENTS FOR RESIDENCE

ROOMS in the residential halls for men, completely furnished exclusive of linen, together with table board at the Institute commons, may be had at prices ranging from twenty to twenty-four dollars a month of four weeks. The rooms will be let in the order of applications received. Diagrams showing the floor plans will be sent on request to any one who may be interested. Accommodations for the residence of young women on the university grounds will not be offered during the coming year. The residential halls for men are of absolutely fireproof construction, heated by steam, lighted by electricity, cleaned by vacuum apparatus, and equipped with the most approved

form of sanitary plumbing, providing adequate bathing facilities on every floor.

Reservations for rooms should be made as early as possible. All the accommodations in the first residential group for men were engaged before the opening of the present academic year. For the coming year new rooms for about one hundred and thirty students will be available in the first wing of the second residential quadrangle for men. This wing is to be completed by September 1st, 1916.

COURSES OF INSTRUCTION FOR DEGREES

Although it is the policy of the new institution to develop its university programme rather more seriously from the science end, there are also being provided facilities for elementary and advanced courses in the so-called humanities, thereby enabling the Institute to offer both the advantages of a liberal general education and those of special and professional training. Extensive general courses in the various domains of scientific knowledge will be available, but in the main the programme consists of subjects carefully coördinated and calling for considerable concentration of study. These programmes have been so arranged as to offer a variety of courses in arts, in science, in letters, and in their applications to the several fields of engineering, architecture, and other regions of applied science, leading after four years of undergraduate work to the degree of Bachelor of Arts. De-

grees will also be offered in architecture and in chemical, civil, electrical, and mechanical engineering. Furthermore, for the degrees of Master of Arts, Doctor of Philosophy, and Doctor of Engineering, every facility will be afforded properly qualified graduate students to undertake lines of study and research under the direction of the Institute's resident and visiting professors.

The academic programmes of study leading to the degree of Bachelor of Arts after four years of study are of a common type for the first two years, but for the third and fourth years are differentiated into two forms: first, general courses leading to the degree of Bachelor of Arts, either with some grade of distinction or without special mention, and second, honors courses leading to the degree with first, second, or third class honors. These two types will be referred to in the sequel as general courses and honors courses respectively.

The general course leading to the degree of B.A. has been arranged to give thorough training to those students who are seeking university instruction in literary and scientific subjects either as a part of a liberal education or as preliminary to entering upon a business or professional career. The general course therefore involves the study of several subjects up to a high university standard but does not include a highly detailed specialized study of any one subject such as is necessary before research work or university teaching can be profitably undertaken. Students wishing to specialize with a view to research work and university teaching may either take an honors course and then proceed by graduate study to the degrees of M.A. and Ph.D., or they may first take a general B.A.

course and after completing it proceed by graduate study to the higher degrees.

The attention of students intending to enter the profession of engineering or architecture is called to the great advantages in first taking a general or honors academic course before beginning special study in engineering or architecture. At present the Institute is not offering courses leading to degrees in law and medicine, but students looking forward to such careers will find in the earlier years of the B.A. course all the requirements for admission to many medical and law schools, provided suitable subjects are chosen. However, attention is called to the fact that several professional schools of law and medicine are now requiring bachelor degrees for admission.

As has already been intimated, the course for the degree of B.A. extends over four years. During the first two years a considerable part of the work is prescribed, while during the last two years each student is allowed, within certain restrictions, to select the subjects he studies. In the majority of the courses the formal instruction offered consists of three lectures a week together with laboratory work in certain subjects. Examinations are held from time to time and at the end of each term. These examinations are conducted under a student honor system. In determining the standing of a student in each class both his work during the term and the record of his examinations are taken into account.

Of subjects included in the B.A. courses the following are now available.

Group A	Group B
1. English	1. Pure Mathematics
2. French	2. Applied Mathematics
3. German	3. Physics
4. Spanish	4. Chemistry
5. Economics	5. Biology
6. Education	6. Chemical Engineering
7. History	7. Civil Engineering
8. Philosophy	8. Electrical Engineering
9. Architecture	9. Mechanical Engineering

Instruction in advanced Latin is also offered.

Candidates for the degree of Bachelor of Arts of the Rice Institute will be required to select studies from the preceding groups according to the yearly programmes exhibited below.

At the beginning of each year of his residence at the Institute, each student is assigned to some member of the faculty who will act as the student's personal adviser in the selection of his studies and courses and in other matters pertaining to life at the Institute.

First Year

(1) Pure mathematics
(2) English
(3) A modern language
(4) A science
(5) One other subject

Second Year

(1) Pure mathematics or a science
(2) English
(3) A modern language [1]
(4–5) Two other subjects

At the beginning of the third year students may elect to take either a general course or an honors course.

Third Year General B.A. Course

Four subjects, of which two must have been taken in the second year and one in both first and second. At least one subject from each of the groups A and B must be taken. Students will receive advice in the selection of their subjects.

Fourth Year General B.A. Course

Four subjects, two of which must have been taken in the third year and one in both second and third or in first and third. At least one subject from each of the groups A and B must be taken.

To students who have completed the general course the B.A. degree will be awarded either with some grade of distinction or without special mention.

The third and fourth year honors courses are intended for students who wish to specialize in particular branches of knowledge with a view to research work or teaching or later professional studies.

[1] Students who enter with credit in two modern languages may substitute another subject for (3) in the second year.

In view of these special objects the requirements in such courses will be more severe than in the general courses in the same subjects. For this reason it is recommended that students exercise due caution and seek advice before electing to take an honors course. Only those students who have shown in their first and second years that they are especially well qualified will be permitted to take an honors course. A student proposing to take an honors course must satisfy the department concerned that he is qualified to proceed with the study of that subject. He will be required to take the lectures and practical work provided for honors students in that subject during each of the two years and in addition certain courses in allied subjects.

In 1916–17 honors courses will be available as follows:

(1) Pure and applied mathematics
(2) Theoretical and experimental physics
(3) Modern languages and literatures
(4) Biology
(5) Chemistry

The following programme of honors courses in physics may be taken as typical of such courses:

Third year, five subjects: (1) mathematics, (2) physics 300, (3) physics 400, (4) physics 410, (5) one other subject.

Fourth year, four subjects: (1) mathematics, (2) physics 410, (3) physics 420, (4) physics 500.

The degree of B.A. with first, second, or third class honors will be awarded at the end of the fourth year to students who have completed an honors course. Candidates for honors who fail may be excused such part of a general course as may be equivalent to the work they have done. Candidates for honors who are not making satisfactory progress may be required to discontinue their honors course and may be excused such part of a general course as may be equivalent to the work they have done.

A student who has completed a general or an honors course for the Bachelor of Arts degree may obtain the Master of Arts degree after the successful completion of one year of graduate work. A candidate for the degree of Master of Arts must select a principal subject and will be required to take such courses in that subject and allied subjects as may be determined for each individual case. He must also undertake research work under the direction of the department of his principal subject and submit a thesis embodying the results of this work.

A student who has completed a general course for the Bachelor of Arts degree may obtain the degree of Doctor of Philosophy after not less than three years' graduate study and research work. A student who has obtained the Bachelor of Arts degree with first or second class honors may obtain the Doctor of Philosophy degree after not less than two years' graduate study and research work. Candidates for the degree of Doctor of Philosophy must submit a thesis and pass a public examination.

STANDING IN SCHOLARSHIP OF UNDERGRADUATE STUDENTS

Removal of entrance conditions and fulfilment of Freshman and Sophomore requirements.—A student having entrance conditions should remove them before the beginning of his third year of residence, and may not, after that time, remove them by passing entrance examinations. A student who has failed to remove his entrance conditions by the beginning of his third year of residence, or who has not by that time completed the prescribed Freshman courses (in mathematics, English, foreign languages and science), will not be allowed to carry more than the regular schedule during his third year of residence. And if, by the beginning of his fourth year of residence, a student has not also completed the prescribed Sophomore courses (in English, foreign languages, and mathematics or science), he will not be allowed to carry more than the regular schedule during his fourth year of residence.

Dropping of students for deficiencies in scholarship.—A student will be required to withdraw from the Institute if he fail in as much as one-half of the work of his schedule.

Probation.—A student who has passed in more than one-half of his work may, nevertheless, be placed on probation if, during his Freshman or Sophomore years, he has received in any one term, V's [1] in two courses, or has

[1] The symbols have the following meanings: I Very high standing, II High standing, III Medium standing, IV Low standing, V Failure.

failed to obtain a grade of III or better in at least one course, and if, during his Junior and Senior years, he has received in any one term a V in one course, or has failed to obtain a grade of III or better in at least one course. A student who is carrying less than full schedule may be placed on probation if he has received in any one term a V in one course, or has failed to obtain a grade of III or better in at least two courses. Students who carry a schedule of two courses or less are expected to obtain a grade of III or better in each course. If a student who has thus been placed on probation fails to improve materially in his standing, he is dropped from the Institute. The length of the period of probation during which a student who is on probation may remain in the Institute is determined in each special case by the Faculty. A student on probation may be dropped at any time at the discretion of the Faculty. A student who is on probation must concentrate his energies on his academic work and may not take part in extra-academic activities.

Promotion.—To attain Sophomore standing, a student must have obtained passing grades in four of the five courses of the Freshman year courses, of which two must have been III or better. To attain Junior standing, a student must have obtained passing grades in nine of the ten courses of the Freshman and Sophomore years courses, of which four must have been III or better. To attain Senior standing, a student must have obtained passing grades in thirteen courses, of which six must have been III or better. To obtain the degree of Bachelor of Arts, a student must have obtained passing grades in eighteen courses, of which eight must have been III or better.

SUBJECTS OF INSTRUCTION FOR 1916–17

AMONG the courses to be offered during the scholastic year 1916–17 it is possible to announce those described below. The numbers designating the courses have the following signification: courses whose numbers begin with 1 are open to all students of the Institute; courses whose numbers commence with 2 are open to sophomores, juniors, and seniors; those beginning with 3 are open to juniors and seniors; those beginning with 4 are senior courses. In this connection it may be remarked that seniors were admitted to the Institute for the first time in 1915–16. Courses whose numbers end in 0 extend throughout the year; those ending in 1, 2, 3, are first, second, and third term courses, respectively. Unless otherwise indicated, all courses consist of at least three exercises a week.

ENGLISH 100. A course in rhetoric, with the use of a text-book, and constant practical exercise in writing. Selected English authors will be read, primarily with the purpose of giving the student some sense of literary values and standards of literary style. It is a course in appreciation and expression.

ENGLISH 200. A systematic study of the history of English literature from its beginnings, by the use of text-books and by lectures. In addition to the formal study of the history, there will be a rapid reading of some of the works of authors representative of the chief epochs in literary history. In connection with the Elizabethan age Shakespeare will be studied in some detail.

ENGLISH 300. Eighteenth and Early Nineteenth Century English Literature. A study of literary history beginning with Pope and extending through Wordsworth. The earlier part of the course will show how changes in the ideals and forms of literature reflect the changes in national life, in politics, society, and philosophy in the eighteenth century; how these changes in literature produced the so-called Romantic-Naturalistic school; and how this development led, in time, to the great group of early nineteenth century poets, novelists, and essayists. The latter and greater part of the course will be in the study of representative works of such poets as Wordsworth, Coleridge, Byron, Shelley, and Keats; of such novelists as Walter Scott; of such essayists as De Quincey, Lamb, and Hazlitt. The instruction will be in the form of lectures, discussions, and readings from the works of the leading authors of the period. There will be essays in connection with the course.

ENGLISH 400. Victorian Literature and American Literature in the Nineteenth Century. A study of the chief British and American authors whose work was done after 1830: Carlyle, Ruskin, Arnold, Browning, Tennyson, Dickens, Thackeray, George Eliot, Rossetti, Stevenson, Meredith, Kipling, Emerson, Hawthorne, Poe, Whitman, and the New England Poets. The lectures will undertake to expound the national and social forces which formed the ideas that were expressed in literature, but the main emphasis will be laid upon the individual author, his work, his philosophy, and his art. Students will be required to read as much as possible of the literature of the period, and to write some essays in connection with the course.

FRENCH 100. Elementary French. A general introductory course, in which the method adopted is based on extensive and rapid reading, without sacrificing the study of syntax and the practice of conversation.

FRENCH 200. Second Year French. Syntax, composition, conversation based on rapid reading, and general survey of French literature.

FRENCH 210. History of French Civilization. A general survey of political, social, and cultural conditions in France from the Roman conquest to the present day. Lectures in English. Assigned readings, essays, reports, and debates. Special library provision has been made for this subject.

FRENCH 300. Third Year French. Advanced composition, themes, lectures in French, discussions and readings on classical French literature of the sixteenth, seventeenth, and eighteenth centuries.

FRENCH 400. Fourth Year French. Composition (themes and essays); literary translation; lectures, discussions, and readings in nineteenth century literature.

GERMAN 100. Elementary German. Grammar, reading, conversation, and composition. Collateral reading in history.

GERMAN 200. Second Year German. Historical, descriptive, and narrative prose. Elements of the history of German civilization. Lectures and collateral reading.

GERMAN 300. Third Year German. The literature and civilization of the eighteenth and nineteenth centuries in Germany. Written reports in German, lectures, and collateral reading.

GERMAN 310. Third Year German. Alternate course. The Middle High German Epic. Introduction to the literature of chivalry.

GERMAN 400. Fourth Year German. Intensive study of some period or group of writers in the eighteenth or nineteenth century. Lectures and discussions; essays and reports in German; collateral reading.

GERMAN 410. German Literature in the Twelfth and Thirteenth Centuries. This course is primarily for advanced students specializing in German, and is intended to give a reading knowledge of Middle High German. Selections from the writings of Walther von der Vogelweide, Hartmann von Aue, Gottfried von Strassburg, and Wolfram von Eschenbach will be read. Lectures and discussions; translation; collateral reading; essays and reports in German.

SPANISH 300. Elementary Spanish. Grammar, composition, and reading from modern Spanish authors. Stress is laid on accurate pronunciation, Castilian being the standard; on the essentials of grammar; and on careful translation into idiomatic English of simple Spanish prose.

SPANISH 310. General survey of Spanish literature and in particular that of the nineteenth century. The readings will include selections from Cervantes or Lope de Vega.

LATIN 100. Selections from Cicero, Nepos, Ovid, Sallust. Course in Latin grammar. Latin composition and essays.

LATIN 200. Selections from Cicero, Livy, Virgil, Horace. Roman literature. Latin composition and essays.

MATHEMATICS 100. Trigonometry, Analytic Geometry, and Advanced Algebra, constituting the freshman course in mathematics which is required of all students in the Institute.

MATHEMATICS 110. Plane Analytic Geometry, Topics from Algebra and Analytic Geometry of Three Dimensions. For students who are already well grounded in trigonometry. The course will be given if a sufficient number of properly qualified students register.

MATHEMATICS 200. Differential and Integral Calculus. This course, including the study of derivatives, indefinite and definite integrals, infinite series, and Taylor's theorem, is the foundation of theoretical physics and advanced mathematics, and the ideas introduced are, as ideas, of fundamental importance in many branches of modern thought.

MATHEMATICS 210. Differential and Integral Calculus. This course covers the ground of course 200, but is more complete and goes further. It is intended for students who have greater facility in mathematical reasoning. It is a sufficient introduction to Mathematics 310, 320, and 330, and is open to students who obtain high grades in Mathematics 100 or otherwise satisfy the instructor of their fitness to take the course.

MATHEMATICS 220. Modern Geometry and Algebra. Introduction to modern methods in geometry and algebra; abridged notation; line coördinates; reciprocal po-

lars; cross ratio; projection; linear transformations; inversion.

MATHEMATICS 230. History of Geometry. Introduction to Non-Euclidean geometry. This course is designed for those who are interested in the teaching of mathematics, and also for those who desire to investigate the development of our ideas with regard to space and time.

MATHEMATICS 300. Advanced Calculus and Differential Equations. Differentiation and integration of functions of several variables; multiple integrals; introduction to the theory of differential equations. This course or Mathematics 310 should be taken by students whose major interest lies in physics or engineering; it is open to those who pass successfully in courses 200 or 210 in mathematics.

MATHEMATICS 310. Advanced Calculus and Differential Equations. Applications of calculus to the study of curves and surfaces; differential equations; multiple and improper integrals. This is a more extended course than course 300, and is intended for students who have greater facility in mathematical reasoning. It is recommended to students who are specializing in mathematics, physics, and engineering.

MATHEMATICS 400. Theory of Functions of a Real Variable. This course consists of the theory of sets of points; multiple, curvilinear, and improper integrals; the Lebesgue integral; Fourier series; and an introduction to the theory of differential equations. Open to those who satisfy the instructor of their fitness to take the course. Not given during the year 1916–17.

MATHEMATICS 410. Theory of Functions of a Complex Variable. An introductory course in the general theory of functions of a complex variable. Open to students who satisfy the instructor that they are prepared to take the course. Not given during the year 1916–17.

MATHEMATICS 420. Differential Equations. Ordinary and partial differential equations, with an introduction to integral equations. This course is designed to follow course 310.

MATHEMATICS 430. Differential Geometry. A study of the properties of curves and surfaces in the neighborhood of a point; curves in the plane; analytical geometry of space; curves and surfaces in space. Open to students who have had course 210 or a third year course in mathematics. Not given during the year 1916–17.

MATHEMATICS 460. Algebra. Introduction to higher algebra; group theory; Galois theory. This is a general course in algebra which introduces students to specialized work in higher algebra and analysis. Students should have covered the ground of course 220 before taking this course.

MATHEMATICS 470. Vector Analysis. Vectors; vector fields; applications to geometry and physics; quaternions; generalized algebras. This course follows course 310.

APPLIED MATHEMATICS 200. Mechanics. A study of the fundamental principles, with applications to machines and structures. It includes elementary statics, dynamics, and hydraulics. This course is a necessary part of the engineering course and is recommended to students of physics.

APPLIED MATHEMATICS 300. General Dynamics. A broader study of the general principles of dynamics than Applied Mathematics 200, it is designed to take its place for students who are more advanced in mathematics. It forms a necessary foundation for further work in mathematical physics.

APPLIED MATHEMATICS 400. The Dynamics of Elastic Bodies and Fluids. In this course the solutions of Laplace's equation and its correlatives by means of harmonic functions, circular, cylindrical, and spherical functions, will be studied and applied to physical problems. Applied Mathematics 300 is a prerequisite.

Besides these courses as listed above, to be given during the academic year 1916–17, others may be given to suit the needs of students. Reading courses are also offered in analysis, geometry, and applied mathematics.

PHYSICS 100. A course of three lectures a week on heat, light, sound, and experimental dynamics. The lectures are fully illustrated by experiments.

PHYSICS 200. A course of three fully illustrated lectures on electricity and magnetism and three hours of practical work per week. In the practical class experiments on mechanics, heat, light, sound, electricity, and magnetism will be carried out by the students.

PHYSICS 300. A course of three lectures and three hours of practical work per week on elementary properties of matter, thermodynamics, theory of vibrations and physical optics. The theory of the experiments to be done in the laboratory will be discussed in the lectures.

PHYSICS 400. A course of three lectures and three hours of practical work chiefly on electricity and magnetism.

PHYSICS 410. Physics Colloquium. One meeting a week at which researches in physics will be discussed. Honors course.

PHYSICS 420. This course consists of about nine hours a week practical work on exact measurements in all branches of physics. Honors course.

PHYSICS 500, 510. A course consisting of three lectures a week extending over two years on various modern developments in physics, including theory of heat conduction, advanced thermodynamics, electromagnetic theory of light, discharge of electricity through gases, Roentgen rays, electrical properties of flames and hot bodies, photoelectricity, theory of radiation, electron theory of properties of insulators and conductors, and constitution of matter. Honors and graduate course.

CHEMISTRY 100. Introductory Inorganic Chemistry. Lectures, recitations, and laboratory work throughout the year. Lectures: three hours a week. The lectures are fully illustrated by experiments and deal with the fundamental principles of chemistry and with the preparation and properties of the more common elements and their principal compounds. The recitations cover the subject matter of the lectures, together with a thorough drill in the solution of chemical problems. Laboratory: three hours a week. First term, a series of experiments designed to illustrate the fundamental laws of chemistry. Second and third terms, qualitative work, the properties

and reactions of the common elements and acids and their detection in various liquid and solid mixtures.

CHEMISTRY 200. Qualitative and Quantitative Analysis. Lectures, laboratory practice, and individual conferences with the instructor in the laboratory. Lectures: two hours a week. Laboratory: six hours a week throughout the year. Qualitative work, first term: separation and detection of a number of metals and acids not studied in course 100. The qualitative analysis of a number of solid mixtures, minerals, alloys, etc. Quantitative work, second and third terms: thorough training in elementary gravimetric analysis and in the preparation and use of volumetric solutions.

CHEMISTRY 210. Organic Chemistry. Lectures, recitations, and laboratory practice. Lectures: three hours a week. Laboratory: six hours a week. Prerequisite, Chemistry 100 and taking 200. The lectures treat of the elements and principles of organic compounds. The laboratory work consists in the preparation of typical carbon compounds, including some work in elementary organic analysis.

CHEMISTRY 300. Introductory Physical Chemistry. Lectures: three hours a week. Laboratory: six hours a week. Prerequisite, Chemistry 210, Physics 100 and Mathematics 200 or taking 200. A systematic study of modern chemical theory. Particular attention is given to the theory of solutions, reaction velocity, chemical equilibrium, and to the practical applications of the principles of physical chemistry.

CHEMISTRY 310. Quantitative Analysis, Advanced Course. Lectures: one hour a week. Laboratory: nine

hours a week. Prerequisite, Chemistry 200 and 210. The work comprises gravimetric, volumetric, electrolytic, spectroscopic, colorimetric, gasometric and combustion methods of analysis.

CHEMISTRY 320. Technical Analysis. Lectures: two hours a week. Laboratory: six hours a week. Prerequisite, Chemistry 200 and 210. The lectures deal with the theory and practice of the methods as outlined in the laboratory work, as well as the technical processes calling for such tests. The laboratory work consists in the analysis of coal and coke, cements, fertilizers, minerals, iron and steel, and gases; the determination of the heating value of gaseous, liquid, and solid fuels; the sanitary analysis of water, the analysis of boiler waters and scale, petroleum oils, vegetable oils, and experience in the manipulation of many types of apparatus used in manufacturing plants. Within certain limits the work may be selected to suit the requirements of the individual student.

CHEMISTRY 330. Chemistry Seminar. One hour a week. All chemical engineers and students who are specializing in chemistry are required, after the completion of their second year, to attend the chemistry seminar. Members of the seminar report upon recent advances, and upon special topics of general interest in chemical science.

CHEMISTRY 400. Advanced Inorganic Chemistry. Three lectures a week. Prerequisite, Chemistry 300. The chemical elements are discussed in the order in which they occur in the Periodic Table of Mendeleeff, special emphasis being laid on the relations of the group properties of the various elements and the relations of the groups to one another. The course also includes a brief sketch of the history of chemistry.

CHEMISTRY 410. Applied Electrochemistry. Lectures: two hours a week. Laboratory: six hours a week. Prerequisite, Chemistry 300, Physics 200. Lectures and laboratory practice in electrolysis and plating; electrolytic extraction and refining of metals; storage cells; electrolytic manufacture of compounds; preparation of compounds in the electric furnace.

CHEMISTRY 420. Chemical Research. Chemical engineers and students who are specializing in chemistry are expected in their senior year to elect at least nine hours a week in research under the direction of some member of the staff of instruction.

CHEMISTRY 430. Colloid Chemistry. Lectures: three hours a week. Laboratory: three hours a week. Prerequisite, Chemistry 300. The course treats of the theories of colloid chemistry and their practical applications to biology and the arts.

CHEMISTRY 440. Advanced Organic Chemistry. Lectures and recitations: three hours a week. Prerequisite, Chemistry 210. A course of advanced topics in organic chemistry, including stereochemistry.

CHEMISTRY 500. Chemical Research. Chemical engineers or students who are specializing in chemistry are expected in their fifth year to elect at least five hours a week in research under the direction of some member of the staff of instruction.

CHEMISTRY 510 TO 570. Advanced courses respectively in inorganic chemistry, organic chemistry, physical chemistry, electrochemistry, sanitary chemistry, agricultural chemistry, and chemistry seminar.

Biology 100. General Biology. This course will include a general study of the origin and constitution of living matter; the differences between animals and plants; the fundamentals of morphology and physiology as illustrated by selected animal types; the development of the individual and of the race; together with a brief introduction to such biological ideas as are of general interest. The course is planned to meet the needs not only of those who intend to continue the study of biology, but also of those who wish to specialize in other branches, but yet are desirous of getting some general knowledge of the subject. It is a prescribed subject for those who wish to enter a medical college later, and it is thought that it will prove valuable to those intending to study theology, philosophy, psychology, economics, or agriculture. Three lectures and one three-hour laboratory period a week.

Biology 200. Comparative Anatomy and Comparative Embryology of Vertebrates. This course is planned as a foundation in stricter zoölogical methods, and is intended chiefly for students who desire to continue in biology or allied sciences. In the first half of the course a series of adult vertebrate types will be studied in the laboratory, and in the second half the detailed development of the dogfish, frog, chick, and pig will be taken up. The student will thus be able to appreciate the zoölogical evidence bearing on the question of evolution, and the probable course of evolution in the vertebrate stock. Three lectures and five hours of laboratory a week. Not offered in 1916–17. Biology 200 and 210 are offered in alternate years; a student can thus get four continuous years of biological work during his undergraduate career.

BIOLOGY 210. Cellular Biology. This course also is intended primarily for those students who wish to continue biological work. In it will be considered the structure and reproduction of cells; the physical basis of reproduction and the cytological mechanism of heredity; experimental embryology and regeneration. In the laboratory students will have an opportunity of studying living and prepared specimens illustrating the course, and to become acquainted with some of the methods of modern biological experiment and technique. Three lectures and five hours of laboratory a week.

BIOLOGY 300. Heredity and Evolution. Open to all students of junior standing who have taken Biology 100. Half the year will be taken up with a consideration of the principles of heredity. Among the topics treated will be the following: The older theories of heredity; the inheritance of acquired characters; Mendelism; the mutation theory; heredity in relation to microscopic discoveries; the heredity of sex; the biometric school; heredity and eugenics. Students will be able to carry out a series of actual breeding experiments on Drosophila. The laboratory work, however, will not be at fixed periods, and will not exceed three hours a week. During the remainder of the year the course will take up the facts and methods of evolution, with special stress upon the historical point of view in biology. The chief topics considered will be as follows: The evidences of evolution; the results of evolution; the theories as to the method of evolution; sexual selection; the descent of man; evolution in its relation to man. In this part of the course there will be themes and required reading, but no laboratory work.

BIOLOGY 400. Invertebrate Zoölogy. A laboratory study of the chief types of invertebrate animals, accompanied by prescribed reading and lectures. Honors course.

BIOLOGY 500. Advanced Genetics. Reading and seminar work in modern genetics, accompanied by practical work and problems. Students will also be given research work to carry on in conjunction with the course. Graduate course.

BIOLOGY 510. General Problems of Zoölogy. Reading, themes, and seminar work on advanced general topics of biology. Graduate course.

ECONOMICS 200. Elements of Economics. An introduction to the fundamental theories of economics and to their applications, with special reference to the problems of money, banking, transportation, international trade, and business organizations. This course is planned to meet the requirements in industrial economics on the schedules of all engineering students.

ECONOMICS 300. An introduction to Sociology and modern social problems, especially immigration, crime, pauperism, and the problems of city life. ~~To be given in alternate years with History 300.~~

EDUCATION 100. An introductory course in the principles of educational psychology and school management, designed to meet the requirements for a first grade State teacher's certificate.

The Department of Education of the State of Texas will grant, without further examinations, a first grade teacher's certificate to students who complete a year's

work at the Institute consisting of the above course in education and four other regular courses.

EDUCATION 200. History of Education. Not to be offered in 1916–17.

EDUCATION 210. Modern Educational Systems and Methods. An examination of the development of educational methods, systems, and ideals in modern Germany, France, England, and in the United States, and an inquiry into the fundamental problems confronting education in present-day democracies.

EDUCATION 300. Philosophy of Education. A direct constructive study of the main educational theories, from Socrates to Froebel.

EDUCATION 400. Advanced Course in Educational Methods. Not to be offered in 1916–17.

The Department of Education of the State of Texas will grant, without further examinations, a permanent teacher's certificate to graduates of the Institute who have completed four of its courses in education.

HISTORY 100. European History. A general survey of the intellectual, social, and political development of Europe from the fourth century through the nineteenth. Lectures and required reading.

HISTORY 200. Constitutional Government. The origins and operation of constitutional government, the formulation of public policy and the conduct of public business, with special reference to England and the United States.

History 300. The Historical Development of the United States, with special reference to the period since the adoption of the Constitution.

History 500. The interpretation of the Constitution by the courts. An advanced seminar course.

Philosophy 201–2. Logic. A study of the process of thinking and the nature of truth. The first part of the course is devoted to the elements and laws of deductive and inductive reasoning, from which the student advances to the consideration of such problems as the nature of thought, the characteristics and types of judgment, and the unification of knowledge. Considerable time is spent in the critical analysis of arguments with a view to developing the student's power of detecting fallacies, of clear consistent thinking, and of efficient argumentation.

Philosophy 203. Problems of Philosophy. A brief elementary discussion of the problems, significance, and value of philosophy; the part it has played in the development of human thought, and its importance in the attainment of true culture. This course follows Philosophy 201–2, and taken together with it comprises a year's credit in philosophy.

Philosophy 300. History of Philosophy. An historical survey of the essential features and main currents of philosophic thought, ancient, medieval, and modern. The bearing of philosophy on the trend and development of science, art, morality, and religion is emphasized throughout the course.

Philosophy 310. Ethics. An account of the origin and development of moral ideals, the essentials of the

main ethical theories, and the problem of morality, individual and social, at the present time. A direct study will be made each year of at least one masterpiece of ethical theory. Not to be offered in 1916–17.

PHILOSOPHY 400. Types of Philosophical Theory. This course is intended to acquaint the student somewhat more intimately with the several distinctively philosophical problems and with the main types of philosophical theory, through lectures and discussions, and more especially through a direct study of some selected masterpieces of ancient and modern philosophy. The works chosen for direct study will vary from year to year. Not to be offered in 1916–17.

PHILOSOPHY 410. Philosophy of Religion. An introduction to the historical-philosophical study of religion, designed to acquaint the student with the main facts in the evolution of religion and the part it has played in the history of human culture. The course will begin with an examination of several theories concerning the origin of religion and a brief survey of religious worship in primitive life; will proceed to an elementary study of the great historic religions and of their sacred books; and will end in a consideration of the more fundamental problems of the religious consciousness. Attention will be paid to the relation of religion to magic, mythology, theology, art, morality, science, and philosophy. Lectures, assigned readings, discussions.

PHILOSOPHY 500. Evolution of Moral Ideas. Seminar.

PHYSICAL TRAINING

In the arrangements for required physical training, students will be given every opportunity to allow the competitive and purely recreational elements to enter into this work, which will be more properly athletic than gymnastic in character. The classes will be organized in such divisions as to eliminate the possibility of the weaker student being compelled to compete with the stronger. So far as may be possible, each student will be allowed to choose his own recreation, but he will be expected to vary his schedule during the year. The classes will take up boxing, wrestling, athletic dancing, shadow boxing, basketball, soccer football, indoor and outdoor baseball, track work, military drill, and the like. Each student will be subjected to two thorough physical examinations, one at the beginning and one at the end of the year. These examinations will determine in large measure the character of work that the individual student will be permitted to take. Lectures will be given on personal hygiene and the general principles of health.

COURSES IN ENGINEERING

Courses will be offered in chemical, civil, electrical, and mechanical engineering. A complete course in any one of these branches will extend over five years. A student who has successfully completed the first four years of a course will be awarded a bachelor's degree, and after successfully completing the remaining year of his course he

will be awarded an engineering degree. The work of the first three years will be practically the same for all students, but in the last two years each student will be required to select one of the special branches mentioned above.

The work of the first two years will consist chiefly of courses in pure and applied mathematics, physics, chemistry, and other subjects, an adequate knowledge of which is absolutely necessary before the more technical courses can be pursued with advantage. During the first two years, however, a considerable amount of time will be devoted to engineering drawing and the elements of surveying.

Technical work will begin in the third year with courses of a general character in mechanical engineering, civil engineering, and electrical engineering, all three of these branches to be taken by all engineering students, with a slight change in schedule for those in chemical engineering. These courses will form an introduction to the technical side of each branch and should enable students intelligently to select a particular branch at the beginning of their fourth year.

In the third year instruction will also be begun in shopwork. The classes in shopwork are intended to give familiarity with workshop methods. The object of these classes is not primarily to train students to become skilled mechanics, but to provide such knowledge of shop methods as is desirable for those who may be expected as engineers to employ mechanics and to superintend engineering shops. It is intended in the engineering courses to pay special attention to the theoretical side, because ex-

perience has shown that theoretical knowledge is difficult to obtain after leaving the university, and without it a rapid rise in the profession of engineering is almost impossible. On the other hand, it is not intended to disregard practical instruction; for this reason the last three years will include besides shopwork a variety of practical work in engineering testing laboratories. It is recommended that students obtain employment in engineering work during the summer vacations, for it should be remembered that no amount of university work can take the place of practical experience in engineering establishments and in the field. The courses in engineering are not intended to take the place of learning by practical experience, but are designed to supply a knowledge of the fundamental principles and scientific methods on which the practice of engineering is based and without which it is difficult, if not impossible, to succeed in the practice of the profession.

Students who can afford the time are recommended to devote three or four years to preliminary work instead of two, taking the B.A. at the end of four years and an engineering degree at the end of six or seven years. Students proposing to do this are advised to take a course devoted largely to mathematics, physics, and chemistry, or an honors course in either mathematics, physics, or chemistry. The subjects taken during the years of preparatory work must include those of the first two years in the general engineering course, which may be substituted for options in the academic B.A. course. The honors course in physics is strongly recommended for those who wish to become either electrical or mechanical engineers.

PRELIMINARY ANNOUNCEMENT

The following are the schedules for the five-year course leading to a bachelor's degree in four years and an engineering degree in five years:

First Year

(1) Mathematics
(2) Physics [1]
(3) English
(4) French or German
(5) Engineering Drawing and Surveying

Second Year

(1) Mathematics
(2) Mechanics [1]
(3) Physics
(4) Chemistry
(5) Engineering Drawing

Third Year

MECHANICAL ENGINEERING AND ELECTRICAL ENGINEERING

(1) Mathematics 300
(2) Mechanical Engineering 300
(3) Electrical Engineering 300
(4) Civil Engineering 300
(5) Mechanical Engineering 310

[1] Chemical engineers take Chemistry.

CIVIL ENGINEERING

(1) Mathematics 300
(2) Mechanical Engineering 300
(3) Electrical Engineering 300
(4) Civil Engineering 300
(5) Civil Engineering 310

CHEMICAL ENGINEERING

(1) Chemistry 300
(2) Chemistry 320
(3) Chemistry 330
(4) Physics 200
(5) Mechanical Engineering 300
(6) Civil Engineering 300

Fourth Year

MECHANICAL ENGINEERING

(1) Mechanical Engineering Laboratory (M.E. 400)
(2) Machine Designs (M.E. 410)
(3) Heat Engines (M.E. 420)
(4) Industrial Management (M.E. 430)
(5) Gas Engines and Producers (M.E. 440)
(6) Economics 200
(7) Seminar (Eng. 400)

ELECTRICAL ENGINEERING

(1) Alternating Currents (E.E. 400)
(2) Electrical Engineering Laboratory (E.E. 410)
(3) Electrical Design (E.E. 420)
(4) Industrial Management (M.E. 430)
(5) Economics 200
(6) Seminar (Eng. 400)

CIVIL ENGINEERING

(1) Graphic Statics and Masonry (C.E. 400)
(2) Roofs and Bridges (C.E. 410)
(3) Municipal Engineering (C.E. 420)
(4) Chemistry 200
(5) Economics 200
(6) Seminar (Eng. 400)

CHEMICAL ENGINEERING

(1) Advanced Inorganic Chemistry (Chem. 400)
(2) Applied Electrochemistry (Chem. 410)
(3) Chemical Research (Chem. 420)
(4) Electrical Engineering 300
(5) Economics 200
(6) Seminar (Eng. 400)
(7) Seminar (Chem. 330)

Fifth Year

MECHANICAL ENGINEERING

(1) Advanced Machine Design (M.E. 500)
(2) Mechanical Processes (M.E. 510)
(3) Power Plant Design (M.E. 520)
(4) Thesis (M.E. 530)
(5) Heating, Ventilation, and Refrigeration (M.E. 540); or Turbine and Boiler Design (M.E. 550)
(6) Chemistry 200

ELECTRICAL ENGINEERING

(1) Advanced Alternating Currents (E.E. 500)
(2) Thesis (E.E. 510)
(3) Heat Engines (M.E. 420)

(4) Seminar (Eng. 400)
(5) Elective

CIVIL ENGINEERING

(1) Structural Design (C.E. 500)
(2) Hydraulic Design (C.E. 510)
(3) Thesis (C.E. 520)
(4) Technical Analysis (Chem. 320)

CHEMICAL ENGINEERING

(1) Chemistry Research
(2) Chemistry Seminar
(3) Machine Design (M.E. 410)
(4) Municipal Engineering (C.E. 420)
(5) Elective

ENGINEERING 100. This course embraces Mechanical Drawing and Plane Surveying. Mechanical Drawing: The use of instruments, lettering; drawing figures in isometric, cabinet, and orthographic projection; intersections and developments. Plane Surveying: The study of the uses and adjustments of surveying instruments. Problems are given in field work to familiarize the student with the chain, compass, level, and transit. Plotting and compilations from field notes.

ENGINEERING 200. This course embraces Descriptive Geometry, Kinematics, and Engineering Drawing. Descriptive Geometry: Orthographic projection of points, lines, planes, warped surfaces, etc., in the four angles of projection; intersections and developments. Kinematics: The study of relative motion of parts of machines, instant centers, velocities, gearing and wrapping connectors.

Engineering Drawing: Lettering; plotting field notes; working drawings and tracings of structural details, etc.

Mechanical Engineering 300. Prime Movers. A general course dealing with the characteristics, fields of usefulness, operation, and test of fuels, engines and turbines, boilers, pumps, condensers, and auxiliaries; properties of steam; valve gears. Laboratory and text work are coördinated as nearly as possible, and numerous problems illustrate the theory discussed. Two recitations and one three-hour laboratory period a week throughout the year. Prerequisites, Physics and Chemistry 100.

Mechanical Engineering 310. Machine Shop. Through text-book and lectures dealing with general shop practice and machine design, the course aims to produce men with a general knowledge of engineering shopwork, such as foremen and managers require. Practice with a variety of bench and machine tools, carefully selected for their fitness in illustrating the principles studied, affords actual contact with machine work and develops a certain degree of skill and resourcefulness in the student. Three periods a week throughout the year.

Electrical Engineering 300. The fundamental principles of dynamo machinery, both direct and alternating current. The course includes laboratory work, which as far as possible parallels the class-room work. Two recitations and one laboratory period per week throughout the year.

Civil Engineering 300. Strength and resistance of materials. Analysis of stresses in beams, columns, and shafts. Hydraulics. The principles of hydromechanics.

The laws of pressure and flow of water. Laboratory work including tensile, compressive, torsional and transverse tests of materials. Three recitations and one laboratory period per week throughout the year.

Civil Engineering 310. Topographic, Railroad, and Geodetic Surveying. The theory and practice of stadia surveying; contour maps; topographic symbols. Triangulation and base-line measurements. Quadrilateral adjustments. The mathematics of simple, compound, parabolic, and spiral easement curves. Computation of earth work and estimate of cost. Reconnaissance, preliminary, and location surveys by methods used in actual practice. Three recitations or practical periods throughout the year.

Mechanical Engineering 400. Mechanical Engineering Laboratory. An advanced course in general steam, oil, water, and power-transmission machinery operation and testing. Prerequisite, Mechanical Engineering 300. Two laboratory periods a week throughout the year.

Mechanical Engineering 410. Machine Design. Calculations and drafting, supplemented by text-book and reference work, involved in the design of machine parts, considering both the theory and its modifications due to shop practice and financial limitations. Prerequisite, Engineering 100 and 200, Mechanical Engineering 310, and Engineering 330 (Mechanics of Materials). Three drafting periods a week throughout the year.

Mechanical Engineering 420. Heat Engines. General thermodynamics; applications of thermodynamics to the design and operation of steam engines and turbines,

air and ammonia compressors, gas engines, and injectors; commercial forms of these machines. Prerequisite, Mathematics 200 and M.E. 300. Three recitations a week throughout the year.

MECHANICAL ENGINEERING 430. Industrial Management. A study of principles and practice in the management of manufacturing plants; location and layout of works; organization of administration, sales, cost, and production departments; selection of machinery, material, and labor; wage systems; cost analysis; welfare work and efficiency methods. Two recitations a week throughout the year.

MECHANICAL ENGINEERING 440. Gas Engines and Producers. A study of the theory, design, and operation of internal combustion engines and gas-producers. Must be preceded or accompanied by M.E. 420. Two periods a week throughout the year.

ELECTRICAL ENGINEERING 400. Alternating Currents. A mathematical treatment of the theory of alternating current phenomena, using Steinmetz's symbolic method. The various types of alternating current generators and motors; their characteristics and operation. Transformers. Synchronous converters. Four recitations per week throughout the year.

ELECTRICAL ENGINEERING 410. Electrical Engineering Laboratory. A laboratory study of alternating current circuits, instruments, and machines. Standard testing of direct and alternating current machinery. Two laboratory periods per week throughout the year.

ELECTRICAL ENGINEERING 420. Electrical Design. Design of machinery for direct and alternating current. Calculation of characteristics. Two drawing periods per week throughout the year.

CIVIL ENGINEERING 400. Graphic Statics. Design of roof trusses. Masonry. Properties and uses of building stone, brick, concrete, sand, gravel, broken stone, cement, lime, etc. Foundations of various kinds under different geological conditions. Design of masonry structures and foundations. Three design periods or recitations a week throughout the year.

CIVIL ENGINEERING 410. Roofs and Bridges. Computation of stresses in roof and bridge trusses; highway and railway bridges; deflection and internal work; continuous, draw, cantilever, and suspension bridges. Structural design involving the principles enumerated above. Three periods a week throughout the year and design periods.

CIVIL ENGINEERING 420. Municipal Engineering. This course is divided into three equal parts. Water supply engineering: a study of rainfall, evaporation, seepage, and run-off. Probability of droughts. Computations for storage. Design, construction, operation, and maintenance of filtration plants. Distribution systems for municipal and irrigation purposes. Roads and pavements: Construction and maintenance of earth, macadam, and bituminous macadam roads, asphalt, brick, wood block and granite block pavements. Sewerage and sewage disposal: Water carriage system, separate and combined. Design, construction, and maintenance of sewers and sewage disposal plants.

ENGINEERING 400. Seminar. A weekly meeting conducted by the fourth year engineering students for the discussion of current topics from the technical periodicals, and of scientific and technical papers of general engineering interest. One meeting a week throughout the year.

MECHANICAL ENGINEERING 500. Advanced Machine Design. The investigation of elaborate complete machines; original design of complete machines; design of mill-building trusses, floors, and structural details.

MECHANICAL ENGINEERING 510. Mechanical Processes. A general course dealing with special plants and processes, such as the manufacture of cement, metallurgy, water-softening, etc., not covered by other special courses.

MECHANICAL ENGINEERING 520. Power Plant Design. A general text and design course covering details of operation and design of power and heating plants.

MECHANICAL ENGINEERING 530. Thesis. The investigation, under the supervision of the Mechanical Engineering staff, of some undeveloped engineering problem, either through experiment, design, or compilation of available information.

MECHANICAL ENGINEERING 540. Heating, Ventilating, and Refrigeration. Text-book, lectures, and problems on the heating and ventilating of public and private buildings and the manufacture of ice and maintenance of low temperatures. Elective. Must be preceded by Mechanical Engineering 420.

MECHANICAL ENGINEERING 550. Turbine and Boiler Design. Text-book, lectures, and drafting practice re-

lating to the design of standard forms of steam turbines and boilers. Elective. Prerequisite, Mechanical Engineering 420.

Electrical Engineering 500. A continuation of Electrical Engineering 400. Advanced alternating currents. Transients. Attention will be given to special branches such as high voltage installations, high frequency, illumination, telephony, wireless telegraphy, etc. Three lectures and one laboratory period per week.

Electrical Engineering 510. Thesis. A thorough report on an engineering investigation selected and carried out by the individual student. It is expected that a great deal of time will be given to thesis work. The course is considered the equivalent of a three-hour course.

Civil Engineering 500. Structural Design. Principles of economic design. Class-room designs of plate girders, pin connected and riveted bridges. Steel frame and reinforced concrete building construction. Three design periods a week throughout the year.

Civil Engineering 510. Hydraulic Design. Design of dams, conduits, penstocks, and turbines; irrigation and drainage systems; sewers and sewage disposal plants; water-supply systems and water-power plants. Three design periods a week throughout the year.

Civil Engineering 520. Thesis. This will consist of an original investigation along some approved line of civil engineering work, an original design, or a critical review of existing work. In every case a complete type-written or printed report will be required, and this will become the property of the Institute and be deposited in the general or departmental library.

COURSES IN ARCHITECTURE

To students of architecture the Institute offers a full course extending over five years, leading to a bachelor's degree at the end of the fourth year and to an architectural degree at the end of the fifth year. It is the purpose of the course in architecture to lead students during their residence to a comprehensive understanding of the art of building; to acquaint them with the history of architecture from early civilization to the present age; and to develop within them an understanding and appreciation of those conceptions of beauty and utility which are fundamental to the cultivation of ability in the art of design.

In arranging the courses which follow it will be observed that there are included certain indispensable elements of a liberal education and also such engineering and technical subjects as are becoming more and more necessary to the general education of a practising architect. Of the more strictly architectural subjects, design is given by far the largest place. As a matter of fact, the courses in history and design and those in freehand drawing, in water color, in drawing from life, and in historic ornament have all a double object: to create in the student an appreciation of architectural dignity and refinement and to increase constantly his ability to express conception of architectural forms. Accordingly, the training of the student is not limited to the training in draftsmanship alone, but all courses conspire to the cultivation of creative and constructive ability in expression and design. With

a view to keeping the student in touch with the progress of his profession and with the daily routine and detail of its practice, it is strongly recommended that he spend a portion of each of his summer vacations in the office of some practising architect.

The following are the schedules for the five-year course leading to a bachelor's degree in four years and a degree in architecture in five years:

First Year

(1) Pure Mathematics
(2) English
(3) A modern language (French recommended)
(4) Physics
(5) Architectural subjects: architectural drawing, elements of architecture, freehand drawing, and shades, shadows, and perspective

Second Year

(1) Pure Mathematics
(2) English
(3) A modern language [1]
(4) A science
(5) Architectural subjects: design, antique drawing, history of architecture, and perspective

Third Year

(1) English
(2) History or Economics

[1] Students who enter with credits in two modern languages may substitute another subject.

(3) Architectural subjects: design, antique drawing, water color drawing, history of architecture, pen and ink rendering, mechanics

Fourth Year

(1) English or History

(2) Architectural subjects: design, construction, water color drawing, pen and ink rendering, drawing from life, history of architecture, historic ornament, special lectures

Fifth Year

Architectural subjects: design, construction, water color drawing, drawing from life, history of architecture, history of painting, architectural practice, special lectures

UNIVERSITY EXTENSION LECTURES

To bring the people of the city and community into more intimate touch with the academic life of the university, and to carry the influence of that life directly to many homes not represented on the rolls of its undergraduate or postgraduate students, regular series of public lectures, in the form of university extension lectures, are offered without matriculation fee or other form of admission requirement. These performances are authoritative in character, but as non-technical and popular in treatment as their subjects will permit. From domains of literature, history, science, art, philosophy, and politics subjects of current interest as well as those of assured and permanent value are chosen. The present plan for these university

extension lectures consists in giving each academic year two regular series of thirty-six lectures each on Mondays, Wednesdays, and Fridays, from the middle of November to the middle of February, the second series running similarly from the middle of February to the middle of May. All these lectures are delivered in the lecture halls and amphitheaters of the Institute, each afternoon lecture beginning promptly at 4:30 and closing not later than 5:30. In addition to the afternoon lectures, occasional Thursday evening lectures are given.

RICE INSTITUTE PUBLICATIONS

Among the publications of the Rice Institute are at present included the Announcements, the Descriptive Brochure, the Programmes of University Extension Lectures, and the Rice Institute Pamphlets. The first three of these have appeared at intervals and in several editions; the Pamphlet, now in its third volume, is published quarterly in January, April, July and October, with a view to giving wider publicity in permanent form to inaugural and other lectures in letters, science, and art by visiting lecturers and professors to the University. In this connection the reader may wish to turn to the paragraph of this Announcement concerning the formal opening of the Institute.

LIBRARY

Quarters for the Library of the Institute have been provided on the second floor of the Administration Building. In its initial equipment the policy is being followed of

providing such books as are necessary to supplement the courses of instruction and to support the independent investigations of the staff and advanced students. In this manner a high degree of efficiency becomes possible at the very beginning of the Library's existence. Moreover, for works of general and more popular interest the shelves of the Carnegie Library of Houston are accessible to all members of the Institute.

Besides several hundred current literary and scientific journals, the Library of the Institute contains at present complete back files of the following magazines and periodicals, exclusive of certain government publications: American Journal of International Law, Contributions of the Jefferson Physical Laboratory of Harvard University, Publications of the Carnegie Institution of Washington, Report of the Hayden Survey, Science Abstracts—Series A and B, Studies from the Rockefeller Institute, Transactions of the American Institute of Electrical Engineers, Transactions of the American Institute of Mechanical Engineers, Annales de la Société Royale des Sciences Médicales et Naturelles de Bruxelles, The Hibbert Journal, Proceedings of the London Mathematical Society, Proceedings of the Royal Society of London, Quarterly Journal of Microscopical Sciences, Revue Semestrielle des Publications Mathématiques, Journal de Mathématiques, Journal de Physique, L'Enseignement Mathématique, Annalen der Physik, Archiv für Entwickelungsmechanik der Organismen, Ergebnisse der Anatomie und Entwickelungs-Geschichte, Jahrbuch der Drahtlosen Telegraphie und Telephonie, Jahrbuch der Fortschritte der Mathematik, Jahrbuch der Radioaktivität

und Elektronik, Mathematische Annalen, Physikalische Zeitschrift, Verhandlungen der Deutschen Physikalischen Gesellschaft, Zoologischer Anzeiger und Bibliographia Zoologica, Zoologischer Jahresbericht, Rendiconti del Circolo Matematico di Palermo, Acta Mathematica, Annual Reports of the American Historical Association, United States Supreme Court Reports, Physical Review, Engineering News, Engineering Record, L'Éclairage Électrique, International Journal of Ethics, Journal of Philosophy, Psychology, and Scientific Methods, Revue Philosophique, Mind, Philosophical Review, Journal of Physical Chemistry, Zeitschrift für Analytische Chemie, The Electrician, Metallurgical and Chemical Engineering, Journal and Proceedings of the Am. Chem. Society, Chemical Abstracts, Journal of Industrial and Engineering Chemistry, Zeitschrift für Physikalische Chemie, Zeitschrift für Anorganische Chemie.

LABORATORY INSTALLATION

THE physics laboratories stand upon the north side of the academic court, adjoining the administration building, and are connected to it by a continuation of the original cloister. The buildings are constructed of brick and marble, corresponding in design to the style as defined in the administration building, but of a simpler character expressing their purpose as laboratories. The physics laboratory proper is a two-story building 275×56 feet, connected with a large lecture amphitheater 121×72 feet. The main building contains four large students' laboratories, two lecture rooms equipped for giving illustrated

lectures, two class rooms, a library, and administrative offices. The principal room of the amphitheater wing is a large lecture hall with seating capacity for about four hundred auditors. The room is fully equipped for giving illustrated lectures and is arranged with seats properly elevated to command a 28-foot lecture table which is supplied with gas, hot and cold water, compressed air, vacuum, and direct and alternating electric currents. In this wing also are six rooms fitted for research work in physics, a battery room in which a battery of 60 Edison storage cells of 300 ampere-hours' capacity has been installed with space provided for another equal battery, a switchboard room where the wires from the battery can be connected in any desired manner for use in the laboratories, a motor generator for charging the batteries, a vacuum pump, a liquid air plant, constant temperature rooms, a preparation room, and a fully equipped workshop. The floor of the workshop is supported free from contact with the surrounding walls so that vibration from the machines does not affect the building. Elevators for moving heavy apparatus are provided, and all laboratories, lecture rooms, and research rooms are equipped with individual service, for the students, of gas, water, steam, compressed air, vacuum, and both direct and alternating currents of electricity. The laboratory now contains a fine collection of modern apparatus suitable for teaching and research work in all branches of physics. This collection includes about seventy ammeters and voltmeters of all types, including a Kelvin gauge reading up to 30,000 volts and standard Weston instruments. About thirty resistance boxes of all kinds are also provided, and

numerous galvanometers, including a Paschen instrument. High potential batteries are available for research work. A large Weiss electromagnet and a Leeds and Northrup potentiometer may be specially mentioned among the other electrical instruments. The optical instruments include a Hilger's wave length spectrometer, monochromatic illuminator, spectrophotometer, and quartz spectrograph; also a set of interferometers of various types. For work in heat, electrical furnaces, various types of radiation pyrometers, resistance thermometers, and standard thermocouples are available. The apparatus for general work includes several Gaede pumps and a molecular pump; also standards of weight, length, etc. The collection of apparatus for illustrating lectures is exceptionally complete.

The department of chemistry is housed in the mechanical laboratory and is supplied with modern apparatus and materials for both lecture-room and laboratory work in inorganic, organic, analytical, physical, electro-, and industrial chemistry. Each laboratory room is equipped with the necessary conveniences, such as water, gas, electric lights, alternating and direct current, air blast, hoods, suction pumps, etc. The lecture rooms are suitably arranged for the illustration of lectures by experiment and lantern projection. In the Library of the Institute will be found the more important journals, works of reference, and standard texts on the different branches of chemistry. These books and periodicals are accessible to all students.

The department of biology is for the present situated in the west end of the main wing of the physics labor-

atories. It contains a laboratory capable of seating fifty students; a lecture room with lantern for microscopic and other forms of projection; three research rooms, a preparator's room, store-rooms, animal rooms, etc. The undergraduate courses are cultural in their aim. Laboratory work is given in all; microscopes of the most modern type are provided for the students. Two Leitz monobjective binocular microscopes with apochromatic objectives, a traveling microscope, and a binocular microscope are available for research work. A departmental library is being started, in addition to the main library, which contains most of the important current zoölogical periodicals.

The department of architecture is located on the second floor of the mechanical laboratory, and is equipped with a large general drafting room modern in all its appointments, and with a large studio for freehand drawing and water color. A working library of architecture adjoins the drafting room and is equipped with the standard architectural publications; current files of architectural periodicals; plates, photographs, and lantern slides. The freehand studio is well equipped with plaster casts from the antique, and of historic ornament. The department also possesses models for elementary instruction in the orders, and models for the teaching of construction.

The civil engineering department is fully equipped with the usual surveying instruments, having six transits, four levels, and three compasses of standard American makes. These include C. L. Berger and Company, Buff and Buff, W. and L. E. Gurley, Bausch and Lomb, Keuffel and Esser, and Eugene Dietzgen Company. There is also a large

assortment of the necessary auxiliary equipment such as rods, tapes, range poles, etc. A materials testing laboratory has been provided for the coming year and will be equipped with the latest types of machines for testing cement, steel, wood, and other materials of construction. With such machines it will be possible to make the usual tests of these materials for tension, compression, cross-bending or torsion.

The electrical engineering laboratory is a long, high room, well lighted and ventilated by many large windows on the long sides. Those on the south are shaded by a wide cloister. With the almost continuous sweeping of a south breeze through the room, a more pleasant place to work could hardly be imagined. The power supply, arranged to be independent of the general Institute lighting and power system by running from a separate generator in the power house, is 220 and 110 volts, 3 phase, 60 cycles. Direct current for laboratory use is obtained from a General Electric three wire generator of 35 kilowatt capacity, 125–250 volts, driven from this alternating source by a direct-connected induction motor. The laboratory is at present equipped for the study of direct current machinery, and its equipment is sufficiently varied to illustrate the details of modern practice in this field. The shunt generator is represented by a 5 kilowatt, 110 volt Commercial, while a Westinghouse 3½ kilowatt and a Weston 5 kilowatt, each for 110 volts, furnish examples of the compound wound generator. There are two shunt motors for 250 volts, a Roth 2 horse-power and a Weston 7½ horse-power. A 4 horse-power, 250 volt Sprague motor illustrates the series type machine. The

effects of a commutating field may be studied on a 3 horse-power variable speed General Electric motor with interpoles. For general driving purposes there is a Fairbanks-Morse squirrel cage induction motor. These smaller machines are coupled by belts. For flexibility they are not permanently mounted, but may be fastened in any desired combination on heavy portable bases. The moving is facilitated by a large floor crane. For safety the belt speeds are lower than average. For the same reason voltages higher than 500 are not used in the laboratory. Elaborate short circuit tests are being made on a 45 kilovolt-ampere synchronous motor used as generator. The equipment of this test, which is available on occasion for student use, includes a 6 volt direct current generator with Tirrill voltage regulator, capable of delivering 500 amperes, driven by a direct connected induction motor, a solenoid operated oil switch, and a completely furnished oscillograph. There is in connection with the laboratory a dark-room for the development of oscillograph films. Additions to the installation during the past year were made as follows: a rotary converter of the split pole, or regulating pole, type; two synchronous generators for parallel operation; a slip-ring induction motor; an induction with internal starting resistance; three 1–1 and 2–1 ratio transformers; several air core reactance coils and a large bank of condensers for the study of alternating current circuits; two compound generators (d.c.) for parallel operation, etc.

The engine laboratory equipment falls into three general classes: steam and oil machinery, hydraulic machinery, and apparatus for testing fuels and lubricants. The

first class contains an 8×18 Murray-Corliss engine equipped with rope brake; a 7×7 vertical Wachs slide-valve engine with Stephenson reversing gear and Prony brake; a 6×4×6 duplex boiler feed pump; and a 20 kilowatt direct current De Laval turbo-generator set, nozzled for condensing and non-condensing operation and fitted with a brake-pulley which may be substituted for the generator. These machines are piped to exhaust either into the power-house stack or into two Wheeler surface condensers served by Christy circulating and wet vacuum pumps. A 15 horse-power Foos oil engine equipped with two types of governors gives opportunity for engine tests using either kerosene or gasoline as fuel. The hydraulic machinery consists of a 3-inch centrifugal pump, driven by the Wachs engine; a calibrated overhead tank; a concrete storage cistern; two Venturi meters; a single tube manometer; a steam pulsometer; a hydraulic ram; a wier box and notch; orifices, water meters, weighing tanks and scales, gauges, and the usual small accessories. A 12-inch Pelton-Doble water wheel with plate-glass sides is being erected. Part of the apparatus for testing fuels and oils is a complete Parr coal calorimeter outfit; analytical balances; a Moyer-Allen flue-gas apparatus; a Scott viscosimeter; a Thurston coefficient of friction machine; hydrometers and specific gravity apparatus; a Junker type gas calorimeter; platinum ware, drying oven, ball mill, etc. In addition, the laboratory contains a double tube injector, dead weight pressure gauge tester, thermometer calibration apparatus, steam calorimeters, the most popular gas and steam engine indicators, planimeters, standard

gauges and thermometers. For class-room demonstrations, a Cussons valve-setting model, a steam pump model, and a collection of blue-prints and curves are available.

The machine shop contains machine tools of quite varied character, each selected for its peculiar fitness to illustrate the principles and common details of modern shop tools and methods. The lathe equipment consists of one 14 × 8 Le Blond cone-head lathe with taper attachment and double back gears; one 14 × 6 Hendey cone-head quick-change lathe; one 14 × 8 standard lathe; one 14 × 7 Prentice geared head quick-change lathe; one 14 × 6 geared head quick-change Lodge and Shipley lathe; and one 14 × 6 motor driven Lodge and Shipley selective head lathe. The planer type of machine is represented by a 16-inch back-geared Rockford shaper with compound head. All kinds of plane surfaces can also be cut upon the No. 1 Kempsmith universal milling machine, which is fitted with a good variety of cutters and a dividing head for gear cutting, differential indexing, spiral grooving, etc. A No. 12 Brown and Sharp motor-driven cutter and universal grinder serves as a practical example of a high-class precision machine tool. For miscellaneous work, a work bench with vises, a two-wheel hand-tool grinder, a power hacksaw, a forge, a 20-inch drill-press, a sensitive drill, and an arbor press are available. A sufficient supply of small hand- and machine-tools, lathe sets, and precision measuring instruments is issued on checks from a separate tool-room. All the power machines except the universal grinder and one lathe are driven through a line

shaft by a 15 horse-power motor. A supply of compressed air offers opportunity to demonstrate pneumatic tools. The shop is on the ground floor, well lighted and ventilated, with ample provision of lavatories and lockers. The students' work is arranged with the aid of a despatch board and time-recording system, and early in the course standard instruction sheets and tool-lists are issued. Later, the student is thrown on his own resources. During the year inspection trips to local foundries, repair shops, and machinery assembling plants bring the student in touch with special machinery and processes not found at the Institute. Similar trips are also made to power-plants in the neighborhood.

STUDENT ORGANIZATIONS

In the residential halls for men, students and instructors are already living in a common society a common life under conditions the most democratic. They sit at a common table; they lounge in common club-rooms; they frequent the same cloisters; in games they meet again upon the same playing fields. The quadrangle is self-governed, with no other machinery of government than is necessary to conduct a gentleman's club. To the quadrangle, as to the college, the only possible passports are intellect and character. In the quadrangle, as on the campus, the business of life is regulated by no other code than the common understanding by which gentlefolk determine their conduct of life, constantly under the good

taste, the good manners, the enduring patience of gentle minds, among strong men who believe that he lives most who works most, labors longest, worries least. The halls have their literary and debating societies, religious associations, and musical and athletic organizations. And from the start the students of the Rice Institute, irrevocably committed to canons of clean sport, have participated in the several forms of intercollegiate athletic contests. Following the organization of the Rice Institute Athletic Association, the first society of students to be organized at the new University was the Young Men's Christian Association. This step on the part of the young men was speedily followed by a similar step on the part of the young women in the organization of their branch of the college Young Women's Christian Association. The founding of these religious societies, both of which have contributed to the social life and the religious spirit of the new University, was followed promptly by the forming of three literary societies, one by the young women, bearing the name of Elizabeth Baldwin, wife of the founder of the Institute, and two by the young men, known respectively as "The Owl Literary Society" and the "Riceonian Literary and Debating Society." These societies meet weekly, and have held occasional intersociety meetings in public debate. The three literary societies are maintaining at present the first of the undergraduate periodical publications, namely, "The Thresher," which has been appearing fortnightly since its initial number in January, 1916. Previous to the organization of the staff of "The Thresher," the Class of 1916 made arrange-

ments for the publication of the first class annual of the Institute, to be known as "The Campanile," and to appear in the spring of 1916. In addition to the student organizations mentioned above, various departmental clubs and scientific societies have been contributing to the intellectual life of the Institute.

LIST OF STUDENTS

1912–1916

LIST OF STUDENTS

Received in the Academic Year 1912–13

Aten, Rex Graham . . . . . *Houston, Texas*
Bankhead, Bessie Walker . . . . *Weatherford, Texas*
Benton, Verner Loraine . . . . *Houston, Texas*
Betts, Wilson Tarry . . . . . *Marlin, Texas*
Bevan, Wilbur Harrison . . . . *Galveston, Texas*
Black, Louise Margaret . . . . *Houston Heights, Texas*
Bradley, Raymond Leslie . . . . *Houston, Texas*
Bramlette, James Lee . . . . . *San Angelo, Texas*
Brigham, Joe . . . . . *Columbus, Texas*
Bulbrook, Harry Marshall . . . *Cisco, Texas*
Burns, James Blaine . . . . . *Houston, Texas*
Bybee, Joseph Alexander . . . . *Willis, Texas*
Clede, Ivan Roy . . . . . *Houston, Texas*
Cockrell, May Belle . . . . . *Houston, Texas*
Crawford, Thurman . . . . . *Humble, Texas*
Cummings, Robert Emmett . . . *Houston, Texas*
Dodge, Clarence Porter, Jr. . . . *Houston, Texas*
Dodge, William Henry . . . . . *Houston, Texas*
Dunseth, Fay Earldine . . . . . *Houston, Texas*
Dupree, Edmund McAshan . . . *Houston, Texas*
Farr, Louis Lee, Jr. . . . . *San Angelo, Texas*
Fernandez, Rudolfo Hulen . . . *Houston, Texas*
Gabert, Lenard . . . . . *Houston, Texas*
Gaines, Micheal Chauncy . . . . *Caldwell, Texas*
Garnett, Oliver R. . . . . *San Diego, California*
Goar, Edith Louise . . . . . *Houston, Texas*
Goar, Lela Jetta . . . . . *Houston, Texas*
Goggan, Walter Hamilton . . . *Houston, Texas*

Goodwin, George Iverson . . . . *Brownwood, Texas*
Green, Oscar Frederic . . . . . *Houston, Texas*
Grimes, Nellie . . . . . *Houston, Texas*
Gross, Bayard Turner . . . . . *Houston, Texas*
Hall, Opal Josephine . . . . . *Houston, Texas*
Harless, Harry Lee . . . . . *Houston, Texas*
Harris, Brantly Callaway . . . . *Texarkana, Texas*
Holley, Lucy Florence . . . . . *Houston, Texas*
Hughes, Ellen C. . . . . *Houston, Texas*
Journeay, George Baldwin . . . *Houston, Texas*
Kalb, Ervin Frederick . . . . . *Houston, Texas*
Kalb, Hildegarde Elizabeth . . . *Bellaire, Texas*
Kane, Mary . . . . . *Houston, Texas*
Killough, J. Evans . . . . . *Bonham, Texas*
Kimbrough, Bradley Duke . . . *Amarillo, Texas*
Knapp, Carl M. . . . . *San Angelo, Texas*
Lea, Frances Kate . . . . . *Houston, Texas*
Leesemann, Edith Jo. . . . . *Houston, Texas*
Martin, Guy Lester . . . . . *Houston, Texas*
Mathee, Norma Wilma . . . . . *Houston, Texas*
Mayo, Gordon Sidney . . . . . *Houston, Texas*
McDonald, Tom . . . . . *Dublin, Texas*
Michaux, Maud . . . . . *Houston, Texas*
Mills, Nellie May . . . . . *Houston, Texas*
Mims, Wesley G. . . . . *Blooming Grove, Texas*
Nathan, William Max . . . . . *Houston, Texas*
O'Farrell, Violet Lee . . . . . *Richmond, Texas*
Red, Hattie Lel . . . . . *Houston, Texas*
Rice, Caroline Miller . . . . . *Houston, Texas*
Ricker, Norman Hurd . . . . . *Galveston, Texas*
Ritchie, Gladys Myrle . . . . . *Houston, Texas*
Robinson, Ruth . . . . . *Clarendon, Texas*
Ryder, Honora . . . . . *Harrisburg, Texas*

Sanders, Isaac C. . . . . *Tyler, Texas*
Scharff, Ruben . . . . . *Groesbeck, Texas*
Shutts, Elmer Edward . . . . . *Lake Charles, Louisiana*
Smith, Lewis James . . . . . *Willis, Texas*
Spiller, J. Browder . . . . . *Esperanza, Texas*
Standish, William Marion . . . *Houston, Texas*
Taylor, R. Wyllys . . . . . *Houston, Texas*
Waggaman, Adele . . . . . *Houston, Texas*
Wall, Lenore . . . . . *Houston, Texas*
Waples, Margaret Amy . . . . *Houston, Texas*
Weinberg, Helen Celestine . . . *Houston Heights, Texas*
Wilber, Herbert Wray . . . . . *Kingsville, Texas*
Wilkinson, George Keener . . . *Houston, Texas*
Wilson, Elizabeth Wallace . . . *Houston, Texas*
Wooten, Clinton Harcourt . . . *Columbus, Texas*
Zax, Ada . . . . . *Houston, Texas*

LIST OF STUDENTS

Received in the Academic Year 1913–14

Allison, Edwin Manly . . . . . *Houston, Texas*
Aten, Rex Graham . . . . . *Houston, Texas*
Baker, Claude . . . . . *Houston, Texas*
Ball, David . . . . . *Houston, Texas*
Bankhead, Bessie Walker . . . . *Weatherford, Texas*
Bennett, Cora Eleanor . . . . . *Dublin, Texas*
Benton, Verner Loraine . . . . *Houston, Texas*
Betts, Wilson Tarry . . . . . *Marlin, Texas*
Bevan, Wilbur Harrison . . . . *Galveston, Texas*
Black, Louise Margaret . . . . *Wichita, Kansas*
Boon, Charles W., Jr. . . . . *Tyler, Texas*
Bouldin, Maurice W. . . . . *Dublin, Texas*
Boyer, Sidney Dean . . . . . *Fort Worth, Texas*
Bramlette, James Lee . . . . . *Mexia, Texas*
Bright, Will Drain . . . . . *Mereta, Texas*
Brodbent, Charles Sykes, Jr. . . *San Antonio, Texas*
Brooks, S. Raymond . . . . . *Flournoy, Louisiana*
Brown, W. Edward . . . . . *Beaumont, Texas*
Bulbrook, Harry Marshall . . . *Cisco, Texas*
Bunting, Robert Lee . . . . . *Waller, Texas*
Bybee, Joseph Alexander . . . . *Willis, Texas*
Cabaniss, W. Milton . . . . . *Lockhart, Texas*
Cain, Earle Smith . . . . . *Tyler, Texas*
Cain, Otta Lee . . . . . *Yoakum, Texas*
Campbell, Walter Douglas . . . *Hillsboro, Texas*
Chandler, Richard Olney . . . . *Port Arthur, Texas*
Clede, Ivan Roy . . . . . *Houston, Texas*
Clyce, Wallace Perrin . . . . . *Sherman, Texas*

Cochran, Edward Kuykendall . . *Pearsall, Texas*
Cornick, George Becker . . . . *San Angelo, Texas*
Cross, Cleo . . . . . *Eagle Lake, Texas*
Cross, Jane . . . . . *Eagle Lake, Texas*
Cross, Lou Es . . . . . *Eagle Lake, Texas*
Cross, Ruthabel . . . . . *Eagle Lake, Texas*
Cummings, Robert Emmett . . . *Houston, Texas*
Daugherty, Ruth . . . . . *Houston, Texas*
Daughtrey, Guy Haughton Darrell *Waco, Texas*
Dean, Alice Crowell . . . . . *Victoria, Texas*
Dodge, Clarence Porter, Jr. . . . *Houston, Texas*
Dodge, D. Kemp . . . . . *Houston, Texas*
Dougherty, Joel W. . . . . *Anson, Texas*
Duncan, Clara K. . . . . *Houston, Texas*
Dunseth, Fay Earldine . . . . . *Houston, Texas*
Dupree, Edmund McAshan . . . *Houston, Texas*
Eggers, G. W. Nordholtz . . . . *Galveston, Texas*
Farr, Louis L., Jr. . . . . *San Angelo, Texas*
Fendley, Francis T. . . . . *Galveston, Texas*
Fernandez, Rudolfo Hulen . . . *Houston, Texas*
Finlay, Robert Wilson . . . . . *Carlsbad, New Mexico*
Fisher, Harvey E. . . . . *Dublin, Texas*
Forman, Ethel . . . . . *Houston, Texas*
Fouts, Martin . . . . . *Gonzales, Texas*
Fowler, Marvin R. . . . . *Mansfield, Texas*
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Garrett, Julius Ellington . . . . *Center, Texas*
Goar, Lela Jetta . . . . . *Houston, Texas*
Godwin, James W. . . . . *Houston Heights, Texas*
Goggan, Walter Hamilton . . . *Houston, Texas*
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Green, Oscar Frederick . . . . *Houston, Texas*
Griffin, Ned C. . . . . *Abilene, Texas*
Grimes, Nellie . . . . . *Houston, Texas*
Grissom, Roland L. . . . . *Houston, Texas*
Gross, Bayard Turner . . . . . *Houston, Texas*
Hall, Grey Martel . . . . . *Nacogdoches, Texas*
Hall, Opal Josephine . . . . . *Houston, Texas*
Harris, Brantly Callaway . . . . *Thomasville, Georgia*
Harris, Fletcher Wootten . . . . *Thomasville, Georgia*
Hartsough, Douglas John . . . . *Houston Heights, Texas*
Heisig, Gladstone Bering . . . . *Houston, Texas*
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Holley, Lucy Florence . . . . . *Houston, Texas*
Huchingson, Robert Earl . . . . *Dublin, Texas*
Hurd, Vernon King . . . . . *Collegport, Texas*
Imhoff, Willard Earl . . . . . *Port Arthur, Texas*
Jeffery, Edd Crawford . . . . . *Graham, Texas*
John, Isabel Mary . . . . . *Houston, Texas*
Johnson, Frank . . . . . *Bonham, Texas*
Johnson, Gaylord . . . . . *Houston, Texas*
Journeay, George Baldwin . . . *Houston, Texas*
Kalb, Ervin Frederick . . . . . *Houston, Texas*
Kalb, Hildegarde Elizabeth . . . *Houston, Texas*
Kennedy, Mabel Louise . . . . *Bay City, Texas*
Kennerly, Irl Ferdinand . . . . *Houston Heights, Texas*
Kimbrough, Bradley Duke . . . *Amarillo, Texas*
Knapp, Carl M. . . . . *San Angelo, Texas*
Lafferty, Preston W. . . . . *Dublin, Texas*
Landers, Elizabeth . . . . . *Houston, Texas*
Leesemann, Edith Jo . . . . . *Houston, Texas*
LeFevre, Lester F. . . . . *Hillsboro, Texas*
Lindley, Cleveland Daniel . . . . *Houston, Texas*

Lokey, Clarence Walters . . . . *Lubbock, Texas*
Longley, Ralph Dunning . . . . *Joliet, Illinois*
Lyon, Eric Ross . . . . . *Fort Worth, Texas*
MacMaster, Helen . . . . . *Houston, Texas*
Marshall, James Cowan . . . . *Hillsboro, Texas*
Marshall, Olive Adelaide . . . . *Houston, Texas*
Martin, Guy Lester . . . . . *Houston, Texas*
Mayo, Gordon Sidney . . . . . *Houston, Texas*
McDonald, Tom . . . . . *Dublin, Texas*
McFaddin, Wm. Perry Herring, Jr. *Beaumont, Texas*
McMillan, Ruby . . . . . *Bellaire, Texas*
Menefee, Tatum J., Jr. . . . . *Center, Texas*
Michaux, Maud . . . . . *Houston, Texas*
Millis, Eugene Russell . . . . . *Houston, Texas*
Mills, Nellie May . . . . . *Houston, Texas*
Milnes, Jean . . . . . *Houston, Texas*
Munn, Kathleen Douglas . . . . *Houston, Texas*
Nathan, William Max . . . . . *Houston, Texas*
Nickles, Carl Newell . . . . . *San Antonio, Texas*
Niland, John Emmet . . . . . *Galveston, Texas*
Parker, May Bell . . . . . *Houston, Texas*
Parslow, Frederick D. . . . . *Tampa, Florida*
Parslow, Paul I. . . . . *Tampa, Florida*
Pattillo, Thomas Bremington . . *Waco, Texas*
Perry, William Armstrong . . . *San Angelo, Texas*
Putnam, Helen Hinman . . . . *Houston, Texas*
Red, Hattie Lel . . . . . *Houston, Texas*
Reybaud, William Henry . . . . *Galveston, Texas*
Reynolds, Charles E. . . . . *Alfred, Texas*
Rice, Caroline Miller . . . . . *Houston, Texas*
Ricker, Norman Hurd . . . . . *Galveston, Texas*
Riley, Robert Milton . . . . . *Yoakum, Texas*
Robinson, Ruth . . . . . *Clarendon, Texas*

Rothrock, Edward Streicher . . *Mercedes, Texas*
Rothrock, Ralph Kinnan . . . . *Mercedes, Texas*
Rudd, Charles Maples . . . . . *Temple, Texas*
Rudnick, Sarah . . . . . *Houston, Texas*
Sanders, Isaac C. . . . . *Tyler, Texas*
Sanford, Clarence Morrow . . . *Houston, Texas*
Scharff, Ruben . . . . . *Groesbeck, Texas*
Schleicher, Boon F. . . . . *Eagle Lake, Texas*
Sewall, Blanche Harding . . . . *Houston, Texas*
Shotwell, J. C. . . . . *Crockett, Texas*
Shutts, Elmer Edward . . . . . *Lake Charles, Louisiana*
Smith, E. Loyd . . . . . *El Campo, Texas*
Smith, Ira . . . . . *Houston, Texas*
Smith, James Fort . . . . . *Mexia, Texas*
Snoddy, Charlotte . . . . . *Houston, Texas*
Spiller, J. Browder . . . . . *Esperanza, Texas*
Spradley, J. Brutus . . . . . *Nacogdoches, Texas*
Stafford, Benjamin Alvis, Jr. . . *Canyon, Texas*
Standish, William Marion . . . *Houston, Texas*
Steckel, Edith Mildred . . . . . *Houston, Texas*
Steinman, Douglas E. . . . . *Beaumont, Texas*
Sudano, Emanuele Francesco . . *Modica, Sicily*
Sullivan, Ruth . . . . . *Temple, Texas*
Teal, Wiley Beecher . . . . . *Dallas, Texas*
Tilley, Robert Nelson . . . . . *Huntsville, Texas*
Tomfohrde, Albert . . . . . *Houston, Texas*
Townsend, David W. . . . . *Houston, Texas*
Traylor, George H. . . . . *Cookville, Texas*
Underwood, Francis Joseph . . . *Galveston, Texas*
Underwood, Patrick Henry . . . *Galveston, Texas*
Victor, Harry . . . . . *Odessa, Russia*
Waggaman, Adele . . . . . *Houston, Texas*
Walker, Frank Erastus . . . . . *Eagle Lake, Texas*

Wall, Lenore . . . . . *Houston, Texas*
Waples, Margaret Amy . . . . *Houston, Texas*
Waters, James Stephen, Jr. . . . *Galveston, Texas*
Webb, Leary Friend . . . . . *Yoakum, Texas*
White, Bradford W. . . . . *Houston, Texas*
Whitfield, Voelian Winton . . . *Tampico, Mexico*
Wilber, Herbert Wray . . . . . *Kingsville, Texas*
Wilkinson, George Keener . . . *Houston, Texas*
Williams, Alice Amelia . . . . . *Chicago, Illinois*
Willner, Zillah Longfellow . . . *Houston, Texas*
Wilson, Guilford Cleo . . . . . *Mansfield, Texas*
Woodruff, Lewis J. . . . . *Blessing, Texas*
Wooten, Clinton Harcourt . . . *Columbus, Texas*
Yeatman, Richard Preston . . . *Marion, Alabama*
Zagst, Francis L. . . . . *Houston Heights, Texas*

LIST OF STUDENTS

Received in the Academic Year 1914–15

GRADUATE FELLOWS

Diamant, Nicholas S., B.A., M.Sc. *Schenectady, New York*
Epperson, Chas., B.A., B.Sc., M.A. *Columbia, Missouri*
Lyon, Eric Ross, B.A. . . . . *Winona Lake, Indiana*
Riley, Joseph Leslie, M.A. . . . *Norman, Oklahoma*
Winton, Will McLain, M.Sc. . . *Fort Worth, Texas*

STUDENTS

Abbey, Wilbur Milo . . . . . *Port Arthur, Texas*
Adams, Ruth Ella . . . . . *Houston, Texas*
Allison, Edwin Manly . . . . . *Houston, Texas*
Alsobrook, Margaret . . . . . *Houston, Texas*
Ball, David . . . . . *Houston, Texas*
Bankhead, Bessie Walker . . . . *Weatherford, Texas*
Barber, Helen Browder . . . . . *Houston Heights, Texas*
Barron, William Ralph . . . . . *Houston, Texas*
Beall, James Eric . . . . . *Trinity, Texas*
Belcia, Ross Ivan . . . . . *Ged, Louisiana*
Bennett, Cora Eleanor . . . . . *Dublin, Texas*
Bentley, Bascom William . . . . *Palestine, Texas*
Benton, Verner Loraine . . . . *Houston, Texas*
Béraud, Louisa Jane . . . . . *Houston, Texas*
Bergman, William Jennings . . . *Sabine, Texas*
Betts, Wilson Tarry . . . . . *Newby, Texas*
Bevan, Wilbur Harrison . . . . *Galveston, Texas*
Biggs, Joe Irvine . . . . . *Carthage, Texas*
Bonart, Mannette . . . . . *Houston, Texas*

Boyd, Laurence Everet . . . . . *Houston, Texas*
Bramlette, James Lee . . . . . *Mexia, Texas*
Bright, Will Drain . . . . . *San Angelo, Texas*
Brock, Lera . . . . . *Paris, Texas*
Brodbent, Charles Sykes, Jr. . . *San Antonio, Texas*
Brown, W. Edward . . . . . *Beaumont, Texas*
Bryan, Cora L. . . . . *Houston, Texas*
Bulbrook, Harry Marshall . . . *Cisco, Texas*
Bunting, Robert Lee . . . . . *Waller, Texas*
Buse, Howard Emmett . . . . . *Houston, Texas*
Cabaniss, Cramer Clark . . . . *Lockhart, Texas*
Cabaniss, W. Milton . . . . . *Lockhart, Texas*
Cain, Otta Lee . . . . . *Yoakum, Texas*
Campbell, Harris Williams . . . *Galveston, Texas*
Carr, Alfred Lewin . . . . . *Marlin, Texas*
Carter, Agnese F. . . . . *Houston, Texas*
Carter, John Winston . . . . . *Houston, Texas*
Carter, Kelso Moore . . . . . *Camden, Texas*
Chandler, Richard Olney . . . . *Port Arthur, Texas*
Clark, Fred Paul . . . . . *San Angelo, Texas*
Clede, Ivan Roy . . . . . *Houston, Texas*
Clyce, Wallace Perrin . . . . . *Sherman, Texas*
Coan, Bartlett E. . . . . *DeLeon, Texas*
Cochran, Edward Kuykendall . . *Pearsall, Texas*
Coleman, Joseph Pickens . . . . *Gurdon, Arkansas*
Colston, Thomas M., Jr. . . . . *Kingsville, Texas*
Cottingham, Charles . . . . . *Houston, Texas*
Cummings, Robert Emmett . . . *Houston, Texas*
Cunningham, Kenneth Wallace . *Beaumont, Texas*
Curtis, Tina Mistrot . . . . . *Houston, Texas*
Dancy, Hibbert Henry . . . . . *Houston, Texas*
Daugherty, Ruth . . . . . *Houston, Texas*
Dean, Alice Crowell . . . . . *Victoria, Texas*

Della Valle, Emil H. . . . . *Bridgeport, Connecticut*
Dillman, Percy Evans . . . . . *Fort Worth, Texas*
Dodge, D. Kemp . . . . . *Houston, Texas*
Duggan, Alston Hardy . . . . . *San Antonio, Texas*
Duncan, Clara K. . . . . *Houston, Texas*
Dunseth, Fay Earldine . . . . . *Houston, Texas*
Dupree, Edmund McAshan . . . *Houston, Texas*
Dyke, Fred Mills . . . . . *Pittsburg, Texas*
Egan, Herol Ward . . . . . *Mulvane, Kansas*
Eggers, G. W. Nordholtz . . . . *Galveston, Texas*
Ellis, Alline Marie . . . . . *Houston Heights, Texas*
Epperson, Arthur Roy . . . . . *Cameron, Texas*
Evans, Margaret . . . . . *Houston, Texas*
Farr, Louis Lee, Jr. . . . . *San Angelo, Texas*
Faver, Irl Irvin . . . . . *Sweetwater, Texas*
Fendley, Francis T. . . . . *Galveston, Texas*
Fernandez, Rudolfo Hulen . . . *Houston, Texas*
Fisher, Harvey E. . . . . *Dallas, Texas*
Ford, Fannie Rivers . . . . . *Houston, Texas*
Forman, Ethel . . . . . *Houston, Texas*
Forman, William Harper . . . . *Houston, Texas*
Fouts, Floyd Festus . . . . . *Willis, Texas*
Fouts, Henry . . . . . *Gonzales, Texas*
Fouts, Martin . . . . . *Gonzales, Texas*
Fulwiler, Howard D. . . . . *Abilene, Texas*
Gabert, Lenard . . . . . *Houston, Texas*
Gaines, Ethel Conklin . . . . . *Houston, Texas*
Garnett, Oliver R. . . . . *San Diego, California*
Goar, Lela Jetta . . . . . *Houston, Texas*
Goggan, Walter Hamilton . . . *Houston, Texas*
Goodwin, George Iverson . . . . *Brownwood, Texas*
Gray, Will Klapp . . . . . *San Angelo, Texas*
Green, Oscar Frederic . . . . . *Houston, Texas*

Grimes, Nellie . . . . . *Houston, Texas*
Gwin, Jesse Heath . . . . . *Galveston, Texas*
Halbert, Lilian . . . . . *Houston, Texas*
Hall, Grey Martel . . . . . *Nacogdoches, Texas*
Hall, Opal Josephine . . . . . *Houston, Texas*
Hargrove, Reginald Henry . . . *Shreveport, Louisiana*
Hargrove, Stone L. . . . . *Pittsburg, Texas*
Harp, John Holland . . . . . *Mount Pleasant, Texas*
Harris, Fletcher Wootten . . . . *Thomasville, Georgia*
Harris, Florence Lea . . . . . *McKinney, Texas*
Harris, Gwin Chandler . . . . . *Lubbock, Texas*
Hart, Louis Folwell . . . . . *Hillsboro, Texas*
Haskell, Irma . . . . . *Houston, Texas*
Hathorn, Edwin Hall . . . . . *Mount Pleasant, Texas*
Hathorn, John Broadus . . . . . *Mount Pleasant, Texas*
Hayth, Emily May . . . . . *Houston, Texas*
Hedges, Frank F. . . . . *Houston, Texas*
Heisig, Ernest Willers . . . . . *Houston, Texas*
Heisig, Theodore Charles . . . . *Beaumont, Texas*
Hodges, Carrie . . . . . *Nacogdoches, Texas*
Hodges, Leland Allen . . . . . *Georgetown, Texas*
Horn, Ruth . . . . . *Houston, Texas*
Houck, Alexander . . . . . *Houston, Texas*
Houseman, Juliet Knox . . . . *Houston, Texas*
Hurd, Vernon King . . . . . *Collegeport, Texas*
Ilfrey, Lawrence Galloway . . . *Houston, Texas*
Imhoff, Willard Earl . . . . . *Port Arthur, Texas*
Jackson, William Ralph . . . . *Enloe, Texas*
John, Isabel Mary . . . . . *Houston, Texas*
Johnson, Gaylord . . . . . *Houston, Texas*
Journeay, George Baldwin . . . *Houston, Texas*
Kalb, Ervin Frederick . . . . . *Houston, Texas*
Kalb, Hildegarde Elizabeth . . . *Houston, Texas*

Keiller, Thomas Mitchell . . . . *Galveston, Texas*
Killough, J. Evans . . . . . *Bonham, Texas*
Knapp, Carl M. . . . . *San Angelo, Texas*
Ladd, Homer William . . . . . *Fort Worth, Texas*
Larkin, Lucille . . . . . *Houston, Texas*
Lee, John Joel . . . . . *Cisco, Texas*
Leesemann, Edith Jo . . . . . *Houston, Texas*
Lefevre, Katharine . . . . . *Houston, Texas*
Lenz, Rudolf Pruessner . . . . *Galveston, Texas*
Lindley, Cleveland Daniel . . . . *Houston, Texas*
Lindsay, Rhea . . . . . *Houston, Texas*
Logan, Fred B. . . . . *San Angelo, Texas*
Lokey, Clarence Walters . . . . *Lubbock, Texas*
Long, Homer Travis . . . . . *Carthage, Texas*
Longley, Ralph Dunning . . . . *Joliet, Illinois*
Lorehn, Edmond Louis . . . . . *Houston, Texas*
Maclaine, George Leith . . . . . *Houston, Texas*
MacMaster, Helen . . . . . *Houston, Texas*
Manaker, Fred Philip . . . . . *Alvin, Texas*
Markham, James Philip . . . . *Houston, Texas*
Martin, Gladys Emma . . . . . *Houston, Texas*
Martin, Guy Lester . . . . . *Houston, Texas*
Martin, Myrle Ayleen . . . . . *Houston, Texas*
Mason, Charles Lee . . . . . *Kerrville, Texas*
McAllister, Florence Betsy . . . *Houston, Texas*
McDonald, Tom . . . . . *Dublin, Texas*
McDonough, James Moore . . . *Galveston, Texas*
McFaddin, Wm. Perry Herring, Jr. *Beaumont, Texas*
McFarland, John William . . . *Houston, Texas*
McKee, Wilna . . . . . *Houston, Texas*
McKenzie, Casimir Perier . . . *Mexia, Texas*
McMahon, Donald . . . . . *Livingston, Alabama*
Michaux, Maud . . . . . *Houston, Texas*

Middleton, Edmund Bunus . . . *Eagle Lake, Texas*
Middleton, Errol . . . . . *Eagle Lake, Texas*
Millis, Eugene Russell . . . . . *Houston, Texas*
Milnes, Jean . . . . . *Houston, Texas*
Mitchell, Rudolph . . . . . *Hull, Texas*
Moore, Howard Delnin . . . . . *Naples, Texas*
Morgan, Ethel . . . . . *Houston, Texas*
Nathan, William Max . . . . . *Houston, Texas*
Neumann, Frederick Hermann . *Houston, Texas*
Niday, Hugh Dudley . . . . . *Houston, Texas*
Niland, John Emmet . . . . . *Galveston, Texas*
O'Connor, Norine . . . . . *Temple, Texas*
Parkinson, John Robert . . . . *Daytona, Florida*
Pattillo, Thomas Bremington . . *Waco, Texas*
Payne, John Pierre . . . . . *Haskell, Texas*
Perry, William Armstrong . . . *San Angelo, Texas*
Prather, Henry Grady . . . . . *Houston, Texas*
Price, Edward P. . . . . *Hereford, Texas*
Putnam, Helen Hinman . . . . *Houston, Texas*
Rather, John Thomas, Jr. . . . . *Belton, Texas*
Red, Hattie Lel . . . . . *Houston, Texas*
Reybaud, William Henry . . . *Galveston, Texas*
Ricker, Norman Hurd . . . . . *Galveston, Texas*
Ricketts, Anna . . . . . *Houston, Texas*
Riglander, Hazel . . . . . *Houston, Texas*
Riley, Robert Milton . . . . . *San Antonio, Texas*
Roach, Sarah . . . . . *Clarksville, Tennessee*
Robinson, Ruth . . . . . *Clarendon, Texas*
Rolfe, Rollin Montfort . . . . . *Fort Worth, Texas*
Rosenthall, Leon Chester . . . . *Houston, Texas*
Rothrock, Edward Streicher . . *Mercedes, Texas*
Rothrock, Ralph Kinnan . . . . *Mercedes, Texas*
Rowe, Elsbeth Thompson . . . . *Houston, Texas*

Rudd, Charles Maples . . . . . *Temple, Texas*
Sanders, Isaac C. . . . . *Tyler, Texas*
Sanders, Oscie . . . . . *Houston, Texas*
Sanford, Clarence Morrow . . . *Houston, Texas*
Saper, Paul G. . . . . *Houston, Texas*
Saunders, George Alderson . . . *Bonham, Texas*
Saunders, Randolph Ramsay . . *Dublin, Georgia*
Scharff, Ruben . . . . . *Groesbeck, Texas*
Schultz, Margaret Ellen . . . . *Houston, Texas*
Seale, Everett Young . . . . . *Floresville, Texas*
Sewall, Blanche Harding . . . . *Houston, Texas*
Seydler, Wayman Alfred . . . . *Houston, Texas*
Shearer, Beth . . . . . *Houston, Texas*
Sherry, Walter P. . . . . *Houston, Texas*
Shutts, Elmer Edward . . . . . *Lake Charles, Louisiana*
Smith, Ira . . . . . *Nacogdoches, Texas*
Snell, Chesley Chapman . . . . *Marlin, Texas*
South, Ira Walter . . . . . *Bryan, Texas*
Spiller, J. Browder . . . . . *Esperanza, Texas*
Standish, William Marion . . . *Houston, Texas*
Steinman, Douglas E. . . . . *Beaumont, Texas*
Stevens, Curtis Lee . . . . . *Comanche, Texas*
Stevenson, Earl Vincent . . . . *Bellaire, Texas*
Stratford, Mary Jane . . . . . *Houston, Texas*
Street, Marguerite . . . . . *Houston, Texas*
Sudano, Francesco Emanuele . . *Modica, Sicily*
Sullivan, Ruth . . . . . *Temple, Texas*
Taylor, Herbert Cecil . . . . . *Magnolia Park, Texas*
Teal, Wiley Beecher . . . . . *Dallas, Texas*
Thomason, Edgar Morris . . . . *Madisonville, Texas*
Tillett, Henry Augustus, Jr. . . . *Abilene, Texas*
Tilley, Robert Nelson . . . . . *Huntsville, Texas*
Tomfohrde, Albert . . . . . *Houston, Texas*

Traylor, George H. . . . . *Mount Pleasant, Texas*
Trolinger, Carrie Lucille . . . . *Houston, Texas*
Underwood, Francis Joseph . . . *Galveston, Texas*
Underwood, Patrick Henry . . . *Galveston, Texas*
Vandiver, Rufus Sterling . . . . *Corsicana, Texas*
Van Valkenburgh, MacRobinson . *Houston Heights, Texas*
Victor, Harry . . . . . *Odessa, Russia*
Waggaman, Adele . . . . . *Houston, Texas*
Waggaman, Camille . . . . . *Houston, Texas*
Walker, Frank Erastus . . . . . *Eagle Lake, Texas*
Wall, Lenore . . . . . *Houston, Texas*
Waples, Margaret Amy . . . . *Houston, Texas*
Waters, James Stephen, Jr. . . . *Galveston, Texas*
Weatherford, Agnes . . . . . *Houston, Texas*
Weaver, Emma Permelia . . . . *Denison, Texas*
Webb, Leary Friend . . . . . *San Angelo, Texas*
Weinberg, Helen Celestine . . . *Houston Heights, Texas*
White, Bessie . . . . . *Houston, Texas*
White, Harold Ogden . . . . . *Houston Heights, Texas*
White, Lloyd Young . . . . . *Waco, Texas*
Whitfield, Voelian Winton . . . *Morrisville, Missouri*
Whittin, Lela . . . . . *Timpson, Texas*
Wilber, Herbert Wray . . . . . *Kingsville, Texas*
Willner, Zillah Longfellow . . . *Houston, Texas*
Wood, Griffin G. . . . . *Itasca, Texas*
Woodruff, Arsie . . . . . *Houston, Texas*
Woodruff, Lewis J. . . . . *Blessing, Texas*
Wooten, Clinton Harcourt . . . *Columbus, Texas*
Worley, Florence . . . . . *Houston, Texas*
Yeatman, Richard Preston . . . *Marion, Alabama*
Yelverton, John H. . . . . *Riverside, Texas*

LIST OF STUDENTS

Received in the Academic Year 1915–16

GRADUATE FELLOWS

Cheney, Walter Lynn, B.A., M.A. *Lincoln, Nebraska*
Dixon, Alfred Alex., B.Sc., M.A. *Guilford, North Carolina*
Marshall, Walter Winfield, B.A. . *Columbus, Ohio*
McCann, Samuel G., B.A. . . . . *Dresden, Ohio*
Sherrick, Jacob L., B.Sc. . . . . *Pittsburgh, Pennsylvania*
Sidis, William James, B.A. . . . *Cambridge, Mass.*
Winsor, Arthur S., B.A. . . . . *Woodstock, New Bruns.*

STUDENTS

Abbey, Wilbur Milo . . . . . *Port Arthur, Texas*
Aldrich, Mary Elizabeth . . . . *Crockett, Texas*
Alkire, Innis Bashford . . . . . *Sugarland, Texas*
Alsobrook, Margaret . . . . . *Houston, Texas*
Ansley, John Sherwood . . . . *Houston, Texas*
Bailey, Herbert A. . . . . *Pittsburg, Texas*
Baker, Richard Royall, Jr. . . . *Crockett, Texas*
Ball, David . . . . . *Houston, Texas*
Bankhead, Bessie Walker . . . . *Weatherford, Texas*
Barber, Helen Browder . . . . . *Houston Heights, Texas*
Barker, Ivyl C. . . . . *Newton, Kansas*
Barron, William Ralph . . . . . *Houston, Texas*
Bartlett, Henry Leigh . . . . . *South Houston, Texas*
Baty, Joseph Russ . . . . . *Palestine, Texas*
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