REGISTER

Of the

University of Arizona

TENTH YEAR
1900-1901

ANNOUNCEMENTS
1901-1902

TUCSON, ARIZONA
MDCCCCI
Entrance Examinations.
Registration of all students.
First Semester begins.
Thanksgiving Recess begins.
Instruction resumed.
Holiday Recess begins.

Jan. 7, Tuesday
Feb. 6, Thursday
Feb. 7, Friday
Feb. 10, Monday
June 1, Sunday
June 3, Tuesday
June 5, Thursday

Instruction resumed.
First Semester ends.
Arbor Day; celebrated also as the Anniversary of the University.
Second Semester begins.
Baccalaureate Discourse.
Annual Commencement Address.
Commencement.
BOARD OF REGENTS

EX-OFFICIO

HON. NATHAN OAKES MURPHY .... Phoenix
Governor of the Territory.

HON. R. L. LONG .... Phoenix
Superintendent of Public Instruction.

APPOINTED BY THE GOVERNOR

HON. WILLIAM HERRING .... Tucson
Chancellor.

HON. JAMES A. ZABRISKIE .... Tucson
Secretary.

HON. HERBERT B. TENNEY .... Tucson
Treasurer.

HON. ANTHONY V. GROSSETTA .... Tucson
FACULTY

MILLARD MAYHEW PARKER, A. M.,
President.

WILLIAM PHIPPS BLAKE, Ph. B., A. M.,
Professor of Geology, Metallurgy and Mining; Director School of Mines.

HOWARD JUDSON HALL, A. M.,
Professor of English; Librarian.

ROBERT HUMPHREY FORBES, M. S.,
Director and Chemist Agricultural Experiment Station; Professor of Chemistry.

SHERMAN MELVILLE WOODWARD, M. S., A. M.,
Professor of Mathematics and Mechanics; Meteorologist Agricultural Experiment Station.

FRANK YALE ADAMS, A. M.,
Lieutenant-Colonel N. G. A., Commandant of Cadets; Professor of History and Pedagogy.

FRANK NELSON GUILD, B. S.,
Professor of Mineralogy and Analytical Chemistry; Associate Professor General Chemistry.

ALFRED JAMES McCLATCHIE, A. M.,
Professor of Agriculture and Horticulture.

DAVID HULL HOLMES,
Director of Manual Training.
MARY ELIZABETH PLIMPTON, A. M.,
Preceptress; Associate Professor of English.

GORDON H. TRUE, B. S.,
Professor of Animal Husbandry Agricultural Experiment Station.

DAVID GRIFFITHS, Ph. D.,
Professor of Biology; Botanist Agricultural Experiment Station.

GEORGE EDSON PHILIP SMITH, B. S., C. E.,
Professor of Physics and Engineering.

MRS. MARY BERNARD AGUIRRE,
Instructor in History and Spanish.

MRS. EMMA MONK GUILD,
Instructor in Sub-Collegiate Department.

LOUISE H. FOUCAR, B. A., Lit. B.,
Instructor in Botany, Mathematics and Languages.

WILLIAM W. SKINNER, M. S.,
Assistant Chemist Agricultural Experiment Station.

OPAL LEBARON McGAUHEY, B. E.,
Instructor in Physical Culture and the Art of Expression.

MABEL GRAY HOOVER,
Instructor in Domestic Science.

NORA TOWNER,
President’s Secretary; Instructor in Stenography and Typewriting.

HERBERT BROWN,
Curator Territorial Museum.
OTHER OFFICERS

MARK WALKER, JR., B. S.,
Commercial Assayer.
(Absent on leave.)

JAMES STEPHEN MANN, B. S.,
Acting Commercial Assayer.

CHARLES E. CHASE,
Engineer.

WILLIAM SIEWERT,
Steward.

STUDENT ASSISTANTS

RUDOLPH CASTAÑEDA
ELBERT J. HOLLINGSHEAD
LESLIE A. GILLETT
HENRY E. CASTAÑEDA
NORMAN J. ROBERTS
J. NEWTON ROBINSON
ROY G. MEAD
MAY KIRKPATRICK
UNIVERSITY OF ARIZONA

ORIGIN

The University was established by an act of the Thirteenth Legislative Assembly of the territory in 1885. The bill was introduced into the council by Hon. C. C. Stephens of Tucson, carried through the house by the able efforts of Hon. Selim M. Franklin and approved by the governor March 12, 1885. The University was opened to students in October, 1891.

DESIGN

The purpose of the University of Arizona is to afford the young men and women of the territory a general education in science and literature; and so far as possible a technical education adapted to the development of the peculiar resources of Arizona. In furtherance of this latter purpose, instruction is especially provided in agriculture, the mechanic arts, and in mining and metallurgy. The Agricultural Experiment Station, a department of the University, is wholly engaged in developing the agricultural resources of the territory. The institution aims to fill in the territory the place occupied in the states by the state universities. That the institution may be of service to all, a sub-collegiate department is maintained.

LOCATION AND CLIMATE

The University of Arizona is located at Tucson, one of the largest towns in the territory.

Tucson is on the main line of the Southern Pacific railway, 312 miles west of El Paso, Texas, and 500 miles east of Los Angeles, Cal. The town lies in a broad, flat valley at an elevation of 2,400 feet above sea level and is surrounded by mountains. Its dry, healthful situation with its mild and equable climate has made Tucson a famous winter resort.

The winter climate is especially good; the temperature is cool and strengthening but not severe, the lowest temperature recorded during the average year being about twenty degrees above zero, Fahrenheit. But little rain falls during the winter; fogs are un-
known; cloudy days are rare, the percentage of sunshine throughout the winter being greater than that recorded at any other place in the United States. Owing to the extreme dryness of the air the highest temperatures known are less oppressive to the senses and less dangerous to the health than the summer heat of the upper Mississippi valley states. The total amount of rainfall averages less than twelve inches.

SITE

The University is situated upon high ground about a mile from the business center of the city with which it is connected by a street-car line. On every side it commands a view of mountain scenery of remarkable extent and grandeur. The location cannot be surpassed for healthfulness. The water supply of the University is drawn from a well on the premises 100 feet deep and is of unusually good quality.

BUILDINGS

The main building is 200x105 feet, two stories in height, the first story of gray stone, the second of red brick, and is completely surrounded by a wide two-story veranda. This building contains the offices, recitation rooms, laboratories and apparatus rooms of the various departments, an assembly room, the libraries of the University and Experiment Station and the territorial Museum. Adjoining the main building is the mining annex, 80x60 feet, equipped with metallurgical machinery.

Three brick houses two stories in height are occupied as homes by the president and instructors.

A dormitory two stories in height built of gray stone of fine quality, originally provided as a home for male students, has been refitted for the use of young women. It contains a students' dining-room, kitchen connected therewith, sixteen rooms each large enough to accommodate two students, and a reception room.

A fine brick dormitory containing forty rooms, with bath and toilet rooms, has been recently built for the use of male students and teachers.

A substantial brick building contains a suite of rooms for the use of the commercial assaying department, the rooms being furnished with a large melting furnace with necessary muffle furnaces and other accessories.
JOINED in continuous structure with the assaying building are the shops of the manual training department, occupying an area 80x95 feet, containing a room for mechanical and free hand drawing, and the machinery and appliances for the working of wood and iron.

Other buildings are the boiler-house, which also contains the wells and pumps whereby the water supply for irrigation and general purposes is obtained; the new green-house, 80x21 feet; the old green-house, used as a propagating-house; the cottage occupied by the classes in domestic science; and a temporary wooden building used for various purposes.

The Twenty-first Legislative Assembly of Arizona has authorized the issuing of territorial bonds to the amount of $25,000 for the purpose of constructing new buildings. It is expected that the erection of a library and museum building which will also contain administrative offices will be started as soon as this act of the Legislative Assembly shall be approved by Congress.

EQUIPMENT

LIBRARY

The library containing 6,000 bound volumes and 10,000 pamphlets is open to the use of all students. The books are new and standard. A valuable feature of the library is the collection of complete sets of scientific and literary periodicals, which are of special service in research work.

A complete title-and-subject card catalogue is maintained.

The reading-room is furnished with about seventy scientific, literary and general periodicals, besides the weekly territorial newspapers.

MUSEUM

The Seventeenth Legislative Assembly of Arizona passed an act establishing a general museum at the University. The object of the museum is to collect materials of all kinds illustrating the resources and development of Arizona, and particularly to preserve historical relics, including those pertaining to the aboriginal inhabitants.
Donations of specimens and collections will be received and acknowledged with thanks, but no special provision has yet been made by the Legislature for the support of this department aside from a small appropriation for the salary of a curator.

The collections now displayed at the University comprise representative series of minerals, ores and rocks of Arizona. Among these may be particularly mentioned superb specimens from the mines of the Copper Queen at Bisbee. There are also collections of typical rocks and minerals for comparison, and many specimens of ores from different parts of the United States and from abroad. Great numbers of valuable specimens are now stored in trays preparatory to classification and distribution in cases. It is desired to make the collection of ores and minerals fully represent the great mineral resources of Arizona.

The museum is indebted to Mr. Herbert Brown, curator, for a large and valuable collection of skins of the birds of Arizona, which he has deposited in the museum, as well as for a collection of ancient aboriginal pottery and other relics. The fossil skull and teeth of an elephant and other fragmentary remains of extinct animals sent from Yuma by Mr. Brown also deserve special mention.

Historical records of much value are gradually accumulating as a part of this museum, and an appeal is made to old settlers and others to bear this fact in mind when making disposition of articles bearing even remote relation to the early pioneers and their history. All records and data of any nature which can be gleaned are worthy of preservation, and we earnestly desire to have them placed at the University, where they will always be accessible for reference.

The professors at the University have the immediate care of the collections in their respective departments.

The museum has attained very considerable importance and value, and it is expected that it will be safely housed in a special museum building in the near future.

**BIOLOGY**

The biological laboratories occupy three rooms on the second floor of the south wing of the main building. The equipment is such as is required for modern instruction and research in the biological sciences. The library and apparatus are well selected and adapted to the region and the courses offered.
The collections possessed by this department form a very important part of its equipment. The herbarium consisting of fully 10,000 sheets of mounted plants, fifty cases of insects, articulate and disarticulate human skeletons, plaster and papier-maché models of the important structures of the human anatomy, duplicate material for study and dissection, and the unique flora and fauna of the mountain, mesa and lowland collecting grounds in close proximity to the institution offer very attractive opportunities for instruction and research.

**CHEMISTRY**

The chemical laboratories are two in number. That used for beginners in the study of general chemistry and qualitative analysis is on the second floor of the main building and is equipped for the experimental and theoretical study of chemical science.

The chemical apparatus and collections are adequate, the equipment is good and the arrangements are fairly satisfactory for this work.

The laboratory for quantitative analysis is on the first floor of the main building. It is provided with analytical and bullion balances of the latest model, and is equipped for the teaching of volumetric and gasometric analysis, blow-pipe analysis, metallurgical chemistry, and wet and fire assaying, including apparatus for the electrolytic determination of metals.

Both laboratories though fairly adequate for their work are overcrowded, and the time is hoped for when the institution will be possessed of a science building suitably constructed for these purposes.

The laboratory of the Experiment Station occupies three rooms on the first floor, being devoted to analytical work and chemical investigations relating to agriculture. Though not intended for the use of students it is of incidental value to the institution through the investigations which are here conducted.

**PHYSICS**

Three rooms on the first floor of the main building are set apart for the teaching of physics. The facilities for experimental demonstration of all important phenomena are very complete. The lecture-room is fitted with shutters so that it can be darkened. A beam of
sunlight directed by a fine clock heliostat outside may be thrown steadily across the lecture table for experiments on light, or used in connection with the solar lantern for a variety of other work. Adjacent to the lecture-room are the laboratory and apparatus-room. Both lecture-room and laboratory are supplied with water and gas.

ENGINEERING

In a partly developed territory like our own, the engineer is called upon for the solution of a great variety of problems in the various lines of civil, hydraulic, mechanical and mining engineering, and in many difficult situations he must depend upon his knowledge and inventive ingenuity to supplement a meager equipment. To prepare the engineering student for such experiences the apparatus in this department has been chosen with a view to giving him the greatest familiarity with the theory, construction and use of those instruments and machines which observation has shown to be of universal adoption in practical engineering work. Already liberal, it is constantly being enlarged. It embraces surveyors' and engineers’ chains; standard field and pocket tapes; plain and solar compasses and transits; mining transits; engineers’ levels; stadia, level and transit rods; aneroid barometers; odometer; automatic water-registers; hook-gauges; three forms of current-meter; stop-watch; meteorological instruments; drafting instruments; mechanical calculators; blue-print apparatus; a four and one-fourth inch astronomical telescope with equatorial mountings and accessories; celestial sphere; a seventy-five light Mather dynamo; a Westinghouse high-speed engine; pumps, steam-gauges, indicator and calorimeters.

AGRICULTURE AND HORTICULTURE

Because of the situation of the territorial University, the educational work in agriculture and horticulture has taken peculiar form, being largely conducted on the correspondence plan, particularly through the “Timely Hints for Farmers” issued under the auspices of the Experiment Station, but of distinct educational value. Three thousand farmers of the territory are reached regularly twice a month by timely publications on subjects of vital interest. Small and well-selected agricultural libraries of slight cost have been forwarded to a considerable number who have expressed a willingness to receive them.
It is believed that this method of dealing with our situation will become increasingly useful.

The equipment for agricultural instruction is good, consisting of an excellent seed collection, a green-house and gardens for experimental purposes containing many rare and interesting plants, and a well-selected agricultural library.

MINING AND METALLURGY

Attached to the main building is an annex or mill containing machinery and appliances for crushing, sampling, concentrating, amalgamating, leaching, chloriding, cyaniding, and for the electrical treatment of various kinds of ore in large or small lots. Power is furnished by a thirty-five horse-power engine.

The mill building has a storage capacity for ore of fifty to one hundred tons. A seven-inch by ten-inch Blake crusher is used for coarse crushing, and a Dodge crusher for finer work. Beneath the Blake crusher is a set of fourteen-inch by twenty-inch Cornish rolls from which the ore passes by a conveyor to the main elevator which carries it up thirty-one feet to the top of the mill. By means of slides and chutes the crushed ore may be sent at will to various machines to be tested by different methods. For concentration there are provided revolving sizing screens giving facilities for preparing six sizes, besides hydraulic separators for classifying slimes into three grades. The coarser sizes may be worked upon full-sized jiggling machines of the Hartz pattern, the finer sizes being jigged upon bottom discharge machines, and the slime worked upon a double Rittinger percussion table, or otherwise as desired. Amalgamation tests may be made upon a working scale by different methods, including plates and riffles, pans and settlers, etc. A five-stamp gold mill, with silvered plates and aprons of the latest and most approved construction, by Fraser & Chalmers of Chicago, permits the working of free-milling gold ores by the usual methods and on a large scale. Several lots of ore have been successfully worked and returns made in gold bullion. In addition to the five-stamp mill, a smaller prospecting mill of three stamps has been added so as to work small lots of ore of from 100 to 500 pounds.

The assay laboratory is equipped with assay furnaces for crucible work, for scorifying and cupeling, and for retorting mercury from amalgam, besides all needed appliances for assaying by dry and wet methods, including electrolysis. The laboratory also has
desks and fittings for the chemical work required in the metallurgical and mineralogical investigation and analysis of ores, mineral fertilizers and in qualitative tests of minerals.

MANUAL TRAINING

The manual training building, completed this year largely through the generosity of the Copper Queen Consolidated Mining Company, has a total floor area of 7,900 square feet, divided as follows: Power room and draughting room, each 1,200 square feet; wood-working shop, forge shop and machine shop, each 1,400 square feet; wash room, 600, model room, 400, and store room 300 square feet.

Each shop provides working space for twenty-four students at benches or forges, and ample space for machines and tool rooms. The draughting room accommodates thirty-six students.

The power room contains two engines, a dynamo, a blower and an exhauster.

The wood-working shop is equipped with a full assortment of hand tools, four wood-turning lathes, a universal wood-worker, a dimension sawing machine and other modern wood-working appliances.

The forge shop contains twenty-four down draught forges, twenty-four anvils, a blacksmith drill-press and all necessary small tools.

The machine shop contains two engine lathes, a shaper, planer, universal milling machine, twenty-four inch drill, grindstone, vises and small tools. Other machinery is constantly being added.

The entire building is well lighted and ventilated and the draughting room is heated by steam.
GENERAL INFORMATION

REGISTRATION

All students are required to register on registration day at the beginning of the year in the president's office. A matriculation fee of $5.00 is required of all students. No student will be registered until the matriculation fee has been paid. After registration no change in classes can be made without the consent of the committee on registration.

RECORDS

The class standing of each student is determined by the instructor in charge. The method of ascertaining the student's record is left to the instructor and his report in all cases is final.

Reports of standing in classes are sent each month from the president's office to parents or guardians. Those to whom these reports are addressed are urgently requested to examine each with care and to spur up delinquent students or commend those who are diligent, as the case may be. Without such hearty co-operation good results cannot be anticipated.

DISCIPLINE

It is earnestly desired that students may be influenced to good conduct by higher motives than fear of punishment. The sense of duty and honor, the courtesy characteristic of ladies and gentlemen are appealed to as the best regulators of conduct. It is the policy of the University to allow as much liberty as will not be abused; but good order will be strictly maintained, and misconduct punished by adequate penalties. Frequenting saloons or billiard rooms, or any conduct harmful to the moral standing of the school will render the student liable to punishment, and in aggravated cases to expulsion. Any attempt on the part of a student to present as his own the work of another, or to pass any test or examination by unfair means is considered a most serious offense. In case of expulsion a student is required by law to surrender to the University his cadet uniform.

Students or classes desiring to make requests of the faculty may do so; but to insure immediate action it is necessary for them to
file their petition in the president's office before the hour of faculty meeting, and class petitions must be presented at least two days before the time of meeting.

VACATIONS AND HOLIDAYS

A short recess (see calendar, page 2) is taken at Christmas time. The long summer vacation begins about June 1st, and continues until near the close of September. The Thanksgiving recess extends from the close of the regular exercises on the Wednesday before Thanksgiving to the next Monday morning.

All legal holidays are observed by the cessation of ordinary University work.

Appropriate exercises in which the students will be expected to join if required may be arranged by the faculty for any legal holiday.

Arbor day has been formally adopted by the University regents as the regular anniversary on which shall be celebrated the founding of the institution, in connection with the ceremonies of tree planting.

LIVING ACCOMMODATIONS

Provision is made as far as possible for furnishing board and rooms to students of both sexes upon the University grounds.

Young men have excellent quarters in South Hall, a new dormitory building.

North Hall, the home of the young ladies, is in charge of an experienced and capable preceptress who has constant supervision of those rooming there.

Rooms contain a clothes press, and are provided with single bedsteads, table, chairs, mirror, wash-bowl, pitcher and slop jar. Students will supply their own lamps, brooms, mattresses, pillows, sheets, blankets, towels, napkins, rugs and such other articles as they may desire for ornamenting their rooms. They will care for their own rooms under the direction of the instructor in charge.
# FEES AND EXPENSES

<table>
<thead>
<tr>
<th>Item</th>
<th>Lowest</th>
<th>Highest</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tuition, free</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Matriculation (paid but once)</td>
<td>$5.00</td>
<td>$5.00</td>
</tr>
<tr>
<td>Laboratory and shop fees, varying according to courses, per annum</td>
<td>$1.00</td>
<td>$25.00</td>
</tr>
<tr>
<td>Books, per annum</td>
<td>$5.00</td>
<td>$20.00</td>
</tr>
<tr>
<td>Board, per month</td>
<td>$15.00</td>
<td>$18.00</td>
</tr>
<tr>
<td>Lights per room, per month</td>
<td>$0.25</td>
<td>$1.00</td>
</tr>
</tbody>
</table>

By resolution of the board of regents of the University, board is to be paid in advance at the beginning of each month. Checks, postoffice or express money orders should be made payable to the president. No reduction will be made for absence for a period of less than one week.

Text-books required are obtained directly from the publishers through a book association managed on the co-operative plan under the direction of the faculty.

Members of the battalion will be required to provide themselves with the prescribed uniform, which may be obtained at the University. The cost of uniform including transportation charges has been $16.25. This uniform has shown better wearing qualities than a civilian suit of equal cost, and parents are urged to consider the matter of uniform when supplying their sons with clothing for the approaching school year. It may be worn on all occasions and thus will remove the necessity for the usual expenditures for outer clothing other than overcoats.

Provision has been made to a limited extent for the self-support of students.

# RAILROAD RATES

The Southern Pacific, the Maricopa, Phoenix & Salt River Valley, the Santa Fe, Prescott & Phoenix, and the Gila Valley, Globe & Northern railways have all generously allowed students in attendance upon the University half rates when journeying to and from their homes. In the case of students coming to the University, these half rates may be secured by notifying the president of the University a sufficient length of time in advance to enable him to secure the permits from the proper authorities. Students at the University may secure transportation to their homes and return at
any time by making application at the office of the president of the University.

**LITERARY SOCIETY**

The Philomathean Society, an organization open to all students, holds its meetings in the assembly room of the University. Its work embraces general literary exercises and parliamentary usage and is a valuable adjunct to the regular college course.

**ATHLETICS**

Encouragement is given to athletics, and athletic organizations are under the immediate care of a committee of the faculty. Membership in these organizations is subject to forfeiture for failure in regular school work.

**REQUIREMENTS FOR ADMISSION**

Applicants for admission to any department of the University will be required to furnish satisfactory evidence of good moral character, and of honorable dismissal from the schools with which they were last connected.

Beginning with September, 1903, for admission to the Freshman class, applicants must be at least sixteen years of age and must pass satisfactory examinations in subjects sufficient to give fifteen credits as described below. Until 1903 twelve credits will be accepted. One study pursued satisfactorily for one year, one period a day, as ordinarily taught in high schools, entitles a student to one credit.

For admission to the course leading to the degree of Bachelor of Philosophy the subjects upon which examinations must be passed, and the credits assigned each, are:

<table>
<thead>
<tr>
<th>Subject</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>English</td>
<td>3</td>
</tr>
<tr>
<td>Mathematics</td>
<td>3</td>
</tr>
<tr>
<td>General History and Civics</td>
<td>2</td>
</tr>
<tr>
<td>Latin</td>
<td>3</td>
</tr>
<tr>
<td>French or German</td>
<td>2</td>
</tr>
<tr>
<td>Science</td>
<td>1</td>
</tr>
<tr>
<td>Elective</td>
<td>2</td>
</tr>
</tbody>
</table>
REQUIREMENTS FOR ADMISSION

For admission to the course leading to the degree of Bachelor of Science the subjects upon which examinations must be passed, and the credit assigned each, are:

<table>
<thead>
<tr>
<th>Subject</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>English</td>
<td>3</td>
</tr>
<tr>
<td>Mathematics</td>
<td>3</td>
</tr>
<tr>
<td>General History and Civics.</td>
<td>1</td>
</tr>
<tr>
<td>French or German.</td>
<td>2</td>
</tr>
<tr>
<td>Science</td>
<td>3</td>
</tr>
<tr>
<td>Elective</td>
<td>3</td>
</tr>
</tbody>
</table>

The scope of work required in these various subjects is as follows:

**ENGLISH**— A competent knowledge of the elements of English grammar, composition, the elements of rhetoric and the following English classics or acceptable equivalents: Longfellow’s Evangeline; Irving’s Sketch Book; Scott’s Ivanhoe and Lady of the Lake; Webster’s First Bunker Hill Monument Oration; Lowell’s Vision of Sir Launfal; Whittier’s Snow-Bound; the Sir Roger de Coverley Papers in “The Spectator”; Shakespeare’s Julius Caesar and Merchant of Venice; Macaulay’s Warren Hastings; George Eliot’s Silas Marner; Syle’s From Milton to Tennyson (ten poems).

In 1903 the requirements for admission will be the same as above for grammar, composition and the elements of rhetoric with the following English classics: The Sir Roger de Coverley Papers in “The Spectator”; Goldsmith’s Vicar of Wakefield; Tennyson’s Princess; Scott’s Ivanhoe; George Eliot’s Silas Marner; Coleridge’s Rime of the Ancient Mariner; Shakespeare’s Merchant of Venice and Julius Caesar; Carlyle’s Essay on Burns; Lowell’s Vision of Sir Launfal; Macaulay’s Essays on Milton and Addison.

**MATHEMATICS**—Arithmetic as covered in White’s Advanced Arithmetic to the appendix, but these subjects will be omitted in the entrance examinations: longitude and time, present worth, stock investments, exchange, equation of payments, compound proportion, partnership and cube root. Algebra, through quadratic equations, as given in Wells’s Essentials of Algebra, or Wentworth’s New School Algebra. Plane geometry as treated in the latest editions of Wentworth or Wells.

**GENERAL HISTORY AND CIVICS**—As much as is included in Adams’s European History and Fiske’s Civil Government in the United States or text-books covering equivalent ground.

**LATIN**—As covered by Collar’s First Latin Book and Viri Romae, together with Allen and Greenough’s Grammar and texts;
sight reading; Cæsar, four books; Cicero, four orations; Vergil, six books; sight reading from Nepos, Cicero and Gellius; Daniell’s or Bennett’s Prose Composition.

*French—As covered by Whitney’s French Grammar, parts I and II; composition; Super’s French Reader; Halévy, L’Abbé Constantin; Sand, Le Mare du Diable; Jean de la Bréte, Mon Oncle et Mon Curé; and at least 400 pages from five different authors.

*German—As covered by Whitney’s German Grammar; composition; Heath’s first year texts; together with Riehl, Der Fluch der Schönheit; Schiller, Marie Stuart and Jungfrau von Orleans; Goethe, Hermann und Dorothea, Iphigenia; Lessing, Minna von Barnhelm.

Science—Under this head may be offered the required number of credits in the following subjects: physical geography, physiology, botany, chemistry, physics. At least half the preparation in science should consist of laboratory work. Note-books covering such laboratory work as has been performed by the student should be presented for examination.

Elective—The remaining credits required may be made up from additional subjects ordinarily taught in high schools.

Students from other institutions of equivalent rank may be admitted to the higher classes upon the presentation of properly authenticated certificates showing to the satisfaction of the faculty that they are qualified to proceed with the desired work.

Arrangements have been made with the Arizona Normal School at Tempe, whereby students from that institution may have their record transferred to the books of the University with full credit, upon presentation of a certificate duly signed by the principal. Students of this University may also obtain the equivalent privilege at the Normal School by presenting the proper certificate of standing, signed by the president.

The faculty desires to establish such relations with high schools and other educational institutions as will enable it to accept their certificates without question. To this end presiding officers are respectfully requested to correspond with the president.

*If any language is offered it must be to the extent of two credits, since a single year’s study of a language is not considered of sufficient educational value to be entitled to credit.
COURSES OF STUDY AND DEGREES

All facilities and privileges of the University are open to qualified persons of either sex.

The University offers four-year courses of study leading to the degrees of Bachelor of Philosophy and Bachelor of Science. In each course the work is partly required and partly elective, as shown by schedules later. Each student taking full work is required to take four hours of recitation work each day. In laboratory work from two to two and one-half hours are considered the equivalent of one recitation hour.

Persons of mature age and with sufficient preparation who are not candidates for a degree will in some cases be admitted to regular classes as special students provided, however, that in all such cases they show to the satisfaction of the instructors in charge that they can take the work with profit to themselves and without detriment to the work of the regular class.

The faculty reserves the right to omit classes in any course of instruction unless a suitable number of students register for the course.

Students who have completed satisfactorily the required work and the specified amount of elective work as shown in the accompanying schedules will be given the degrees of Bachelor of Philosophy or Bachelor of Science. The special character of any course of study may be indicated by adding to the degree the name of the department, as: Bachelor of Science in Mining, or Bachelor of Science in Chemistry, etc.

Each candidate for graduation is required to present an acceptable thesis embodying the results of a special study of some subject within the range of the course pursued. The subject of the thesis must be submitted for the approval of the faculty not later than the opening of the second semester of the Senior year and the completed thesis must be presented not later than three weeks before commencement day.

The advanced degrees of Master of Science and Master of Arts will be conferred upon Bachelors, graduates from this University or from institutions of equivalent grade, who have successfully pursued at the University a course of study marked out by the faculty and requiring not less than one year.
COURSES OF INSTRUCTION

The following schedule shows the courses in which instruction is offered. The courses themselves are explained later.

Military science and tactics or physical culture is required during the Freshman and Sophomore years. If for any reason a student is excused from these exercises an additional subject having a minimum of three recitation hours per week will be required.

Numbers within parentheses indicate hours of recitation per week; when no number is given five hours per week is understood.

FRESHMAN YEAR

<table>
<thead>
<tr>
<th>Course</th>
<th>Hours</th>
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</thead>
<tbody>
<tr>
<td>Military Science and Tactics</td>
<td>4</td>
</tr>
<tr>
<td>Physical Culture</td>
<td>4</td>
</tr>
<tr>
<td>English 1, 2</td>
<td></td>
</tr>
<tr>
<td>Mathematics 1, 2</td>
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<tr>
<td>Latin 1, 2</td>
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<tr>
<td>French 1, 2</td>
<td></td>
</tr>
<tr>
<td>Oratory 1, 2 (2)</td>
<td></td>
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<tr>
<td>German 1, 2</td>
<td></td>
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<tr>
<td>Spanish 1, 2</td>
<td></td>
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<tr>
<td>History 1, 2</td>
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<tr>
<td>Botany 1, 2</td>
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<tr>
<td>Drawing 1, 2</td>
<td></td>
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<tr>
<td>Shopwork and Drawing 1, 2</td>
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<tr>
<td>Descriptive Geometry 1, 2</td>
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SOPHOMORE YEAR

<table>
<thead>
<tr>
<th>Course</th>
<th>Hours</th>
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<tbody>
<tr>
<td>Military Science and Tactics</td>
<td>4</td>
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<tr>
<td>Physical Culture</td>
<td>4</td>
</tr>
<tr>
<td>English 3, 4 (3)</td>
<td></td>
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<tr>
<td>Mathematics 3, 4</td>
<td></td>
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<tr>
<td>Latin 3, 4 (4)</td>
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<tr>
<td>French 3, 4 (4)</td>
<td></td>
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<tr>
<td>German 3, 4 (4)</td>
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<tr>
<td>Oratory 3, 4 (2)</td>
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<tr>
<td>Spanish 3, 4 (4)</td>
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<tr>
<td>Botany 3, 4</td>
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</tr>
<tr>
<td>Chemistry 1, 2</td>
<td></td>
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<tr>
<td>History 3, 4 (2)</td>
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<tr>
<td>Surveying 1, 2</td>
<td></td>
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<tr>
<td>Physics 1</td>
<td></td>
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<tr>
<td>Shopwork and Drawing 3, 4</td>
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JUNIOR YEAR

<table>
<thead>
<tr>
<th>Course</th>
<th>Hours</th>
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</thead>
<tbody>
<tr>
<td>Military Science and Tactics</td>
<td>4</td>
</tr>
<tr>
<td>Physical Culture</td>
<td>4</td>
</tr>
<tr>
<td>English 5, 6 (3)</td>
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</tr>
<tr>
<td>English 7, 8 (2)</td>
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<tr>
<td>Mathematics 5, 6</td>
<td></td>
</tr>
<tr>
<td>Economics 1, 2 (2)</td>
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<tr>
<td>Economics 3, 4 (3)</td>
<td></td>
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<tr>
<td>Zoology 1, 2</td>
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<td>Mineralogy 1</td>
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<td>History 5, 6 (3)</td>
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<td>History 7, 8 (2)</td>
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<td>Chemistry 3, 4</td>
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<tr>
<td>Metallurgy 1</td>
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<tr>
<td>Drawing 3, 4</td>
<td></td>
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</tbody>
</table>
COURSES OF STUDY AND DEGREES

SENIOR YEAR

Military Science and Tactics (4)  Ethics 1
Physical Culture (4)  Metallurgical Chemistry and Assaying 1, 2
English 9, 10 (2)  Steam Engineering and Prime Movers 1, 2
English 11, 12 (3)  Engineering Construction and Hydraulics 1, 2
Psychology 1
Pedagogy 1
History 9, 10 (3)
Astronomy and Geology 1, 2
Logic 1

CREDITS FOR DEGREES

A credit consists of one subject taken five hours per week throughout the year, or an equivalent of five hours per week. Sixteen credits besides Military Science and Tactics or Physical Culture are required for graduation in any course. Credits offered in the different subjects are shown in the following scheme:

<table>
<thead>
<tr>
<th>Credits</th>
<th>GROUP C.</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>English</td>
<td>... ... ... ... ... 4</td>
<td>Botany</td>
</tr>
<tr>
<td>Oratory</td>
<td>... ... ... ... 1</td>
<td>Zoology</td>
</tr>
<tr>
<td>Mathematics</td>
<td>... ... ... ... 4</td>
<td>Chemistry</td>
</tr>
<tr>
<td>GROUP A.</td>
<td></td>
<td>Met. Chem. and Ass'ng.</td>
</tr>
<tr>
<td>Latin</td>
<td>... ... ... ... 2</td>
<td>Astronomy and Geology</td>
</tr>
<tr>
<td>French</td>
<td>... ... ... ... 2</td>
<td>Mineralogy</td>
</tr>
<tr>
<td>German</td>
<td>... ... ... ... 2</td>
<td>Physics</td>
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<tr>
<td>Spanish</td>
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</table>

GROUP B.

<table>
<thead>
<tr>
<th>Credits</th>
<th>GROUP D.</th>
</tr>
</thead>
<tbody>
<tr>
<td>History</td>
<td>... ... ... ... 3</td>
</tr>
<tr>
<td>Economics</td>
<td>... ... ... ... 1</td>
</tr>
<tr>
<td>Philosophy</td>
<td>... ... ... ... 2</td>
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</tbody>
</table>

The credits necessary for the degree of Bachelor of Philosophy are as follows:

I. Required,—English 3 credits, Philosophy 2 credits, History and Economics 1 credit.

II. Group Electives,—From Group A 4 credits, from Group C 2 credits.

III. Free Electives,—4 credits.
The credits necessary for the degree of Bachelor of Science are as follows:

I. Required,—English 1 credit, Mathematics 2 credits.

II. Group Electives,—From Group A 1 credit, from Group B 1 credit, from Group C 4 credits, from Group D 3 credits.

III. Free Electives,—4 credits.

Women desiring the degree of Bachelor of Science may be allowed to substitute two credits in Group C or in Mathematics for two credits of those required in Group D.

To obtain the degree of Bachelor of Science in Mining the following courses must have been elected:

Shop and Drawing 1, 2; Surveying 1, 2; Mine Engineering 1; Metallurgy 1; Mineralogy 1; Astronomy and Geology 1, 2; Chemistry 3, 4; Steam Engineering and Prime Movers 1, 2; Engineering Construction and Hydraulics 1, 2.

To obtain the degree Bachelor of Science in Agriculture the following course is required:


Sophomore Year—Higher Algebra, Analytic Geometry, Meteorology, Chemistry, Surveying, Botany, Drawing, Farm Equipment, Soil and Irrigation.

Junior Year—Farm Crops, Breeds of Live Stock, Botany, Anatomy, Zoology, Entomology, Floriculture, Landscape Gardening, Forestry, Horticulture.

Senior Year—Stock Breeding and Feeding, Dairying, Veterinary Medicine, Geology, Fruits and Fruit Culture, Vegetables and Vegetable Culture.
<table>
<thead>
<tr>
<th></th>
<th>MONDAY</th>
<th>TUESDAY</th>
<th>WEDNESDAY</th>
<th>THURSDAY</th>
<th>FRIDAY</th>
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</thead>
<tbody>
<tr>
<td>I  9:00-9:50</td>
<td>+Psychology 1</td>
<td>+Psychology 1</td>
<td>+Psychology 1</td>
<td>+Psychology 1</td>
<td>+Psychology 1</td>
</tr>
<tr>
<td>I  9:50-10:40</td>
<td>+Psychology 1</td>
<td>+Psychology 1</td>
<td>+Psychology 1</td>
<td>+Psychology 1</td>
<td>+Psychology 1</td>
</tr>
<tr>
<td>II  10:40-11:30</td>
<td>Mathematics 1, 2</td>
<td>Mathematics 1, 2</td>
<td>Mathematics 1, 2</td>
<td>Mathematics 1, 2</td>
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<tr>
<td>II  11:30-12:15</td>
<td>Mathematics 1, 2</td>
<td>Mathematics 1, 2</td>
<td>Mathematics 1, 2</td>
<td>Mathematics 1, 2</td>
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<tr>
<td>III 1:00-1:50</td>
<td>+Logic 1</td>
<td>+Logic 1</td>
<td>+Logic 1</td>
<td>+Logic 1</td>
<td>+Logic 1</td>
</tr>
<tr>
<td>III 1:50-2:40</td>
<td>+Mine Engineering 1</td>
<td>+Mine Engineering 1</td>
<td>+Mine Engineering 1</td>
<td>+Mine Engineering 1</td>
<td>+Mine Engineering 1</td>
</tr>
<tr>
<td>IV 1:00-1:50</td>
<td>Astronomy and Geology 1, 2, Mineralogy 1</td>
<td>Astronomy and Geology 1, 2, Mineralogy 1</td>
<td>Astronomy and Geology 1, 2, Mineralogy 1</td>
<td>Astronomy and Geology 1, 2, Mineralogy 1</td>
<td>Astronomy and Geology 1, 2, Mineralogy 1</td>
</tr>
<tr>
<td>IV 1:50-2:40</td>
<td>+Physics 1</td>
<td>+Physics 1</td>
<td>+Physics 1</td>
<td>+Physics 1</td>
<td>+Physics 1</td>
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<tr>
<td>V  1:00-1:50</td>
<td>+Ethics 1</td>
<td>+Ethics 1</td>
<td>+Ethics 1</td>
<td>+Ethics 1</td>
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<tr>
<td>V  1:50-2:40</td>
<td>+Movers 1</td>
<td>+Movers 1</td>
<td>+Movers 1</td>
<td>+Movers 1</td>
<td>+Movers 1</td>
</tr>
<tr>
<td>VI 1:00-1:50</td>
<td>+Mine Engineering 1</td>
<td>+Mine Engineering 1</td>
<td>+Mine Engineering 1</td>
<td>+Mine Engineering 1</td>
<td>+Mine Engineering 1</td>
</tr>
<tr>
<td>VI 1:50-2:40</td>
<td>+Metalurgy 1</td>
<td>+Metalurgy 1</td>
<td>+Metalurgy 1</td>
<td>+Metalurgy 1</td>
<td>+Metalurgy 1</td>
</tr>
</tbody>
</table>
EXPLANATION OF COURSES OF INSTRUCTION
(The hours mentioned are the hours of recitation per week.)

ENGLISH

PROFESSOR HALL, ASSOCIATE PROFESSOR PLIMPTON.

The purpose of the courses outlined below is to give a general knowledge of English literature from the sixteenth century to the present time. Chief stress is placed upon the study of a few authors of the most important periods, though the history of our literature is also traced from age to age.

The course in composition aims to develop accurate thought and clear, vigorous expression.

ENGLISH 1, 2. NINETEENTH CENTURY PROSE AND BRIEF HISTORY. a—Appreciative, sympathetic criticism of a few prose writers, chiefly Macaulay, Carlyle, Emerson, DeQuincey, Ruskin and the foremost novelists. Lectures and discussions. b—A brief survey of the field of English literature. Stopford Brooke’s English Literature with reading, lectures and discussions. Open to all students. Five hours both semesters. (Hall.)

ENGLISH 3, 4. RHETORIC AND COMPOSITION.—Expository and argumentative composition; briefs, themes, essays. Lectures and discussions; Genung’s Practical Rhetoric and Rhetorical Analysis; Baker’s Specimens of Argumentation (modern). Open to students who have taken English 1, 2. Three hours both semesters. (Plimpton.)

ENGLISH 5, 6. ELIZABETHAN LITERATURE.—Shakespeare, selected plays; other Elizabethan drama, especially Jonson and Marlowe; Spenser’s Faerie Queene and shorter poems. Lectures and discussions. Open to students who have taken English 1, 2. Three hours both semesters. (Plimpton.)

ENGLISH 7, 8. EIGHTEENTH CENTURY LITERATURE.—From the death of Dryden to the publication of the Lyrical Ballads, 1700–1798; special attention given to the Queen Anne period and the early romantic revival. Lectures and discussions. Two hours both semesters. (Plimpton.)

ENGLISH 9, 10. SEVENTEENTH CENTURY LITERATURE.—From the closing of the theaters to the death of Dryden, 1642–1700. Lec-
tures and discussions. Open to students who have taken English 1, 2. *Two hours both semesters.*

**ENGLISH 11, 12. NINETEENTH CENTURY POETRY.**—From the publication of the Lyrical Ballads to the death of Tennyson, 1798–1892. Lectures and discussions; Macmillan’s Globe editions. Open to students who have taken English 1, 2. *Three hours both semesters.*

**RHETORICALS.**—The appearance in public rhetorical exercises once during each semester is required of all students taking a University course in English, or taking any course of study leading to a degree.

**LATIN**

**INSTRUCTOR FOUCAR.**

The courses below are open to students who have completed the first two years of Latin in the sub-collegiate department, or an equivalent. The aim of the instruction is to impart a comprehensive knowledge of the language and literature. Constant, thorough drills are given in technical grammar and prose composition. In reading the matter is subjected to grammatical, metrical, rhetorical and historical explanation. The study of the text is made the means of mental discipline, of developing the faculties of observation and critical judgment, and of acquiring habits of thoroughness and accuracy.

**LATIN 1, 2. CICERO AND VERGIL.**—Cicero’s Orations, the four Catilinarian; Vergil’s Aeneid, six books. Allen and Greenough’s texts. Sight-reading from Nepos, Gellius and Cicero; Daniell’s Prose Composition throughout the year. *Five hours both semesters.*

**LATIN 3, 4. LIVY, HORACE, CICERO.**—Livy, Book XXI; Horace, selected Odes, Satires; Cicero, De Amicitia and De Senectute; Latin prose composition and sight-reading. Open to students who have taken Latin 1, 2. *Four hours both semesters.*

**FRENCH**

**INSTRUCTOR PLIMPTON.**

The object of the courses in French is to give the student a practical knowledge of French forms, syntax and pronunciation.
Translating from English into French forms a large part of the work. The reading of numerous works of standard authors is designed to enlarge the student's vocabulary, and to give him an appreciative acquaintance with the genius of the language and literature.

**French 1, 2.—** Whitney's French Grammar, Part I; Super's French Reader; Halévy's L'Abbé Constantin; Sand's Le Mare au Diable; Jean de la Bréte, Mon Oncle et Mon Curé. Open to all students. *Five hours both semesters.*

**French 3, 4.—** Whitney's French Grammar, Part II; selected masterpieces of eighteenth and nineteenth century authors. Lectures; collateral reading. Open to students who have taken French 1, 2. *Four hours both semesters.*

**German**

**Instructor Plimpton.**

The object of the courses in German is to enable the student to gain rapidly a practical knowledge and use of the German language, a facility in translating, and an intelligent acquaintance with German literature. Special attention is given to grammatical structure, pronunciation, the acquiring of vocabulary and the mastery of idioms. In the reading, the aim is also a study of the form and thought of the works selected.

**German 1, 2.—** Whitney’s German Grammar; Heath’s first-year texts. Open to all students. *Five hours both semesters.*

**German 3, 4.—** Riehl’s Der Fluch der Schönheit; Lessing’s Minna von Barnhelm; Schiller’s Marie Stuart, Jungfrau von Orleans; Goethe’s Hermann und Dorothea, Iphigenia. Composition; collateral reading; essay writing. Open to students who have taken German 1, 2. *Four hours both semesters.*

**Spanish**

**Instructor Aguirre.**

The courses outlined below aim to give thorough instruction in Spanish grammar, and in reading, writing and speaking the language.
Spanish 1, 2—De Tornos’s Combined Spanish Method; selections from Cartillas Historicas. Much attention is given to writing and speaking Spanish. Open to all students. *Five hours both semesters.*

Spanish 3, 4—Reading and speaking the Spanish language; much practice in composition and letter writing will be given, and selections from different authors read in class. Spanish will be the language of the class room. Open to students who have taken Spanish 1, 2. *Four hours both semesters.*

HISTORY, POLITICAL SCIENCE AND PHILOSOPHY

PROFESSOR ADAMS.

HISTORY

In the work in history emphasis is placed on the social and political development, the relation of cause and effect and the unity of history. The laboratory method is used wherever possible and individual work insisted upon. In political science the historical method is used, and the *subject* rather than any one writer’s presentation of it is treated. After a brief presentation of pure economics, the course deals with practical questions.

History 1, 2. **English History.**—Green’s Short History of the English People used as a basis; much assigned reading. A thesis is required. Open to all students. *Five hours both semesters.*

History 3, 4. **American Colonial History.**—A detailed study of the American colonies under Great Britain, and of the United States to the adoption of the Constitution. Lectures and assigned reading. A thesis is required. Open to students who have taken History 1, 2. *Two hours both semesters.*

History 5, 6. **Economic History of the United States.**—A study of the course, manner and development of the economic history of the United States. Lectures and assigned reading. A thesis is required. Open to students who have taken History 1, 2. *Three hours both semesters.*

History 7, 8. **Spanish American History.**—Spanish settlement and administration during the colonial period; the growth and development of the Southwest, with special reference to Arizona. Lectures and assigned reading. Open to all students. *Two hours both semesters.*
EXPLANATION OF COURSES OF INSTRUCTION

HISTORY 9, 10. CONSTITUTIONAL HISTORY OF THE UNITED STATES.
—A detailed study of the formation of the Union, and of the political
and constitutional history of the United States, based on letters and
speeches of American statesmen, public documents and special his-
tories. A thesis is required. Open to students who have taken His-
tory 3, 4. Three hours both semesters.

POLITICAL SCIENCE

Economics 1, 2.—A study of the general principles and laws of
political economy. Text-book, Walker’s Advanced Political Eco-

omy. Open to Juniors and Seniors. Two hours both semesters.

Economics 3, 4.—A study of economic and sociologic problems,
such as the currency question, tariff reform, banking, taxation and
similar subjects. Lectures and assigned reading. A thesis is re-
quired. To be preceded or accompanied by Economics 1, 2. Three
hours both semesters.

PHILOSOPHY

Psychology 1.—A special consideration of the subject as ap-
plied to teaching. Lectures, recitations and collateral reading.
Open to Juniors and Seniors. Five hours first semester.

Pedagogy 1.—An account of educational evolution, both as a
culture fact in the history of civilization and as a foundation for pro-
fessional work; lectures, giving a brief but comprehensive outline of
the school systems of ancient, medieval and modern countries with
a special study of leading educators, such as Socrates, Commenius,
Pestalozzi, Froebel, Mann and others; the present trend of peda-
gogical thought and practice, methods of teaching, school manage-
ment, art of questioning and school law. Upon the completion of
this course, graduates of the University will receive a Territorial
Teacher’s Certificate. Open to students who have taken Psychol-
ogy 1. Five hours second semester.

Logic 1.—Text-book, Jevons’s Logic; reading from Mill, Hamil-
ton, Thomson and others. Open to Juniors and Seniors. Five hours
first semester. (Professor Woodward.)

Ethics 1—Theoretical and practical ethics; view of the histori-
cal development of the science; origin and development of the
moral consciousness; application of the principles of ethics to the problems of life. Lectures and discussions. Open to Juniors and Seniors. Five hours second semester. (President Parker.)

MATHEMATICS

PROFESSOR WOODWARD, PROFESSOR SMITH.

It is the aim of the work in mathematics to train the student to the habit of logical and vigorous courses of reasoning, to show the wonderful breadth of application of higher mathematics, to display the beauties and pleasures of the demonstrations, methods, and results of higher geometry and calculus, and to give such practice in the use of these agents as will enable students who pursue the higher branches of engineering to use them naturally and easily in those numberless applications where they are indispensable.


MATHEMATICS 5, 6. CALCULUS: MECHANICS.—Calculus first semester, differential and integral, with special reference to their use in the various branches of engineering. Lectures and recitations; text-book, Hall's Differential and Integral Calculus. Mechanics second semester; composition and resolution of forces; energy; revolving bodies; moment of inertia; impact; stress and strain in materials; graphical and analytical determination of stresses in ties, beams, columns, shafting, and in the members of bridge and roof trusses. Open to students who have taken Mathematics 3, 4. Five hours both semesters.

BIOLOGY

PROFESSOR GRIFFITHS.

The courses which follow are calculated to articulate with the work done in biology in average western high schools.
Botany 1, 2. Elementary Botany.—The general principles of plant morphology, physiology and histology; a knowledge of the more important functions in the vital economy of plant life, followed by a study of the types of the more important groups; a general survey of the plant kingdom. Guide, Atkinson’s Botany, supplemented by other texts and lectures. The laboratory studies will form the basis of all the work. Open to all students. Five hours, or an equivalent, both semesters.

Botany 3, 4. Advanced Botany.—The second year’s work is not definitely outlined, but is purposely left open to be formulated as the needs of the students applying appear to demand. Courses in general morphology of the fungi; morphology of the fungi with special reference to parasitic forms injurious to vegetation in the southwest; histology; physiology, and similar subjects are offered here. Opportunities and facilities are offered for research work. Open to students who have taken Botany 1, 2. Five hours, or an equivalent, both semesters.

Zoölogy 1, 2.—Conducted along lines corresponding very closely to those followed in Botany 1, 2. Laboratory studies as in that course are made the main feature of the work. This is based upon living, native material where such is available; but some groups are necessarily studied by the aid of preserved specimens. In the study of the Mammalia constant reference is made to human anatomy, so that this portion is made in a part review of the course in anatomy and physiology offered in the sub-collegiate department. Text-book, Parker and Hazwell’s Manual of Zoölogy. Open to all students. Five hours, or an equivalent, both semesters.

Physics

Professor Smith.

It is the object of this course to familiarize the student with the physical principles which underlie the higher courses of mechanics, thermodynamics, chemistry and engineering; and therefore special attention is given to the study of force and work, the physics of liquids and gases, and heat.

Physics 1.—Lectures, recitations and laboratory work. Open to students who have taken a course in elementary physics, and Mathematics 1, 2. Three hours, or an equivalent, second semester.
The instruction in chemistry has two main objects in view: first, to promote general culture; and secondly, to introduce students to technical work, especially in mining. The first two years' work in general chemistry, qualitative and quantitative analysis, places the student in a position to take up advantageously the study of mining and metallurgy. The third year's work, metallurgical chemistry, can be pursued to advantage only by advanced students. The larger portion of the work, being investigative, requires on the part of the student a certain amount of originality and ingenuity in designing and carrying out experiments. The experience which a student may gain in this work is of great value to him in conducting an assay laboratory or in filling the position of superintendent of a metallurgical plant.

CHEMISTRY 1. GENERAL CHEMISTRY.—Lectures illustrating the chemical properties of the elements and their compounds, supplemented by recitations and laboratory practice. Text-book, Remsen's Briefer Course. Open to all students. Five hours, or an equivalent, first semester.

CHEMISTRY 2. QUALITATIVE ANALYSIS.—Practical work in the laboratory, including the analysis of alloys, commercial products, minerals, and like substances. The course is accompanied by lectures and recitations. Text-book, Eliot and Storer's Qualitative Analysis, and various reference books. Open to students who have taken Chemistry 1. Five hours, or an equivalent, second semester.

CHEMISTRY 3, 4. QUANTITATIVE ANALYSIS.—Laboratory practice, with lectures and recitations; gravimetric, volumetric, gasometric, calorimetric and electrolytic methods of analysis; quantitative analysis of silicates, minerals, and mattes. Text-books, Fresenius's Quantitative Analysis, Sutton's Volumetric Analysis, and various reference books. Open to students who have taken Chemistry 2. Five hours, or an equivalent, both semesters.

METALLURGICAL CHEMISTRY AND ASSAYING 1, 2.—Assaying of gold, silver and lead by the furnace method; bullion assaying according to the methods employed in the United States Mint; cyanide process for the extraction of gold; the assaying of cyanide solutions,
precipitation of gold, and the treatment of the zinc residues; the chlorination process; the leaching of silver ores by hyposulphite; preparation and analysis of alloys, with a study of their properties; analysis of iron and steel, fuels and furnace gases. Open to students who have taken Chemistry 5, 6. *Five hours, or an equivalent, both semesters.*

**MINERALOGY**

**PROFESSOR GUILD.**

The main object of the course in mineralogy is to familiarize the student with facts and methods which will enable him to determine the character of an ore or mineral by an observation of its physical properties and by the performance of a few simple tests with the blow-pipe. The value of such a course cannot be overestimated, since these quick methods of analysis are frequently needed in the field and mine when recourse cannot be had to a well-equipped chemical laboratory. The course is of value also to the student of general science, since it adds to the pleasure of a day in the mountains or field, and is necessary to a full appreciation of the study of geology. The course is not only practical, but the theoretical side of the subject receives attention in mineral optics, crystallography and similar topics.

**MINERALOGY 1, 2.—**Lectures and recitations in crystallography and the classification and uses of minerals; laboratory work in blow-pipe analysis and determinative mineralogy; work with the reflecting goniometer in measuring the angles of crystals, and with the polariscope in studying the optical properties of minerals; the study of a type collection of 600 minerals arranged and classified according to Dana. Text-books, Dana’s Text-book of Mineralogy and Brush’s Manual of Determinative Mineralogy and Blow-Pipe Analysis. Open to students who have taken Chemistry 2. *Five hours, or an equivalent, both semesters.*

**ASTRONOMY**

**PROFESSOR BLAKE.**

A short course of instruction in astronomy, in which are considered the relations of the earth to the solar and stellar systems is given as an introduction to the study of geology. The astronomy
being considered a part of geology is granted no independent credit toward any course of study. Open to Seniors. Lectures and recitations.

**GEOLOGY**

**PROFESSOR BLAKE.**

The purpose of the course in geology is to acquaint the student with the principles of the science and to give him such a practical knowledge of the subject as will be of use in the development and operation of mines.

**ASTRONOMY AND GEOLOGY 1, 2.**—Astronomical introduction (see Astronomy above); geognosy—the formation and composition of the crust of the earth, rock-forming minerals, crystalline and mechanically formed rocks; dynamic geology—volcanic formations, metamorphism, erosive agencies, transportation and deposition of rock-forming materials; structural geology—stratification and the movements to which strata have been subjected; stratigraphic and historical geology—the geological record, progress of life, theories of evolution. *Economic geology*; mineral deposits, veins, occurrence of ores and metals. *Mining and mining machinery*; methods of mining, transportation of ores, mechanical treatment of ores.

Lectures, illustrated by rocks and fossils in the museum, photographs, maps, drawings; occasional excursions to the field and to prominent mines. Text-books first semester: Todd’s New Astronomy; Heilpin’s Earth and its Story; Geikie’s Text-Book of Geology and Class-Book of Geology; Dana’s Manual of Geology. Text-books and reference books second semester: Kemp’s Ore Deposits of the United States and Canada; Rothwell’s Mineral Industry; Bowie’s Hydraulic Mining; Reports of the United States Geological Survey; Transactions of the American Institute of Mining Engineers. Open to Seniors. *Five hours both semesters.*

**DRAWING AND DESCRIPTIVE GEOMETRY**

**DIRECTOR HOLMES.**

Under this head instruction is offered in artistic drawing designed especially for young women in the Freshman year; in instrumental drawing including training in machine design; and in descriptive geometry which is included in the three credits offered in drawing in group D.
EXPLANATION OF COURSES OF INSTRUCTION 35

Drawing 1, 2. Artistic Drawing.—Elementary principles of drawing natural objects; outline drawing; perspective; light and shade; ornamental design; color in ornament; appreciation of the decorative arts. Open to all students. Five hours, or an equivalent, both semesters.

Drawing 3, 4.—Graphical statics, kinematics and machine design taught in connection with mining and mechanical engineering. A knowledge of shopwork and drawing described below is highly desirable. Open to Juniors and Seniors. Five hours, or an equivalent, both semesters.

Descriptive Geometry 1, 2.—Orthographic projections; intersection of surfaces; spherical projections; shade and shadow; perspective; practical application to timber-framing, stone-cutting, sheet-metal work and to architectural draughting strongly emphasized. Text-book, Church’s Descriptive Geometry and Shades and Shadows, with plates. Open to students who have taken or are taking Shopwork and Drawing 1, 2. Five hours, or an equivalent, both semesters.

SHOPWORK AND DRAWING
DIRECTOR HOLMES.

The purpose of the courses of instruction outlined below is to teach the properties and commercial classification of common materials of manufacture, the processes of manufacture, the use of tools and machines, and the design of tools, machines and other objects of utility. In equipment and design, the shop is modeled after the best examples in American practice.

The general method of instruction is as follows: In all the work explanation is made of the physical properties of the materials used, of the use and care of tools, of the theory of their action on materials, of the laying out of work and of the finishing of the object. Each student makes a series of graded exercises, and drawings of the same. Exercises assume as far as practicable the form of common objects of utility. Students are encouraged to apply the knowledge gained in any exercise to the design of original work.

Shopwork and Drawing 1, 2.—Shopwork: carpentry; pattern-making; forging. Drawing: tracing; blue-printing; shop drawings. Open to all students. Five hours, or an equivalent, both semesters.
Shopwork and Drawing 3, 4.—Shopwork: chipping and filing; vise-work in iron; use of engine lathe, shaper, planer, milling and other machines. Drawing: shop drawings; elements of machine design. Open to students who have taken Shopwork and Drawing 1, 2. Five hours, or an equivalent, both semesters.

Engineering

Professor Woodward, Professor Smith.

The courses offered under this head are selected with reference to the local conditions and needs of the territory. While they are made as technical as is possible without sacrificing in other directions, yet the fact is constantly borne in mind that engineering practice changes from year to year, and that a graduate who is thoroughly grounded in the principles of his profession will readily acquire the technical side. The former is necessary; the latter, desirable.

Surveying 1, 2.—Use and care of instruments, including plain and solar compasses, levels, transits; plane land surveying; United States system of land surveys; city, topographical, railroad and mine surveying; earthwork computations; determination of azimuth, latitude, longitude and time by observations on the circum-polar stars and on the sun. One full half-day each week is devoted to field practice; plots are made of field surveys and a topographic map of some area in the vicinity of Tucson is executed by each student. Lectures, recitations, drawing and field work; text-book, Raymond’s Surveying. Open to students who have taken Trigonometry. Three hours both semesters and Saturday forenoons.

(Smith.)

Mine Engineering 1.—Engineering work underground; methods of mining; ventilation; explosives; analytical design of a steel hoisting frame. Recitations and draughting. Open to students who have taken Mathematics 5, 6. Five hours first semester.

(Smith.)

Metallurgy 1.—Iron and steel; copper; lead; special reference to the mechanical operations of ore-reduction; complete analytical design of a roaster, smelter or some equally important structure will be given each year. Open to students who have taken Mathematics 5, 6. Five hours second semester.

(Smith.)
Engineering Construction and Hydraulics 1, 2.—a—Engineering construction first semester: materials of construction and their properties; masonry construction; culverts, bridge piers, dams, retaining walls, arches; graphical investigation of stability; use of concrete; foundations, pile and masonry, on land and in water; cofferdams, cribs, and caissons.  
b—Hydraulics second semester: velocity and discharge from orifices, weirs, tubes, and pipes; flow in sewers, ditches, canals, and rivers; energy of a jet; measurement of water power; water wheels of various types; pumping machinery. Text-book, Merriman’s Hydraulics. Open to students who have taken Mathematics 5, 6. Five hours both semesters.  

(Smith.)

Steam Engineering and Prime Movers 1, 2.—Elementary thermodynamics; theory of the steam engine; types of engines; steam valves and valve diagrams; theory and use of the indicator; compound engines; heat and combustion of fuel; types of boilers; design of chimneys; gas, oil, and hot-air engines; solar engines; wind and water as natural sources of power. Text-book, Kinealy’s Steam Engines and Boilers. Open to students who have taken Mathematics 5, 6. Five hours both semesters.  

(Woodward.)

The value of the engineering courses, especially in designing, is enhanced by a collection of blue prints of actual constructions. The University is indebted to Fraser & Chalmers of Chicago for a recent gift of blue prints of mining machinery, including a smelter, a roaster, a converter, hoisting frames, and stamp mills. As occasion offers excursions will be made to the important mining plants of the territory. During the present year a visit was made by the senior mining students with instructors to Bisbee, where, through the courtesy of Mr. Walter Douglas, superintendent of the Copper Queen Mining Company, the entire plant both below and above ground was inspected and studied under most favoring circumstances. Plans are maturing for two similar trips in the near future.

Oratory  
Instructor McGauhey.

The object of this course is to give instruction and training in the principles of expression. Special attention is paid to developing the voice, to strengthening all the powers of the voice and body and to bringing these powers into such perfect harmony that the
student may adequately express his ideas. The training leads to proficiency in the various lines of elocution and oratory.

**Oratory 1, 2.**—Physical training, laws of health, voice culture, articulation, pronunciation, elements of modulation, physiology of the voice, cure of faults of voice and manner; recitation, rendering of thought, gesture, emphasis, grace and deportment; recitations committed to memory and delivered before the class. Open to all students. *Two hours both semesters.*

**Oratory 3, 4.**—Analysis of higher forms of literature; interpretation; delivery of original orations. A knowledge of psychology, rhetoric, logic and English literature is highly desirable. Lectures and class drill. Open to students who have taken Oratory 1, 2. *Two hours both semesters.*

**MILITARY SCIENCE AND TACTICS**

**Lieutenant-Colonel Adams.**

**Practical Course.**—Exercises on the drill ground covering (a) Infantry exercises in the schools of the soldier, company and battalion; extended order movements, target practice, reviews and parades. (b) Military signaling with flag; telegraphy. Required of all able-bodied male students throughout the Freshman and Sophomore years and elective during the remainder of the course.

**Theoretical Course.**—Recitations covering the Infantry drill regulations with lectures on military law, discipline, military history, and allied topics. Required of all commissioned and non-commissioned officers.

Students claiming exemption from drill will be required to secure a certificate of disability from a physician designated by the faculty unless the disability is apparent. Those so excused will be required to elect a subject in place of this course. The officers will be appointed from an eligible list determined by examinations, both scholarship and class standing being taken into account.

Each member of the military organization will be required to provide himself with the required uniform within six weeks after his entrance. A deposit covering the cost of the uniform should be made upon registration. The uniform consists of cap, coat and trousers of cadet gray cloth trimmed with black braid and closely resembles the undress uniform of the United States Military Academy at West Point.
SHORT COURSE OF INSTRUCTION IN ASSAYING

In order to meet the needs of persons who desire to learn the art of assaying the common ores and who have not the time required for a full four years' course of study, the Board of Regents has approved a short course of instruction in practical assaying, metallurgy, and allied subjects.

This course commences with the first semester in each year and requires at least two years; students are advised, however, to take the regular course in engineering and mining, if possible, since in two years they cannot expect more than to make a beginning in these subjects.

REQUIREMENTS FOR ADMISSION

Those desiring to take this course are required to be at least eighteen years of age, to have good health, and to have a knowledge of English, mathematics and elementary science sufficient to enable them to pursue the course with advantage. For elementary science, physics, and for mathematics algebra to quadratics is sufficient.

Instruction is gratuitous, but each student is required to pay a matriculation fee of five dollars and to pay the cost of materials, glassware, and apparatus used by him. For this purpose a deposit of ten dollars will be required in advance each semester and any balance will be refunded.

The right is reserved to vary this course according to the aptitudes or necessities of those concerned.

FIRST YEAR.

General chemistry, one semester.
Qualitative analysis, one semester.
Mathematics, two semesters.
English or Spanish, two semesters.
Practical free-hand drawing and shopwork, or physics, two semesters.

SECOND YEAR.

Mineralogy, blow-pipe analysis and fire assaying, two semesters.
Quantitative analysis and wet assaying, two semesters.
Mathematics, two semesters.
Geology, two semesters.
Text-Books.

The following text-books and others are used:
Chemistry—Remsen, Eliot & Storer, Fresenius.
Assaying—Ricketts, Brown, Furman, Aaron.
Mineralogy—Dana; Brush’s Determinative Mineralogy, revised by Penfield; Dana’s How to Study Minerals.
Geology—Dana, LeConte, Geikie.

ARIZONA SCHOOL OF MINES

SCHEDULE OF RATES FOR ASSAYING AND WORKING ORES

In accordance with the Legislative enactment approved March 3, 1899, the rates for assaying heretofore in force under the law of March, 1897, have been changed. The fifty-cent rate is no longer in force. Former circulars and schedules of rates are revoked and withdrawn. Under the provisions of the new law, the Regents of the University of Arizona have established the following rates for assaying ores taken from deposits and mines in the territory of Arizona:

ASSAYING ORES FROM ARIZONA

<table>
<thead>
<tr>
<th>Commodity</th>
<th>Rate</th>
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<tbody>
<tr>
<td>Silver and Gold, or either</td>
<td>$1.00</td>
</tr>
<tr>
<td>Silver, Gold and Copper</td>
<td>2.00</td>
</tr>
<tr>
<td>Copper</td>
<td>1.00</td>
</tr>
<tr>
<td>Lead</td>
<td>1.00</td>
</tr>
<tr>
<td>Zinc</td>
<td>1.00</td>
</tr>
<tr>
<td>Iron</td>
<td>1.00</td>
</tr>
<tr>
<td>Gold, Silver, Copper and Lead</td>
<td>2.50</td>
</tr>
<tr>
<td>Gold, Silver, Copper and Iron</td>
<td>2.50</td>
</tr>
<tr>
<td>Gold, Silver, Copper and Zinc</td>
<td>2.50</td>
</tr>
</tbody>
</table>

All assays are made in duplicate and in the most careful and thorough manner by an expert assayer.
PAYMENT IN ADVANCE REQUIRED.

The Director is required, in all cases, to hold the assay until the fee or charge therefor is paid. Remittances may be made by check or money order; or the money, securely wrapped, may be sent with the sample.

RATES FOR SAMPLING AND WORKING ORES.

Lots of 100 pounds or less, including assays of three metals........................................... $ 5.00
Each additional 100 pounds, to 500 pounds..................... 1.00
Over 500 pounds, to 1 ton.................................. 10.00
Each additional ton........................................ 4.00
Ordinary stamp mill test and plate amalgamation, for first ton or fraction of a ton.................. 20.00
From 1 to 2 tons......................................... 30.00
Pan amalgamation, including crushing and assays, ton...................................................... 20.00
Large lots proportionately less; small lots more in proportion.

CYANIDE PROCESS.

The School of Mines is prepared to make experimental tests of ores and of tailings by the cyanide process, in large or small quantities, at rates to be agreed upon with the Director.

Working tests and experiments by other processes may be undertaken at rates to be agreed upon in each instance, depending upon the amount of materials, time and labor required.

CONCENTRATING (INCLUDING ALL ASSAYS).

Wet or dry test of small lot (under 500 pounds)..............$15.00
500 pounds to 1 ton........................................ 20.00
Each additional ton........................................ 7.00

QUALITATIVE TESTS.

The determination of the nature of rare and peculiar minerals, not requiring a chemical analysis, or an assay, is made gratuitously. Samples sent for this purpose should be in their original condition as broken out, and not crushed to a powder or pulp. Tests requiring determination of the presence of gold or silver must be paid for at assay rates. Samples may be sent by mail at the rate of one cent per ounce. They should be distinctly labeled inside of the
package by the name of the sender, and a letter should be posted at
the same time giving the full name and address, and inclosing
a stamp for the reply. This offer of free examination is intended
to apply to minerals unknown to the sender and does not cover
special tests for precious metals or for any metal the presence of
which is usually determined by an assay.

HOW TO SEND SAMPLES.

For small samples, under four pounds in weight, the most ex-
peditious and cheapest way is to send by the ordinary mail. If sam-
ples or letters containing the postal order are sent by registered
mail, a delay of from one to three days is caused, as notice of arrival
is given first and then the registered parcel must be sent for. A
similar delay results from sending by express. The express com-
pany does not deliver parcels at the University. Delays often re-
sult from the want of identification. Sometimes the only clue to
the name of the sender is the comparison of the handwriting upon
the sample and that upon the letter. The postal laws permit the
name of the sender to be written and inclosed in the package. Each
sample should be labeled by a slip of paper, inside, giving the name
and locality of the claim and the address of the sender.

The name of the claim is desired in order that the value and
distribution of the mineral wealth of the territory may be better
known.

NEW ASSAY LABORATORY.

Samples are now received and the assays are made in the new
laboratory for mining and qualitative work. This laboratory is in-
dependent of and apart from the laboratory for students. A special
expert assayer of experience is employed. The assays are not made
by the students.

Special rates for freight on consignments to the "DIRECTOR OF
THE SCHOOL OF MINES," are granted by the Southern Pacific R. R.
from points in Arizona. Ask the agent at shipping point for par-
ticulars.

All business communications, checks and money orders should
be addressed to the

ARIZONA SCHOOL OF MINES,

Wm. P. Blake, Director.

TUCSON, Pima Co., Arizona.
ORGANIZATION AND WORK

The Agricultural Experiment Station is a legally constituted department of the University, whose purpose is "to aid in acquiring and diffusing * * * useful and practical information on subjects connected with agriculture, and to promote scientific investigation and experiment respecting the principles and applications of agricultural science."

With the above objects in view, the organization of the station includes the administrative office, and the departments of agriculture and horticulture, animal husbandry, botany and chemistry, the whole or a major portion of the time of one or more members of the station staff being devoted to each department of station work. Provision is made for meteorological and entomological work also, though to a less degree.

Owing to the wide variation in agricultural conditions in Arizona, it has been found of advantage to distribute the work so that each department is located, so far as possible, in the situation most favorable to the accomplishment of its own special results. According to this principle, the various lines of Experiment Station work have been distributed as follows:

The Director’s office and the departments of botany and chemistry are maintained at Tucson in the University buildings. Through this arrangement, the Experiment Station profits by the buildings, libraries and associations of the University, while the Uni-
versity is benefited from time to time by the teaching ability of members of the station staff. It has been found that from this base of operations the three great agricultural districts of the territory—Salt River valley, the lower Colorado, and the upper Gila—are accessible with equal convenience for field work and observations.

On the same grounds—fitness in location for the work undertaken—the experiment station farm has been maintained and strengthened at Phoenix. Salt River valley is intermediate in elevation, in situation, and in mean yearly temperature between the other two important farming districts above mentioned, and for this reason the agricultural and horticultural results obtained there are capable of the most general application in the territory at large.

The date palm orchard again, is located in the alkaline district south of Tempe, where a successful demonstration of this palm as a commercial fruit producer will be of the greatest value, creating use for the great areas of alkaline land in the arid Southwest.

The range station also, for the study of worn-out range country with a view to its reclamation to usefulness, is located in a typical district near Tucson, and is conducted under the auspices of the department of botany.

The services of specialists in various subjects, such as entomology, meteorology and soil survey work have also been secured from time to time.

The results of the experiment station work are made public at frequent intervals in the bulletins and reports of the station. These publications are made in two series; first, the longer and more technical bulletins, stating in considerable detail the investigations as they mature, and secondly, the “Timely Hints for Farmers,” which are brief writings issued at the time when they will be most useful, written in plain language, and presented in popular form. The annual reports also are for the most part written popularly, and afford a convenient and readable summary of each year's work as it comes to completion.

The station work conducted and published on the lines indicated above has a two-fold value. In the first place, the suggestions made or derived from the investigations of the station are of direct material profit to the agricultural public and may often be immediately applied to advantage in the solution of agricultural problems. In the second place, these writings are intended to serve an educational purpose, inasmuch as they are so presented as to constitute lesson sheets for the benefit of the careful reader. It may therefore
be considered that the Experiment Station reaches a class of some three thousand readers in the Southwest twice a month through its "Timely Hints" and other publications; the operations of the range study tract at Tucson, the experiment station farm at Phoenix, the date palm orchard at Tempe, and the sugar beet plots on the upper Gila serve also as an object lesson to the adjacent public.

It is believed that this distributed and mobile organization is especially effective, not only for the purposes of the Experiment Station, but also for those of the University as well, since it allows the station to conduct its work in localities suitable for the accomplishment of results; and again, it causes the public to become better acquainted with the territorial University, of which the station is a department.

ACKNOWLEDGEMENTS

The University gladly acknowledges the generous gift by the Copper Queen Consolidated Mining Company of three thousand dollars as aid in the erection of the manual training shops.

Thanks are due various publishers and individuals for a number of valuable books given to the library.

The museum has received during the past year many valuable specimens of rocks and minerals, and is especially indebted to Mr. Herbert Brown, of Yuma, for gifts of specimens in natural history, for rare Arizona fossils and remains of extinct animals.
SUB-COLLEGIATE DEPARTMENT

INSTRUCTORS

Millard Mayhew Parker, A. M., President
Howard Judson Hall, A. M., English
Sherman Melville Woodward, A. M., Elementary Science
Frank Yale Adams, A. M., History and Civics
David Hull Holmes, Shopwork and Drawing
George Edson Philip Smith, B. S., C. E., Physics
Mrs. Mary Bernard Aguirre, History and Spanish
Mrs. Emma Monk Guild, English and Mathematics
Mary Elizabeth Plimpton, A. M., English and French
Opal LeBaron McGauhey, B. E., English Reading and Physical Culture
Louise H. Foucar, B. Lit., Latin, Mathematics and Botany
Mabel Gray Hoover, Domestic Science
Nora Towner, Stenography and Typewriting
Elbert J. Hollingshead, Bookkeeping and Commercial Law

GENERAL INFORMATION

In this department the University carries on the work of a model High School, with the added advantages of the shopwork and drawing of the manual training department.

Students of sufficient age who have finished the study possible to them in their home schools are enabled to continue their preparation for college, at the University, under most favorable circumstances. The equipment of the scientific laboratories is available for use in this sub-collegiate work, wherever it can be used advantageously, and makes possible strong work in elementary science. The instructors in this department are assisted by the professors of the college department, several of whom regularly conduct sub-collegiate classes. By reference to the course of study which follows, it will be seen that it offers a comprehensive training for those who may not be able to pursue their studies further, while it gives a good preparation for college.

To each student who completes the studies of this course, a certificate stating that fact will be given, which certificate will entitle the holder to admittance to the University courses of instruction without examination.
The following course of study will be required of all students who fit themselves at the University for entrance to the Freshman class in 1903. Such variations from it will be made during the next two years as will adapt it to the case of students already in the sub-collegiate department.

Military drill or physical culture is required of all able-bodied students throughout the course.

Numerals indicate number of recitations per week. Subjects marked * are elective. Two subjects must be chosen each year for the last three years from the electives.

<table>
<thead>
<tr>
<th>FIRST YEAR</th>
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<tbody>
<tr>
<td>English</td>
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<tr>
<td>Commercial Arithmetic</td>
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<td>American History</td>
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<th>SECOND YEAR</th>
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<tr>
<td>English</td>
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<tr>
<td>Algebra</td>
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<tr>
<td>*Bookkeeping</td>
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<tr>
<td>General History</td>
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<th>THIRD YEAR</th>
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<tr>
<td>English</td>
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<td>Plane Geometry</td>
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<td>Civics</td>
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<tr>
<td>English Reading</td>
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<tr>
<td>Parliamentary Practice</td>
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<tr>
<td>*Physiology 1/2, Chemistry, 1/2</td>
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<th>FOURTH YEAR</th>
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<tr>
<td>English</td>
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<tr>
<td>Algebra 1/2, Higher Arith. 1/2</td>
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<tr>
<td>English Reading</td>
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<tr>
<td>Parliamentary Practice</td>
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<tr>
<td>*Physics</td>
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</table>
MATHEMATICS

The course in arithmetic begins with percentage and includes a thorough review of the remainder of the subject. Special stress is laid on thoroughness and accuracy and a comprehension of the unity of the subject. Much time is given to mental examples in order to develop accuracy and rapidity in all mental operations.

In algebra special attention is given to the transition from arithmetic to algebra, to the fundamental operations and especially to factoring. The course includes as much as is found in any good text-book of algebra through quadratic equations.

Plane geometry occupies one year. This is so taught as to develop orderly habits of thinking and of investigation. To that end much original work is required, including practical problems involving the application of the principles learned.

ENGLISH

The course in English embraces grammar, composition and rhetoric, besides a critical study of assigned classics. It begins with a systematic study of grammar. Throughout the whole course attention is paid to work in composition, the aim being to enable the student to express himself clearly, accurately and with ease. In rhetoric much attention is paid to the principles of style and expression. The English classics studied in this department are those required for entrance to the University, as mentioned on page 23.

Under the general head of English reading the students are given drill in the elementary principles of reading and of elocution.

HISTORY

The aim of all the work in history is to lead the pupil to see the development of races and nations along political, social and religious lines, and to arouse in him a love for the subject and a habit of broad and discriminate reading.

American history is reviewed during the first year. Montgomery is used as a text-book with White's Outline Studies, but much collateral reading is required and the institutional side of the history is made prominent.

The work of the second year includes ancient, mediæval and modern history. The aim is to give the student an idea of the essential unity of history and the leading facts in the political devel-
opment of races and nations. Adams’s European History is used supplemented by the reading of references contained therein.

Fiske’s Civil Government in the United States is the text-book in civics. The historical development of the subject is made prominent while practical problems, such as taxation and municipal government, are made the subject of special investigation and study.

Coman and Kendall’s History of England is used as the text-book in the fourth year.

LATIN, FRENCH, SPANISH AND GERMAN

For an outline of the course in Latin see pages 19, 20, under requirements for admission.

For an outline of the courses in French, Spanish and German see pages 26, 27, 28.

DRAWING AND SHOPWORK

The drawing course is designed to be helpful in the study of the arts and sciences wherever graphic representation of the subject is possible. Historic ornament is studied in connection with the history courses. Sketches of apparatus are made in connection with the courses in physics and chemistry. Accurate instrumental drawings are made of the exercises in geometry and shopwork. The application of useful drawing is thus apparent at every stage of the student’s development. At the end of the year’s course every student is required to design and make some useful article involving the application of the principles learned and the use of the tools with which he has become familiar.

The shop work consists of bench work in wood and of forge work. The course in bench work in wood consists of exercises with the different wood working bench tools, so arranged as to embrace the manipulations of the tools in their various applications. It will also include the most rapid and economical methods of preparing the wood for the machine. Turning of all kinds forms a part of the course. In the forge work students are carried through a series of graded exercises in both iron and steel.

DOMESTIC SCIENCE

The course in domestic science covers the preparation which the proper care of the house requires. It includes home hygiene, household science, chemistry of cooking, the study of foods and
practice in all kinds of cooking, plain and fancy sewing, nursing, care of the house, management of servants, social duties and customs of society.

BOOKKEEPING, STENOGRAPHY AND TYPEWRITING

Bookkeeping is taught by the modern budget system. The work is individual and each student may progress as fast as his time and ability permit. The course is thorough in all the details of office practice. The course includes instruction in commercial law. A complete course in stenography is offered, the Pitman system being used. The department is equipped with Remington typewriters.

PARLIAMENTARY PRACTICE AND DEBATE

The two higher classes in the sub-collegiate department devote one period of each week to work in parliamentary practice and debate. The classes are organized under a regular constitution and by-laws. Instruction is given in parliamentary law, Roberts's Rules of Order being used as a text-book. The members are required to introduce resolutions and prepare debates upon them and to appear at stated times with recitations and declamations. They are also given practice in performing the duties of secretary and in presiding in the meetings.

SCIENCE

It is the object of the course in science to initiate the student into the processes and methods used in laboratory work, to teach close observation, careful manipulation and logical deduction; to acquaint the student with the fundamental facts of the various branches of science and to give full practice in the use of good English in describing various observations and experiments.

An introductory laboratory course is given in the first year. The third year is given half to physiology and half to chemistry, pursued on the laboratory plan. During the fourth year a rigid course is given in physics, fully covering college preparatory physics with ample experimental work. Abundant apparatus and laboratory facilities are supplied for all these courses.
MILITARY ORGANIZATION 1900-01

Commandant of Cadets, Lieut.-Col. Frank Yale Adams, N. G. A.

STAFF AND MUSICIANS

Adjutant ........ Second Lieutenant Elbert J. Hollingshead.
Sergeant-Major ........ Norman J. Roberts.
Chief Trumpeter ........ Henry E. Castañeda.
Trumpeter ........ Benito G. Suarez.

COMPANY A

Captain ........ Rudolph Castañeda.
First Lieutenant ........ Philip M. Reilly.
Second Lieutenant ........ Duncan H. Campbell.
First Sergeant ........ Roy G. Mead.
Sergeant ........ Allan C. Bernard.
Sergeant ........ Elbert P. Drumiler.
Sergeant ........ Walter E. Hadsell.
Sergeant ........ Kirke T. Moore.
Corporal ........ William D. Whipple.
Corporal ........ Clancy C. Olney.
Corporal ........ Ross M. Russell.
Corporal ........ Christopher A. Smith.

COMPANY B

Captain ........ George M. Parker.
First Lieutenant ........ J. Newton Robinson.
Second Lieutenant ........ William T. Olney.
First Sergeant ........ George Martin.
Sergeant ........ Edward S. Stafford.
Sergeant ........ Courtland F. Day.
Sergeant ........ Marion B. Kays.
Sergeant ........ William E. Clark.
Corporal ........ A. Charles Alexander.
Corporal ........ Roy W. Moore.
Corporal ........ Frank G. Reynolds.
Corporal ........ William W. Dickinson.

SIGNAL CORPS

Captain ........ Edwin H. Andrews.
First Sergeant ........ Walter J. Wakefield.
ALUMNI ASSOCIATION
Organized June 2, 1897

CONSTITUTION

In order to promote the interests of the University, to secure unity among its graduates, and to foster an attachment to our Alma Mater, we do hereby constitute ourselves an association to be known as the ALUMNI ASSOCIATION OF THE UNIVERSITY OF ARIZONA.

I

All persons who have received a degree from the University of Arizona are members of this association.

II

All members of the faculty are honorary members of this association.

III

The officers of this association shall be a president, one vice-president from each successive group of five classes, provided that when the last group shall number three classes it shall thereafter be entitled to a vice-president; a secretary and a treasurer.

IV

There shall be an executive committee to consist of the following persons: The secretary and treasurer of the association, and three others chosen by the association, one of whom shall be designated as chairman of the committee.

V

It shall be the duty of the executive committee to arrange the programmes for Alumni Day and other public occasions; to regulate the finances of the association; to perform such other duties as may be imposed upon them, and to attend to all business of the association not otherwise provided for.

VI

The president shall be ex-officio a member of all committees. At each annual business meeting he shall appoint a committee of two persons to audit the treasurer’s accounts.
VII

The officers and the executive committee shall be elected by ballot at the annual business meeting to be held on Alumni Day, a majority of all votes cast being necessary for election.

VIII

Any proposition to alter or amend these articles of the association must be made at a regular meeting, and have the assent of two-thirds of the members present.

ALUMNI OF UNIVERSITY OF ARIZONA

1895

Charles Oma Rouse, B. S., Clerk of Board of Supervisors of Pima county, Tucson, Ariz.
Mercedes Anna Shibell, B. S. (Mrs. M. A. Green), Teacher, 2103 Thompson street, Los Angeles, Cal.
Mary Flint Walker, B. S., Student University of California, 1895-97; Teacher, Benson, Ariz.

1897

Clara Cramond Fish, B. S., Teacher, Tucson, Ariz.
George Ojeda Hilzinger, B. S., Court Interpreter, Tucson, Ariz., 1898; student in School of Law, Ann Arbor, Mich.
Mark Walker Jr., B. S., Assistant Chemist University of Arizona, 1898; Commercial Assayer University of Arizona 1899; Superintendent of Exposed Reef Mining Co., Reef, Ariz.

1898

Hattie Ferrin, B. S., Teacher, Tucson, Ariz.
Minnie Watts, B. S. (Mrs. Dr. W. B. Smith) Teacher, Altaville, Cal.
*John Desha Young, B. S., Assayer Elkhart Mining Co., Chloride, Ariz.

* Died April 8, 1899.
1899
Robert L. Morton, B. S., Assayer, Yuma, Ariz.

1900
Ida Clarissa Flood, B. S., Teacher, Tucson, Ariz.
Samuel Pressly McCrea, B. S., Teacher; Student, Stanford University, Palo Alto, Cal.
Charles Pierce Richmond, B. S., Assayer, Congress, Ariz.

DEGREES CONFERRED 1900

BACHELOR OF SCIENCE

Ida Clarissa Flood
Charles Pierce Richmond

Samuel Pressly McCrea
Florence Russell Welles
REGISTER OF STUDENTS
1900-1901

GRADUATE STUDENTS
Cowan, Edith Clement (A. M., Due West College) ....
   Spanish .... .... .... .... .... Tucson
Rogers, Anne E. (A. B., Centenary Female College),
   Pedagogy .... .... .... .... Tucson

SENIORS
Castañeda, Rudolph .... .... .... Benson
Ferrin, Clara .... .... .... Tucson
Parker, George Millard .... .... Tucson

JUNIORS
Blumenkranz, Moses .... .... .... St. Louis, Mo.
Brown, Ruth .... .... .... Tucson
Haynes, Felix Grundy .... .... .... Casa Grande
Parker, Grace Miles .... .... .... Tucson
Reid, Ida Christina .... .... .... Tucson
Reilly, Philip Matthew .... .... .... New York City
Smith, Bertram Louis .... .... .... Phoenix
Smith, Bessie .... .... .... Tucson
Wakefield, Walter James .... .... .... Tucson

SOPHOMORES
Campbell, Duncan Hugh .... .... .... Prescott
Christy, Fred Chase .... .... .... Phoenix
Dunham, Ozra Kenneth. .... .... .... Santa Monica, Cal.
Gillett, Leslie Alexander .... .... .... Phoenix
Ham, Harold Allen .... .... .... Phoenix
Kays, Marion Reed .... .... .... Phoenix
Stout, Charles Signor .... .... .... Tucson

FRESHMEN
Ballance, Harry Greene .... .... .... Willcox
Bley, John Payran .... .... .... Pasadena, Cal.
Cauthorne, Emily Burns .... .... .... Tucson
Culver, Emma Louise .... .... .... Tucson
Drane, Richard Lamar  ....  .... ... Mesa
Drumiler, Elbert Perl  ....  .... ... Congress
Harrison, Eleanor Hargrave  ....  .... ... Tucson
Holmesley, Georgia Ann  ....  .... ... Tempe
Katzenstein, Alma Fanny  ....  .... ... Tucson
Mead, Roy Gibbons  ....  .... ... Patagonia
Norway, Ora Elinor  ....  .... ... Los Angeles, Cal.
Reynolds, William Graham  ....  .... ... San Mateo, Cal.
Robinson, James Newton  ....  .... ... Safford
Whiteside, William Herschel  ....  .... ... Youngstown, Ohio

UNCLASSIFIED

Balcom, William Elder, Chemistry and Spanish, Santa Paula, Cal.
Fish, Frank Wakefield, Mining  .... ... Tucson
Goodwin, James Cooper, Mining  .... ... Globe
Harrison, William H., Assaying  .... ... Tucson
Hawley, Fred Graham, Mining  .... ... Los Angeles, Cal
Hollingshead, Elbert John, History and English, Phoenix
Hurley, Thomas Jay, Mining  .... ... Brooklyn, N. Y.
Martin, Ida Reyner, English and Spanish  .... ... Tucson
Nash, John T., Surveying  .... ... Thatcher
Sewell, Russell, Mining  .... ... Cedartown, Ga.
Small, Mary Blanche, French  .... ... Sacramento, Cal.

FOURTH SUB-COLLEGIAE

Alexander, Andrew Charles, Jr.  .... ... Fort Thomas
Anderson, Quintus James  .... ... Tucson
Barkley, Hassie May  .... ... Glendale
Bernard, Allen Chouteau  .... ... Tucson
Castañeda, Henry Elias  .... ... Benson
Day, Courtland Francis  .... ... Duncan
Fish, Florence  .... ... Tucson
Marshall, Thomas K  .... ... Mammoth
Martin, George, Jr.  .... ... Tucson
Moore, Kirke Tonner  .... ... Tucson
Murphey, Carobel  .... ... Tucson
Olney, William Thomas  .... ... Solomonville
Roberts, Norman John  .... ... Benson
Russell, Ross Moody  .... ... Phoenix
Soldini, Constance Rosalie  .... ... Tucson
Stafford, Edward Sarterlie  .... ... Safford
Whipple, William Dominicus  .... ... Clifton
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Murphey, Robert Bivins .... .... Tucson
Myers, Gertrude Adelaide .... .... Tucson
Olney, Clanton Claborn .... .... Solomonville
Pascoe, Benjamin Franklin, Jr. .... .... Clifton
Payne, Alfred Edward .... .... Clifton
Pendleton, Rose .... .... Globe
Perry, Mary E. .... .... Tucson
Priest, Raymond Marshall .... .... Yuma
Purcell, Stella Teresa .... .... Tucson
Reynolds, Francis Meredith .... .... San Mateo, Cal.
Robertson, Edith .... .... Tombstone
Scow, Oliver .... .... Dos Cabezas
Smith, Christopher Andrew .... .... Arizola
Tarbox, Birdie Evaline .... .... Tucson
Thomas, Samuel Pierce .... .... Tucson
Whittle, Callie .... .... Tucson
Wilbur, Mary Strange .... .... Tucson

SECOND SUB-COLLEGIATE

Alexander, Albert Lea .... .... Fort Thomas
Allison, Mamie Jane .... .... Tucson
Bell, Helen Margaret .... .... Tucson
Bernard, Noah Curry .... .... Tucson
Brena, Pedro .... .... Tucson
Brookner, Laura May .... .... Globe
Brown, Harriet Estella .... .... Tucson
Brown, James Kilroy .... .... Tucson
Clarke, Edna May .... .... Tucson
Cole, Leah Margaret .... .... Phoenix
Connell, Henrietta Fenwick .... .... Tucson
Contreras, Stefana .... .... Tucson
Cable, Francis Drake .... .... Tombstone
Cromb, Annie Russell .... .... Clifton
Davis, Hattie Louisa .... .... Contention
Drachman, Lucille .... .... Tucson
Ferrin, Arthur Harry .... .... Tucson
Fetterly, Zena Ownby .... .... Tucson
Garner, Lillian Bertha .... .... Tucson
Hauser, Julius .... .... Willcox
Hildreth, James Albert .... .... Safford
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**FIRST SUB-COLLEGIAGE**

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**UNCLASSIFIED**

Anspach, Clarence A. Sayler, Stenography and Spanish
Connell, Frances Safely, Stenography and Bookkeeping
Dabney, Parker R., English and Mathematics
Felix, Arthur E., Stenography
Griggs, Ethel, Stenography
Hayes, Wilbur Oliver, English and Algebra
McCulloch, Mrs. Katherine, Stenography and Spanish
McEwen, William Edward, Shopwork and Drawing
Mayer, Mary Belle, Stenography and Bookkeeping.
Mayer Quinn, Harry J., Spanish and Bookkeeping .... Detroit, Mich.
Richardson, Nellie Beryl, Stenography and Spanish ... Tucson
Roca, Lydia, Stenography and Spanish ...... Tucson
Rush, Clara, Stenography and Typewriting .... Tucson
Siewert, Elsie, French and Spanish ......... Tucson
Slaughter, Jennie Violet, Stenography and Typewrit-
ing .... .... .... .... .... ...Bisbee
Wood, Pauline Clifton, Stenography ...... Tucson

SUMMARY

Graduate Students .... .... .... .... .... .... 2
Seniors .... .... .... .... .... .... .... 4
Juniors .... .... .... .... .... .... .... 9
Sophomores .... .... .... .... .... .... .... 7
Freshmen .... .... .... .... .... .... .... .... 14
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Fourth Sub-Collegiate .... .... .... .... .... .... 17
Third Sub-Collegiate .... .... .... .... .... .... .... 57
Second Sub-Collegiate .... .... .... .... .... .... 48
First Sub-Collegiate .... .... .... .... .... .... 40
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