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ARIZONA. UNIVERSITY.
CATALOGUE.

UNIVERSITY
OF ARIZONA.

FIRST ANNUAL CATALOGUE.

1892.

OFFICERS
OF THE
UNIVERSITY OF ARIZONA.

COURSE OF INSTRUCTION

AND

General Information.



CALENDAR FOR 1892-93.

Wednesday, Sept. 28,.....Entrance examinations, 9 a. m.
Friday, Dec. 23,.....Close of examinations for Fall Term.
Tuesday, Dec. 27,.....Winter Term begins.
Tuesday, March 7,.....Close of examinations for Winter Term.
Wednesday, March 8,.....Spring Term begins.
Wednesday, May 31,...Close of examinations for Spring Term.
Thursday, June 1,.....Summer course in Field Work, ending
June 21.



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BOARD OF REGENTS.

MERRILL P. FREEMAN, *President*,.....Tucson.
JOHN M. ORMSBY, *Secretary*,.....Tucson.
SELIM M. FRANKLIN, *Treasurer*,.....Tucson.
JOHN GARDINER,.....Tucson.

EX-OFFICIO.

N. A. MORFORD, *Secretary of the Territory*,.....Phoenix.
GEO. W. CHEYNEY, *Superintendent of Public Instruction*,
.....Tombstone.



FACULTY AND OTHER OFFICERS.

MERRILL P. FREEMAN,
Chancellor.

FRANK A. GULLEY, M. S.,
Dean of School of Agriculture, Professor of Agriculture, Director of Experiment Station.

THEODORE B. COMSTOCK, Sc. D.,
Director of School of Mines, Professor of Mining and Metallurgy.

CHARLES B. COLLINGWOOD, M. S.,
Professor of Chemistry.

† VASA E. STOLBRAND, C. E.,
Professor of Mathematics and Irrigation Engineering.

JAMES W. TOUMEY, B. S.,
Professor of Botany and Entomology.

I. E. BENTON,
Acting Professor of Horticulture.

* _____
Professor of Physics and Applied Mathematics.

* _____ U. S. A.
Professor of Military Science and Tactics, Instructor in Mathematics.

MEADE GOODLOE,
Instructor in Assaying.

* _____
Professor of Geology and Mineralogy.

Instructor in Mechanics and Industrial Drawing.

HOWARD J. HALL, B. S.,
Principal of Preparatory Department.

* Chairs to be filled at an early date.

† Resigned; to take effect September 30, 1892.

CATALOGUE OF STUDENTS.

Freshmen.

Clarence K. Coffman, *S. M.....	Tombstone, Ariz
Mary Osborn, *S. A.....	Tucson, Ariz
Nellie Reid, S. A.....	Tucson, Ariz
Chas. O. Rouse, S. M.....	Tucson, Ariz
Mercedes Shibell, S. A.....	Tucson, Ariz
Mary F. Walker, S. A.....	Tucson, Ariz

Specials.

F. A. Norton, S. A.....	Lowel, Mich
Mark Walker, S. A.....	Tucson, Ariz
John A. Wright, S. M.....	Tucson, Ariz

*S. M., School of Mines. S. A., School of Agriculture.

Preparatory Course.

Belle Barber.....	Madison, Wis
Brewster Cameron.....	Tucson, Ariz
William Cooper.....	Tucson, Ariz
Charles Drake	Tucson, Ariz
Myra Drachman.....	Tucson, Ariz
Perfito Elias	Tucson, Ariz
Sadie Etchells.....	Tucson, Ariz
Clara Fish.....	Tucson, Ariz
Beatriz Ferrar.....	Tucson, Ariz
Fred Graves.....	Tucson, Ariz
Emma Hughes	Tucson, Ariz
Jessie Hughes.....	Tucson, Ariz
Lulu Hilzinger.....	Tucson, Ariz
Allie Harding.....	Tucson, Ariz
Hilda Jacobs.....	Tucson, Ariz
Stanley J. Kitt.....	Tucson, Ariz
Zoe Knapp.....	Tucson, Ariz
John McKenna.....	Tucson, Ariz
Chas. Messersmith.....	Tucson, Ariz
Raymond W. Satterwhite.....	Tucson, Ariz
Frank C. Town.....	Nogales, Ariz
Gottfried J. Winnermark.....	Tucson, Ariz

HISTORY AND ORGANIZATION.

The University of Arizona was established by an Act of the Territorial Legislature in the Spring of 1885, which made provisions for the appointment of a Board of Regents, with authority to organize and equip an institution of learning which should be known as the University of Arizona. The establishing Act located the University at Tucson, and an appropriation of \$25,000 was made to begin the work.

In compliance with this Act a Board of Regents was appointed, the Board formally organized, and a beginning made in the organization of the institution. A tract of land lying just outside of the limits of the city of Tucson was donated to the University, and selected by the Board as the University grounds. A building was planned and a contract entered into for its erection in October, 1887, the building to cost \$37,969.00. Owing to lack of funds to complete the building, the University was not opened to students until October 1st, 1891, the first session closing June 1st, 1892. The Institution is now well equipped in the Schools of Agriculture and Mines, and for instruction in the Preparatory Department.

Resources.

In 1887 an Act was passed by Congress appropriating to each State and Territory \$15,000 per annum to broaden the work of the Agricultural Colleges. The following extract from the Bill as past sets forth the object sought: "To promote scientific investigation and experiment respecting the principles and applications of agricultural science, there shall be established under the direction of the college or colleges, or agricultural departments of colleges in each State or Territory established, or which may hereafter be established, in accordance with the provisions of an Act approved July 2nd, 1862, entitled 'An Act donating lands to the several States and Territories which may provide colleges for the benefit of agricul-

ture and the mechanic arts,' or any of the supplements to said Acts, a department to be known and designated as an 'Agricultural Experiment Station.' "

In the fall of 1889 the Board of Regents, acting in conjunction with the Governor of the Territory, took the initiatory steps "to establish an Experiment Station" in Arizona.

An Agricultural College was established as a part of the University, and a Director appointed, who was also elected Professor of Agriculture.

"After considerable labor on the part of the Board of Regents, ably assisted by the Governor of the Territory, ten thousand dollars for Arizona was, by the recommendation of the Secretary of Agriculture, placed in a deficiency bill, which included New Mexico and Utah." "This amount was made available in June of 1890, and the Board entered into contracts covering the amount allowed for the fiscal year ending June 30, 1890." For the year ending June 30, 1891, and June 30, 1892, Arizona received her full quota, which, with the appropriation for 1890, was expended in the equipment and support of four Agricultural Experiment Stations, one at the University, one at Phoenix, one three miles south of Tempe on the M. & P. railway, and one near Yuma.

In 1862 an Act known as the "Morrill Bill" was passed by Congress, appropriating 30,000 acres of the public lands to each State for each Congressional Representative, for the support of an Agricultural and Mechanical College, No funds from this source are yet available, but on August 30, 1890, a supplementary bill passed by Congress, was approved, which appropriates to each State and Territory, commencing with the year ending June 30, 1890, \$15,000 for the first year, "and an annual increase of the amount of such appropriation thereafter for ten years, by an additional sum of one thousand dollars over the preceding year, and the annual amount to be paid thereafter to each State and Territory shall be \$25,000, to be applied only to instruction in Agriculture, the Mechanic Arts, the English language, and the various branches of mathematical, physical, natural and economic sciences, with special reference to their applications in the industries of life, and to the facilities of such instruction."

With the exception of one-fifth of the appropriation for Experiment Stations for the first year, and 5 per cent. thereafter, the Acts provide that these funds shall not be expended in the erection or repairs of buildings. The first must be used to carry on investigations; the latter to equip and support schools of learning, it being intended that the several States should supply land and buildings.

Arizona has received the appropriation of \$15,000 for 1890, \$16,000 for 1891, and \$17,000 for 1892, and these sums have been expended in the equipment and support of the University.

In 1889 the Legislature of Arizona passed a bill appropriating three-fourths of a mill on each one dollar of the assessed value of all property in the Territory for the support and maintenance of the University. This Act was amended by the last Legislature, making the present annual appropriation one-half of a mill.

The appropriations from the Territory have been expended in the construction of University buildings, the national appropriations for equipment and support.

In addition to the above, after the Territory becomes a State, the University will also have the revenue to be derived from interest on moneys received from the sale of 72,000 acres of public lands from an appropriation made to Arizona and to several other Territories in 1881 for the support of a University.

Departments of Instruction.

The Territorial enactment establishing the "University of Arizona" provides (Sec. 10) "The University shall consist of five departments:

First—The Department of Science, Literature and the Arts.

Second—The Department of Theory and Practice, and Elementary Instruction.

Third—The Department of Agriculture.

Fourth—The Normal Department.

Fifth—The Department of Mineralogy and the School of Mines.

The income of the University not being sufficient to equip and support all the departments provided for in the Legislative enactment, it was deemed wise by the Board of Regents to

establish only such departments as could be well equipped and conducted, and make the courses of study and facilities for work equal to those in older institutions in other States.

Agriculture and Mining being the two prominent industries of the Territory, it was decided to establish the Third and Fifth Departments as the beginning of the University. The Fourth Department is provided for by legislative enactment in the popular and well-managed Territorial Normal School at Tempe.

The First and Second Departments will be established when the income of the University will permit.

Organization.

The several departments of the Institution are independent colleges of equivalent rank, which together constitute the University, and the Board has formally placed the responsible management of each in the hands of a Director, who is charged with the duty of organizing, equipping, and conducting the work of the college.

Each Director, by approval of the Board, lays out the plan of his college, procures the necessary equipment, selects his instructors and other assistants, acting as Dean of his Faculty, and generally as the executive head of the college which he directs.

The University Council is made up of the Directors of all the Colleges, one of whom is annually chosen Chairman, or Dean, of the University Faculty. The Council has jurisdiction in matters of general executive character, affecting University policy, and especially in matters affecting the assignment of work which is equivalent in two or more colleges. By this arrangement duplication of labor is avoided.

The University Faculty is composed of all the Directors, Professors, and Acting Professors in the different colleges. This body (to which Assistant Professors and Instructors are admitted without voting powers) is charged with the discipline and routine work relating to the students, much the same as in other institutions of learning.

The student body comprises several classes, occupying somewhat diverse positions as regards their relation to each other, but all amenable to the direction of the University Faculty.

A. Undergraduate students may be either:

1. Regular. In each college there are established courses leading to degrees. Students pursuing such courses are classed as Regulars. All questions pertaining to their entrance, class standing, discipline and the like, are adjudicated by the University Faculty. Or

2. Special. Special students are those who, for any reason, may be pursuing particular lines of study, either under the advice and supervision of the University Faculty or of its committees, or under the care of one of the colleges or its Director. These students are also subject to the regulations of the General Faculty.

B. Post-graduate students, graduates of the University of Arizona or of institutions of equal rank, are eligible to special privileges of study, subject always to the control of the General Faculty. Certain of these, upon successful competition, may be chosen as Fellows, who receive a moderate financial compensation while pursuing special post-graduate study. Fellows will be required to assist to a limited degree in the instruction of the lower classes.



SCHOOL OF AGRICULTURE.

FRANK A. GULLIFY, M. S.,
Dean of the Faculty, Professor of Agriculture.

CHARLES B. COLLINGWOOD, M. S.,
Professor of Chemistry.

† VASA E. STOLBRAND, C. E.,
Professor of Mathematics and Irrigation Engineering.

JAMES W. TOUMEY, B. S.,
Professor of Botany and Entomology.

HOWARD J. HALL, B. S.,
Instructor in English.

L. E. BENTON,
Acting Professor of Horticulture.

* —————
Instructor in Mathematics.

* —————
Professor of Geology.

* —————
Instructor in Mathematics and Industrial Drawing.

* Chairs to be filled during the summer.

† Resigned; to take effect September 30, 1892.

COURSE OF INSTRUCTION.

School of Agriculture.

FRESHMAN CLASS.

Fall Term—Algebra, English, Botany, Rhetoricals, Drill.

Winter Term—Algebra, Physics, Rhetoric, Drawing, Rhetoricals, Drill.

Spring Term—Geometry, Horticulture, Botany, Drawing, Rhetoricals, Drill.

SOPHOMORE CLASS.

Fall Term—Geometry, Horticulture, Inorganic Chemistry, Modern Languages, Rhetoricals, Drill.

Winter Term—Chemistry, Trigonometry and Surveying, Physiological Botany, Modern Languages, Rhetoricals, Drill.

Spring Term—Organic Chemistry, Higher Algebra, Surveying—field work; Modern Languages, Rhetoricals, Drill.

JUNIOR CLASS.

Fall Term—Physics, Zoology, Horticulture, Drawing, Modern Languages, Rhetoricals, Drill.

Winter Term—Anatomy, Geology, Chemistry of Soils, Modern Languages, Rhetoricals, Drill.

Spring Term—Entomology, Physics, Hydraulics and Irrigation; Modern Languages, Rhetoricals, Drill.

SENIOR YEAR.

Fall Term—Physiology, Meteorology, half-term; Astronomy, half-term; English Literature, Modern Languages, Horticulture, practice preservation of fruits; Rhetoricals, Drill.

Winter Term—Farm and Irrigation Laws, half-term; Landscape Gardening, half-term; Constitutional History, Cryptogamic Botany, Rhetoricals, Drill.

Spring Term—Political Economy, Forage Plants and Forestry, Agricultural Chemistry, Rhetoricals, Drill, Graduating Thesis.

ENGINEERING COURSE.

The Engineering Course is the same as the Agricultural Course to the end of the Fall Term of the Junior Year.

JUNIOR YEAR.

Winter Term—Analytical Geometry, Physics, Geology, Drawing, Modern Languages, Rhetoricals, Drill.

Spring Term—Topographical Surveying, Physics, Irrigation Hydraulics, Hydraulic Practice, Modern Languages, Rhetoricals, Drill.

SENIOR YEAR.

Fall Term—Calculus, Meteorology, half-term; Astronomy, half-term; Hydraulics, Modern Languages, Hydraulic Practice, Rhetoricals, Drill.

Winter Term—Calculus, Farm and Irrigation Law, Constitutional History, Hydraulics, Modern Languages, Engineering, laboratory or field practice; Rhetoricals, Drill.

Spring Term—Canals, Reservoirs, Political Economy, Modern Languages, Strength of Materials, Rhetoricals, Drill, Graduation Thesis.

Provision is made for two regular courses leading to the degree B. S. (Bachelor of Science), and advanced studies leading to the degree M. S. (Master of Science), C. E. (Civil Engineer) and I. E. (Irrigation Engineer).



MATHEMATICS.

Beginning with the Freshman Year:

Algebra.

During the Fall Term, Preparatory, the design is to give the student a thorough grounding in Literal Notation and in the four fundamental operations. During first and second terms of the Freshman Year, the work will be carried through the Quadratic Equation—work will be text-book, amply supplemented by original problems. Advanced Algebra will occupy the Spring Term of the Sophomore Year.

Geometry

Will occupy the last term of the Freshman Year and the first term of the Sophomore. The text-book, re-enforced by solution of original theorems and problems such as come before the surveyor, will fill out the class-room work.

Trigonometry and Land Surveying

Will be studied in the winter term, Sophomore. Only Plane Trigonometry will be taught. Original exercises will be solved in class-room and in the field by aid of the surveyor's instruments.

Higher Algebra

Followed, in appropriate season, in later Junior and Senior Years, by Analytic Geometry, Descriptive Geometry, Descriptive Astronomy, and Calculus.

The above course in Mathematics is for the Engineering Course, which leaves the general Agricultural Course at the end of the Fall Term, Junior Year.

The Agricultural students do not, in general, take the mathematical studies outlined for later Junior and Senior Years, Engineering.

The course in Irrigation Engineering is sufficiently outlined in the Curriculum, without farther explanations. It may have to be altered or amended somewhat to suit the exigencies of the moment, though the general design remain unchanged.

Instruction in Hydraulics, Canal and Reservoir work, will be mainly by lecture, supplemented by illustration and experiment.

A short course in Meteorology and Soil Physics will be given by lectures.

The Department of Mathematics and Irrigation Engineering is equipped with transits, both plain and solar; wye levels; compasses, plain and solar; rods, chains, tapes; clinometers, rulers, drawing instruments; current meters; water-registering apparatus; hook gauges; tanks; maximum and minimum and self-registering thermometers and aneroid barometers; drawing papers, blue-print frames, etc.; also with a library of Engineering reference books; and with drawings and designs of pumps of various kinds.



COURSE IN CHEMISTRY

For Agricultural Students.

In the Fall Term of the Sophomore Year Inorganic Chemistry commenced; lectures and recitations five (5) hours per week, laboratory five (5) hours per week. In the laboratory, manipulations and experiments will accompany the lectures and recitations. Each student will be required under careful supervision to perform all the experiments necessary to an understanding of the fundamental principles of Chemistry.

During the Winter Term Inorganic Chemistry completed. Five (5) hours per week, lectures and recitations; laboratory work five (5) hours per week, consisting of experiments and classification and grouping of metals preparatory to qualitative analytical work.

Spring Term, Chemistry of the Carbon Compounds. Classroom work, five (5) hours per week; laboratory work, five (5) hours per week in qualitative analysis, bases and acids. During this term each student will be required to analyze forty (40) prepared and selected substances.

During the Winter Term of the Junior Year lectures and recitations on Agricultural Chemistry, commencing with the chemistry of the soil and tracing out the principles of plant growth.

During the Spring Term of the Senior Year lectures and recitations on Agricultural Chemistry—continuing subject of plant-growth, fertilizers and special crops.

Chemical Department.

Equipment—The chemical laboratories occupy the basement of the south wing and half of the second story. On the ground floor is the Laboratory of the Experiment Station, fitted with gas, water, ventilating hoods and a complete equipment for all kinds of analytical work. Here also are rooms which can be used for advanced students in quantitative work. The student will thus have the advantage of working in a laboratory where practical analytical work is constantly being carried on.

On the second floor is the lecture-room and laboratory for qualitative work. The room is so arranged that students may pass from recitation room to laboratory desks and conduct the experiments which illustrate the lecture or recitation. Each student is provided with ample desk room, on which are reagent bottles, gas, water, and pneumatic trough. Ventilating hoods are provided for boiling substances which give off injurious fumes. The rooms are well lighted and thoroughly ventilated. A complete set of apparatus for illustrating theoretical chemistry has been carefully selected, which is for the instruction and use of students.



BOTANY.

I. Structural—Recognizing the fact that in the study of Botany no real progress can be made until the pupil has learned to observe closely and correctly, pupils are set to work upon the material itself. For a reference-book, Gray's Lessons is used. The course occupies the Freshman Fall Term with laboratory work for two hours a day for five days in the week. Each student is given the use of a stand microscope, and continues for some time the study of specimens directly under the eyes of the Instructor. So far as expedient, the plants selected for these exercises are such as are suggested by the subject in the book used for reference, and include, so far as possible, the economic and common plants of the neighborhood.

The study of the difficult subjects, such as ovules, seeds and morphology, are given special attention. Drawing in India ink various parts of the plant, and notes worked out by the student in connection with these drawings, thoroughly fixes the subject in the pupil's mind.

The latter part of the term is given to a general review of the subjects studied.

II. Systematic—Six hours a week during the Spring Term of the Freshman Year is given to the study of flowering plants, especially in relation to classification, nomenclature, synonyms and description. Considerable time is given to collecting and preserving specimens. A herbarium containing a large number of Arizona plants is of considerable aid to students in this work. Lectures once a week on the economic plants of the families studied and the study of specimens of a number of the more difficult orders constitute an important part of the term's work.

III. Physiological and Anatomical—During the winter term of the Sophomore Year, eight hours a week is given to work with the compound microscope. Each student is given the laboratory use of the instrument during the term and prepares

his own slides, and makes notes and drawings of the objects which he studies.

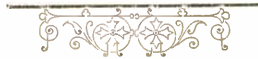
A lecture is given one day each week on the subjects previously studied by the class including the use and care of microscope, cutting of sections, and on the physiology of plants.

Strausburger's Handbook, Bessey's Textbook, Sach's Lectures and Goodale's Physiological Botany are the principal books for reference. During this term only the higher plants are studied.

IV. Cryptogamic—In the Winter Term of the Senior Year two (2) hours a day, five (5) days in the week, are given to microscopic study.

In this work the student is mostly occupied in the laboratory with the study of the lower plants by use of compound microscope. Special attention is given to study of rusts and smuts and allied forms in their relation to plants of economic importance.

V. Forage-Plants and Forestry—In the last term of the Senior Year the course, which varies somewhat in accordance with the wishes of the student, will be given mostly to the study of such botanical subjects as are of economic importance.



ZOOLOGY.

The course includes work in Comparative Anatomy, Human and Comparative Physiology, General Zoology and Entomology.

I. Anatomy—A term is given to instruction in Anatomy, considerable attention being given to human anatomy. The work is illustrated by necessary apparatus, diagrams and anatomical preparations. A part of the term includes laboratory practice, when the students make drawings and notes illustrating their work.

II. Physiology—A course of lectures upon human physiology, some attention being directed to the physiology of domestic animals. Some time is spent in the dissection of animals that the student may become familiar with the position and appearance of the various organs. The study of the minute structure of tissues by use of microscope is a part of the course.

III. General Zoology—A term is given to the study of the principles of the classification of animals, their structure and development, considerable time being spent in the laboratory in making dissections and in the microscopic study of animal histology. The geographic distribution and habits of animals are given some attention.

IV. Entomology—In this study, much attention is given to work upon insects of economic importance. Lectures are given upon the anatomy of insects, their development, transformations, geographical distribution and general classification. The study is pursued during the Spring Term, when the students make collections illustrating the different orders. A collection of insects illustrating the various orders, and especially those of economic importance, is for students' use in this study.

AGRICULTURE.

A course of lectures through the Winter Term of the Senior Year discussing general farm management, stock-growing, dairying, growth of forage crops, use of water in irrigation; lectures are supplemented by study of field work in progress on the University and Experiment Station grounds and on ranches in the vicinity.



HORTICULTURE.

FRESHMAN YEAR.

Third Term—This Term will be given to an extended and careful study of the plants of the orchard and garden; their nature, habits of growth, care, cultivation, propagation and management, when grown on a large scale; practical methods of treatment for insects and other enemies. Ten (10) hours a week in class-room, field and laboratory.

SOPHOMORE YEAR.

First Term—The work of the First Term continued. Special attention will be given to the soil and climate of Arizona and their influence upon the various plants grown. Various practical works upon garden and fruit culture will be used for reference in topical discussions. Ten (10) hours required as in First Term.

JUNIOR YEAR.

First Term—In this Term more attention will be given to the underlying principles of Horticulture. A text-book will be used. The flower, its parts, its office, its product, the structure and duty of leaf, stem and root, will be considered from a horticultural standpoint. In the same manner growth, fruiting, propagation, fertilization, crossing, seed reproduction, and other similar subjects, will be taken up. Three (3) hours a week in laboratory or field.

SENIOR YEAR.

First Term—The different methods of preparing fruits for use and market, comparisons of methods as applied to varieties, apparatus and appliances employed.

Composition of fruits. Value as food products and comparative effects upon soils. Three (3) hours laboratory work.

[Landscape Gardening.

Lectures discussing the principles of the art in general, and suggestions referring to laying out grounds, selection of trees and ornamental plants, planting and care of same. The object of the study is to develop a taste for rural beauty, and to give the student some knowledge of the details of the work.

ENGLISH AND LITERATURE.

English Language—The study of the English sentence, etymology, and the use of correct and forcible English in writing and speaking, occupies the first term of the Freshman Year.

Rhetoric—This study is taken up during the winter term of the Freshman Year, the work of D. J. Hill used as a textbook.

English Literature—A course of eleven weeks in the Fall Term of the Senior Year embraces lectures upon the growth of the language, with sketches of the lives of leading authors, and critical study of selections from their works.

Rhetorical Exercises—All students meet at least once each week for Rhetorical Exercises.

Modern Languages—French is studied through the Sophomore Year, and Spanish or German through one or both of the two latter years of the course.

Geology—A course of lectures through the Winter Term of the Junior Year embracing Historic Geology and causes of the various geologic changes; special attention is given to the study of rock and soil formation in Arizona.

Constitutional History—Is taught by a course of lectures designed to familiarize the student with the Constitution of the United States.

Political Economy—Recitation and lectures, with discussion of practical problems affecting the industries of the country.

Farm and Irrigation Laws—Five weeks lecture course discussing the statutory rights of the farmer, and laws governing the control and use of water for irrigation.

SCHOOL OF MINES.

THEO. B. COMSTOCK, Sc. D., DIRECTOR,
Professor of Mining and Metallurgy, Dean of the Faculty.

CHARLES B. COLLINGWOOD, M. S.,
Professor of Chemistry.

† VASA E. STOLBRAND, C. E.,
Professor of Mathematics.

*

Professor of Physics and Applied Mathematics.

JAMES W. TOUMEY, B. S.,
Professor of Biology.

*

Professor of Geology and Mineralogy.

*

Professor of Military Science and Tactics, and Instructor of Mathematics.

MEADE GOODLOE,
Instructor of Assaying.

*

Instructor of Mechanics and Industrial Drawing.

* Chairs to be filled at an early date.

† Resignation takes effect September 30, 1892.

COURSE IN MINING ENGINEERING.

FRESHMAN YEAR.

Fall Term—Algebra, English, Physics, Projection Drawing, Drill, Rhetoricals.

Winter Term—Algebra (advanced), Rhetoric, Physics, Projection Drawing, Physical Laboratory, Drill, Rhetoricals.

Spring Term—Geometry, English, Physics, Descriptive Geometry and Lettering, Physical Laboratory, Drill, Rhetoricals.

SOPHOMORE YEAR.

Fall Term—Geometry, Chemistry, General Botany, Modern Language, Drill.

Winter Term—Trigonometry and Land Surveying, Chemistry, General Zoology, Modern Language, Drill.

Spring Term—Topographical Surveying and Field Work, Calculus, Chemistry, Modern Language, Drill.

JUNIOR YEAR.

Fall Term—Analytical Mechanics, Mine Surveying, Chemical Laboratory, Modern Language.

Winter Term—Resistance of Materials, Mineralogy, Geology, Modern Language.

Spring Term—Dynamics, Electrical Engineering, Assaying, Geology, Modern Language.

SENIOR YEAR.

Fall Term—Mining Engineering, Engineering Geology, Mining Law, Wind-wheels and Hydraulics, Practical Work.

Winter Term—Mining Engineering, Metallurgy, Mining Accounts, Practical Work.

Spring Term—Mining Engineering, Mine Administration, Mine Examination and Report, Thesis and Practice.

Course in Metallurgy.

This Course is identical with the Mining Course in the Freshman and Sophomore Years; in the later years the Course is as below:

JUNIOR YEAR.

Fall Term—Architectural Drawing and Designing, Mechanics, Quantitative Laboratory, Modern Language.

Winter Term—Resistance of Materials, Mill Work, Mineralogy, Geology, Modern Language.

Spring Term—Dynamics, Analysis of Ores, Geology, Assaying, Modern Language.

SENIOR YEAR.

Fall Term—Metallurgy, Analysis of Fuels, Fluxes, etc., Wind-wheels and Hydraulic Engines, Mill Accounts.

Winter Term—Metallurgy, Practical Mill-work, Memoirs, Practice.

Spring Term—Metallurgy, Administration, Thesis and Practice.



THE SCHOOL OF MINES.

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It is the determined purpose of the officers of the Arizona School of Mines to make this College of the University subserve a two-fold object, namely:

First, the thorough training of young men in the sciences and arts of Mining and Metallurgy to such an extent as to fit them to undertake the development of the mineral resources of the country, after a supplementary period devoted to practical work;

Secondly, to make use of the laboratories for tests, experiments and investigations of practical utility to the mining industries.

Owing to the lack of any special provision of funds by either the National or Territorial government, the work of the second class named above is at present performed at some disadvantage, and it is necessary to rely, in a degree, upon the fees collected as a means of support. Full particulars concerning this branch of the service may be obtained from the Bulletins and circulars already issued from the office of the Director. The educational features of this School are herein set forth.

Equipment, Etc.

Provision has been made for instruction in all branches which are commonly recognized as essential in the best mining schools, and for these competent professors have been engaged. In those subjects which are less important to this School, or which can not be pursued as specialties by mining students, general instruction is given by members of the Faculty of the School of Agriculture. The foundation work in mathematics and other subjects is performed by professors employed by both Schools. The School of Mines reciprocates by providing outline work in certain branches for the students of the School of Agriculture. This arrangement prevents needless duplication, and enables better facilities to be afforded students than could otherwise be; the library, collections and laboratories thus acquiring double value for illustration.

The special facilities afforded in each department of instruction and the means of illustration provided for each will be described beyond, under proper headings.

Department of Mining and Metallurgy.

This department, at present under the immediate supervision of the Director, has ample facilities for illustration of the various processes employed in mining work and in the principal methods of ore-treatment. Attached to the main building is an annex containing machinery and appliances for crushing, sampling, concentrating, amalgamating, leaching, chlorinating, and the electrical treatment of various kinds of ore in large or small lots. The student has access to this apparatus and is required to familiarize himself with its manipulation. Power is furnished from a seventy horse-power boiler, detached from the main building, the steam being carried underground to the engine-room, which contains a thirty-five horse-power engine, built by the Walburn-Swenson Manufacturing Co., of Ft. Scott, Kas., and a sixteen horse-power Westinghouse automatic engine, the latter being used for running the dynamo.

The mill building has a storage capacity for ore of fifty to one hundred tons. From the bins the ore passes to a chute from which it is elevated, by means of a three horse-power electric motor, to the crushing floor above. 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 ten inch by twenty inch Cornish rolls from which the ore passes by a conveyor to the main elevator, which carries it up thirty-five 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 jigging machines of the Hartz pattern, the finer sizes being jigged upon slide-motion machines and the slimes being worked upon a double Rittinger percussion table, or otherwise, as desired. A small apparatus, run by electric motor, is also provided for dry concentration. Amalgamation tests may be made

upon a working scale by different methods, including plates and riffles, pans and settlers, and special machines. Above the engine-room is the electrical laboratory containing a seventy-five light Mather incandescent dynamo from which six circuits are distributed to different parts of the University building. Of these, two circuits are for lighting purposes; one extends to the hoisting motor, another to the motor which runs the concentrating machinery, another circuit to the fan motors used for ventilating purposes, and the sixth branch goes to the storage batteries which provide current for electrolytic work in the Assay Laboratory.

The Assay Laboratory is one of the most complete in the West in its appointments. This is equipped with assay furnaces for crucible work, for scorifying and cupelling, and for retorting mercury from amalgam. An adjoining room, supplied with water, gas, and electric current, has a roomy hood for work involving fumes, with tables and desks for student work, besides all needed appliances for assaying by dry and wet methods, including electrolysis. This room also contains an experimental desk and fittings for making working analyses of all kinds required in this department. A store-room for supplies adjoins this room, and a balance-room with fittings for the storage of pulp samples is convenient to this laboratory and to the main office. The balances and other special apparatus are of the highest grade, and they are rigidly set upon tables free from vibration, having no connection with any part of the building.

The instruction in this department includes courses of lectures by Dr. Comstock to the Seniors in Mining Engineering and in Mine Administration. A special course in engineering geology is also given in the fall term of the senior year. In the laboratory the course of instruction in assaying, supplemented by special work under the care of Instructor Goodloe, is followed by detailed work bearing upon the tests made in the mill and laboratory. Each student is required to superintend the working of ores assigned him, making his own assays, and reporting results at every step in his progress.

The mining students in the Senior year devote themselves to problems relating to the location and working of mineral pro-

perties, while the metallurgical students give most of their time to practical work in the mill. Summer courses of three or four weeks are provided, attendance upon which is made obligatory upon students whose previous work fits them for such instruction. These courses include practical work in geology, surveying, mining and milling, and will necessitate field excursions to points at some distance from Tucson. Memoirs upon subjects assigned by professors in charge of the departments will be required from time to time during the course.

Department of Chemistry.

The instruction in general chemistry and in qualitative and quantitative analysis is given in the class-rooms and laboratories of the School of Agriculture, under the direction of Prof. Collingwood and Mr. Heberly. During the fall and winter terms of the Sophomore year the work in inorganic chemistry is the same as for the Agricultural students. It consists of lectures and recitations five hours per week, supplemented by daily work in the laboratory five hours per week.

In the spring term, lectures and recitations are given on the chemistry of the carbon compounds, five hours per week. Laboratory work in qualitative analysis occupies two hours per week. Each student in the mining courses will be required to analyze qualitatively fifty substances selected with especial reference to the character of the student's future work. During the last half of the term the principles of volumetric analysis are taught. Each student will prepare standard solutions, calibrate burettes, and make analyses of silver (with sodium chloride) and of iron and calcium (by potassium permanganate).

In the fall term, Junior year, ten hours per week is devoted to lectures and laboratory work in gravimetric quantitative analysis. Substances will be selected for analysis which bear directly upon the future professional work of the student. Members of the class have access to the chemical section of the library, and are required to look up references and compare methods. Accurate, thorough work on a few substances will be considered of more importance than the number of substances analyzed.

Students who are sufficiently prepared may be allowed access to the laboratory for extra work in the later terms, if they evince decided interest in the subject.

For details regarding the equipment and facilities afforded in this department, consult matter under the head of "Department of Chemistry" in the School of Agriculture, page 16, of this catalogue.

Department of Physics and Applied Mathematics.

The equipment in this department consists of a good supply of apparatus including a powerful dynamo and motors for electrical studies, and a considerable sum of money has been reserved for securing proper illustration in the different branches of physics to be expended the coming year under the advice of the Professor in charge of the department. Surveying instruments and all needed accessories are being provided as the wants of students require. The physical laboratory is situated upon the ground and all apparatus will be so placed as to entirely avoid vibrations from the building. A lecture room and laboratory are being fitted up for the use of the department. Instruction includes a full course in physics and electrical engineering, and the Professor at the head of this department is also charged with the work of instruction in the applications of mathematics to surveying and other engineering subjects necessary for mining students.

Department of Mechanics and Industrial Drawing.

This department is supplied with all necessary apparatus for instruction in drawing, especially in its industrial applications. The mathematical subjects of Calculus, Mechanics, and the mechanical applications are also entrusted to this department. As the demands of students require, it will be placed upon an equal footing with other departments in the School of Mines.

Department of Geology and Mineralogy.

Instruction in Mineralogy comprises thorough courses in crystallography, determinative mineralogy, and blow-pipe analysis. Special attention is given to laboratory work in which the student is made familiar with a great variety of minerals. The collections in the possession of the University include fine

examples of modes of occurrence and of variations in forms of minerals, and constant additions are being made by donations and otherwise from all parts of the Territory, which cannot be surpassed as a field for the study of this important science. In addition to collections made by Prof. Blandy, formerly Territorial Geologist, the private collections of the Director of the School of Mines are on deposit in the Museum. These contain much material from eastern localities, and a full suite from the Yellowstone National Park, besides a variety of ores and minerals from Arkansas, Texas, and other regions.

The instruction in geology extends through three terms, and comprises both class-room and laboratory work, with which is combined a large amount of practical field-work. Instruction will also be provided in microscopic petrography. A survey of the Territory is in progress under the auspices of the School of Mines, and competent students will be afforded opportunity for instruction in the methods of field work, geologic and topographic. A beginning has been made towards the accumulation of collections in this department, and additions are rapidly being made from all parts of the country.

We desire to secure authentic data concerning the geological structure of Arizona. Donations of specimens of rocks, fossils, minerals, etc., will be thankfully acknowledged.

The subject of engineering geology, or the relations of geology to engineering work, is made especially prominent. A course of lectures upon this subject is given in the Senior year.

General Remarks.

While it is regarded by the Faculty of the School of Mines as a matter of great importance that students should be required to pursue the courses laid down in the order in which the subjects occur in this catalogue, there is a disposition to meet individual wants as far as possible. Reasonable privileges of election of studies will be allowed, and opportunity for advanced work, especially after graduation, is provided in all departments.

No claim is made that students leaving this Institution as graduates will be fitted to occupy responsible positions at the head of mining or milling establishments; but it is contended

that students with proper qualifications will be so well trained in this Institution that they can very quickly acquire the needed experience.

The qualities which pertain to the make-up of a successful engineer are largely those of natural endowment, and no institution can guarantee the success in practice of any who have received the benefits of its instruction. We can only promise the best possible work in the way of training:

Address all communications relating especially to the School of Mines to Theo. B. Comstock, Director, Tucson, Arizona.



REQUIREMENTS FOR ADMISSION.

Candidates for admission into the Freshman Class in the University must be at least sixteen years of age, of good character, and must pass a thorough examination in Elementary Algebra, Arithmetic, Geography, Grammar, and History of the United States, and show evidence that they have sufficient knowledge of language to write a short essay in good English on some assigned topic.

A knowledge of elementary algebra is essential to enable a student to keep up with the prescribed work of the class.

Admission From Other Schools.

Graduates from schools in Arizona having a regular course of study will be admitted upon the presentation of certificates from Principals of such Schools, provided the course of instruction is such as to warrant a suitable preparation.

Schools desiring to enter into the foregoing relations with the University will be informed as to what studies are necessary to enable their students to enter, by conferring with the Dean of the Faculty.

Admission to Advanced Studies.

Students desiring to enter any class after the first year, or during the year, will be required to pass the regular entrance examination, and also an examination in such studies as the class may have passed over, or equivalent studies.

Select Course.

Persons of suitable age and requirements desiring to study special branches taught in the University, may, under certain limitations, and at the discretion of the Faculty, pursue such a course of study, but the work must be equal to that of the regular courses.

Graduate Students.

Graduates of the University, or of other Colleges, will be received without tuition or matriculation fees, and will be en-

titled to such degrees as are conferred by the University after pursuing such work as may be assigned and passing examinations satisfactory to the Faculty.

Special Students.

Recognizing the fact that there are in the Territory certain persons of mature age who feel that they cannot spare the time to take up a regular course of study, but who feel the need of instruction in certain things that would materially assist them in their callings, the Board of Regents has made provision for a short course of technical study in the two Schools of the University, subject to certain limitations.

This class of instruction must, of necessity, be restricted to those subjects which are not dependent on prior training in special lines.

It is not proposed to encourage superficial work, nor can the time of the Faculty be given to those who desire to study a subject for which they are not prepared. For these reasons applications of students for a special course must be considered individually, with a clear understanding of all the circumstances.

Applications of students should be forwarded to the Dean of the School of Agriculture, or to the Director of the School of Mines, stating what is desired and what qualifications the applicant may have to fit him for the course.

Applicants may begin such studies at any time during the year when members of the Faculty have time for the work. While at the University they will be enrolled as students and subjected to the rules of the institution. No charge will be made by the University for such instruction, except for material used.

No entrance examination will be required as a rule, and no formal certificate of proficiency can be given, but any special student who has complied with all the requirements will be entitled to a written document setting forth the facts.

Applicants must be at least eighteen years of age, and they will be expected to present references with application, in regard to character and industrious habits.

EXPENSES.

Tuition free.

Matriculation fee, to be paid but once, \$5.00. Students will be charged for material used in laboratories.

A Dormitory for the accommodation of a limited number of students has been fitted up in the University Building, to be used until the students' dormitory is built, where students will be boarded at cost, which will not exceed \$20.00 per month.

Furnished rooms in Tucson to accommodate two persons may be had at from eight to twelve dollars per month, and board costs from fifteen to twenty dollars per month.

Books will cost from five to ten dollars per year.

The Military Department will be organized at the opening of the next session, and students will be required to procure an undress uniform.



PREPARATORY COURSE.

Fall Term—Arithmetic, English, U. S. History, Drawing, Writing, Rhetoricals.

Winter Term—Arithmetic, English, U. S. History, Drawing, Rhetoricals.

Spring Term—Algebra, General History, Physical Geography, Drawing, Rhetoricals.

The following ground will be covered as nearly as possible in the Preparatory Department for the ensuing year:

Fall Term—Arithmetic 5*, to percentage; English 5, to syntax; U. S. History 5, to the Revolutionary War; Drawing 4, the straight line and rectilinear objects; Writing 4, penmanship, letter-writing and business forms; Rhetoricals 1 to 2, reading English Classics, and original essays upon assigned subjects.

Winter Term—Arithmetic 5, finish; English 5, syntax and analysis with diagraming; U. S. History 5, to present time; Drawing 8, the curve and curvilinear figures in combination with previous work; Rhetoricals 1 to 2, continuation of previous term.

Spring Term—Algebra 5, through fractions; General History 5, to the fall of the Western Roman Empire; Physical Geography 5, subject covered; Drawing 8, light and shade, in combination with previous work; Rhetoricals 1 to 2, continuation of previous work with declamations.

The preparatory course is designed for such students as do not have facilities at home to prepare them for entering the regular classes in the University Schools.

In the establishment of this department of the University it is not the intention at present to afford opportunity for a common school education, but simply a school that will prepare students for taking up the technical work of the schools now organized in the University.

For entrance into the preparatory school students will be required to pass an examination that will show that they have some knowledge of arithmetic, grammar, geography, and be able to write legibly and spell simple, common words correctly.

Students in this department must be not less than fifteen years old, and they will be under the same rules and discipline as other students of the University.

* The figures show the number of hours of recitation per week in each branch.



AGRICULTURAL EXPERIMENT STATION.

BOARD OF CONTROL:

Board of Regents of the University.

STATION STAFF.

Frank A. Gulley, M. S.	-	-	-	-	-	-	<i>Director</i>
Chas. B. Collingwood, M. S.	-	-	-	-	-	-	<i>Chemist</i>
Vasa E. Stolbrand, C. E.	-						<i>Meteorologist, Irrigation Eng.</i>
James W. Toumey, B. S.	-	-					<i>Botanist, Entomologist</i>
Joseph A. Heberly,	-	-	-	-			<i>Assistant Chemist</i>
L. E. Benton	-	-	-	-	-	-	<i>Horticulturist</i>
Mark Walker	-	-	-	-	-		<i>Asst. Horticulturist</i>
R. S. Stockton	-	-	-	-	-	-	<i>Stenographer</i>
R. J. Ferguson	-	-	-	-	-	-	<i>Engineer</i>
M. Moss, Phoenix Station	-	-	-	-	-	-	<i>Foreman</i>

The Agricultural Experiment Station is made a department of the University, and the Station Staff is made up principally from the Faculty of the School of Agriculture.

The object and aim of the Station is to make investigations and carry on experiments in the interest of the agricultural industry of the Territory.

The University grounds are used as one of the Field Stations and Stations have been established in the Salt River Valley and near Yuma. The work of the Experiment Station will be utilized, so far as possible, as a means of illustration for the School of Agriculture, and thus made instructive and of value to students.

The work of the Station includes testing plants, soils, waters, study of insect depredations, plant diseases, introduction of new plants, and making any investigation that is of interest to farmers, fruit-growers and stockmen.

Correspondence is solicited. Bulletins are published giving results of work and mailed free to any applicant.

Address all communications to Experiment Station, Tucson, Arizona.

PHOENIX ARIZ.:
PHOENIX HERALD PRINT.
1892.