

Mineral Industries

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THE DIVISION OF MINERAL INDUSTRIES EXTENSION

THE PENNSYLVANIA STATE COLLEGE

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Number 3

SECOND MINERAL INDUSTRIES OPEN HOUSE

In response to numerous requests from members of the College staff, students from other schools, and local business men, the staff and student body of the School of Mineral Industries will hold Open House on Wednesday evening, April 10, 1935, according to the program on pages 2 and 3. Open House is a popular activity at a number of leading colleges and universities and the School carried out the idea at Penn State for the first time last year. Under the plan, the Mineral Industries Building is thrown open for inspection, all of the undergraduate laboratories and research projects are in full operation, and both staff and students are on hand to explain the work. Hereafter, Open House will be held on alternate years.

The new building was made ready for use about four years ago and the staff has been working arduously ever since in the face of many obstacles, such as the present depression, to work out the details of the reorganized program. The staff feels that the work is in such order now that friends and those interested in the program and progress of the School can see for themselves the educational service being rendered to the mineral producing and

processing industries of Pennsylvania. Truly, Pennsylvania's mineral resources have been the very heart of her economic development.

In the past, mineral engineers and technologists have been the men who mixed dollars with science in the exploitation and processing of mineral resources for the use and benefit of mankind. In the future, they must comprehend and take into account the political, social and economic consequences of all new developments in these basic industries. The new demands on technically trained men must be met by new standards and methods of education.

The new program was worked out with the cooperation and advice of nine advisory boards representing the different branches of primary mineral industries in Pennsylvania. Annual industrial conferences have been made an integral part of the educational program and some of the conferences are sponsored by national mineral industries societies, for example: five Pennsylvania chapters of the American Society for Metals cooperated in a conference at the School last May; and the Coal Division of the American Institute of Mining and Metallurgical Engineers and Pittsburgh Sec-

tion of the American Ceramic Society last October.

The School does not differentiate between resident instruction, extension instruction, correspondence instruction, and research. All are educational functions which are now completely unified into a program of service to the mineral industries of Pennsylvania. This avoids double standards and places the entire facilities of the School, both personnel and physical plant, back of any particular program or project.

The undergraduate enrollment in the School exceeds 200. Service courses for other Schools have developed rapidly during the past few years with an enrollment this year of nearly 750 men and women. This year 2,780 mineral industries workers are enrolled in standardized three-year extension courses in mining, metallurgy, petroleum and natural gas, and ceramics. This work is carried on in 75 class centers located in 30 counties. Requests for help on technical problems are ever increasing in each branch of the mineral industries. At present there are 8 subsidized research fellowships totalling \$18,120.



Mineral Industries

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THE PENNSYLVANIA STATE COLLEGE
Division of Mineral Industries Extension
H. B. NORTHRUP, Director

Pennsylvania's School of Mineral Industries and Experiment Station

Dedicated to the exploration, development, and conservation of Pennsylvania's natural mineral resources, and their preparation, processing, and efficient utilization.

FIELD OF WORK

Geology, Mineralogy, Geography
Petroleum and Natural Gas
Mining and Geophysics
Mineral Economics
Fuel Technology
Metallurgy
Ceramics

DIVISIONS OF SERVICE

Resident Instruction
Extension Instruction
Correspondence Instruction
Mineral Industries Research

Entered as Second Class Matter at State College, Pa., November 7, 1931, Under the Act of February 28, 1925.

MARCH, 1935

MINERAL INDUSTRIES CURRICULA

In reality, the School now offers one curriculum in Mineral Industries with six options, beginning with the junior year, leading to Bachelor of Science degrees in geology, mining engineering, petroleum and natural gas engineering, fuel technology, metallurgy, and ceramics. The three latter curricula emphasize the scientific phases of these fields, as well as their engineering application. Those who graduate with distinction are encouraged to take a fifth year leading to the Master of Science degree. Graduate work for a doctorate is also offered under the new program. It is believed that the revised curricula and courses of study more nearly conform with the new order and will meet the requirements of the mineral industries ten

OPEN HOUSE PROGRAM

April 10, 1935

6:30 p. m.-10:30 p. m.

Room 1-99, Ground Floor; 100-199,
First Floor; 200-299, Second Floor;
300-399, Third Floor.

SENIOR THESES

Investigation of the Properties of Brass Die Casting Alloys. (Cooperation of the Titan Metal Mfg. Co.). Mr. Haag.

Flotation of Bituminous Coal—Adaptation of the Bulk Oil Process to Coal Recovery. Mr. Price.

Observation of Structural Changes in Tempering Plain Carbon Steels. Mr. Lansdale.

Study of the Effect of Sandstone Structure on the Yield of Oil Obtained by Water Flooding. Mr. Borland.

Study of the Effect of Sandstone Structure on the Yield of Oil Obtained by Gas Drive. Mr. Powell.

Binders for Case Carburizing Compounds Using Anthracite Coal. Mr. Brown.

Study of the Phenomena of Slip in Metals. Mr. Sharbaugh.

Annealing Processes for Producing Malleable Cast Iron. (Cooperation of Columbia Malleable Casting Co. and Lake City Malleable Co.) Mr. Wertz.

Spheroidization of Hypereutectoid Steels. Mr. Kelley.

Study of the Properties of High Temperature Alloys at Elevated Temperatures. Mr. Nickol.

X-ray Determination of Solid Phase Reactions in the System $\text{CaO}-\text{Al}_2\text{O}_3-\text{SiO}_2$ and $\text{MgO}-\text{Al}_2\text{O}_3-\text{SiO}_2$. Mr. Whittaker and Mr. Condon.

Adherence of Glass to Metals. Mr. Wertz.

High Temperature Stability of Lead Silicate Glasses. Mr. McCloskey.

Study of the Wetting Effect of Enamels on Metals. Mr. Lias.

Physical Properties and Annealing Characteristics of Certain Orthodontic Dental Alloys. (Cooperation of the S. S. White Dental Mfg. Co.) Mr. Slotterback.

Flotation of Bituminous Coal—Effect of Various Frothing Reagents upon Froth Characteristics. Mr. Craig

RESEARCH IN PROGRESS

Properties of Brass Die Casting Alloys (Cooperation of Titan Metal Mfg. Co.) Professor Malin.

The Accurate Measurement of Temperature of Molten Steel in the Induction Melting Furnace. Mr. Ham (candidate for M.S. degree)

Methods of Measuring Permeability of Sandstone and of Studying the Capillary Sizes of Sandstones. A Mechanical Brain for Treating Problems of the Mechanics of Fluid Flow in Permeable Sands. Dr. Hassler, Dr. Hill and Mr. Barnes.

Hydrogenation of Bituminous Coal. (Supported by Bituminous Research, Inc.) Dr. Wright.

Recovery of Oil from Bradford Sands by Water Flooding. (Supported by Bradford District Pennsylvania Oil Producers' Assn.) Dr. Yuster.

Studies in Economic Geography—the Johnstown and York, Pennsylvania, Regions. (Grants-in-Aid from Chambers of Commerce). Dr. Murphy.

Fossils of the Silurian and Lower Devonian of Central Pennsylvania. (Grants-in-Aid by Geological Society of America and the Pennsylvania Topographic and Geological Survey.) Dr. Swartz.

Study of Crystal Symmetry by Etching with Optically Active Solutions. (Grant-in-Aid from Geological Society of America). Dr. Honess and Mr. Jones.

Microscopic Studies of Oil Sands. Dr. Waldo.

Transformations in Alloy Steels at Liquid Air Temperatures. Professor Knight.

Comparative Studies on the Creep, Oxidation and Metallographic Characteristics of Alloys at Elevated Temperatures. Cooperation of: Allegheny Steel Co.; Bethlehem Steel Corp.; Carpenter Steel Co.; The Heppenstall Co.; Latrobe Electric Steel Co.; Republic Steel Corp.; Vanadium Alloys Steel Co.; Westinghouse Electric & Mfg. Co.) Dr. Austin and Mr. Mairs (candidate for M.S. degree).

Corrosion Studies on Wrought Irons. Professor Knight.

Thermodynamic Properties of Crystalline B_2O_3 . Mr. Smith (candidate for M.S. degree)

Catalysis of Polymorphic Changes in Solids. Mr. Ellefson (candidate for Ph.D. degree)

Reactions in the Solid State. Dr. F. J. Williams.

Kinetics of Solid Phase Reactions. Dr. N. W. Taylor.

Fusion Temperature and Clinkering of Coal Ash. (Supported by Central Pennsylvania Coal Producers' Association). Dr. Barrett and Dr. J. A. Taylor.

Combustion Velocities of Anthracite. (Supported by Philadelphia and Reading Coal and Iron Company). Mr. Brysch

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NOTE: Undergraduate laboratories in Mining, Petroleum and Natural Gas and Fuel Technology have been, in the main, equipped by industry.

SPECIAL FEATURES

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7 Peg Model Showing Subsurface in Western and Northern Pennsylvania. 1

8 Exhibit of Full Size Drilling Tools and Special Equipment for Oil Wells. 1

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School Gallery of (36) Oil Paintings. (Largest collection of mineral industries paintings in America. Gifts by artists and friends of the School). 102

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NOTE: Due to their locations, the Seismographic Station and Meteorological Observatory are not available to the public.

MINERAL INDUSTRIES STAFF

Edward Steidle, Dean of the School

CERAMICS

Nelson Woodsworth Taylor, Head

George Joshua Bair

Francis Jesse Williams

FUEL TECHNOLOGY

Alfred William Gauger, Head (Director of Research, Experiment Station)

Elliott Pierce Barrett

Otto Paul Brysch

Calvert Charles Wright

Harlan Willis Nelson

George Anthony Brady

James Alonzo Taylor

GEOLOGY, MINERALOGY AND GEOGRAPHY

Chesleigh Arthur Bonine, Head

Arthur Pharaoh Honess

Clair Willard Robinson

Frank McKim Swartz

Raymond Edward Murphy

Emil Frank Williams

Allen Worcester Waldo

METALLURGY

David Ford McFarland, Head

Charles R. Austin

Oscar Allen Knight

Ogden Bailey Malin

James Richard Long

MINING AND GEOPHYSICS

William Reuel Chedsey, Head

James Warren Stewart

Helmut Landsberg

PETROLEUM AND NATURAL GAS

Chesleigh Arthur Bonine, in charge

Gerald L. Hassler

Kenneth Burton Barnes

Earl S. Hill

Donald Robert Blumer

Samuel Terrill Yuster

EXTENSION DIVISION

Harry Benedict Northrup, Director

Donald Campbell Jones

Rex Wendell Woods

Elbert Sands Rowland

TECHNICAL LIBRARY

M. Lucille Jackson

INSTRUMENT AND REPAIR SHOP

Ellwood F. Sheeder

SECRETARIAL STAFF

Daisy M. Rowe, Secretary to the Dean

Marjorie Campbell, Secretary to Director of Research and Department of Fuel Technology

Lenore Peters, Secretary to Director of Extension

Helen M. Forgeus, Secretary to Departments of Mining, Geology, and Petroleum and Natural Gas

Margaret C. Jackson, Secretary to Departments of Metallurgy and Ceramics.

STUDENT COMMITTEE ON

OPEN HOUSE

Ceramics, Alfred B. Condon

Fuel Technology, Louis J. Valentine

Geology, Mineralogy and Geography, William Parrish

Metallurgy, James P. Kelley

Mining and Geophysics, John E. Williams Jr.

Petroleum and Natural Gas, William L. Gordon

Sigma Gamma Epsilon, James I. Craig

DEPARTMENT OF CERAMICS

The most abundant earth elements are oxygen, silicon, magnesium, calcium, iron and sodium. The field of ceramics properly includes the study of processes occurring by the action of intense heat on silicates, carbonates, oxides and related compounds of these elements.

In the potter's kiln or the furnace, they are combined and made into products which, in Pennsylvania, value over a quarter billion of dollars a year. These products include: glass; high melting refractory brick; spark plugs; chinaware and electrical porcelain; wall and floor tiles for decoration, sound absorption and heat insulation; enamels for stoves and refrigerators; cement; lime; brick; terra cotta and abrasive compounds.

Ceramic products have been tried by fire, they do not rust, and they endure for centuries. Ceramic science is based on physics, chemistry and mineralogy of the solid and vitreous states. It is relatively a new application of the exact sciences to a comparatively old industry.

DEPARTMENT OF FUEL TECHNOLOGY

Instruction in Fuel Technology has long been important in colleges and universities in Europe as a result of economic necessity. The importance of fuels in Pennsylvania is evident when one considers the capital investment in the coal industry alone. In 1928, approximately 20 per cent of the total investment in productive industries was in bituminous coal production and processing and in anthracite production.

As long as the highest quality fuels were available for easy recovery, the Commonwealth had a natural geographic advantage. As the better grades are used up, intelligent methods of utilization must take the place of natural advantage. Pennsylvania is a leading fuel state and it is entirely fitting that the School of Mineral Industries should take the lead in fuel technology instruction, to include the origin, constitution, classification, testing, preparation, processing and utilization of fuels, not only as a basic curriculum but because of the application of fuels to many branches of industry.

DEPARTMENT OF GEOLOGY MINERALOGY, GEOGRAPHY AND METEOROLOGY

The birth of the earth and its nature and changing aspect throughout geologic time, form a fascinating story which every educated person should know, for certainly the capacity to enjoy and understand life is enhanced by such knowledge.

In addition to their cultural value, geology and mineralogy have been of great service in the industrial advancement of the nation. Through the work of professional geologists exploring the earth it has contributed much to the growth of the iron, steel, coal, petroleum, and other great industries.

Collegiate geography as distinguished from that of secondary schools deals with the philosophical aspects of the subject

rather than place relationships, i. e., with the adaptation of the human race to the natural environment. It has, also, an important practical application in the changing world of the present.

DEPARTMENT OF METALLURGY

We live in the Metal Age. Every part of our daily life is affected by or made possible by use of metals.

The trained metallurgist is a key man, controlling the extraction of the metals from their ores, their refining for particular use, their fabrication into useful shapes and their treatment to bring out the best that is in them.

Metallurgical training involves knowledge and application of the fundamental sciences of chemistry, physics and mathematics, together with extended study of a variety of related applied scientific fields.

Application of these basic sciences to study of processes of production, fabrication and treatment of metals has enormously extended their fields of usefulness. Study of alloys or mixtures of metals has opened up a universe of new materials which we are depending upon more and more in our daily life.

Obviously, the metallurgist, the man who knows metals, is a man to be cultivated, and the field offers many opportunities.

DEPARTMENT OF MINING AND GEOPHYSICS

Civilization, as we know it today, is possible only through the extensive use of minerals, ores, and the products derived from them. The job of the mining engineer is to examine and develop the mineral deposits of the world and then, from the most suitable of them, produce or mine the desired quantities of coal, ores of the different metals, and other minerals. This takes him wherever the minerals, ores or coal may be found, be it the settled regions such as Pennsylvania, or the frontiers of the earth such as equatorial Africa. He is depended upon to so mechanically treat, prepare or "dress" the products at the mine so that only a minimum of waste material is shipped to the ultimate consumer.

Building construction, accurate surveying and the extensive use of mechanical, electrical and geophysical equipment in mine operation call for knowledge in these types of engineering. Safety, and the economic and social effects of his work must be considered also. Such diversity requires very broad training and extreme adaptability.

DEPARTMENT OF PETROLEUM AND NATURAL GAS

Along with the phenomenal growth of the petroleum industry, due principally to the rapid increase in the use of automobiles, diesel engines and domestic oil burners, a new profession has arisen—that of the petroleum and natural gas engineer.

In the utilization of the Nation's petroleum and natural gas resources up to the present, men have been wasteful, skimming the cream of the deposits wherever found. Now the time has come for careful appraisal and planning, for no economical substitutes have been found to take the place of petroleum products.

It will be necessary to rework the oil fields from which the flush production has been taken in order to procure an oil production adequate for the future. In like manner, methods of refining and utilization must be improved. New gas fields must be discovered and the gas piped to remote points of consumption. In this program, for many years to come, the key man will be the petroleum and natural gas engineer.

EXTENSION DIVISION

The Mineral Industries Extension Division is the college medium through which the educational resources of the School are extended and made effective throughout the State. Educational processes taken into the mines, mills and plants result in the promotion of mutual understanding between employers and employees in the interests of efficiency, safety and economy.

The mineral industries extension service program arises from the current economic and social needs of the Commonwealth. Through this service, the principles and truths developed by study and research are translated and carried to the people and applied to the industries.

The extension service includes instruction through correspondence or home study as well as through the formation of extension classes in mineral industries communities throughout the State. None of the extension training offered at this time is of collegiate rank but many correspondence courses are available for college credit.

EXPERIMENT STATION

The Mineral Industries Experiment Station is the college medium through which research service is rendered to the public and to the mineral industries of Pennsylvania. It likewise plays an important part in the undergraduate and graduate instruction program.

In our changing civilization, economic planning is beginning to occupy a position of equal importance with industrial efficiency. The Mineral Industries Experiment Station recognizes this fact and therefore weaves an economic thread into its entire pattern of research.

A survey of the economic aspects of the primary mineral industries was made and published by the Greater Pennsylvania Council in July, 1933. This survey furnishes the ground work for planning our research programs. Approximately thirty projects are under way at the present time. These cover all of the branches of the mineral industries education program from the fundamental earth sciences such as geology, mineralogy and paleontology, through mining and petroleum and natural gas production into the various technologies such as fuel technology, metallurgy, and ceramics.