

Laboratory of Applied Geophysics and Geochemistry

By DR. SYLVAIN J. PIRSON*

A laboratory of applied geophysics and geochemistry has recently been established at The Pennsylvania State College under the direction of Dr. Sylvain J. Pirson. The program of work includes both resident instruction and fundamental as well as practical research in the development of new mineral resources.

For the first time in the history of American academic institutions a course in geochemistry will be given at Penn State. A beginning, however, was made by the Graduate School of the Department of Agriculture in Washington, D. C., which introduced a course in the subject in 1943 under the charge of Dr. Chambliss.

Geochemistry, *stricto sensu*, is not a well known field in the United States and in this respect we are possibly 20 to 25 years behind the Russians who have produced outstanding modern geochemists such as W. I. Vernadsky, A. E. Fersman, E. S. Vederov, and others. Accordingly, the field of work should be defined and delineated in order that confusion may not exist with the meaning of the word "geochemistry" when used *lato sensu*.

In its strictest sense, geochemistry is the study of the origin, occurrence, association, abundance, migration distribution, dispersion, and accumulation of atomic elements within the geosphere including the atmosphere. Since the earth is derived from cosmic matter, it is natural that the basis for a chemical understanding of the earth's atomic processes should be based on astrophysical and astrochemical concepts. The origin of matter and its evolution in the earth over astronomic time is the special field of geochemistry. The border line fields of chemical and atomic physics provide the fundamental laws for this study: nuclear and electronic configurations of the atoms; atomic numbers and weights; atomic and ionic radii; co-ordination numbers; crystal structures; energies and lattices, etc.; ex-

plain the paragenetic relationships of the 92 geochemical and of the possible transuranic elements.

The pragmatic aspect of geochemical sciences is not neglected in the new courses. The application of the principles of geochemical processes and associations is the basis of the long range forecast of future reserves of essential industrial elements. An understanding of these principles will help to conceive, formulate, and develop new technological means for prospecting and delineating hidden mineral reserves. The best method known thus far in this country is geochemical prospecting for oil and gas fields, the principles of which are taken as preposterous by much of the practical geological profession notwithstanding some remarkable successes and a commendable score in the ratio of exploration successes to failures.

Compared to geochemistry exploration for oil and gas, exploration for ore deposits has made but a timid start. The fundamental concept at the basis of these methods of approach is the ionic diffusion of elements to near surface layers where their abnormal presence may be revealed by micro analytical tests of soils, ground water, and vegetation. Broad geochemical provinces may thus be outlined in which chemical centres (zonal distribution patterns), belts, zones, nodes, etc., may be delineated and the probable existence of hidden mineral treasures may be ascertained.

The standard methods of geophysical prospecting for minerals are not neglected in the Penn State program of study and research, nor their most recent developments. A program of airborne magnetometer surveys of part of the State of Pennsylvania in cooperation with the U. S. Geological Survey has been initiated, the purpose of which is to study the manner in which the parallel structures visible in the Allegheny Mountains may be traced into the Appalachian Geosyncline where deep oil and gas structures are expected to be found in close association with uplifts within the precambrian basement rocks.

New Appointment in the Department of Earth Sciences

Dr. E. F. Osborn was appointed Professor of Geochemistry and Head of the Department of Earth Sciences on August 1, 1946. As far as the records reveal, this is the first professorship in geochemistry in the United States.

Dr. Osborn has a Bachelor of Arts degree in geology, DePauw University, 1932; Master of Science in geology, Northwestern University, 1934; and Doctor of Philosophy in petrology and geophysics, California Institute of Technology, 1937. He is a fellow of the Geological Society of America and of the Mineralogical Society of America.

He has done geologic field work in the Lake Superior iron country of



DR. E. F. OSBORN

Minnesota, Ontario, and Michigan; in the Black Hills, South Dakota; in the Sawatch and Mosquito Ranges, Colorado; in the vicinity of Goldfield, Nevada; in the igneous complex of southern California; and in the gold mining region of northwestern Quebec.

Dr. Osborn was a teaching fellow at Northwestern University 1932-34 and at the California Institute of Technology 1934-37. He substituted for Professor J. T. Stark in petrology at Northwestern University during 1937. He has engaged in laboratory inves-

*Associate Professor of Geophysics and Geochemistry and Chief of the Division of Geophysics.

MINERAL INDUSTRIES

Published monthly by the School of Mineral Industries from October to May inclusive.
THE PENNSYLVANIA STATE COLLEGE
 Mineral Industries Extension Services
 H. B. NORTHRUP, Director

Pennsylvania's School of Mineral Industries and Experiment Station

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

Fields of Work

Geotechnology

Earth Sciences: Geology, Mineralogy, Geography, Geophysics, Meteorology, and related subjects. **Mineral Engineering:** Mineral Economics, Mining, Mineral Preparation, and Petroleum and Natural Gas. **Mineral Technology:** Fuel Technology, Metallurgy, and Ceramics.

Divisions of Service

Resident Instruction
 Extension Instruction
 Correspondence Instruction
 Mineral Industries Research

Entered as second-class matter at State College, Pa., November 1, 1938, under the Act of August 24, 1912.

DECEMBER 1946

TRENDS and OBJECTIVES

By DEAN EDWARD STEIDLE

PIONEERING FORMAL HIGHER EDUCATION IN MINERAL ECONOMICS

A feature article, "Fuel Technology at Penn State," was published in the May 1939 issue of *Mineral Industries*. The article indicated that fuel technology instruction and research was initiated by the School in 1893; that an option in fuel technology was offered as a part of the metallurgy curriculum in 1930, and that a fuel technology curriculum was approved by the College Board of Trustees in 1932. This was the first curriculum in fuel technology offered in the United States.

Instruction and research in mineral economics have been included in various courses in the School since 1896. A curriculum in mineral economics was approved by the College Board of Trustees on May 10, 1946. Formal enrollment was initiated beginning with the fall semester. This curriculum is the first distinct curriculum offered in mineral economics in the United States. Here again the School assumes the role of a pioneer.

The new curriculum is offered because of the urgent need for precise information pertaining to the economic aspects of the mineral industries. There is a growing demand for men especially trained to gather and interpret statistical information in this field, much of which has technical im-

plications. Minerals have furnished two-thirds of the primary wealth of Pennsylvania. To supply our industries importations of raw materials are required from many other states and from 28 foreign countries. These materials are processed with Pennsylvania fuels and labor. Technical-economic studies of the production and processing of remaining resources and their relation to imported materials are necessary to insure the permanent maintenance of these basic industries.

Dr. W. M. Myers is Chief of the Division of Mineral Economics, classified under the Department of Mineral Engineering. The curriculum will emphasize basic training in mathematics, chemistry, physics, and economic geology, including the occurrence, production, utilization, and marketing of mineral products. Instruction will include also elements of the earth sciences, of mineral engineering, and of mineral technology.

The last two years of the curriculum are arranged to permit instruction in the special problems of mineral economics and in the study of related subjects in statistics, business law, and labor relations. In addition, a sequence of approved electives in technical and nontechnical subjects will permit the student to select a progressive series of courses in any technical subject in which he may have special interest.

The curriculum is designed to prepare graduates for participation in management, marketing, statistical analysis, and financial investment and for employment in those federal and State agencies, institutions, and industries concerned with the economics of the mineral industries.

New Appointment in the Department of Earth Sciences

(Continued from page 1, column 3).

tigations in silicate chemistry and petrology at the Geophysical Laboratory, Washington, D. C.; on ballistic problems for Division 1 of the National Defense Research Committee, Washington, D. C.; and on the chemical, mechanical, and optical properties of novel optical glasses at the Eastman Kodak Research Laboratories, Rochester, New York.

His contributions to scientific literature include studies in petrology, economic geology, and silicate chemistry. He made numerous reports to National Defense Research Committee on ballistics which have not been released by War and Navy Departments as of this date.

Eastman Kodak is establishing a research grant in the School of Mineral Industries, including graduate assist-

ants, on phase equilibrium and rate of crystallization studies in systems related to geochemical problems and optical glass fields under Dr. Osborn.

Correspondence Courses Offered in the School of Mineral Industries

This is the first of a series of articles on the correspondence courses offered in the Earth Sciences, Mineral Engineering, and Mineral Technology Departments in the School of Mineral Industries at The Pennsylvania State College. While complete information on the course work is given in The Pennsylvania State College Circular Number 24, "Correspondence and Extension Class Instruction," numerous questions are still received concerning the types of courses which are presented. The correspondence staff has therefore, thought it desirable to present a series of articles in the hope of answering some of these questions and to introduce the correspondence work to those who have not seen the regular correspondence catalogue.

The first of this series is devoted to geography. Six courses, each consisting of 25 carefully prepared lessons are now available. Three of the courses, **Elements of Geography**, **Economic Geography**, and **World Geography**, are fundamental geography courses. The remaining three, **North America**, **Pennsylvania** and **Europe** are regional courses on these particular areas. No previous work in geography is needed to take these courses except the **Europe** course. The **World Geography** course is recommended for those who desire a general picture of the way man lives in each of the countries of the world. The **Economic Geography** course presents a study of the geographic distribution of economic activities over the earth, discussing such subjects as agricultural activities, mineral production, commerce, transportation, etc. All of the geography courses are organized as to be of particular value to teachers in elementary and secondary school geography.

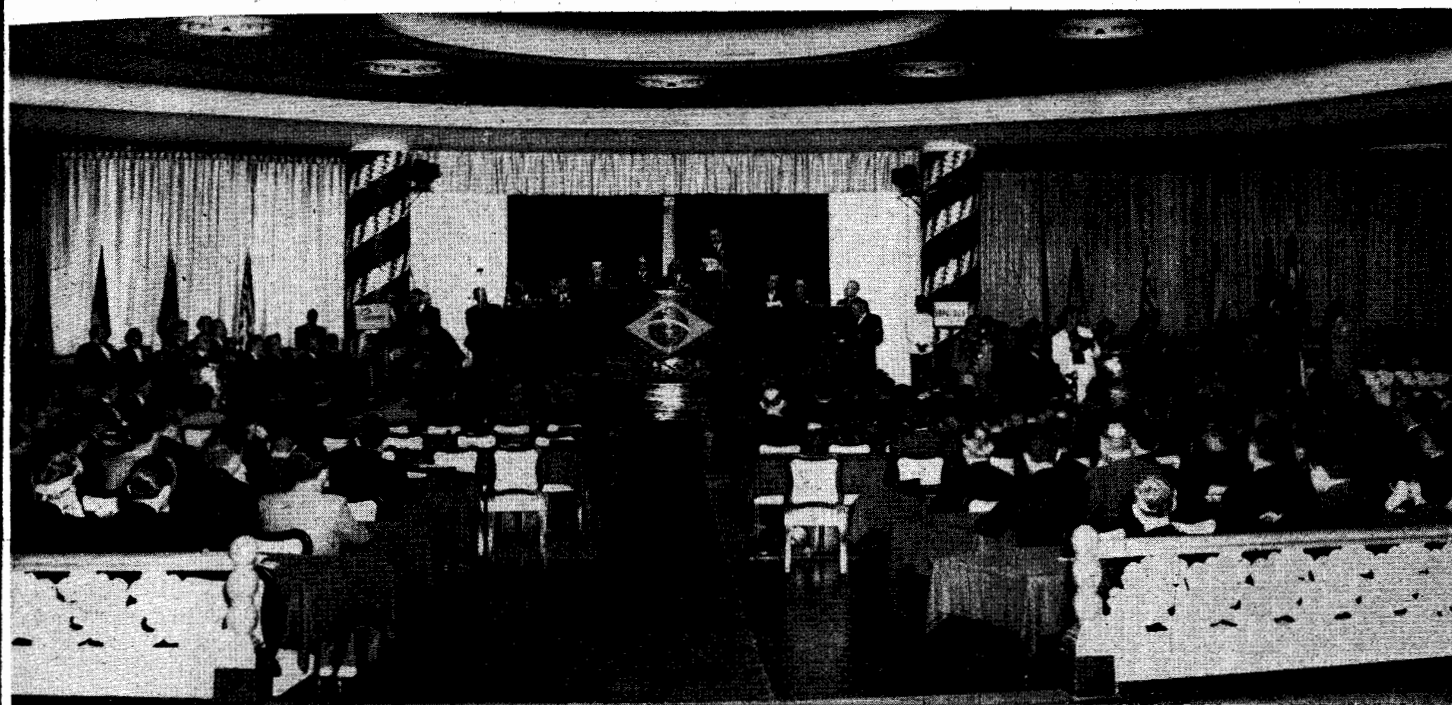
The geography correspondence courses are presented under the direction of Dr. E. Willard Miller, Chief of the Division of Geography. Further information on the correspondence courses will be furnished upon request to the Mineral Industries Extension Services, The Pennsylvania State College, State College, Pennsylvania.

Complete descriptions of the geography correspondence courses are as follows:

Geog. 20C. World Geography: A brief systematic regional description of the earth's surface, including both man-

(Continued on page 4, column 1).

Second Pan American Congress of Mining Engineering and Geology



Formal opening, Second Pan American Congress of Mining Engineering and Geology, sponsored by Brazil, Hotel Quitandinha, Petropolis (summer capital), in the mountains 35 miles back of Rio de Janeiro. Dean Steidle is on the rostrum on extreme right. The United States delegation is seated at upper left corner.

The Second Pan American Congress of Mining Engineering and Geology was held October 1-15, Petropolis, Brazil. There were 134 official delegates to the Congress; registration for the various commissions totalled 357. The third Congress is likely to be held in the United States.

The United States delegation to the Congress is listed below:

Chairman:

Paul C. Daniels,
Counselor of Embassy,
American Embassy,
Rio de Janeiro, Brazil.

Delegates:

Dr. R. R. Sayers,
Director, Bureau of Mines,
Department of the Interior.

Dr. Edward Steidle,
The Pennsylvania State College,
State College, Pennsylvania.

Dr. William E. Wrather,
Director, Geological Survey,
Department of the Interior.

Technical Advisors:

Clarence C. Brooks,
Counselor of Embassy for Economic
Affairs, American Embassy,
Rio de Janeiro, Brazil.

Emerson I. Brown,
Minerals Attache,
American Embassy,
Rio de Janeiro, Brazil.

Ivan G. Harmon,
Petroleum Attache,
American Embassy,
Rio de Janeiro, Brazil.

Roger Rhoades,
Chief Geologist,
Bureau of Reclamation,
Department of the Interior.

Special Assistant to the Chairman:

Clarence A. Wendel,
Division of International Resources,
Department of State.

Dean Steidle is current chairman of the United States Section, Pan American Institute of Mining Engineering and Geology. He was elected one of three vice-presidents of the Congress, representing North America; also chairman of Commission No. 9 on Education. He made one of the addresses at the formal opening; also an address at the 70th Anniversary exercises, National School of Mines of Brazil, Ouro Preto. Mrs. Steidle attended the Congress with Dean Steidle. The New York City to Rio de Janeiro flight is made in 26 hours.

Seven days during the Congress were spent by the delegates inspecting diamond and quartz crystal fields, mica, bauxite, coal, iron, and manganese mines, as well as the deepest gold mine in the world, and the National School of Mines of Brazil. All long jumps on inspection trips were made by airplane.

The staff of the School of Mineral Industries prepared 15 technical papers for various commissions of the Congress. These are: "Faunal Development, Conditions of Deposition, and Paleogeography of Some Appalachian Mid-Paleozoic Sediments," by Dr. F. M. Swartz; "Microscopic Morphology of Quartz," by Dr. P. D. Krynine; "An Electrolytic Theory of the Origin of Oil," by Dr. S. J. Pirson; "Geophysical Searching for Iron, Lead and Zinc,"

by L. O. Bacon; "Geography and the Mineral Industries," by Dr. E. W. Miller; "Minerals and Conservation," by Dr. W. M. Myers; "Increasing Loading Time in Bedded Deposits by Consolidation and Elimination of Car Changing," by Professor R. D. Snouffer; "The Use of Amines in the Froth Flotation Process," by H. H. Kellogg; "Calculating Bottom Hole Pressures in Gas Wells," by A. W. McCray; "Plastic Properties of Chilean Coals," by Dr. A. W. Gauger and Dr. A. Albala; "Steel Making Practice in the United States," by Professor W. J. Reagan; "Plastic Deformation of Metals," by Dr. J. R. Low, Jr.; "The Role of Iron Oxide in Refractories," by Dr. Samuel Zerfoss; "The Fluorescence and Photochemistry of Glass," by Dr. W. A. Weyl; "Pan American Institute of Mineral Industries," by Dean Steidle.

DIVISION OF MINERALOGY

Mr. Robert L. Folk was appointed on July 15 as a research assistant in mineralogy on the Petroleum Special Research project dealing with the extension of oil-producing areas in the State. Mr. Folk graduated from Penn State in 1946 and was Evan Pugh scholar at graduation.

Mr. C. T. Bressler, formerly connected with the Alaskan Branch of the United States Geological Survey, and Mr. Henry H. Gray, Department of Geology of the University of Michigan, were appointed to similar positions as of September 15 and October 1, respectively.

Correspondence Courses Offered in the School of Mineral Industries

(Continued from page 2, column 3).

made and natural features, together with explanation of these features. Textbook: Whitebeck, R. H., and Finch, V. C., **Economic Geography**, Fourth Edition, 1941, McGraw-Hill Book Company, Inc., \$3.50. 25 assignments.

Fee \$21; 3 college credits.

Geog. 24C. Elements of Geography: A general survey of the characteristics of the major types of land surfaces, climates, soils, and resources that comprise the natural environment of man. Textbook: Finch, V. E., and Trewartha, G. T., **Elements of Geography**, Second Edition, McGraw-Hill Book Company, Inc., \$4.00. 25 assignments.

Fee \$21; 3 college credits.

Geog. 26C. Economic Geography: The geography of the world's commodities and their regional aspects. Land uses, extractive and manufacturing industries are studied as to their natural and cultural relationships. Textbook: Jones, C. F., and Darkenwald, G. G., **Economic Geography**, The MacMillan Company, 1941, \$4.25. 25 assignments.

Fee \$21; 3 college credits.

Geog. 30C. Geography of North America: A survey of America north of the Rio Grande; a description and interpretation of the industries, the farms, forests, towns, and highways that have developed as a result of the human occupation and use of each of the regions with its characteristic conditions of climate, topography, soil, drainage, and natural resources. Textbook: Smith, J. Russell, and Phillips, M. Ogden, **North America**, Harcourt, Brace and Co., Inc., 1940, \$4.75. Set of 12 maps, No. DD5, A. J. Nystrom Co., Chicago, Ill., \$0.30. 25 assignments.

Fee \$21; 3 college credits.

Geog. 32C. Geography of Pennsylvania: A survey of the geography of the State. The climate, topography, soils, mineral resources, and other elements of Pennsylvania's natural environment will be considered, followed by a brief summary of the historical geography. The State will be discussed by geographic regions, the various outstanding industries being taken up in connection with the regions in which they are most important. Textbook: Murphy, Raymond E., and Murphy, Marion, **Pennsylvania: A Regional Geography**, The Pennsylvania Book Service, \$4.00. Set of 20, letter size, outline maps of Pennsylvania, Rand McNally Co., New York, N. Y., \$0.25. 25 assignments.

Fee \$21; 3 college credits.

Geog. 442C. Geography of Europe: The geographic factors in the economic, social, and political progress of the nations. Emphasis is placed on the

major natural regions, distribution of resources, industrial development, and major problems of the continent in light of the geographic background. Prerequisites: Geog. 24 and Geog. 26. Textbook: Hubbard, G. D., **The Geography of Europe**, D. Appleton-Century Co., New York, 1937, \$5.00. 25 assignments.

Fee \$21; 3 college credits.

MINERAL ENGINEERING

During recent months the School has had several distinguished foreign visitors. Dr. Georges A. Homes, Professeur a la Faculte Polytechnique de Mons, Mons, Belgium joined with us on June 11; Professor D. G. Doeglas, Landbouwhoogeschool, Afdeeling Regionale Geologie en Bodenkonde, Wageningen, Netherlands, July 31; Professor Marcel Roubault, Directeur de l'Ecole superieure de Geologie, Universite de Nancy, Nancy, France, August 18; Professor M. G. Driessen, Chief, Mining Research Department, State Mines, Heerlen, Netherlands, August 10; and Dr. Victor Kersnich, Faculty of Mines, University of Ljubljana, Ljubljana, Yugoslavia, September 21.

CERAMICS

Dr. Woldemar A. Weyl, professor of Glass technology, attended a Symposium on Luminescent Materials at Cornell University from October 23 to 26 where he gave a paper "On the Fluorescence of Cadmium Sulfide." This meeting was sponsored by the Division of Electron and Ion Optics of the American Physical Society.

This paper is based on some recent research done in collaboration with John K. Inman and Anne M. Mráz.

At a meeting of the Penn State Student Branch of the American Ceramic Society, in the Mineral Industries Art Gallery, Monday evening, November 18, R. F. Geller, Chief, Porcelain and Pottery Section, National Bureau of Standards, Washington, D. C., gave an interesting address on the subject "Refractory Porcelains." Mr. Geller explained a number of important technologic aspects in the development of new ceramic bodies for engineering applications at high temperatures. An enthusiastic audience of 50 students and staff members attended.

Pennsylvania Ceramics Association

Balloting held recently for membership of the Board of Directors of the Pennsylvania Ceramics Association resulted in the election of R. Birch, L. T. Brownmiller, J. R. Cox, E. C. Henry, H. M. Kraner, T. H. Lineweaver, E. P. McNamara, A. F. Mond, R. R. Robinson, and K. A. Ru for the term November 1, 1946 to October 31, 1948. According to the constitution of the association, one-half of the membership of the Board is elected annually for a two-year period.

The Board of Directors of the Association met at the Mellon Institute in Pittsburgh, on Tuesday afternoon, November 12, and re-elected as officers for the association's fiscal year November 1, 1946 to October 31, 1947 the following: President, R. F. Geller, Glen-Gery Shale Brick Corporation, Harrisburg, Pennsylvania; Vice-president, R. W. Rowland, President, Newcastle Refractories Company, Newcastle, Pennsylvania; Secretary, Treasurer, J. R. Coxey, Supervisor of Ceramics Extension, The Pennsylvania State College; Managing Director, E. C. Henry, Chief, Division of Ceramics, The Pennsylvania State College. Plans were made for an annual meeting in State College next spring. After discussing matters of policy, the Board concluded its meeting with dinner at the University Club.

Research Fellowship

The Structural Clay Products Manufacturers Association of Pennsylvania has established a fellowship in the Division of Ceramics for research on problems of importance in the production of structural clay wares. The Association requested that work be done first in studying the value of adding various chemicals, as reported frequently in the technical literature for improving the control of the manufacturing procedures. The fellowship this year will sponsor the research programs of two graduate students: C. J. Reagan, a ceramic graduate of The Pennsylvania State College in 1943, was appointed a research fellow effective October 1, 1946. It is expected that G. J. Morris, a Penn State graduate of 1939, will start his work at the beginning of the spring semester. Both of these men are veterans of the armed forces.