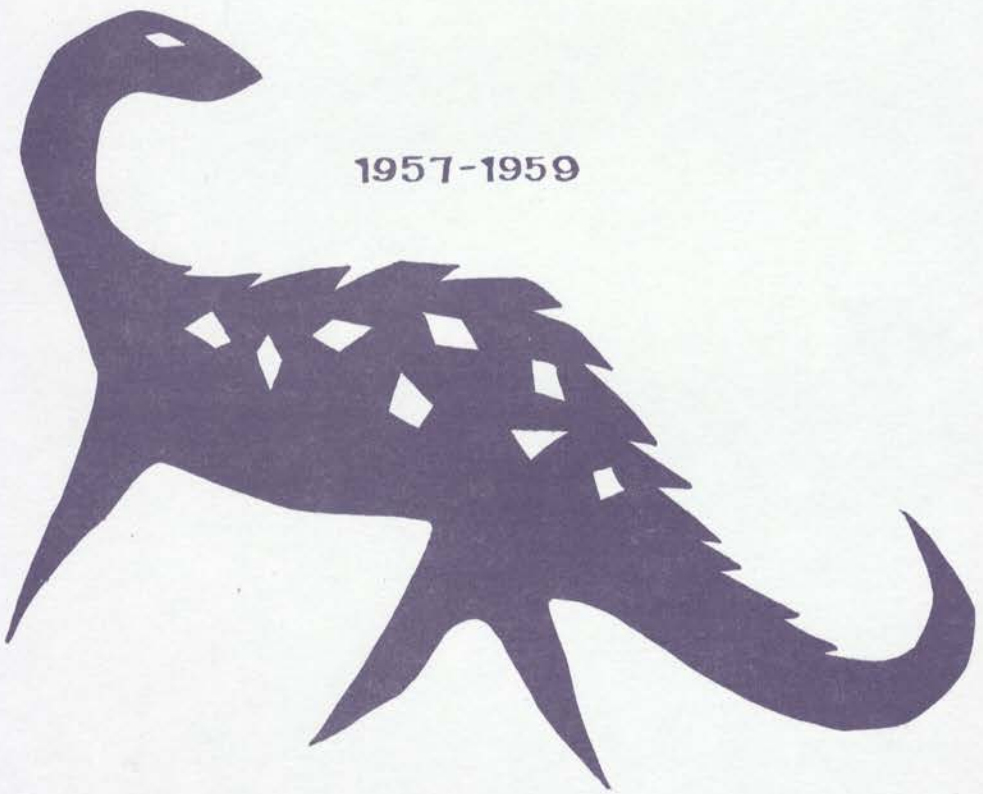
The Geological Survey of Wyoming

Horace D. Thomas, State Geologist

Biennial Report

of the State Geologist

1957-1959



Laramie, Wyoming

January, 1959

January 20, 1959

The Honorable Joseph J. Hickey
Governor of the State of Wyoming
Cheyenne, Wyoming

Dear Governor Hickey:

Pursuant to the requirements of Article 12, Section 18-1204, Wyoming Compiled Statutes, 1945, the Biennial Report of the State Geologist for the years 1957-59 is herewith submitted.

Respectfully yours,

Horace D. Thomas

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State Geologist

HDT:dc

Biennial Report of the State Geologist
of the
State of Wyoming

for

1957 - 1959

by

Horace D. Thomas

INTRODUCTION

This report covers the activities and accomplishments of the Geological Survey of Wyoming during the two-year period 1957-59. The geological projects undertaken are briefly described, the various activities of the Survey are discussed, and the resulting publications are listed.

ORGANIZATION OF THE GEOLOGICAL SURVEY

All states but Massachusetts and Colorado have active geological surveys. Many are located at state universities or colleges and are commonly affiliated in some fashion with the department of geology. During 1957, the total appropriation for these surveys approximated $6,000,000 for geological research and administration, or an annual average appropriation exceeding $100,000 each. Many state geological surveys have annual appropriations ranging from $200,000 to $400,000, and the Illinois Geological Survey receives more than $800,000 per year. Wyoming, with its contingent of $26,175 per year, is far below the national average in money appropriated for geological research.

In 1957, on the basis of the best available figures, the average state geological survey employed 8.9 full-time geologists, compared to the 1.5 comprising the staff of the Geological Survey of Wyoming. Illinois, for example, employs 41 full-time geologists; Michigan and California, 32 each; Indiana, 24; Kansas, 19; and Missouri, 14.

Wyoming is a far more important mineral producer than most states, and in 1957 ranked 17th with a mineral production valued at $345,600,000. Wyoming ranks 5th in petroleum production, 1st in bentonite production, 2nd in sulfur production, 3rd in sodium sulfate production, and 4th in uranium production. Our importance as a mineral producing state is far greater than that of many states which appropriate a great deal more money for geological work than does Wyoming.

It should be pointed out, however, that some of the state geological surveys carry on certain programs which in Wyoming are undertaken by the Natural Resources Research Institute and the offices of the State Mineral Supervisor and the State Mine Inspector. It is believed, though, that Wyoming obtains more geological information per dollar spent than do most states.

The Geological Survey of Wyoming has been located at the University of Wyoming since 1933. Dr. S. H. Knight, Professor of Geology, served as State Geologist from 1933 to 1940. The incumbent, Dr. H. D. Thomas, Professor of Geology, has served since April, 1941. The State Geologist, by virtue of action of the University Administration, carries a half-time teaching load and devotes the other half of his time to the Geological Survey.

In 1951, for the first time, a full-time Assistant State Geologist was employed. Mr. William H. Wilson resigned from the Ground Water Branch of the U.S. Geological Survey to accept the appointment. He holds B.S. and Geological Engineer degrees from the University of Utah, and an M.A. degree from the University of Wyoming, having specialized in economic geology (mineral deposits) and ground water geology. The addition of Mr. Wilson to the staff aided immeasurably in broadening the program and the services of the State Geological Survey.

A full-time secretary, Mrs. Dorothy Clark, is also employed. Her duties involve the maintenance of office records, the distribution of publications and maps, and the supervision of routine office matters.

Students in geology at the University are employed on a part-time basis to undertake specific geological assignments, to serve as geological draftsmen, to maintain collections of samples and cores from wells drilled for oil, and in many other ways.

The general organization of the Geological Survey, its location at the University, and its affiliation with the Department of Geology are sound. Because of its location at the University, it is possible to obtain the advice and part-time assistance of the 6 geologists on the staff of the University Geology Department. The Wyoming office of the Fuels Branch of the U.S. Geological Survey is located in Geology Hall, and close cooperation is held with that agency. In addition, collaboration is maintained with

the University of Wyoming Natural Resources Research Institute, whose work is research on the utilization of Wyoming mineral resources. The U.S. Bureau of Mines Laramie Petroleum Research Center is located nearby on the campus. The advice, suggestions and assistance of chemists, physicists, engineers and other scientists on the campus are readily obtainable. The laboratories and library facilities on the campus are valuable aids in carrying on the work of the Geological Survey.

In September, 1955, quarters in the new Geology Building on the campus were occupied. The Survey has three offices, a map filing and distribution room, and a drafting and filing room. In addition, a large part of the basement is devoted to storage space for oil well samples and cores. The library has been combined in one stack room with the University geological library. Most important, the Survey benefits from the installation of fine new technical equipment by the Department of Geology, such as X-ray diffraction equipment, differential thermal analysis equipment, and other devices used in mineral and rock determinations.

ACTIVITIES OF THE GEOLOGICAL SURVEY

TECHNICAL INVESTIGATIONS

Absaroka Mountains

The study of the old Kirwin mining district, in the southern Absaroka Mountains, Park County, which was begun in 1951, has been substantially completed. The mapping project, as originally conceived, has been expanded beyond the Kirwin district proper, and of a proposed total area of approximately 600 miles, more than 200 have already been mapped. An open-file report summarizing the work to date is currently being prepared.

Precambrian Project

The Precambrian project, which has as its object the mapping in detail of great areas of Precambrian rocks in Wyoming which have never been adequately mapped, was initiated in July, 1957. During the biennium, 8 geologists participated in the mapping program. Seven of these are, or were, graduate students at the University of Wyoming and their research constituted a part of the program of study leading to the Master's degree. This work has been under the direction of Dr. R. S. Houston, Assistant Professor of Geology, and a part of the regional mapping has been done by him.

During the two summers, approximately 11 townships, or 396 square miles, were mapped in the Sierra Madre and Medicine Bow ranges.

Mapping was done on a scale of 600 feet to the inch, which is considered detailed geological mapping. An area of pre-Cambrian rocks in the Owl Creek Mountains was also mapped during the 1958 field season.

In addition to regional mapping, all mines within the mapped areas have been restudied. The surface geology of the Ferris-Haggerty mine in the central Sierra Madre Mountains has been mapped, and a possible extension of the fracture zone has been noted west of the mine. All vermiculite mines in the North Platte Valley have been studied and a detailed plane table map has been made of one deposit. The mode of origin of the vermiculite deposits has been established and concrete suggestions can be made on prospecting for new deposits. The rare-earth pegmatite district on the west slope of the Medicine Bow Mountains has been mapped in detail, and the mineralogy of the rare-earth oxides is being investigated. The surface geology in the vicinity of the Keystone mine and the New Rambler mine in the central Medicine Bow Mountains has been mapped, and previously unknown faults and shear zones which may be mineralized have been delineated in this area.

The five maps and six reports which so far have resulted from the project are all on open-file at the Survey offices and are available for public inspection.

Board of Mines Projects

A sum of $5,000 was made available by the Board of Mines to sponsor graduate students in the geologic mapping of areas in which mineral deposits are being developed or produced, or areas in which there are chances for the commercial utilization of mineral resources. Seven graduate geologists were subsidized and their research will constitute part of the work for the Master's degree. Each student spent two months in the field during the summer of 1958.

Leucite Hills, Sweetwater County - In 1912 it was estimated that there are roughly two billion tons of potash-bearing rocks in the Leucite Hills. No detailed geological studies had been made since that time. During the past summer two geologists mapped 110 square miles in the area. The resulting detailed maps will prove useful in recalculating reserves and in delineating the areas containing pumice. New data on the composition of the volcanic rocks of the region have been obtained.

Shirley Basin, Carbon County - Two geologists carried on detailed geological mapping over 168 miles of the Shirley Basin. It is believed that this region may be one of the richest uranium-producing areas in the State, and detailed maps will prove useful in both exploration and developmental work.

Crooks Gap area, Fremont County - For the first time, detailed

geological mapping was carried on in the region between Crooks Gap and Muddy Gap. This is an area in which there is both oil and uranium production. About 100 square miles were mapped by two geologists. The resulting maps will be useful in the search for additional mineral resources.

Green River Valley, Sweetwater County - One geologist carried on a detailed study of oil shale in an area south of the town of Green River. The U.S. Bureau of Mines is cooperating in this project by assaying the samples collected. Shales having an oil content as high as 59.8 gallons per ton have been found.

Engineering Geology

Dam sites - During the biennium the following dam sites were investigated: Soda Lake, Sublette County; Wood River, Park County; West Tensleep Lake, Big Horn County; Bates Creek and Kerfoot Creek, Natrona County, and Savery Creek, Carbon County. Altogether, during the past three years 24 dam site investigations have been made and reports on each written for the Natural Resource Board.

Shoshone Canyon tunnel - During 1958 the Geological Survey collaborated with the geologist of the Highway Department on the geology of the new highway tunnel in Shoshone Canyon. Recommendations were made on those parts of the tunnel which will need artificial support.

Disposal of radioactive waste - Assistance was given the University of Wyoming in selecting a suitable geological location for the subsurface disposal of radioactive waste materials.

Mineral Inventory

As a long-range project, the Geological Survey has been compiling factual and reliable data on the known mineral deposits of the State. As a result of this program, Bulletin No. 45, "Wyoming Mineral Resources", issued in 1952, was brought up to date to be published as Bulletin No. 50, "Mineral Resources of Wyoming". In addition, data on radioactive mineral deposits in the State have been compiled to be published as Report of Investigations No. 7. In addition to those mineral deposits studied under the Precambrian project, field examinations were made of gold-silver-lead deposits, a sulfur deposit, a uranium deposit, and a copper-molybdenum deposit, all in Park County.

Ground Water

Helpful advice was given to many individuals, principally ranchmen, on the possibilities of obtaining water on their lands and on the drilling depths to possible aquifers.

Mineral Identification Service

The Geological Survey maintains a free mineral identification service designed to be of value to prospectors, amateur rock collectors, and the general public. If the submitted specimens appear to have possible economic importance, they are turned over to the Natural Resources Research Institute for assay or analysis. Several potentially important mineral deposits in the State have been brought to light through this service in the past.

With the great increase in prospecting brought about through the discovery of uranium in Wyoming, there has been a much greater demand for this service. As a result of this intensive prospecting, valuable minerals other than uranium have been and will be discovered.

COOPERATION WITH THE U.S. GEOLOGICAL SURVEY

Informal cooperation is carried on with all branches of the U.S. Geological Survey. The State Geologist has brought to the attention of the U.S. Geological Survey certain geological problems needing attention, and the Federal Survey has taken action on them. Conversely, the Federal Survey keeps us informed on the independent projects it is carrying on in Wyoming. This complete cooperation lends effectiveness and efficiency to the geological work carried on by both agencies in the State and prevents overlap or duplication of effort.

During the summer of 1958, the U.S. Geological Survey was independently carrying on 40 specific projects in Wyoming, according to Dr. W. H. Bradley, Chief Geologist. These include regional geology (18 projects), oil and gas investigations (2 projects), geochemistry and geophysics (4 projects), economic geology and mineral resources (10 projects), and stratigraphy and paleontology (6 projects).

Formal cooperation on a fund-matching basis with the U.S. Geological Survey has been carried on in Wyoming since 1941. In the past, projects have been undertaken which dealt with phosphate rock, titaniferous magnetite, anorthosite, cordierite, regional geology, and ground water.

Two cooperative projects carried on during the past two years are (1) "Titaniferous black sands in Upper Cretaceous rocks", in which all field work has been completed and with the manuscript nearing completion for publication as a State Geological Survey bulletin, and (2) "Regional Upper Cretaceous facies relationships", which was started in September, 1957, and has not been completed. The first project is concerned with titanium-bearing sandstones and the second is concerned in part with oil, gas, coal, and other commodities.

During the biennium a map showing the anorthosite (alumina rock)

area of the Laramie Range was issued as a federal document as a result of earlier cooperative fund matching with the Mineral Deposits Branch of the U.S. Geological Survey.

Cooperation without fund matching is maintained with the Fuels Branch office located in the Geology Building at the University. Dr. W. R. Keefer is supervising geologist, Dr. J. D. Love is research geologist, and Laura McGrew is geologist. A draftsman and secretary complete the staff. Since the establishment of this office on the campus in November, 1943, 36 maps, charts and bulletins have been issued as federal documents prepared in cooperation with the Geological Survey of Wyoming and the Department of Geology, University of Wyoming. Seven State publications have originated through this cooperative program.

COOPERATION WITH OTHER FEDERAL AGENCIES

U.S. Bureau of Mines - In 1953, the State Geological Survey entered into a formal agreement with the U.S. Bureau of Mines for the annual collection of basic data on Wyoming mineral production. Close, but informal, cooperation is carried on in other ways. Deposits of certain minerals which need core drilling, or other subsurface development, have been brought to the attention of the Bureau of Mines and, if warranted, that agency has carried on subsurface exploratory work. There has been a free interchange of information between the State Geological Survey and the Bureau of Mines. The Petroleum Research Center, located on the campus, has been especially helpful to the State Geological Survey.

U.S. Coast and Geodetic Survey - Since 1941 the State Geologist has served as Collaborator in Seismology and has collected reports on earthquakes felt in Wyoming. A fine seismograph has now been installed in the Geology Building by the Geology Department, and reports on the earthquakes registered are forwarded three times weekly to the Coast and Geodetic Survey. The station here has also participated in the study and detection of waves created by atomic blasts.

Other Agencies - The State Geological Survey is called upon to supply geological information to many other Federal agencies, such as the Soil Conservation Service, the Grazing Service, the Reclamation Bureau, the Department of Commerce, and others. Data have been supplied to Congressional Committees and to other Federal groups or committees.

COOPERATION WITH UNIVERSITY AGENCIES

Department of Geology - The intimate interrelationship of the Geological Survey and the Department of Geology has been pointed out earlier in this report. It should be pointed out further, however, that the field research undertaken by graduate students is of great value to the Geological Survey.

These results are made available to us early. Many of the resulting theses have been published by the Geological Survey. In turn, the Geological Survey has assisted students in defraying field expenses on projects in which the Survey is interested, or by supplying thin sections or polished surfaces.

The graduate students constitute a valuable store of part-time assistance for the Survey. They have been employed to catalog oil well samples, plot oil well logs, draft geological maps and illustrations, and to undertake other assignments. The students, in turn, receive useful experienc e in applied geology. If it were not for the high-quality part-time help available through the employment of graduate students, the full-time staff would have to be considerably larger.

Although the State Geological Survey underwrote the thesis work of a few graduate students during the biennium, dozens of other graduate students undertook research on the geology of Wyoming at their own expense, the investigations serving as part of the requirements for advanced degrees. The results of all these investigations are immediately available to the Survey.

Natural Resources Research Institute - The Natural Resources Research Institute was established to carry on scientific research on the utilization of the mineral resources of the State. The Geological Survey and the Natural Resources Research Institute work in close cooperation, and the State Geologist is a member of the executive committee of the Institute. The Geological Survey may bring to the attention of the Institute any mineral deposits whose quality or uses might be determined through laboratory investigations. In turn, the Institute supplies the State Geological Survey with needed analytical information on mineral specimens submitted as an aid in determining the potentialities of certain deposits.

COOPERATION WITH STATE DEPARTMENTS

Natural Resource Board - The State Geological Survey stands ready to cooperate with the Natural Resource Board in any possible mann er on the mineral resources of the State or in engineering or ground water problems on which geology has a bearing. The Geological Survey has supplied data on mineral deposits, made examinations of potential damsites, conferred on ground water problems, and participated in public conferences held over the State on natural resources. In turn, the Natural Resource Board paid most of the cost of compiling and printing Geological Survey of Wyoming Bulletin 50, "Mineral Resources of Wyoming".

Commissioner of Public Lands - Prior to the issuance of permits for the collection of fossils in Wyoming, which are obtained from the State Commissioner of Public Lands, the endorsement of the State Geologist is necessary. The Geological Survey also has been called upon to offer opinions on mineral associations in respect to State mineral leases. These are strictly geological matters, and each one appears to constitute an individual problem.

In addition, the Geological Survey advised on and materially contributed to the revision of State mineral leases.

State Highway Department - From time to time the Geological Survey is asked to collaborate on problems in engineering geology which confront the Highway Department.

State Game and Fish Commission - Through the years the Geological Survey has assisted the Game and Fish Commission, principally on problems of water supply for hatchery use or in dam site investigations.

Oil and Gas Conservation Commission - The State Geologist, by law, is a member of the Oil and Gas Conservation Commission.

OIL WELL SAMPLE LIBRARY

The Geological Survey has in its oil well sample library the most important collection of Wyoming oil well samples in the Rocky Mountain region. The collection has been accumulated through the collaboration of oil companies operating in Wyoming who have donated samples and cores with the belief that they will be properly cataloged, cared for, and preserved for the future at the University. During the biennium 1,500 square feet of shelving was erected in the basement of Geology Hall. Two students have worked part time in cataloging and storing the sets of samples and cores, but a great deal of work remains to be done before the collection is in finished order.

PUBLIC EDUCATION

Wyoming industrial rock and mineral sets - Sets of 16 important Wyoming rocks and minerals have been prepared in special compartmented boxes. Composition, properties, uses, and occurrences are given inside the lid. These sets are available to Wyoming secondary schools for instructional purposes. A simplified brochure on Wyoming mineral resources has been prepared for use in conjunction with the sets of specimens. In order to fill the many requests received from out-of-state teachers, school children, and other interested persons for specimens of Wyoming rocks or minerals, special sets of two specimens have been prepared.

Tourist information - Many tourists planning to visit Wyoming are amateur mineralogists and prior to their visits ask for information on the occurrence of mineral specimens in the State. A pamphlet on rock and mineral localities has been prepared to fill such requests.

PUBLIC SERVICES

Office callers - Almost every day representatives of oil and mining companies or other individuals interested in mineral resources call at the Geological Survey offices. One of the most effective points in handling such

callers is that here in one building such persons may take advantage of advice and information available from the staffs of the State Geological Survey, the U.S. Geological Survey and the Department of Geology of the University. In addition, it is possible for such persons to confer also with other agencies located on the campus, such as the Bureau of Mines Petroleum Research Center, the Natural Resources Research Institute, the Engineering College, or other departments.

Correspondence - A large volume of inquiries seeking information on Wyoming mineral resources, petroleum geology, and geology in general is received daily by the office. Properly answering this mail constitutes a rather imposing chore.

Topographic sheets - The Geological Survey carries a supply of the topographic maps covering Wyoming. These are useful to hunters, fishermen, campers, prospectors, ranchmen and others, and many copies are distributed each year.

Air photos - The entire State has aerial photographic coverage, but because of the cost of such photos, it has been impossible to purchase more than a fraction of all the available ones. It is hoped that by adding to the air-photo library from time to time, it will eventually be possible to obtain complete coverage. These photographs are very useful to anyone seeking information on surface features, or the geology, of specific areas.

PUBLICATIONS, MAPS AND REPORTS

Geological examinations have little value unless the accumulated information is made available to the public. Every effort has been made to publish printed reports on the results of projects of any magnitude. About 400 copies of each publication are deposited in libraries in the United States and foreign countries. Other copies are distributed to individuals, corporations, agencies, and others on request.

Along with increased activity in petroleum exploration in Wyoming and with the intensive prospecting for uranium, there has been an increased demand for our publications. Many of the earlier ones are now out of print and not available for distribution.

Printed documents - The following documents were published by the Geological Survey of Wyoming during 1957-59.

"Stratigraphy of the Sundance, Nugget and Jelm formations in the Laramie Basin", Geol. Survey Wyo. Bull. No.47, by G.N. Pipiringos

"Geologic history and structure of Wyoming", Geol. Surv. Wyo. Contrib. No.18, by H.D. Thomas

Papers published in periodicals - The following papers were published in periodicals during the biennium:

"Geological history and petroleum geology of Wyoming", Interstate Oil Compact Commission Bulletin, Vol. XVI, No. 1, 1957, pp. 13-16, by H. D. Thomas

"Wyoming oil prospects", World Oil, Vol. 147, No. 1, July, 1958, pp. 83-88, by H. D. Thomas

Papers in press - The following papers have been completed, edited, and are currently being printed:

"Structure and petrology of the northern Big Horn Mountains, Wyoming", Geol. Survey Wyo. Bull. No. 48, by Frank Osterwald

"Mineral Resources of Wyoming", Geol. Survey Wyo. Bull. No. 50, by Frank and Doris Osterwald, Joseph Long and William H. Wilson

"Radioactive mineral deposits of Wyoming", Geol. Survey Wyo. Rept. Investigations No. 7, by William H. Wilson

Papers in manuscript form - The manuscript of the following paper has been edited by the U. S. Geological Survey and is being given final revision by the authors. It will be ready for publication in 1959.

"Titanium-bearing black sandstone deposits of Wyoming", Geol. Survey Wyo. Bull. No. 49, by R. S. Houston and John Murphy

U. S. Geological Survey cooperative publications - Since the beginning of cooperative work with the Fuels Branch of the U. S. Geological Survey, 37 maps and charts pertaining to the geology of Wyoming have been printed. Those issued during the period 1957-59 are:

"Geologic map of anorthosite areas, southern part of Laramie Range, Wyoming", U.S. Geol. Survey Mineral Investigations Field Studies Map MF119, by W. H. Newhouse and A. F. Hagner, 1957

"Geology of the Du Noir area, Fremont County, Wyoming", U.S. Geol. Survey Prof. Paper 294-E, by W. R. Keefer, 1957

U. S. Bureau of Mines cooperative publications - The following reports published by the Bureau of Mines were prepared in cooperation with the Geological Survey of Wyoming:

"The mineral industry of Wyoming -- 1955", preprint, Bureau of Mines Mineral Yearbook, 1955 (1957)

"The mineral industry of Wyoming -- 1956", preprint, Bureau of Mines Mineral Yearbook, 1956 (1958)

Unpublished maps and reports - Numerous unpublished maps and reports have been compiled during the biennium. These pertain to individual mineral deposits, to dam sites, and to regional geology. All are available for public inspection. During the biennium 40 students completed theses for advanced degrees, and copies of the maps or charts accompanying them are available from the Geological Survey. The texts of the theses are available in the Geology Library.

TECHNICAL MEETINGS

In order to keep abreast of new geological or technological developments, the staff has partcipated in or attended various technical meetings. During the biennium the State Geologist served on the Appointment Advisory Committee of the American Association of Petroleum Geologists, on the Committee on Secondary Recovery of the Interstate Oil Compact Commission, and on the Press Relations Committee of the Rocky Mountain Oil and Gas Association. The Assistant State Geologist served as a member of the Governors' Mining Advisory Council.

The following regional or national meetings were attended either by the State Geologist or by the Assistant State Geologist:

National Western Mining Congress, Denver, 1957, 1958
Wyoming Mining Association, Casper, 1957, 1958
Western Governors' Mining Advisory Council, Reno, Nevada, 1957
American Association Petroleum Geologists, Los Angeles, 1958
Rocky Mountain Section, A.A.P.G., Salt Lake, 1957, Casper, 1958
Interstate Oil Compact Commission, Canyon, Y.N.P., 1957, Salt Lake, 1958

The State Geologist spoke on "Petroleum exploration in Wyoming" at the 1957 Interstate Oil Compact Commission meeting and on "The future of Wyoming minerals" at the 1957 Wyoming Mining Association Meeting in Casper.

Respectfully submitted,

Horace D. Thomas

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