



East entrance to the State Bureau of Mines and Mineral Resources. The laboratories and offices of the Bureau occupy the south wing of the Research Laboratory of the New Mexico Institute of Mining and Technology.

NEW MEXICO INSTITUTE OF MINING AND TECHNOLOGY

E. J. Workman, President

STATE BUREAU OF MINES AND MINERAL RESOURCES

Alvin J. Thompson, Director

BIENNIAL REPORT

FOR THE FISCAL YEARS ENDING

30 JUNE 1957-1958

Prepared by  
the Director

SOCORRO

1958

## THE REGENTS

### NEW MEXICO INSTITUTE OF MINING AND TECHNOLOGY

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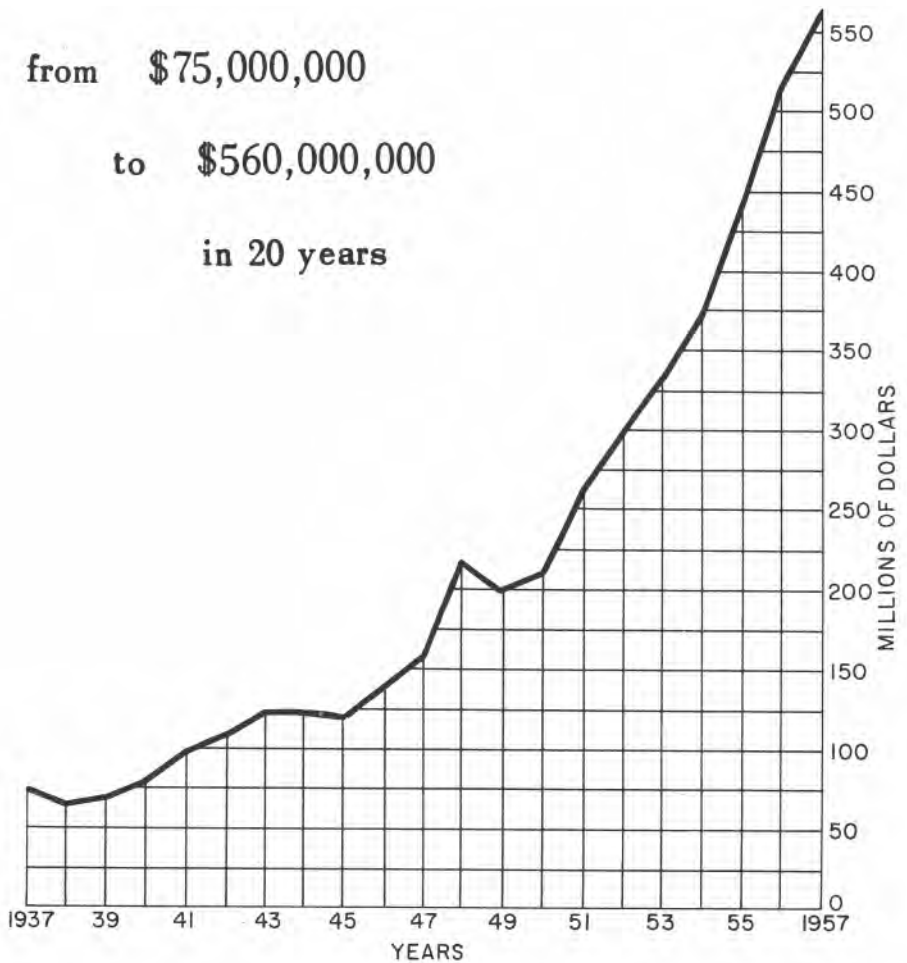
I have the honor of transmitting to you the Biennial Report of the State Bureau of Mines and Mineral Resources for the years ending June 30, 1957-1958, as required by Section 3, Chapter 115, of the session laws of the Eighth State Legislature, approved March 4, 1927.

Respectfully submitted,

E. J. WORKMAN

President

from \$75,000,000  
to \$560,000,000  
in 20 years



## ANNUAL MINERAL PRODUCTION IN NEW MEXICO

## FOREWORD

During the past 2 years the annual rate of mineral production in New Mexico has reached and exceeded the half-billion-dollar mark. The growth has been rapid and almost phenomenal in recent years. With this growth, the minerals industry has come to play a uniquely important part in the State's economy.

The total valuation of property in New Mexico is assessed currently at around a billion dollars. About a third of this sum is assessed to the minerals industry. Payments by this industry for the support of the State government are in excess of 50 million dollars annually, and account for well over one-third of the total revenue received by the State from all sources, exclusive of Federal grants. This does not take into account the indirect revenue accruing to the State from taxes paid by employees and those engaged in supporting industries.

The activities of the New Mexico Bureau of Mines and Mineral Resources are summarized in this report to show the efforts expended in aiding the minerals industry in its maintenance and growth. During the past biennium the Bureau has received from the State very close to a quarter of a million dollars a year. This annual appropriation amounts to only 0.05 percent of the value of the yearly mineral production within the State, and to about 0.5 percent of the State's direct revenue from the minerals industry.

The benefits derived by the State from the activities of its Bureau of Mines are not directly measurable. It is believed, however, that the State is receiving an ample return from the money expended.

## GENERAL STATEMENT

The program of the State Bureau of Mines and Mineral Resources is designed to serve all the residents of New Mexico. The Bureau was established in 1927, by an act of the Eighth State Legislature, as a division of the New Mexico School of Mines. This act was so broad in its scope and so farsighted that no further legislation has been necessary to enable the Bureau to meet the great changes in the population and economy of New Mexico and the remarkable advances in technological development that have taken place in recent years.

In establishing the Bureau of Mines, the Legislature defined the objects and duties of this new State agency as follows:

(1) To collect, to compile and to publish statistics relative to New Mexico, geology, mining, milling, metallurgy and oil and natural gas and the refining thereof.

(2) To collect typical geological and mineral specimens and samples of products; to collect photographs, models and drawings of appliances used in the mines, mills, smelters, oil wells, natural gas wells and the refineries of oil and natural gas in New Mexico.

(3) To collect a library and bibliography of literature pertaining to the progress of geology, mining, milling, smelting and the production of oil and natural gas and refining the same in New Mexico.

(4) To study the geological formations of the state with special reference to their economic mineral resources, both metallic and nonmetallic.

(5) To examine the topography and physical features of the state with reference to their practical bearing upon the occupation of the people.

(6) To study the mining, milling, smelting operations and oil and natural gas production and the refining of the same carried on in the state with special reference to their improvement.

(7) To prepare and publish bulletins and reports with the necessary illustrations and maps, which shall embrace both a general and detailed description of the natural resources and geology, mines, mineral deposits, both metallic and nonmetallic, oil wells, natural gas wells, reduction plants, smelters, mills, oil refineries and natural gas refineries.

(8) To make qualitative examinations of rocks and mineral samples and specimens.

(9) To assist in the education of miners and prospectors through lectures and publications.

(10) To consider such other kindred, scientific and economic problems and questions as in the judgment of the Board shall be deemed of value to the people of the state.

(11) To communicate special information on New Mexico geology, mining, both metallic and nonmetallic, oil and natural gas and to serve as a bureau of exchange and informa-

tion on the mineral, oil and natural gas resources of New Mexico.

(12) To cooperate with the University of New Mexico, with the state mine inspector and with other departments of state government as may be mutually beneficial and to cooperate with the United States geological survey and with the United States bureau of mines in accordance with the regulations of those institutions.

The Bureau of Mines and Mineral Resources is the only State organization charged with the duty of investigating, studying, and reporting on the geology of the entire State, as well as on all types of mineral resources, such as uranium, oil and gas, coal, metallic and nonmetallic minerals, and ground water. Having no regulatory or law-enforcement functions, the Bureau is free to cooperate impartially with all companies, individuals, agencies, and institutions, acting as a clearinghouse in receiving and sharing nonconfidential information.

In its capacity as an agency concerned with collecting and disseminating information on the mineral resources of New Mexico, the Bureau of Mines and Mineral Resources is engaged in three types of activity: Pure research, applied research, and service work. Pure research has included such projects as the laboratory study of feldspars, the study of stratigraphic relations on a local and regional basis, and the study of characteristics of stream gradients and channels. At the other extreme, several staff members devote a significant part of their time to service work, which includes answering questions pertaining to the geology and mineral resources of New Mexico, identifying mineral specimens brought in by prospectors and rockhounds, and otherwise making practical use of previous and current research.

Many of the projects of the Bureau, however, lie between and overlap these extremes, involving practical research applied to problems of interest to the minerals industry. These projects have been mostly geological in nature. For several years a considerable amount of time has been devoted to detailed studies of key areas in New Mexico. The geology of approximately 2,400 square miles has been mapped in detail by the Bureau of Mines in the past biennium. General or reconnaissance studies have covered larger areas. Reconnaissance maps for about 8,700 square miles have also been published during the same period.

Other regional studies include the significance and sequence of late Cretaceous and Cenozoic volcanic rocks (of ultimate value to the mining industry) and the correlation of Paleozoic formations (of importance to the petroleum industry). Reports such as Bulletin 41 on Puertecito quadrangle, and Bulletin 48 on the Cerrillos area, are basic to the larger understanding of volcanic rocks. The memoir on the San Andres Mountains is an example of basic studies of stratigraphy.





San Andres Mountains

In addition to its independent activities, the Bureau gives what assistance it can to other State, Federal, or private agencies which are working in the New Mexico minerals industry field. It helps in the accumulation and publication of data in studies made by professors and students in the geology and engineering departments of the New Mexico Institute of Mining and Technology. Cooperative projects have been completed, and others are in progress, between the Bureau and the U. S. Geological Survey in ground-water surveys and geologic mapping. An active part is taken by Bureau staff members in projects sponsored by engineering and geological professional societies which it is believed will add to the knowledge of the State's mineral resources and improve its minerals economy.

The Bureau often aids, in a manner and to an extent consistent with general State policy, in projects initiated by private agencies. Geologists and mineral engineers serving with industry or working as consultants have made important contributions to the understanding of New Mexico's geologic features and mineral resources. Consistent with the policies of the private agencies involved, the Bureau endeavors to accumulate and make available to others the information so obtained.

Information-obtained by the Bureau of Mines is made available to the public through: (1) Published reports; (2) consultations with prospectors, rockhounds, and geologists at the Bureau's offices or in the field; (3) papers presented at meetings of professional organizations; (4) participation in field trips of geological societies; and (5) talks given before community organizations in various parts of the State.



An Early Drilling Operation in the Shiprock Area

## DEPARTMENTAL ACTIVITIES

### Petroleum Industry

The petroleum industry is a significant part of the economy of New Mexico. In addition to indirect contributions to the petroleum industry through its program of geologic field and laboratory projects, the State Bureau of Mines and Mineral Resources performs important direct services to this industry.

Accurate records of more than 20,000 test wells drilled in the State are on file at the Bureau. New records are being added to this file at the rate of about 2,000 wells per year. Information from these records is compiled annually for publication as circulars on oil and gas tests, and on petroleum developments; and county maps are prepared which show the locations of wells drilled for oil and gas.

Drillers' logs on more than 7,200 wells are duplicated and offered for sale. At least 100 such logs are sold each month.

Probably the most important service performed by the Bureau in the petroleum field is the maintenance of a well-sample library. Representative samples of the various rocks penetrated during the drilling of a test well are stored in this library, providing an extremely valuable source of subsurface geological information. From the microscopic study of sample cuttings, the depth of producing horizons and the type of oil reservoir can be determined. Information from well cuttings is used in correlating geologic formations, constructing cross-sections, and determining subsurface conditions in general. The charting of subsurface information on maps helps to indicate the location of structural and stratigraphic traps which may be future oil and gas pools. With the continued advance of the science of petroleum geology, the sample library will become even more valuable as a source of information on abandoned areas which are and will be capable of future production under new and improved techniques.

Present storage facilities for the well-sample library are grossly inadequate; samples are stored in two separate rooms of the Research Building and in a temporary warehouse some distance from the Bureau's offices. More than 4,600 test wells are represented by samples in the library, and samples from nearly 300 new tests are added each year. The average oil test costs about \$50,000 to drill, and in most cases the samples are the only tangible result. The Bureau is able to obtain without cost samples of all tests drilled in the State. However, the Bureau requests samples only of wells that are located a mile or more from wells already represented. Even with this selectivity of



Anaconda's Jackpile Mine

1 well in 8, storage facilities are overtaxed and inconvenient. The ultimate solution should be to store all samples in one room adjacent to a small laboratory in which the staff and visitors can study the material, and adjacent to the offices and files of the Bureau's petroleum department. Such facilities are included in the Minerals Industry Building being proposed by the Bureau.

At least 100 visitors come to Socorro each year to study the drilling records and to examine samples from one or more test wells. In addition, another 100 to 150 interested persons avail themselves of the Bureau's services through correspondence and telephone calls. These persons include representatives of oil companies and of Federal and State agencies, consulting geologists, independent operators, businessmen, drillers, lease brokers, and landowners. Through study of data on file and through discussion with members of the staff, such persons seek geological and other information on wells that have been drilled, assistance in the identification of well cuttings, estimates as to depths to certain formations, and any other information which will help them arrive at decisions in regard to the leasing of land, investments, and evaluation of areas as to petroleum possibilities. In serving these various groups, the Bureau assists and encourages the petroleum industry of New Mexico.

### Mining

If New Mexico is to continue as a leading minerals-producing State, its dwindling ore reserves must be replenished through new discoveries. Exploration should be encouraged and assisted wherever economic discovery is promising.

The principal function of the Bureau's mining engineer has been to advise prospectors and small mine operators throughout the State. In spite of the tremendous strides which have been made in the field of exploration, prospectors continue to make most of the new discoveries. The recent uranium boom is a good example of the tremendous value of the individual prospector.

The mining engineer gives technical assistance to those prospectors who request aid. This assistance may take the form of giving advice "on the ground" at the prospect, office discussions, or answering the many inquiries received by mail. The more specialized members of the staff frequently assist in this task when the problems deal with a particular area or field of interest in which they are expert.

Bulletin 39, Metal Resources of New Mexico and Their Economic Features, has been widely distributed and well received through-



out the mining industry. The bulletin has been useful to mining companies and prospectors because practically every metal mine in the State is briefly described.

A series of four maps, showing the locations of the principal metal, nonmetal, and fuel deposits, and the land status of the State, has been prepared under contract with the Southwest Research Institute, San Antonio, Texas. The maps, which have been printed by the Bureau, became available for distribution shortly after the close of this biennial period. These maps will be of interest and service to the general public as well as to those in the minerals industry.

The Bureau of Mines has prepared and submitted a report on the use of water in the minerals industry of the Rio Grande and San Juan Basins. The report, made under contract with Resources for the Future, Inc., an agency of the Ford Foundation, is one of a series of reports on the use of water by various industries. Other State agencies and universities are participating in the program. The purpose of the series is to evaluate present and future water requirements of the Rio Grande and San Juan Basins.

Field study of the ore deposits in Lincoln County is nearing completion, and a circular will be published containing descriptions of the many deposits in the county. Lincoln County presently does not produce a significant amount of ore, but it has a wide variety of deposits, both metallic and nonmetallic.

Plans have been made to start field investigation of the uranium mines in the Grants district in McKinley and Valencia Counties during the summer of 1958. The study will include the geology, mining methods, and milling practices of the district. It is hoped that the mining companies of the area will assist in this project by supplying pertinent information relative to their operations. The entire study will take approximately 2 or 3 years to complete and publish, but the information gained in the field will be of immediate use to the Bureau's mining engineer in advising prospectors and new mine operators.

The pamphlet entitled New Mexico's Underground Resources, first released in 1954, has been revised and was reprinted for public distribution near the end of the biennial period. The aim of the pamphlet is to help the public recognize the economic importance of the minerals industry.

Geologic mapping, which is a large part of the Bureau's effort, provides the best exploration tool for prospectors and the exploration departments of the large mining companies. Through the publication of geologic maps and accompanying reports, the Bureau makes available to the mining industry important information relating to the geology of given areas within the State. Such maps, by showing the out-

crop pattern of the various rock types and the geologic structure and age relationships of the areas studied, are helpful in determining ore-bearing potentialities.

All quadrangle studies made by the Bureau include descriptions of the known ore bodies in the area mapped and the factors which influenced their deposition. This information is of great value to persons engaged in finding similar ore deposits in that vicinity.

### Ground Water

Ground water in New Mexico continues to be a basic resource, growing in importance with the increase in population and with the expanding economy. Agricultural needs are mounting as additional areas are irrigated from wells and as older areas are expanded. Further, an increase in water consumption may be expected as agriculture turns to more concentrated methods of farming.

Although the State Engineer Office and the Ground-water Branch of the U. S. Geological Survey carry on the major part of ground-water investigation in New Mexico, the New Mexico Bureau of Mines and Mineral Resources has been engaged in a number of ground-water projects and has participated with the U. S. Geological Survey in additional studies.

Major field studies undertaken by the Bureau include the hydrology of the Tucumcari area and the ground-water resources of Union County. A manuscript representing the Tucumcari project is being edited for publication. Field work on the Union County study is completed. The geologic map is being prepared for printing, and the manuscript on the geology of the county is ready for editing. The well records and hydrologic maps are essentially compiled.

A preliminary report (Circular 46) has been issued on irrigation wells near Clayton. This report was written for ranchers and farmers. The text and illustrations were reprinted in the Union County Leader. The Clayton area was selected because of recent seismic exploration by oil companies in the vicinity; study of the logs of shotholes drilled in such activity made it possible to map buried valleys, which are capable of supplying irrigation wells.

In the fall of 1956, on request of the Governor's Office, an investigation was undertaken at Las Vegas in the interest of the State Mental Hospital and the Meadows Home for the Aged.

As a part of his regular duties, an effort is being made by the hydrologist to keep abreast of developments in the Socorro valley. A





Large Spring Near Santa Rosa

report on the Socorro-Magdalena area has been placed on open file and may be published in two volumes; for the statistical treatment of the chemistry of ground water in this area a separate publication is planned.

Some 60 visitors were received during the biennium, and letter replies to requests (oral, written, or telephoned) numbered about 25 per year. These letters ranged from brief notes to lengthy replies which could not be prepared without field investigation. Reports prepared for the Cuba Independent Rural Schools and the Sacramento Boy Scout Camp are two cases in which field investigations were required.

The ground-water hydrologist collaborates with scientists of the Research and Development and College Divisions of the Institute in the development of new and improved techniques of discovering subsurface water and of studying its movement underground.

During the biennium, the ground-water section acquired a portable submersible pump, trailer-mounted, which is used for production tests of low-capacity wells and for collecting water samples from wells of 4 inches or more in diameter. This equipment, which was assembled at the Institute, has given substantial impetus to the quality-of-water program.

Under a cooperative agreement with the Quality of Water Branch of the U. S. Geological Survey, water samples submitted by the Bureau are analyzed by the U. S. G. S. The contract requires that only half the cost of chemical analysis be borne by the State.

The cooperative agreement with the Ground Water Branch, for which a special appropriation of \$10,000 per year has been authorized for some years by the Legislature, continues in effect. The most recent publication resulting from this program is Ground Water Report 5, Geology and Ground-Water Resources of Torrance County, New Mexico. The detailed report on ground-water resources of the Santa Fe area, prepared in cooperation with the U. S. Geological Survey and the Research and Development Division of the Institute, will be published shortly by the Geological Survey. Reports on Quay County, southern Lea County, and eastern Valencia County are being completed by U. S. Geological Survey personnel under this same agreement. An increase in appropriation for this program is highly desired in order to accelerate its progress and cover the rising costs, which in the past several years have tended to retard the rate at which such studies can be made. At the present pace, the entire State may not be covered for many years.



### Homestake Sapin Mill, Grants, New Mexico

Uranium ore from the Ambrosia Lake district is now being treated in this new plant (capacity, 1,500 tons per day) owned by the Homestake Sapin Partners. Part of the mill of the Homestake New Mexico Partners is also visible (upper left). (Photograph courtesy of Homestake Sapin Partners.)

## Metallurgy

The primary need of the New Mexico Bureau of Mines and Mineral Resources is for space and equipment for testing and research on New Mexico ores and mineral products. Currently it is necessary for those engaged in mining in the State to solicit the aid of outside agencies for research and testing on newly discovered or refractory ores, even though New Mexico mineral production is considerably in excess of that of any of the neighboring States of Arizona, Colorado, and Utah, where much of the research and testing on New Mexico ores has been performed.

In addition to providing facilities whereby testing and research on specific ores can be contracted, it is believed that the Bureau of Mines should be actively engaged in studies relating to the general problems of the industry. This would include research on ores that at present are of too low grade or too refractory to be considered commercial.

In the fall of 1956, plans were drawn up for a \$400,000 Bureau of Mines building to house a metallurgical laboratory and to provide space for other Bureau activities for which the present accommodations are inadequate. Funds for this building were requested as part of a general school-bond-issue bill which was proposed in the 1957 Legislature but not enacted. The Bureau expects to propose that funds be made available for this urgently needed building by the next Legislature.

During the summers of 1957 and 1958, when classes were not in session, the Bureau carried on research projects in the small student metallurgical laboratory of the College Division.

In the summer of 1957, the Bureau cooperated with a New Mexico potash company in the treatment of a refractory potash ore. This was the first time that the Bureau has entered into a cooperative program with a mining company in metallurgical testing or research. This activity was without expense to the State, as all costs, including staff time, were paid by the cooperating company. Considerable information of value both to the mining company and to the Bureau was accumulated.

In the summer of 1958, the Bureau experimented with the use of newly developed organic compounds as flotation collectors on various New Mexico ores. It is hoped that this work will result in improved methods for treating some of the refractory copper, zinc, and manganese ores in the State.

Although some work can be continued in the College Division laboratory during periods when classes are not in session, such an ar-

rangement is neither efficient nor adequate. The Bureau's activities in the important field of metallurgical research will have to be curtailed greatly until a separate laboratory for the Bureau is provided.

Any support which the State may provide for such activities of the Bureau will enhance greatly the basic economy of the State and yield returns which will far more than offset the financial outlay required.

### Petrology and Mineralogy

The Bureau's mineralogist-petrographer devotes his time to service work and research. Rocks and minerals, including core samples from oil tests, are submitted to the Bureau for identification. The identification is effected by chemical tests, microscopic study, or in some instances by X-ray analysis. The importance of this service is indicated by the large number of samples received. In addition, the mineralogist has carried on independent research on rocks and minerals.

Though many aspects of the study of rocks and minerals are theoretical, much of this work is of direct practical value. Several of the staff members participate in such activity.

### Stratigraphy and Paleontology

A primary function of the Bureau's paleontologist is the determination of the proper succession of rock units throughout the State, their regional variation from place to place, and their fossil content, the latter serving to fix the age and permit correlation of units whose continuity is interrupted by erosion or by cover of other formations. Such work is of great practical value to mining and petroleum engineers in their study of the location of mineral deposits. Certain formations are more favorable as locations for petroleum or natural gas accumulations, others for uranium, and still others for various metals and nonmetals.

## ACTIVE PROJECTS

In addition to the projects which have been completed by the publication of a final report, as listed under Publications, and those listed as being in press or preparation, the Bureau of Mines has 37 active projects:

- Carrizozo quadrangle, Lincoln County, by R. H. Weber.
- Capitan quadrangle, Lincoln County, by J. E. Allen.
- Stratigraphic study of the Sacramento Mountains area, by L. C. Pray.
- Winston and Sugarloaf Mountain quadrangles, by R. H. Jahns.
- Big Hatchet Peak quadrangle, by R. A. Zeller, Jr.
- Las Cruces quadrangle, by F. E. Kottowski.
- Stratigraphic study of La Luz area, by Carl Otte.
- Mt. Sedgwick quadrangle, by C. T. Smith.
- Pelona NE. and Pelona NW. quadrangles, by C. E. Stearns.
- Ojo Caliente area, Rio Arriba County, by R. H. Jahns and C. T. Smith.
- Iron Mountain tungsten, Sierra County, by R. H. Jahns.
- Pennsylvanian stratigraphy, by L. M. Cline.
- Pyramid Mountains, Lordsburg quadrangle, by F. R. Flege.
- Pennsylvanian stratigraphy and paleontology, Mud Springs Mountains, by J. L. Gehrig.
- San Diego Mountain quadrangle, by F. E. Kottowski.
- Walnut Wells quadrangle, by Allen Alper.
- Gila River area, by C. H. Hewitt.
- Engle NE. quadrangle, by Eugene Cserna.
- Cebolla NW. and Cebolla SW. quadrangles, by W. R. Muehlberger.
- Bueyeros area, Harding County, by C. J. Mankin.
- Truchas region, by Arthur Montgomery, J. P. Miller, and P. K. Sutherland.
- Clay minerals in Cretaceous rocks, by M. E. Willard.
- Pennsylvanian sections in New Mexico, by M. L. Thompson.
- Exsolution of feldspars, by F. J. Kuellmer.
- Mimbres quadrangle, by F. J. Kuellmer.
- Structure and volcanic sequence northeast of Lordsburg, by Fr. D. L. Ballman.
- Paraje (30-minute) quadrangle, by J. H. Schilling.
- Reserve (30-minute) quadrangle, by R. H. Weber and M. E. Willard.
- Florida Mountains, by C. L. Balk.
- Ghost Ranch and Echo Amphitheater (7-1/2-minute) quadrangles, by C. T. Smith.

- Pelona (30-minute) quadrangle, by C. E. Stearns and M. E. Willard.
- Geology and ground-water resources of Union County, by F. X. Bushman and B. Baldwin.
- Geology and ground-water resources of Quay County, by C. F. Berkstresser, Jr.
- Ground water in the structural basin west of Tucumcari, by F. X. Bushman and Frederick Trauger.
- Geology and ground-water resources of southern Lea County, by Alexander Nicholson.
- Gypsum deposits in New Mexico, by R. H. Weber and F. E. Kottlowski.
- Geology and ground-water resources of eastern Valencia County, by F. B. Titus, Jr.



## Montage of Bureau of Mines Publications

The issuing of bulletins, memoirs, circulars, and other publications is an important part of the Bureau's program.



## PUBLICATIONS

The accomplishments of the New Mexico Bureau of Mines and Mineral Resources for the past 7 years are summarized in large part by the publications of the past biennium. The extensive list of publications represents work on a number of projects that were begun some years ago. A major effort has been made during the biennium to edit manuscripts and draft maps and illustrations, in order to make available to the public in printed form the results of field studies previously undertaken.

Manuscripts of reports have been reviewed by various staff members, under the direction of Max E. Willard, who has served as geologic editor. All reports have been prepared for the printer by Edmund H. Kase, Jr., publications editor of the Institute. Prof. Howard E. Sylvester, head of the department of humanities, gave considerable editorial assistance in the summer of 1957, and Miss Joann Kellogg has provided invaluable help in proofreading, indexing, and editing.

### Bulletins

Bulletins of the New Mexico Bureau of Mines and Mineral Resources are the main medium of publishing technical reports. The format established in 1953 has been followed with only minor modifications.

Published during the biennium:		Counties covered
38	<u>Geology and mineral resources of Dwyer quadrangle, Grant, Luna, and Sierra Counties, New Mexico, by W. E. Elston</u>	Grant, Luna, Sierra
39	<u>The metal resources of New Mexico and their economic features through 1954, by E. C. Anderson</u>	
41	<u>Geology of Puertecito quadrangle, Socorro County, New Mexico, by W. H. Tonking</u>	Socorro
45	<u>Precambrian and Tertiary geology of Las Tablas quadrangle, New Mexico, by Fred Barker</u>	Rio Arriba
48	<u>Geology of the Cerrillos area, Santa Fe County, New Mexico, by A. E. Disbrow and W. C. Stoll</u>	Santa Fe
49	<u>Permian sedimentary facies, central Guadalupe Mountains, New Mexico, by D. W. Boyd</u>	Otero, Eddy
51	<u>Geology of the Questa molybdenum (Moly) mine area, Taos County, New Mexico, by J. H. Schilling</u>	Taos



- |    |   |                      |
|----|---|----------------------|
| 52 | <u>Bibliography of New Mexico geology and mineral technology, 1951-1955</u> , by C. F. Schilling and J. H. Schilling                        |                      |
| 53 | <u>Geology of Questa quadrangle, Taos County, New Mexico</u> , by P. F. McKinlay  | Taos                 |
| 54 | <u>Volcanic rocks of the Cienega area, Santa Fe County, New Mexico</u> , by M.-S. Sun and Brewster Baldwin                                  | Santa Fe             |
| 55 | <u>The Pelican area, Palomas (Hermosa) district, Sierra County, New Mexico</u> (preliminary map issue), by R. H. Jahns                      | Sierra               |
| 56 | <u>Geology and mineral resources of Mesa del Oro quadrangle, Socorro and Valencia Counties, New Mexico</u> , by H. L. Jicha, Jr.            | Socorro,<br>Valencia |
| 57 | <u>Geology of the central Peloncillo Mountains, Hidalgo County, New Mexico, and Cochise County, Arizona</u> , by Elliot Gillerman           | Hidalgo              |
| 58 | <u>Geology of Dog Springs quadrangle, New Mexico</u> , by D. B. Givens  | Socorro              |
| 59 | <u>Wall-rock alteration in the Cochiti mining district, New Mexico</u> , by W. M. Bundy   | Sandoval             |
|    | In press or preparation:  |                      |
| 46 | <u>Topical study of lead-zinc gossans</u> , by W. C. Kelly  |                      |
| 50 | <u>Late Pennsylvanian and early Permian stratigraphy of the northern Sacramento Mountains, Otero County, New Mexico</u> , by Carl Otte, Jr. | Otero                |
| 61 | <u>Lexicon of New Mexico geologic names: Parts 1, 2, 3</u> (to supersede Circular 40), by H. L. Jicha, Jr., and Christina Lochman-Balk      |                      |

### Memoirs

Memoirs of the New Mexico Bureau of Mines and Mineral Resources are a new vehicle of publication; the first was published in 1956. The page size of the memoir accommodates large illustrations and permits monographic treatment of particular topics in a volume of convenient size.

Published during the biennium:

- |   |   |                     |
|---|---|---------------------|
|   |   | Counties<br>covered |
| 1 | <u>Stratigraphic studies of the San Andres Mountains, New Mexico</u> , by F. E. Kottowski, R. H. Flower, M. L. Thompson, and R. W. Foster | Sierra,<br>Dona Ana |
| 2 | <u>Studies of the Actinoceratida</u> , by R. H. Flower  |                     |

In press:

- |   |  |        |
|---|--|--------|
| 3 | <u>Middle Pennsylvanian brachiopods from the Mud Springs Mountains and Derry Hills, New Mexico</u> , by J. L. Gehrig | Sierra |
| 4 | <u>High mountain streams: effects of geology on channel characteristics and bed material</u> , by J. P. Miller       |        |
| 5 | <u>The Mississippian of west-central New Mexico</u> , by A. K. Armstrong   |        |

### Ground-Water Reports

Ground-water studies of large areas, usually countywide in scope, are published as ground-water reports. Most of the studies were made in cooperation with the U. S. Geological Survey. In addition to describing ground-water conditions, areas of availability of ground water, and quality of water, these reports describe the general geology of the area concerned. The treatment is less technical than in the usual bulletin report.

Published during the biennium:

Counties  
covered  
Torrance

- |   |   |
|---|---|
| 5 | <u>Geology and ground-water resources of Torrance County, New Mexico</u> , by R. E. Smith |
|---|---|

In preparation:

Santa Fe

- |   |  |
|---|--|
| 9 | <u>Geology and water resources of the Santa Fe area, New Mexico</u> , by Zane Spiegel and Brewster Baldwin, with contributions by F. E. Kottowski and E. L. Barrows, and with a section on geophysics by H. A. Winkler |
|---|--|

### Circulars

Circulars of the New Mexico Bureau of Mines and Mineral Resources include reports of interest to miners and prospectors, the petroleum industry, farmers and ranchers, and professional geologists and engineers. The ample size of the page permits the printing of moderate-sized maps and other illustrations. The circular is well suited for brief technical reports.

The circulars embrace a wide variety of subjects: (1) Annual developments in the petroleum industry, (2) lists of oil and gas tests drilled each year, (3) ground-water studies of limited areas, (4) commodity studies of particular minerals in limited areas, (5) brief technical reports, (6) miscellaneous compilations.

Published during the biennium:		Counties covered
40	<u>Lexicon of New Mexico geologic names: Part I, Precambrian and Lower Paleozoic, compiled by H. L. Jicha, Jr.</u>	
41	<u>The making of a mine, by J. E. Allen</u>	
42	<u>Subsurface completion data of wells drilled for oil and gas during 1955, compiled by R. W. Foster and C. F. Schilling</u>	
44	<u>Geology and petrography of the Stendel perlite deposit, Socorro County, New Mexico, by R. H. Weber</u>	Socorro
45	<u>Index to samples from oil and gas well tests in library at Socorro, New Mexico (January 1, 1955 to January 1, 1958), compiled by R. A. Bieberman and M. M. Dowdle</u>	
46	<u>Guides for development of irrigation wells near Clayton, Union County, New Mexico, by Brewster Baldwin and F. X. Bushman</u>	Union
47	<u>High-purity dolomite deposits of south-central New Mexico, by F. E. Kottowski</u>	
48	<u>Petroleum developments in New Mexico during 1956, by R. W. Foster and R. A. Bieberman</u>	
49	<u>Subsurface completion data of wells drilled for oil and gas during 1956, compiled by R. W. Foster, R. A. Bieberman, and M. M. Dowdle</u>	
50	<u>Petroleum developments in New Mexico during 1957, by R. W. Foster and R. A. Bieberman</u>	
51	<u>Subsurface completion data of wells drilled for oil and gas during 1957, compiled by R. W. Foster, R. A. Bieberman, and M. M. Dowdle</u>	

### Scenic Trips to the Geologic Past

The Scenic Trips series attracts attention to the scenery and geologic features of New Mexico. Some areas lend themselves to short trips radiating from one large community, whereas others are best studied along a full-day's trip. In either case, the tourist, the touring geologist, and the science club student and teacher can all profit from the summary of the geology of the area studied.

The series was initiated in 1955 as an experiment, with a description of the Santa Fe area. The Santa Fe guidebook was well re-

ceived, and three others have now been prepared. The newer guide-books summarize the history of the area in addition to the geology.

Published during the biennium:		Counties covered
2	<u>Taos - Red River - Eagle Nest, New Mexico; Circle Drive, by J. H. Schilling</u>	Taos, Colfax
3	<u>Roswell - Capitan - Carrizozo - Ruidosa Loop Drive, by J. E. Allen and F. E. Kottlowski</u>	Chaves, Lincoln
In press:		
4	<u>Southern Zuni Mountains, by R. W. Foster</u>	McKinley, Valencia

### Geologic Map Series

The Geologic Map series was inaugurated in 1956 and has already become an important medium of geologic publication. The series is designed for those areas that have been mapped geologically, but for which no written report is planned. The explanation of geologic units is expanded more than has been customary, to offset the absence of an accompanying text.

Most of the maps published to date in this series come from reconnaissance geologic mapping in southwestern New Mexico, and the first few maps are listed in the "Thirty-Minute Quadrangle Series." The mapping was done for the new "Geologic Map of New Mexico," which will be on the small scale of 1/6 inch to the mile. The 30-minute quadrangle maps are on a larger scale of 1/2 inch to the mile and therefore show more detail than the State map.

Published during the biennium:		Counties covered
1	<u>Hillsboro Peak (30-minute) quadrangle, compiled by F. J. Kuellmer</u>	Sierra, Grant, Luna
2	<u>Luera Spring (30-minute) quadrangle, by M. E. Willard</u>	Socorro, Catron
3	<u>Piñonville (30-minute) quadrangle, by M. E. Willard</u>	Catron
4	<u>Inscription Rock (15-minute) quadrangle, by C. T. Smith</u>	Valencia
5	<u>Datil (30-minute) quadrangle, by M. E. Willard</u>	Socorro, Catron
6	<u>Cañon Largo (30-minute) quadrangle, by M. E. Willard</u>	Catron
In preparation:		
7	<u>Foster Canyon (15-minute) quadrangle, by C. T. Smith</u>	Valencia, McKinley

- 8 Dog Mountains (15-minute) quadrangle, by R. A. Hidalgo  
Zeller, Jr.
- 9 Playas (15-minute) quadrangle, by R. A. Zeller, Jr. Hidalgo

### Technical Papers

The professional activity of staff members of the Bureau of Mines is presented not only in Bureau publications but also in a variety of outside publications. Much of the work is summarized in technical papers delivered at meetings of geological societies. Such papers are represented by abstracts, which are printed in scientific journals for nationwide distribution.

Guidebooks of the various local and regional geological societies have become an important source of geologic information on New Mexico. The guidebooks are prepared for field conferences on aspects of the geology of the State. Many of the Bureau's staff members have made important contributions to the preparation of these guidebooks or to the organization of the field conferences.

The technical papers of staff members are listed below:

- Anderson, E. C. (1956) Mining in the southern part of the Sangre de Cristo Mountains, N. Mex. Geol. Soc. Guidebook, 7th Field Conf., 139-142.
- Baldwin, Brewster (1956) The Santa Fe group of north-central New Mexico, N. Mex. Geol. Soc. Guidebook, 7th Field Conf., 115-121.
- \*\*----- (1958) Geologic problems of Union County, New Mexico (abs.), N. Mex. Geol. Soc., 12th Ann. Meeting, Roswell, April.
- (1958) Geologic problems of northeastern New Mexico (abs.), Geol. Soc. Am. Bull., v. 69, Golden, Colo., May.
- \*-----, and Bushman, F. X. (1957) Guides for development of irrigation wells near Clayton, Union County, New Mexico (abs.), N. Mex. Geol. Soc., 11th Ann. Meeting, Socorro, May.
- Callaghan, E., and Sun, M.-S. (1956) Correlation of some igneous rocks of New Mexico by the fusion method, Am. Geophys. Union Trans., v. 37, 761-766.
- Flower, R. H. (1956) Some paradoxes in taxonomy with special reference to the Protista, Jour. Paleont., v. 30, 700-706.
- (1956) Montoya-Bighorn-Richmond correlations (abs.), Geol. Soc. Am. Bull., v. 67, 1793-1794; Albuquerque, May.
- (1956) Age of the Red River faunas (Ordovician), Manitoba to New Mexico (abs.), Geol. Soc. Am. Bull., v. 67, 1698; Minneapolis, Minn., November.

- (1957) Nautiloids of the Paleozoic, in Treatise on marine ecology and paleoecology, v. 2, Geol. Soc. Am. Mem. 67, 829-852.
- (1957) Pre-Onate deformations in southern New Mexico (abs.), Geol. Soc. Am. Bull., v. 68, 1726-1727; Atlantic City, N. J., November.
- (1958) Cambrian-Mississippian beds of southern New Mexico, Roswell Geol. Soc. Guidebook, 11th Field Conf., 61-78.
- , and Teichert, Curt (1957) The cephalopod order Discosorida, Kansas Univ. Paleont. Contr., Mollusca, Art. 6, 1-144.
- Foster, R. W. (1956) Subsurface stratigraphy of northern Union County, New Mexico, Okla. City Geol. Soc. Guidebook, 35 Anniv. Field Conf., 136-141.
- (1957) Stratigraphy of west-central New Mexico, Four Corners Geol. Soc. Guidebook, 2d Field Conf., 62-72.
- Kottlowski, F. E. (1957) Geology along the Million Dollar Highway, N. Mex. Geol. Soc. Guidebook, 8th Field Conf., 14-26.
- (1957) Mesozoic strata flanking the southwestern San Juan Mountains, Colorado and New Mexico, N. Mex. Geol. Soc. Guidebook, 8th Field Conf., 138-153.
- (1957) Geologic road logs for routes in New Mexico, N. Mex. Geol. Soc. Guidebook, 8th Field Conf., 235-240.
- \*----- (1957) Dolomite deposits in south-central New Mexico (abs.), N. Mex. Geol. Soc., 11th Ann. Meeting, Socorro, May.
- (1958) Formation or formation, Am. Assoc. Petrol. Geol. Bull., v. 42, 893-894.
- \*\*----- (1958) Pennsylvanian rocks of southwestern New Mexico and southeastern Arizona (abs.), N. Mex. Geol. Soc., 12th Ann. meeting, Roswell, April; also Permian Basin Section of Soc. Econ. Paleont. and Mineralogists, Midland, Tex., March; also, Roswell Geol. Soc., 11th Field Conf., Deming, May.
- (1958) Pennsylvanian and Permian rocks near the late Paleozoic Florida Islands, Roswell Geol. Soc. Guidebook, 11th Field Conf., 79-87.
- (1958) Lake Otero--second phase in formation of New Mexico's gypsum dunes (abs.), Geol. Soc. Am. Bull., v. 69; Golden, Colo., May.
- , and Bushnell, H. P. (1956) Late Cretaceous and early Tertiary outcrops of Jornada del Muerto (abs.), Geol. Soc. Am. Bull., v. 67, 1798; Albuquerque, May.
- Kueller, F. J. (1957) Compositions of alkali feldspars in some igneous rocks (abs.), Geol. Soc. Am. Bull., v. 68, 1785; Atlantic City, N. J., November.

- (1958) Alkali feldspars in a Tertiary porphyry near Hillsboro, New Mexico, Jour. Geol., v. 66, 151-162.
- Muehlberger, W. R., and Baldwin, Brewster (1957) Brunton compass desensitized to give direction of magnetization of late Cenozoic basalts, northeastern New Mexico (abs.), Geol. Soc. Am. Bull., v. 68, 1771; Atlantic City, N. J., November.
- , and ----- (1958) Field method for determining direction of magnetization as applied to late Cenozoic basalts, northeastern New Mexico, Jour. Geophys. Research, v. 63, 353-360.
- Sun, M.-S. (1957) A home-made Laue camera, Norelco Reporter, Philips Electronics, Inc., Mount Vernon, N. Y., v. 3, 16.
- (1957) The nature of iddingsite in some basaltic rocks of New Mexico, Am. Mineralogist, v. 42, 525-533.
- (1957) Minerals of the Hansonburg mining district, Socorro County, New Mexico, Rocks and Minerals, v. 32, 563-564.
- , and Allen, J. E. (1957) Authigenic brookite in Cretaceous Gallup sandstone, Gallup, New Mexico, Jour. Sed. Petrology, v. 27, 265-270; also (abs.), Geol. Soc. Am. Bull., v. 68, 1873; Logan, Utah, May.
- , and Weber, R. H. (1957) Santafeite, a new hydrated vanadate from New Mexico (abs.), Geol. Soc. Am. Bull., v. 68, 1802; Atlantic City, N. J., November.
- , and ----- (1958) Santafeite, a new hydrated vanadate from New Mexico, Am. Mineralogist, v. 43.
- Zeller, R. A., Jr. (1958) Geology of southwestern corner of New Mexico, Roswell Geol. Soc., 11th Field Conf., Deming, May.

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\*Abstract printed in New Mexico Geological Society Guidebook, 8th Field Conference.

\*\*Abstract to be printed in New Mexico Geological Society Guidebook, 9th Field Conference.





### Student Assistants

Students enrolled in the College Division of the Institute under the "Cooperative Program" are given part-time employment on the campus. Some of these students are assigned to the Bureau of Mines for the performance of secretarial and other services.



## PERSONNEL

In the past biennium there have been important changes in the staff of the Bureau of Mines and Mineral Resources. Chief among these is the change in the office of director. The great majority of the professional personnel, however, have been on the staff for more than 6 years, and the new director has been associated with the Institute for 11 years.

Eugene Callaghan became director of the Bureau in September 1949 and resigned at the end of January 1957 to take a position in private industry.

Alvin J. Thompson was appointed director in February 1957. He had taught at the University of Arizona from 1935 to 1942 and had been at Battelle Memorial Institute, in Ohio, from 1942 to 1947. In 1947 he was appointed head of the department of mining and metallurgy at the New Mexico Institute of Mining and Technology. He has continued to serve in the latter capacity concurrently with his new office as director of the Bureau.

E. Carter Anderson, who had been director of the Bureau of Mines prior to September 1949, and had served as the Bureau's mining engineer subsequent to that date, retired at the end of June 1957. Bulletin 39, Metal Resources of New Mexico, compiled by Anderson and published during this biennium, is a much needed report and will serve as a lasting reminder of his important contribution to the development of the minerals economy of the State.

George B. Griswold was appointed mining engineer in June 1957. In 1955 he received his B. S. degree in mining from the New Mexico Institute of Mining and Technology. After experience at the San Manuel copper mine in Arizona, and with the Wah Chang Mining Corporation in California, he took graduate courses in mining at the University of Arizona and received the M. A. degree in 1957.

John Eliot Allen resigned from the staff in August 1956 and was made head of the department of geology at Portland State College, in Oregon. He had served in a similar position in the College Division of the Institute prior to his transfer to the Bureau of Mines in June 1952.

Henry L. Jicha, Jr. resigned at the end of May 1957 to take a position in the department of geology at the Colorado School of Mines. While associated with the Bureau, he mapped the geology of several quadrangles in New Mexico. His report on the Mesa del Oro quadrangle was published during the biennium.

John H. Schilling resigned in July 1956 to take a position with the Cerro de Pasco Corporation, in Peru. He had joined the staff in September 1954. His report on the Questa molybdenum mine was published in the past biennium.

Christina Lochman-Balk, who had joined the Bureau staff in March 1955, was transferred to the College Division in January 1957.

William E. Bertholf joined the staff in January 1958. From 1939 to 1949 he practiced as a mining engineer and geologist in the Lake Superior iron district, and received the B. S. and M. S. degrees from the University of Chicago in 1946. After taking courses in law, he received the J. D. degree from the University of Chicago in 1953. From then until 1958, he practiced as an attorney and mining consultant. His unusual combination of legal and geologic interests should enable him to make a valuable contribution to the development of the minerals economy of New Mexico.

Many students are employed part time by the Bureau of Mines. Some, particularly the graduate assistants, receive technical experience under professional members of the staff. Others help prepare illustrations and geologic maps for reports. Wives of students are employed as clerical assistants. The names of these and others who have worked for the Bureau in the past biennium are listed below.

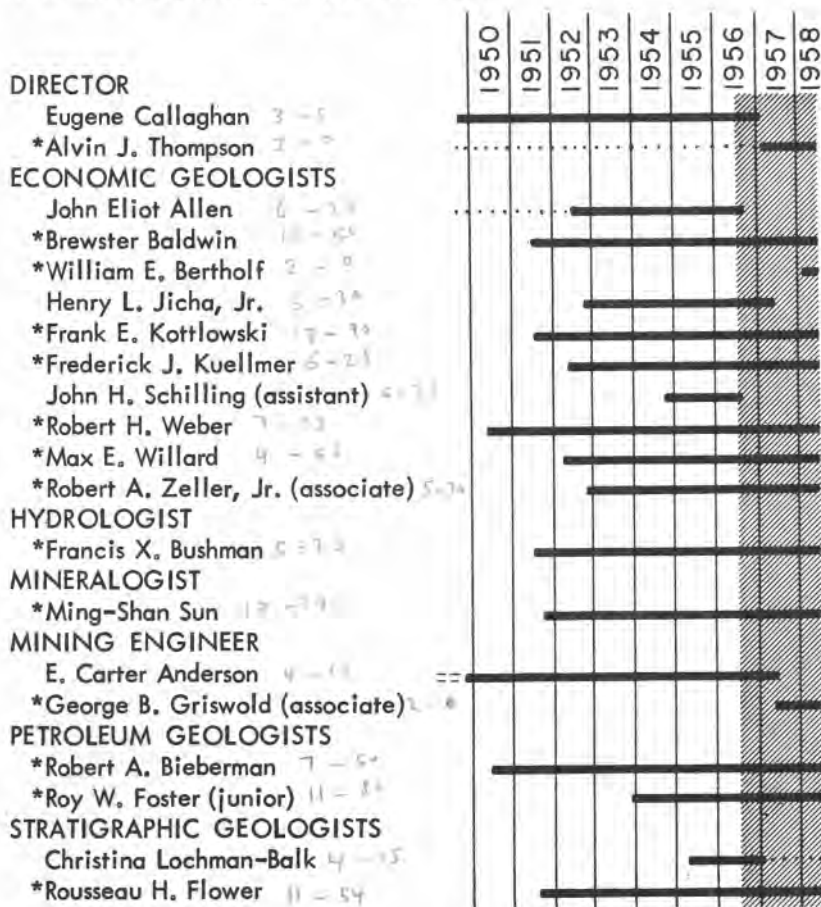


Bureau Staff

## Professional Staff

Most of the members of the professional staff of the State Bureau of Mines and Mineral Resources have served the Bureau continuously for 7 or more years. During this period the staff has become familiar with almost every part of New Mexico. Certain members, moreover, have specialized knowledge of each main field of geology. This professional group has thus become a valuable resource of the State.

Service record of members of the professional staff associated with the Bureau during the past biennium:



..... Service in the College Division.

\* Employed at end of biennium.

## Other Staff

*Arnold, William E.	Draftsman
*Chavez, Richard R.	Laboratory Assistant
Clark, Mrs. Berta S.	Clerk-Typist
Coffman, Mrs. Dora A.	Office Manager
Dowdle, Mrs. Mary M.	Clerk-Typist
*Greenwald, Mrs. Lelia C.	Office Manager
Hardin, Mrs. Janice H.	Clerk-Typist
Hawk, Harry H.	Draftsman
*Morris, Miss Myrtie M.	Secretary to the Director
Quinones, Mrs. Emena M.	Clerk-Typist
Razaghnia, Mrs. Fidelia B.	Clerk-Typist
*Richards, Mrs. Nadine D.	Clerk-Typist

## Temporary Employees

Barber, Miss Irene E.	Junior Geologist
*Caine, Mrs. Theresa M.	Clerk-Typist
*Carman, Mrs. Joyce C.	Clerk-Typist
Cobos, Rosalio	Field Assistant
Dick, Herbert W.	Field Assistant
Frische, Mrs. L. Maureen	Draftsman
Griffith, William E.	Draftsman
Hayward, Richard N.	Field Assistant
Lendenmann, Ernest C., Jr.	Draftsman
Longgood, Theodore E., Jr.	Field Assistant
McAlester, Arcie, L., Jr.	Field Assistant
*Price, Robert L.	Draftsman
Quay, Jack H.	Draftsman
Radovich, Donald	Draftsman
Scanland, Mrs. M. Louise	Clerk-Typist
Schilling, Mrs. Constance F.	Clerk-Typist

## Geologists and Engineers on Special Projects

Armstrong, Augustus K.	<sup>2</sup> University of Cincinnati
*Elston, Wolfgang E.	<sup>5</sup> University of New Mexico
Jahns, Richard H.	<sup>5</sup> California Institute of Technology
*Latvala, Woodrow J.	<sup>1</sup> N. Mex. Institute of Mining and Technology
*Muehlberger, William R.	<sup>4</sup> University of Texas
Stearns, Charles E.	<sup>3</sup> Tufts University
*Sutherland, Patrick K.	<sup>2</sup> University of Oklahoma
*Worley, Morris T.	<sup>1</sup> N. Mex. Institute of Mining and Technology

### Recipients of Field-Assistance Fellowships

Alper, Allen	Columbia University
Ballmann, Donald L.	University of Illinois
Doney, Hugh H.	University of Texas
Mankin, Charles J.	University of Texas

### Student Employees

Archuleta, Miss Angelina E.	Huang, Min-Sheng
*Baker, Miss Mary F.	*Imprescia, Richard J.
*Borys, Ronald	Jacobson, Rudolph H., Jr.
*Carman, John H.	*Kim, Young Chang
*Colclasure, Miss Ellen L.	Leamer, Richard J.
Dittmar, Ray I.	Learned, Robert E.
Edmondson, James D.	McCullough, Edgar J., Jr.
*Farrar, Miss B. Shirley	Nenno, Jack H.
Garcia, Meliton M.	Renault, Jacques R.
Gentile, Anthony L.	Scanland, M. Vaughn
*Hambleton, Arthur W.	Schrier, Gerald
*Hardt, Miss Jo Ruth	Tippin, Robert B.
Hathaway, Lawrence R.	Trujillo, Theodore G.
Houston, Samuel D.	Tucker, Darril L.
Howell, Miss Betty M.	

### Editorial Staff

*Kase, Edmund H., Jr.	McPeters, Mrs. Joanne R.
*Kellogg, Miss Joann E.	Sylvester, Howard E.

# FINANCIAL STATEMENT

The Business Manager of the New Mexico Institute of Mining and Technology, who supervises the finances of the Bureau, has submitted the following statements:

## STATE BUREAU OF MINES - GENERAL

<u>Receipts</u>	<u>1956-1957</u>		<u>1957-1958</u>	
State appropriation	\$224,091		\$249,503	
Receipts from sales of bulletins, etc.	<u>5,780</u>		<u>6,086</u>	
TOTAL revenue		\$229,871		\$255,589
<u>Disbursements and Commitments</u>				
Personal services:				
Regular salaries	122,643		126,817	
Part-time salaries	<u>28,084</u>	150,727	<u>24,942</u>	151,759
Travel and automotive:				
Travel and per diem	9,773		7,430	
Gas, repairs, and insurance	<u>3,215</u>	12,988	<u>4,456</u>	11,886
Repairs and maintenance	<u>0</u>	0	<u>2,656</u>	2,656
Supplies and materials:				
Postage and resale supplies	3,856		2,410	
Office supplies	1,803		1,720	
Laboratory and scientific supplies	<u>2,461</u>	8,120	<u>2,103</u>	6,233
Printing and reproduction	<u>22,117</u>	22,117	<u>29,297</u>	29,297
Other operating expense:				
Telephone and telegraph	1,662		1,629	
Professional services	4,435		6,774	
Retirement	3,575		3,968	
Social Security	2,517		2,640	
Overhead	9,033		10,650	
Freight, express, insurance, audit, repairs, subscriptions, etc.	<u>7,741</u>	28,963	<u>7,687</u>	33,348
Capital outlay		<u>5,249</u>		<u>8,244</u>
TOTAL expenditures		\$228,164		\$243,423
Year-end balance		\$ 1,707		\$ 12,166

# FINANCIAL STATEMENT

## BASIC GEOLOGY

<u>Receipts</u>	<u>1956-1957</u>	<u>1957-1958</u>
Beginning balance, July 1	\$ 1,419	\$ 119
State appropriation	<u>10,000</u>	<u>10,000</u>
TOTAL revenue	\$11,419	\$10,119
<u>Disbursements and Commitments</u>		
Salaries	9,300	8,579
Travel	1,000	218
Overhead	<u>1,000</u>	<u>1,000</u>
TOTAL expenditures	\$11,300	\$9,797
Year-end balance	\$ 119	\$ 322

## GROUND-WATER SURVEYS

<u>Receipts</u>	<u>1956-1957</u>	<u>1957-1958</u>
Beginning balance, July 1	\$ 470	\$ 470
State appropriation	<u>10,000</u>	<u>10,000</u>
TOTAL revenue	\$10,470	\$10,470
<u>Disbursements and Commitments</u>		
Salaries	8,000	8,000
Printing and publication	1,000	1,000
Overhead	<u>1,000</u>	<u>1,000</u>
TOTAL expenditures	\$10,000	\$10,000
Year-end balance	\$ 470	\$ 470



## MINERAL PRODUCTION IN NEW MEXICO, 1956-1957

As has been true for a number of years, petroleum products in 1957 accounted for a large part of the total mineral production in New Mexico. Compared with the preceding year, the value of such products increased \$60.6 million.

The production of potash, the next most important mineral commodity, was valued at \$75,100,000, compared with \$72,800,000 in 1956.

The value of copper production, which reached an all-time high of \$63 million in 1956, fell to \$39 million in 1957. Although there was an appreciable drop in the amount of copper produced, the drastic dropoff in valuation was mainly due to a decline in prices. The average price received for copper in 1957 was 30.0 cents per pound, compared with 42.5 cents in 1956. The value of production of the other base metals, zinc and lead, also suffered from falling prices during the year, and a consequential reduction in production rate. The value of zinc and lead produced in 1957 declined 26 percent and 19 percent respectively, compared with the preceding year.

The valuation of uranium production in 1957 remained close to what it had been in 1956. However, a marked increase in 1958, and a further increase in 1959, are anticipated. With construction of milling capacity proceeding as planned, the production of uranium concentrates should reach an annual value of several times the 1957 figure.

Coal output in New Mexico has been declining sharply since 1950. Estimated production in 1957 was 85,000 tons, a decline of 46 percent from 1956. The tonnage production of coal, which during the last few years has averaged less than 10 percent of the 1930 to 1950 yearly average, can be expected to improve in the near future. The Kaiser Steel Corporation acquired the properties of the St. Louis, Rocky Mountain and Pacific Company, in Colfax County, in 1955, and has begun a major program of rehabilitation. Considerable interest is developing in the large reserves of coal in San Juan County; substantial coal production from this area seems probable within the next few years.

Of the remaining commodities listed in the adjoining table, about half showed moderate declines, and about half moderate increases, in the value of production.

The curve on page 2 of this report shows how the total value of mineral production has been increasing markedly in recent years. The value of production since 1949 exceeds that of all the years prior to that time. There is reason to believe that this growth will continue, and that the State's mineral production may double again in the course of the next few years.

# MINERAL PRODUCTION IN NEW MEXICO IN THE CALENDAR YEAR 1957

		<u>Value*</u>
Crude oil	93.7 million bbl	
Natural gas	717.8 billion cu ft	\$385,220,000
Natural-gas liquids	652.6 million gal	
Potassium salts		
(K <sub>2</sub> O equivalent)	2,028,000 tons	75,110,000
Copper <sup>†</sup>	65,500 tons	39,300,000
Uranium (concentrates)	2,200 tons <sup>‡</sup>	35,000,000 <sup>‡</sup>
Zinc <sup>†</sup>	30,900 tons	7,110,000
Sand, gravel, and stone	8,300,000 tons	7,950,000
Manganese ore and concentrates		
(35% or more Mn)	24,400 tons	1,980,000
Lead <sup>†</sup>	5,350 tons	1,540,000
Perlite (crude)	175,000 tons	1,330,000
Helium (shipments)	69.0 million cu ft	1,200,000
Molybdenum	750 tons <sup>‡</sup>	1,000,000 <sup>‡</sup>
Pumice	312,000 tons	722,000
Salt	60,000 tons	526,000
Coal	85,000 tons	500,000
Silver <sup>†</sup>	311,400 troy oz	282,000
Lime	22,000 tons	268,000
Manganiferous ore and concentrates		
(5% to 35% Mn)	42,500 tons	152,000
Gold <sup>†</sup>	3,600 troy oz	126,000
Clays	37,000 tons	89,000
Barite	3,000 tons	60,000
Mica: sheet	2,000 lb	17,000
scrap	1,600 tons	40,000
Gem stones	-----	30,000
Beryllium	30 tons	15,000
<b>TOTAL (estimated)<sup>‡</sup></b>		<b>\$560,000,000</b>

\*Except as otherwise noted, values taken from preliminary annual figures issued by the U. S. Bureau of Mines.

<sup>†</sup>Recoverable content of ores, etc.

<sup>‡</sup>Estimates by the New Mexico Bureau of Mines and Mineral Resources.

<sup>§</sup>Other products, on which no reliable estimates of value can be made at the present time, are iron ore, carbon dioxide, magnesium compounds, elemental sulfur, vanadium, and rare earths.