



Annual Report

July 1, 1969, to June 30, 1970



NEW MEXICO STATE
BUREAU OF MINES AND MINERAL RESOURCES

THE NEW MEXICO BUREAU OF MINES AND MINERAL RESOURCES

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DAVID A. SCHWAB, *Geochemist*

Plus more than 35 undergraduate assistants

Cover Photographs

Front: Santa Fe's unit coal train being loaded at York Canyon mine.

Back: Unit coal train enroute to Fontana, Calif., from Raton, N. Mex.

(Courtesy of Santa Fe Railway)

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for the Fiscal Year
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NEW MEXICO STATE
BUREAU OF MINES AND MINERAL RESOURCES
DON H. BAKER, JR., *Director*

A Division of

NEW MEXICO INSTITUTE OF MINING AND TECHNOLOGY
STIRLING A. COLGATE, *President*

THE REGENTS

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The Honorable David F. Cargo *Governor of New Mexico*
Leonard DeLayo *Superintendent of Public Instruction*

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Steve S. Torres, Jr. *Socorro*
Richard M. Zimmerly *Socorro*



Uranium ore being loaded into new air-dump hopper cars at Jackpile mine.
(Courtesy of Santa Fe Railway)



Mrs. Lynn A. Brandvold, Bureau chemist, operates electron microprobe recently donated by the New Mexico Tech Research Foundation.



New Mexico State Bureau of Mines and Mineral Resources

Socorro, New Mexico 87801

Business/Publications Office: 505-835-5410

Director's Office: 505-835-5420

August 27, 1970

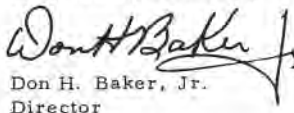
TO: Board of Regents
Honorable Stirling A. Colgate, President
Members of the New Mexico Legislature
Board of Educational Finance
Taxpayers of New Mexico

It is indeed a pleasure for me to transmit the Annual Report for the 57th year, fiscal year 1969-1970, of the New Mexico State Bureau of Mines and Mineral Resources. In this report we have tried to detail the major activities of the Bureau in support of the State and its mineral industry.

There is an administrative item which has been instituted to provide improved control over both State and contract-grant funds. This is the hiring of outside assistance to perform short-term projects on a contractual basis, with partial payment withheld until completion of a publishable report. Action of this nature insures more rapid completion of sponsored projects in a professional manner for utilization by the State and the industry.

Grant-contract funds from other sources can be of tremendous value in achieving State goals, but these funds cannot be utilized to increase the size of the Bureau. Practice is to limit the quantity of the funds to 20 percent or less of the Bureau budget and to hire temporary staff to perform this research under the supervision of Bureau staff.

Respectfully submitted,


Don H. Baker, Jr.
Director

Rapid economic change imposes upon all institutions, particularly those supported by the taxpayer, new functions and responsibilities, and diminishes or enhances the importance of old ones. Failure to respond to such changing priorities makes an institution less effective or even obsolete. The Bureau's first duty is to perform its mission with maximum effectiveness.

ANNUAL REPORT

This year has been one of evaluation, reorientation, and change. The first major reorientation evoked was in the philosophy of our function. The Bureau is a technical organization whose mission is to serve the minerals industry of the State, to advise and assist other State agencies and Federal agencies, and to aid in the education of the minerals and fuels communities and the public by dissemination of technical and semitechnical information and data.

To accomplish this required that the staff travel extensively within the State, attend sectional and subsectional professional meetings of the industry, and meet with directors and staffs of various State agencies. In these activities we have emphasized our willingness and desire to assist, without regard for politics, in any technical field where the Bureau has the expertise. The Bureau has aggressively searched for ways to expand, enhance, and disseminate knowledge about New Mexico and its mineral resources.

Because of the diversity of the Bureau's programs and of its contacts with numerous industrial and governmental organizations, it was felt that private consulting by staff members—even outside the State—could easily lead to conflicts of interest. Bureau policy now prohibits private consulting by the staff in any form. The legislature agreed with this policy and allowed an extra salary increment for the elimination of private consulting, effective July 1, 1970. The philosophy of the Bureau is that geology, treatment and extraction techniques for mineral and fuel resources, and environmental problems are not constrained by political boundaries and, therefore, a problem and its solution that have possible application within New Mexico will be examined regardless of their geographic location.

The staff has evaluated the Bureau's projects and programs that have been under investigation for some time and has provided for prompt completion of some, redirected others to produce information more rapidly and effectively, and terminated some that lacked a potential for significant results. Also, support for some outside projects has been eliminated because they failed to produce publishable reports. These were preliminary steps in the development of a long-range program that will systematically cover the State with geological maps and resource-potential studies.

The Bureau has been expanding its efforts to advise and assist operators, particularly the smaller ones, in the solution of chemical and metallurgical problems. Although there have been, and will continue to be, joint projects with the major companies to develop new or improved extraction methods with minimal ecological side effects, the small-mine operator is receiving and will continue to receive the most direct metallurgical help. Blended with direct assistance will be a program of engineering and theoretical research.

The restructuring and modification of the Bureau's philosophy has been made possible because of the cooperation and support given the Director by the President of New Mexico Institute of Mining and Technology in presenting a realistic, appropriately justified budget, and by the action of the Board of Regents in establishing a degree of autonomy for the Bureau in its dealings with the industry.

In support of the Bureau's philosophy for the coming decade, the emphasis of the programs in geology, mineral resources, and stratigraphy has focused on resource-oriented geologic mapping, applied research, and cooperative projects with State and Federal agencies and with individuals.

The problems associated with pollution of our environment have received an increasing amount of attention by the staff. The Bureau sponsored a symposium on mill-tailings waste. Staff members attended and participated in several educational programs aimed at better understanding and engineering to offset environmental problems. The services of the Bureau have been made available to local and State governmental entities for advice concerning geological problems associated with waste disposal. The Director has been made a member of the U. S. Solid Waste Liaison Committee. A bibliography of stabilization techniques is in preparation under our sponsorship.

A major cooperative project initiated this year was the determination of the San Juan Basin's low-sulfur strippable coal deposits [1]* in cooperation with the National Air Pollution Control Administration and the Federal Bureau of Mines. Although not a cooperative program, the Bureau contracted with the State Land Office to evaluate the minerals and fuel potential of the trust land in east-central New Mexico [20].

Geologic mapping projects (see map, p. 8) in various stages of completion are: west half of Tucumcari 1:250,000 quadrangle [2] by Bejnar; Pelona 30-minute quadrangle [3] by Willard and Stearns; Roswell and Carlsbad 1:250,000 quadrangles [4] by Kelley; San Agustin Plains area [5] by Weber; Glorieta 7½-minute quadrangle [6] by Budding; San Diego Mountain area [7] by Seager, Hawley, and Clemons; Silver City 7½-minute quadrangle [8] by Cunningham and LeMone; west halves of Brownfield [9], Clovis [10], and Hobbs [11] 1:250,000 quadrangles by Reeves; Eagle Nest area [12] by Clark and Read; southern Peloncillo Mountains [13] by McGehee; Mt. Riley-Aden area [14] by Hoffer; Montezuma Springs area [15] by Bejnar; Regina-Cuba area [16] by Woodward; volcanic exposures in Magdalena-Tres Montosos area [17] by Chapin; Little Hatchet Mountains [18] and Big Hatchet Mountains [19] by Zeller.

Mineral-resource projects (see map, p. 9) include New Mexico Energy Resources Map by Bieberman and Weber (published November 1969); petroleum potential of southwestern New Mexico [21] and southern Arizona by

* Numbers in brackets refer to areas shown on project maps (p. 8-9).

Kottlowski (in press, American Petroleum Institute); Exploration for Mineral Resources (Circ. 101, published June 1969); Black Range tin [22] by Jahns; zeolites by Weber; radiometric dating of igneous rocks and associated mineralization by Kottlowski, Weber, and Willard; Luis Lopez manganese deposits [23] by Willard and Nicholson; White Oaks gold area [24] by Willard; mineral resources of Socorro County [25] by Chapin; trace metallic elements of Cooks Peak and Tres Hermanas Mountains [26] by Babu; tin-bearing rhyolites [27] by Lufkin; Nogal mining district [28] by Thompson; low-sulfur strippable coal in San Juan Basin [1] by Shomaker, Beaumont, Kottlowski, et al.; beryllium mineralization near Apache Warm Springs [29] by Hillard (Circ. 103, published September 1969); Gallinas Mountains mining district [30] by Perhac (Bull. 95, in press); clays in New Mexico by Hawks (Part 1, central New Mexico, Circ. 110, in press); mining history of the State by Christiansen; mineral resources on State lands in east-central New Mexico [20] by Foster, C. Smith, and Parkhill; hydrologic studies of De Baca County [44] by Maurant and Shomaker, and of Doña Ana County [45] by King, Hawley, Taylor, and Wilson.

The building materials-resource group, reestablished in January, has contributed information on potential clay resources to private industry and government, including the Four Corners Development Commission and the U. S. Forest Service. They have evaluated pitchstone (perlite) deposits and limestones from the southwestern section of the State.

General geologic studies (see map, p. 8) are: a revision of the southern Zuni Mountains scenic-trip guidebook [31] by Foster; a scenic-trip guidebook of Southwestern New Mexico [32] by James; geochemistry of basalts [33] by Renault; post-card geologic map of New Mexico (published December 1969); Lake Valley Limestone crinoids [34] by Macurda; radiometric dating of volcanic rocks in Glenwood area [35] by Bikerman; and geology of Rock Hound, City of Rocks, Pancho Villa, Valley of Fires, and Storrie Lake State Parks.

Paleontologic studies by Flower included identifications of cephalopod collections from Utah, Nevada, Alaska, eastern United States, eastern Canada, Spitzbergen, Sweden, and Turkey; collecting cephalopod faunas from eastern Canada; a short study on Ordovician cephalopods of Malaysia, and work on descriptions of the Endoceratida and of Tarphyceratida of the El Paso Limestone.

Current and completed stratigraphic investigations (see map, p. 9) include sedimentary influence of the Pedernal uplift [36] by Kottlowski (in press, West Texas and North Texas Geol. Soc.); Border Stratigraphy Symposium (Circ. 104, published April 1969); key oil tests and stratigraphic sections in southwestern New Mexico [37] by Kottlowski, Foster, and Wengerd (published in 1969, New Mexico Geol. Soc. guidebook); Wolfcampian Joyita uplift in central New Mexico by Kottlowski and Stewart and fusulinids of the

Joyita Hills [38] by Stewart (Mem. 23, published April 1970); San Andres Limestone in central New Mexico [39] by Pierce; Wolfcampian carbonate facies in southern New Mexico [40] by Jordan and Wilson; Early Pennsylvanian fusulinids of southern New Mexico [41] by King; Paleozoic and Mesozoic stratigraphy of Hidalgo County area [42] by Greenwood, Kottlowski, LeMone, and Armstrong (in press, New Mexico Geol. Soc., 1970 guidebook); and Permian reef facies of Guadalupe Mountains [43] by D. Smith.

As part of the Bureau's service to the petroleum industry, rock cuttings from wells are available for examination at no charge. Data supplied consist of identification of rock types and correlation with the standard stratigraphic sequence. Lithologic logs are not normally prepared, although such logs do become available for examination following completion of subsurface studies in various parts of the State. The sample library issued a catalog of new acquisitions as Circular 109 (June 1970).

Chemical and metallurgical research has continued in the areas of mineral beneficiation, hydrometallurgy (in-situ leaching and heap or column leaching), and chemistry of mineral reactions with leach solutions. Development of computer programs and models to assist in projection of engineering designs have also been carried forward as exemplified by "Large Flotation Cells—Selection of the Proper Size and Number," published by Roman in June 1970 *Mining Congress Journal*. Other publications were: Circular 105 (September 1969), "Evaluation of Ground Mica Products from New Mexico Pegmatites," by Horst and Bhappu; Circular 106 (May 1970), "Selective Flotation of Molybdenite from Chalcopyrite Concentrates by Potassium Permanganate," by Escalera and Bhappu; Circular 108 (May 1970), "Analysis of Rhenium in Molybdenites," by Goebel; AIME Preprint 7-B-70, "Heap Leaching Studies on Oxide and Sulfide Copper Ores," by Johnson and Bhappu; and AIME Preprint 70-AG-69, "A Study of the Leaching Chemistry of an Impermeable Chino Dump," by Johnson and Bhappu.

During the past year, approximately 20 ore samples from throughout New Mexico were evaluated as a service to small mining companies and individuals. These samples represent potential sources of gold, silver, lead, zinc, and copper, as well as nonmetallics such as mica and limestone. Evaluations ranged from simple identifications to an evaluation of a metallurgical recovery scheme. Approximately 30 individuals visited or wrote to the Bureau seeking answers to specific questions on flotation problems, equipment selection, and economics and applicability of recovery techniques. These people represented all size groups from individual rancher-prospectors to companies such as Kennecott Copper Corporation and E. I. du Pont de Nemours & Company.

Our laboratories have continued to develop new or improved techniques for more rapid and accurate sample analyses and have cooperated with various company laboratories in developing and establishing analytical techniques and procedures. The laboratories participated in a program of the

Analytical Reference Service to evaluate old and new methods of water and waste analysis. Under the program, more than 100 participants run various assays; the data are then collected and analyzed, and each participant is notified of the results. The Bureau participated in three separate studies during the past year.

Donations of analytical instruments have further expanded our laboratories' capabilities. Chevron Research Company gave a densitometer that greatly enhanced interpretations of emission-spectrograph films. The New Mexico Tech Research Foundation donated an electron probe, which now makes possible precise matrix analyses; the first samples analyzed were historic copper slags from the pre-Roman era.

Besides the preparation of geologic maps, the drafting section turned out drawings for lantern slides, display charts, signs, graphs, and some art sketches for the Bureau as well as for the College and Research Divisions.

Arnold and Nicholson attended a meeting of the Association of Earth Science Editors in October 1969. One session was devoted to modern methods of map making; the methods used at the Bureau were found to compare favorably with those currently in use elsewhere.



Bureau staff practices first-aid techniques during course conducted by Mr. Angelo Pais (standing behind the "victim"), deputy mine inspector and first-aid specialist, Office of the State Mine Inspector.

FINANCIAL STATEMENT FOR BOARD OF EDUCATIONAL FINANCE—LEGISLATIVE BUDGET

Receipts

Beginning balance		\$ 39,033.92
State appropriation		494,000.00
Publication sales		15,653.64
Basic geologic and ground-water appropriation		<u>20,000.00</u>
Total Receipts		<u>\$568,687.56</u>

Disbursements and Commitments

Salaries		
Full time	\$291,480.00	
Part time (mostly students)	<u>97,582.20</u>	\$389,062.20
Travel and Automotive		
Travel and per diem	\$ 11,100.66	
Gas, repairs, and insurance	<u>3,874.64</u>	14,975.30
Repairs and Maintenance	\$ <u>1,980.90</u>	1,980.90
Supplies and Materials		
Postage and resale	\$ 5,742.39	
Office	5,905.29	
Laboratory and scientific	<u>10,405.61</u>	22,053.29
Printing and Publications	\$ <u>31,609.40</u>	31,609.40
Other Operating Expenses		
Building use charge—New Mexico Tech	\$ 7,000.00	
Telephone and telegraph	10,244.89	
Professional services	11,112.79	
Retirement	12,770.35	
Social security	8,202.72	
Overhead—New Mexico Tech	16,600.00	
Computer service	5,050.00	
Freight, insurance, audit, Board of Educational Finance, subscriptions, etc.	<u>5,028.62</u>	76,009.37
Capital Outlay	\$ <u>23,496.60</u>	<u>23,496.60</u>
Total Expenditures		<u>\$559,187.06</u>
Balance		\$ 9,500.50
Budgeted in November '69 for F.Y. 70-71		<u>8,746.00</u>
Uncommitted balance, June 30, 1970		<u>\$ 754.50</u>

FINANCIAL STATEMENT FOR GRANTS AND CONTRACTS BUDGET

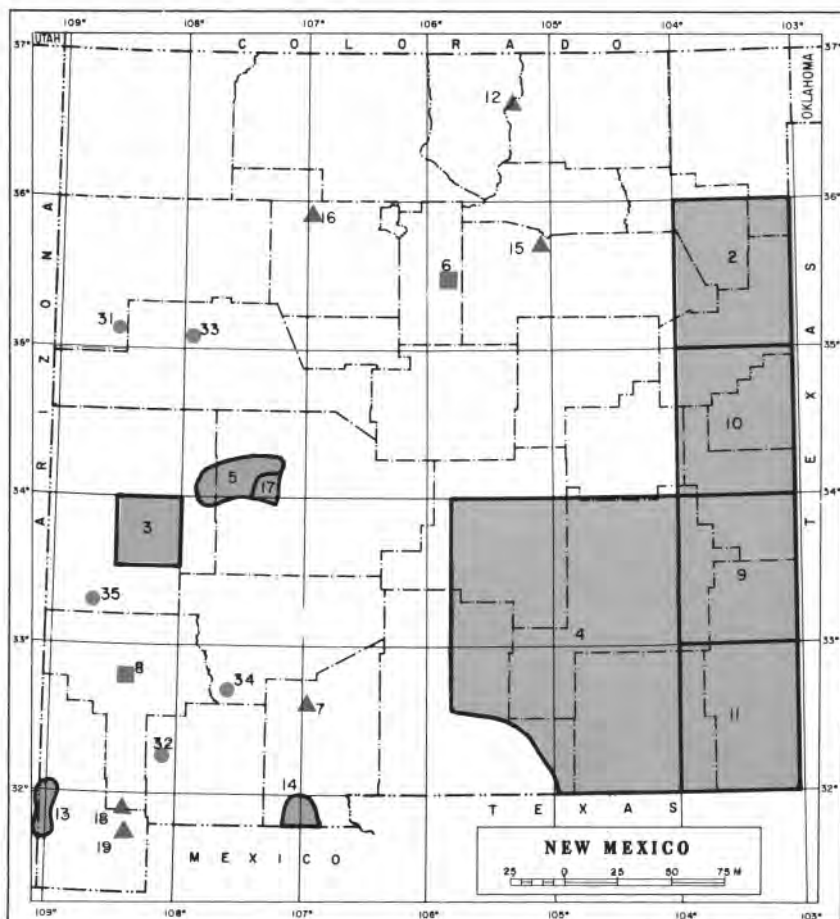
Receipts

Federal and State	\$70,280.00	
Nonprofit organization	6,407.80	
Industrial	2,258.90	
	<hr/>	
Total Receipts		\$78,946.70
Balance carried forward July 1, 1969		<u>6,928.96</u>
Total funds available		\$85,875.66

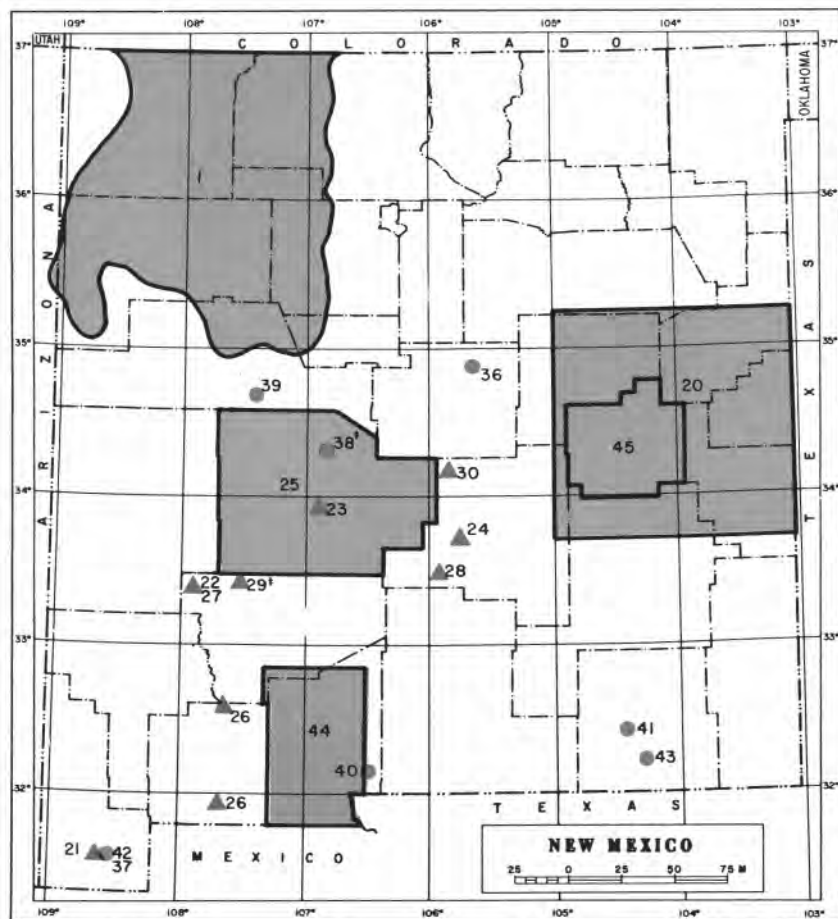
Expenditures

Salaries	\$36,324.09	
Retirement	1,597.50	
Social security	1,572.15	
Travel	6,363.88	
Supplies	3,368.65	
Printing	2,064.35	
Equipment	3,600.00	
Others	2,441.42	
Overhead	19,886.00	
	<hr/>	
Total Expenditures		<u>77,218.04</u>
Balance, June 30, 1970		<u>\$ 8,657.62</u>

GEOLOGIC MAPPING AND GENERAL STUDIES



MINERAL-RESOURCE AND STRATIGRAPHIC INVESTIGATIONS



† Published report



▲ Mineral-resource project



● Stratigraphic investigation

APPENDIX

New Mexico's National Standing

New Mexico ranked fifth among the states in total value of the minerals and fuels produced in 1969, with a value of \$966,286,000, according to preliminary figures released by the Federal Bureau of Mines. This represented an increase of just over 8 percent from 1968. Of the total value, 67.4 percent resulted from coal, gas, and petroleum production. The ratio of fuels to mineral-production value has, each of the last few years, shown a steady decrease. This emphasizes the fact that the mineral productivity of the State is becoming more balanced. California, with 65.9 percent of its production value from fuels, is the only other state in the top six that has a more balanced fuel and mineral production. The other four states receive more than 90 percent of their mineral-production value from fuels.

Bureau Services

Two issues of the *Director's Newsletter*, which is designed to call information of general interest and Bureau activities to the attention of the minerals and fuels industry, have been distributed.

Technical meetings sponsored or cosponsored by the Bureau included a mill-tailing stabilization symposium attended by 52 persons representing ten mining companies, two Federal agencies, six State agencies, and four academic institutions, and included persons from eight states and Canada. Dr. Thomas Z. Fahidy, Professor of Chemical Engineering, University of Waterloo, Waterloo, Canada, gave two lectures, "Dynamics of Some Electrolytic Processes" and "Automatic and Computer Control of Processes." The Annual AIME Uranium Symposium and Idea Conference, attended by 180 people from 14 states, the District of Columbia, British Columbia, and Ontario, was cosponsored by Tech, the Bureau of Mines, and AIME.

Prices of Bureau publications were increased to reflect more nearly unit publication costs. About 7,000 copies of Bureau reports and publications are distributed under cooperative and exchange programs with various state geological surveys, educational institutions, libraries, and 22 foreign governments. This distribution costs the State Bureau between \$12,000 and \$15,000 per year; this cost is more than offset by the value of the reciprocal publications from throughout the world obtained by the State's institutions of higher learning. Cash sales amounted to \$15,654.

The analytical laboratories performed 7,162 assays on 4,108 samples, including 62 complete water analyses. Mineralogical investigations were made on 239 groups of samples and appropriate reports issued. The museum received, among other donations, the Walter's mineral collection, amounting to

more than 600 specimens, with a value of more than \$5,000. The cuttings and well-log library has this year received data (cuttings and logs) from more than 9,000 wells, compared to an average of 300 wells per year for the past several years. The Bureau was called upon for technical information and advice by 2,850 visitors, 10,855 letters, and 4,715 phone calls. We filled 539 requests for rock and mineral samples. Our staff was augmented by the work performed by the 64 undergraduate students, 9 graduate students, and 2 special students we supported.

Staff members, in performing their duties, have traveled a total of 94,237 miles during this fiscal year, they have spent 547½ days on per diem and 346 days in the field without per diem.

Professional Activities

Each professional staff member has attended a national or major regional professional meeting during the year. Memberships in the following professional organizations are held by one or more staff members: Geological Society of America; American Association of Petroleum Geologists; American Institute of Professional Geologists; American Association for the Advancement of Science; Society of Economic Geologists; American Geophysical Union; American Institute of Mining, Metallurgical and Petroleum Engineers; Society of Economic Paleontologists and Mineralogists; Sigma Xi; National Association of Geology Teachers; New Mexico Geological Society; New Mexico Mining Association; New Mexico Academy of Science; West Texas Geological Society; Coal Geology Division of Geological Society of America; Roswell Geological Society; Société Géologique de France; Paleontological Research Institution; International Paleontological Union; The Paleontological Society; Society of Systematic Zoologists; Society for the Study of Evolution; Ohio Academy of Science; American Society for Engineering Education; American Ceramic Society; National Institute of Ceramic Engineers; Association of Earth Science Editors; Tau Beta Pi.

Staff members served on numerous regular committees of these organizations. In addition, they served on the following special committees: American Commission on Stratigraphic Nomenclature, United States Solid Waste Liaison Committee, New Mexico Mining Safety Advisory Board, Western Governors' Advisory Council, Natural Resources Council for the Federation of Rocky Mountain States, Four Corners Regional Commission's Minerals and Fuels Advisory Committee, New Mexico State Land Commission Advisory Council, Professional Ethics Committee of the American Institute of Professional Geologists, New Mexico Mapping Advisory Committee.

The Bureau provided speakers and/or panelists at 18 nontechnical meetings and 7 technical meetings during the past fiscal year. The staff also assisted in the educational program of the College Division by giving lectures, serving on graduate research committees, and directing thesis research.

Personnel Changes

The Directorship of the Bureau was assumed by Don H. Baker, Jr., on July 1, 1969. Dr. Frank E. Kottlowski was officially promoted to Assistant Director in November 1969. Dr. Roshan B. Bhappu has been on sabbatical leave in Turkey for the year on a UNESCO assignment. Mrs. Lynn A. Brandvold was placed in charge of the instrumentation and wet-analytical chemical laboratories of the Bureau in March 1970. Mrs. H. Elise Brower went on leave of absence in September 1969 to complete her Ph.D. Dr. Paul H. Johnson resigned in March 1970 to go into business for himself. Mrs. Donna Mae Peckenpaugh, secretary in the petroleum department, and draftsman Heidi Warlies resigned January 1970.

Staff additions are Mrs. Marilyn J. Szydlowski, secretary in the petroleum section (February 1970); Mrs. Martha K. Arnold, part-time editorial assistant (July 1969); John W. Shomaker, geologist (August 1969); Alex. Nicholson, editor-geologist (October 1969); William L. Hawks, materials engineer (January 1970); and Dr. Charles E. Chapin, geologist (June 1970).

Training Programs

The Bureau, this year, sponsored: (1) first-aid training for all staff, and had 100-percent participation; (2) telephone education class presented by Mountain States Telephone & Telegraph Co. for secretaries; (3) a monthly secretarial workshop; and (4) monthly staff meetings. A safety committee has been established, and periodical safety inspection of the offices and laboratories instituted.

New Bureau Publications

New Mexico Energy Resources Map, compiled by Robert A. Bieberman and Robert H. Weber. Scale 1 inch = 16 miles. \$0.50.

Map shows oil and gas fields, pipelines, coal fields, electric transmission lines and installations, and uranium occurrences.

Simplified Geologic Map of New Mexico, Scale 1 inch = 40 miles, \$0.40. Scale 1 inch = 80 miles, \$0.10.

Eleven-color postcard map. 40-mile scale is on 12x16-inch card; 80-mile scale is on 6x8-inch card. Geology of State is divided into 11 stratigraphic megunits.

Memoir 23. *The Wolfcampian Joyita Uplift in Central New Mexico and Fusulinids of the Joyita Hills, Socorro County, Central New Mexico*, by Frank E. Kottlowski and Wendell J. Stewart. 82 pages, 14 figures, 10 plates. \$4.00.

The Joyita uplift is a documented key to the central New Mexico late Virgilian and early Wolfcampian episode of erosion and accompanying deposition of clastic strata. Detailed studies of the lithologies and fusulinid faunas of the Pennsylvanian and Early Permian rocks confirm this uplift and the related unconformity.

- Circular 102. *An Instrumental Study of New Mexico Earthquakes, July 1, 1964, through Dec. 31, 1967*, by Allan R. Sanford and Daniel J. Cash. 7 pages, 1 figure, 3 tables. \$0.50.

Lists data for all earthquakes with magnitudes 2.7 or greater in or near New Mexico; Most significant was a 5.5-magnitude earthquake near Dulce, New Mexico, which accounted for more than half the total seismic activity during the 3½-year period. The remaining activity was broadly distributed over the State.

- Circular 103. *Geology and Beryllium Mineralization near Apache Warm Springs, Socorro County, New Mexico*, by Patrick D. Hillard. 16 pages, 2 figures, 2 tables, 3 plates. \$1.00.

Rocks exposed in area are pre-Datil Tertiary pyroclastics, andesites, and latites, and lower Datil-equivalent rhyolite flows and tuffs. Quaternary rocks are the Winston beds, probably equivalent to the Santa Fe Group. Beryllium mineralization in the form of bertrandite is restricted to one highly faulted and brecciated zone in an altered rhyolite tuff. Concentrations range from 0.05 to 2.5 percent beryllium oxide.

- Circular 105. *Evaluation of Ground Mica Products from New Mexico Pegmatites*, by William E. Horst and Roshan B. Bhappu. 27 pages, 2 figures, 11 tables. \$0.50.

Micas from San Miguel, Rio Arriba, and Valencia Counties were tested for suitability for roofing, joint-cement, oil-well, paint and rubber, and wallpaper products. All but one of the samples proved suitable for one or more of these purposes.

- Circular 106. *Selective Flotation of Molybdenite from Chalcopyrite Concentrates by Potassium Permanganate*, by Saul J. Escalera and Roshan B. Bhappu. 15 pages, 6 figures. \$0.50.

The oxidizing characteristics of potassium permanganate depend on reagent concentration, pH, temperature, and conditioning time. Under certain circumstances, permanganate is more effective than conventional oxidants.

- Circular 107. *Theses and Dissertations of the New Mexico Institute of Mining and Technology, 1931-1969*, compiled by Irma Youngblood and Henry H. Koehn. 20 pages. \$0.50.

List comprises 141 theses and dissertations submitted for advanced degrees at the Institute. Thoroughly indexed, it includes the major areas of atmospheric physics, chemistry, geology, geophysics, hydrology, metallurgy, mining technology, and physics.

- Circular 108. *Analysis of Rhenium in Molybdenites*, by Lorna M. Goebel. 17 pages, 4 figures, 5 tables. \$0.50.

An improved technique for the determination of rhenium content of molybdenites involves calcining with calcium oxide, leaching with a hot aqueous oxidizing solution and spectrophotometric determination with alpha-furildioxime. Standard deviations of determinations are substantially lower than those published for other methods.

- Circular 109. *Index to Samples from Oil and Gas Well Tests in Library at Socorro, New Mexico, July 1, 1966, to June 1, 1970*, compiled by Robert A. Bieberman. 10 pages. \$0.25.

Samples from approximately 2,000 wells added to Bureau of Mines Sample Library; supplements earlier lists published as Circulars 30, 45, 61, and 88.

Publications in Press

- Bulletin 94. *Geology and Mineral Resources of the Eagle Nest Area, New Mexico*, by Kenneth F. Clark with Charles B. Read.
- Bulletin 95. *Geology and Mineral Deposits of the Gallinas Mountains, Lincoln and Torrance Counties, New Mexico*, by Ralph M. Perhac.
- Bulletin 96. *Geology of the Little Hatchet Mountains, New Mexico*, by Robert A. Zeller, Jr.
- Circular 110. *Test Data for New Mexico Clay Materials, Part 1, Central New Mexico*, by William L. Hawks.
- Ground-Water Report 10. *Hydrologic Reconnaissance of De Baca County, New Mexico*, by Walter A. Mourant and John W. Shomaker.

Reissued Bureau Publications

- Bulletin 37. *Geology and Mineral Deposits of Lake Valley Quadrangle, Grant, Luna, and Sierra Counties, New Mexico*, by Henry L. Jicha, Jr., 1954. 93 pages, 13 figures, 5 plates. \$2.50.
- Circular 5. *Gold Mining and Gold Deposits in New Mexico*, by E. H. Wells and T. P. Wootton, 1932; revised by T. P. Wootton, 1940. 26 pages. \$0.50.
- Scenic Trip 1. *Santa Fe*, by Brewster Baldwin and Frank E. Kottlowski, second edition, 1968. 51 pages, 44 figures. \$1.00.

External Staff Publication Reprinted by Bureau

- Early Paleozoic of New Mexico and the El Paso Region*, by Rousseau H. Flower. 44 pages, 5 figures. \$0.50.

Reprinted from *The Ordovician Symposium*, El Paso Geological Society, 1969. A review of the development of early Paleozoic stratigraphic nomenclature in New Mexico and a report on the most recent refinements based upon biostratigraphic studies. The current nomenclature is tentatively correlated with the generalized column for North America.

New External Publications Available from Bureau

- Guidebook to Four Corners, Colorado Plateau, Central Rocky Mountain Region*, edited by Clay T. Smith for a field conference of the Southwest Section of the National Association of Geology Teachers, June 1970. 183 pages, 43 figures. \$4.00.

Contains five articles by J. D. Haun, H. C. Kent, C. T. Smith, C. S. Breed, C. F. Royse, J. S. Wadell, R. G. Updike, T. L. Pówé, and H. J. Bissell; and 15 regional road logs from Denver, Colo., Albuquerque, N. Mex., and Tempe, Ariz., to Cedar City, Utah, and return by different routes.

- The Border Region*, edited by Diego A. Córdoba, Sherman A. Wengerd, and John Shomaker. Guidebook for the 20th Field Conference of the New Mexico Geological Society, Oct. 23-25, 1969. 218 pages, 150 figures. \$13.50.

Twenty-five articles on the geology and history of Chihuahua, Mexico, and adjacent areas of southwestern New Mexico. Three-day road log covers route from Juarez to Nuevo Casas Grandes to Chihuahua and return.

Manuscripts Being Edited

Computerization of the New Mexico Bureau of Mines Mineralogical Museum, circular by Jacques Renault, Rena Mae Bonem, and Ronald W. Riese.

Geology and Ground-Water Resources of Central and Western Doña Ana County, New Mexico, ground-water report by W. E. King, J. W. Hawley, A. M. Taylor, and R. P. Wilson.

Brochures for *Rock Hound*, *City of Rocks*, *Pancho Villa*, and *Storrie Lake State Parks*, by Bureau staff.

Reconnaissance Geologic Map of the Pelona Thirty-Minute Quadrangle, by Max E. Willard and Charles E. Stearns.

Manuscripts Available for Publication

Geology of the Southern San Mateo Mountains, Socorro and Sierra Counties, New Mexico, by Steven E. Farkas.

Water Resources and Geology of Guadalupe County, New Mexico, by George A. Dinwiddie.

Geology of the San Diego Mountain Area, Doña Ana County, New Mexico, by William R. Seager, John W. Hawley, and Russell E. Clemons.

Scenic Trip to the Geologic Past No. 10, Southwestern New Mexico, by Harold L. James.

Scenic Trip to the Geologic Past No. 4, Central Zuni Mountains, second edition, by Roy W. Foster.

Mineral Deposits of the Nogal Mining District, Lincoln County, New Mexico, by Tommy B. Thompson.

New Mexico's Thermal Waters, by W. K. Summers and William E. Bertholf.



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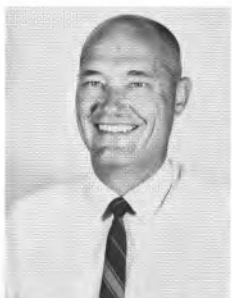
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Dr. Jacques Renault, Bureau geologist, and student assistant Rena Bonem confer over IBM cards used in the computerization of the Bureau Mineral Museum. Computerization of the museum collection enables rapid location of specimens having any combination of required characteristics.

SOME PUBLIC SERVICES AVAILABLE AT THE BUREAU

1. Mineralogical identification of rock and ore samples from New Mexico.
2. Make available for public use cuttings from oil wells, as well as electric, radioactive, sonic, and other types of well logs.
3. Make available up-to-date county petroleum exploration maps.
4. Assist, through conferences, geologists, mining engineers, prospectors, landowners, rock hounds, and others by providing geologic and mining engineering information necessary for exploration.
5. Provide speakers for technical and nontechnical talks to groups interested in mineral resources, exploration, and rocks and minerals.
6. Maintain sales office for Bureau publications including scenic guidebooks to selected areas, as well as topographic maps and other publications of Federal agencies and scientific organizations that are related to New Mexico's mineral resources and geology.
7. Perform feasibility and amenability metallurgical and beneficiation tests on mineralized samples.
8. Confer on and assist in the development of chemical and metallurgical flow sheets for New Mexico mining properties.
9. Maintain a public mineral museum that has both educational and research functions.
10. Sponsor occasional public and professional meetings to disseminate new information about New Mexico mineral resources and geology.

