

1980-81

ANNUAL REPORT

BUREAU OF GEOLOGY AND MINERAL TECHNOLOGY

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ARIZONA GEOLOGICAL SURVEY
OPEN-FILE REPORT

81-81

This report is preliminary and has not been edited or reviewed for conformity with Arizona Geological Survey standards

SUMMARY OF ACTIVITIES DURING 1980-81

During FY 1980-81 the following projects were completed by Bureau geologists (funding agencies are in parentheses): Uranium occurrences (Department of Energy); molybdenum occurrences (U.S. Geological Survey); and geologic mapping along Salt River (Water and Power Resources Services). One report, the 1887 Sonoran earthquake was published as Special Paper No. 3. Funding was provided by the U.S. Geological Survey.

Discussions and negotiations were completed for additional funding to support the Quaternary Map project, Neotectonic project, compilation of mineral production statistics, and the geologic hazards map of Arizona. All of these projects will be funded by the U.S.G.S.

During the year we were informed that the Department of Energy will not provide funding for the geothermal project after January, 1982. Claudia Stone was promoted to geothermal project leader and will bring the project to completion.

A new program in mine safety and health was initiated in cooperation with the Arizona Center for Occupational Safety and Health (ACOSH) at the Arizona Medical Center. Mr. Meliton Garcia, a mining engineer/industrial hygienist was hired to direct the program.

The following persons were hired: William G. Davenport, Tom Young, Meliton Garcia, and Stephen Reynolds. Dr. Davenport begins as Assistant Director in July, 1981. Reynolds will be responsible for preparing a revised, more detailed state geologic map of Arizona.

Faculty resignations or retirements included: William H. Drescher, Director; W. Richard Hahman, Associate Geologist; Douglas Robinson, Metallurgist; David D. Rabb, Metallurgist; and Stanley B. Keith, Assistant Geologist. Dr. William Cosart was named as Acting Director.

New office space was made ready in August, 1980, in the Arid Lands Information Building and resulted in consolidation of the Geological Survey Branch professional staff.

Data and Assistance. The Geological Survey Branch sells geologic maps and reports, maintains geological data on open-file, and provides expertise and professional assistance to the public about geology and mineral technology. During 1980-81 publication sales totaled \$20,048.

More than 3,000 persons visited our offices or wrote or telephoned for information and/or assistance on technical problems.

Research and Data Collection. Much of the data and information provided on request are derived from specific research and data collection projects focusing on Arizona's geologic framework, metallic and non-metallic mineral resources, geological factors that affect land use, and mineral processing. Federal funds (grants/contracts) are used to supplement the State appropriation insofar as practical. Five federally funded projects were completed, six were extended, and funding for two new projects was received.

Summary of Activities During 1980-81 (continued)

Geologic framework projects completed or in progress include a state geologic map, surficial materials map, outcrop map of rocks of Laramide age, and terrain-corrected gravity maps. Mineral resource studies include a compilation of the occurrence of radioactive mineral resources and mining district map. Assessment of the geothermal potential of Arizona is in its fifth and final year. We have been informed that this project will terminate in January, 1982. Work is continuing on an overview of geologic hazards in the State. A compilation of historic earthquakes felt in Arizona and an accompanying earthquake epicenter map are in progress. A report on the 1887 Sonoran earthquake, the strongest quake to be felt in much of Arizona, was completed.

Public Service Statistics

- Performed mineralogical analyses on 291 sample lots brought to the Bureau by members of the public.
- Performed metallurgical process amenability tests on over 42 lots of ore for members of the public.
- Provided consultative advice to more than 3500 individuals who visited the Bureau seeking advice pertaining to geology, minerals, and mining.
- Distributed over 10,000 technical bulletins and maps, and 15,000 copies of FIELDNOTES.
- Participated in deliberations of, and provided technical assistance to:
 - *Governor's Commission on Arizona's Environment
 - *Arizona Oil and Gas Conservation Commission
 - *Arizona Division of Emergency Services
 - *Arizona Parks Department, Natural Areas Advisory Council
 - *Arizona Office of Economic Planning and Development
 - *Arizona Department of Transportation
 - *Arizona Land Department
 - *Arizona Department of Health Services
 - *Arizona Department of Mineral Resources
 - *Arizona Mining Association
 - *Arizona Department of Education
 - *Arizona Department of Game and Fish
 - *U.S. Geological Survey
 - *U.S. Forest Service
 - *U.S. Nuclear Regulatory Commission
 - *U.S. Bureau of Reclamation
 - *U.S. Bureau of Land Management
 - *U.S. Department of Energy
 - *Mesa School District
 - *Office of Arid Lands Studies
 - *Arizona-Sonora Desert Museum

Summary of Activities During 1980-81 (continued)

--Provided lectures on geology, minerals, and mining to:

- *Arizona State University
- *The University of Arizona
- *Northern Arizona University
- *U.S. Geological Survey
- *Society of Sigma Xi
- *Women in Geosciences
- *Audubon Society
- *Museum of Northern Arizona
- *Arizona Department of Game and Fish
- *Sigma Gamma Epsilon
- *National Association of Business Economists
- *U.S. Department of Energy
- *Arizona Department of Education
- *Geological Society of America
- *Toastmasters International
- *Arizona Department of Transportation
- *American Society of Civil Engineers
- *Women in Science and Engineering
- *92 talks to elementary school classes

--Provided field trip leadership at:

- *Arizona Geological Society
- *Mesa School District
- *Audubon Society
- *University of Arizona Continuing Education Department
- *Arizona-Sonora Desert Museum
- *Sabino Canyon Visitor Center
- *Group of petroleum exploration geologists

Research

Projects on-going or completed during the year:

- Assessment of Arizona's Geothermal Resource Potential - P.I.: Hahman
Funding: DOE - approximately \$364,000
- Radioactive Mineral Occurrences in Arizona - P.I.: Scarborough
Funding: DOE - \$54,270
- Compilation of the Geology and Mineral Resources for the Mesa 1⁰ x 2⁰
NTMS Quadrangle, Arizona - P.I.: Peirce/Scarborough
Funding: DOE - \$2,692
- Geology of Salt River, Roosevelt Dam to Stewart Mountain Dam
P.I.: Peirce/Scarborough
Funding: Bureau of Reclamation - \$7,234
- Geology Along Salt River, Stewart Mountain Dam to Granite Reef Dam
P.I.: Peirce/Scarborough
Funding: Bureau of Reclamation - \$2,700

Summary of Activities During 1980-81 (continued)

- Historical Seismicity in Arizona - P.I.: DuBois
Funding: NRC - \$10,146
- Statewide Assessment of Geologic Hazards in Arizona - P.I.: DuBois
Funding: USGS - \$30,000
- Interpretation of Historical Earthquake Reports and Seismically-Induced
Surface Phenomena - P.I.: DuBois/Sbar
Funding: USGS - \$28,210
- Occurrence of Molybdenum and Molybdenum-Bearing Minerals in Arizona
P.I.: Keith
Funding: USGS - \$21,000
- Computerized Resources Information Bank - P.I.: Keith
Funding: USGS - \$40,000
- Operation of Tucson Station of the Worldwide Standardized Seismograph
Network - P.I.: Peirce
Funding: USGS - \$3,881
- Quaternary Geologic Map of Arizona - P.I.: Morrison/Menges
Funding: USGS - \$10,000, received as of June 30, 1981
- Identification and Interpretation of Young Faults in Arizona
P.I.: Menges/Reynolds
Funding: Bureau - \$7,557
USGS - \$10,363
- Correlation of Stratigraphic Units in Arizona - P.I.: Reynolds/Knepp
Funding: Bureau - \$1,200
COSUNA - \$2,000

Major Publications

- The 1887 Sonoran Earthquake (Special Paper 3)
- Carboniferous Rocks of Arizona (Circular 21)
- Radioactive Occurrences and Uranium Production in Arizona (DOE Open
File Report 81-)

MAJOR STRENGTHS

The major strength of the Bureau is that it has a highly qualified professional staff. For example, Dr. H. Wesley Peirce has been an employee of the Bureau for 25 years and has as much knowledge of the geology and resources of the State as any other individual. He willingly shares this knowledge with representatives of industry, governmental agencies, and the public.

Robert T. O'Haire, associate mineralogist and Bureau employee for the past 26 years, is widely known as an expert in the mineralogy of copper, including copper ore minerals and turquoise. His expertise in mineral identification and his advice in mineral separation matters is sought by many State agencies as well as private individuals from all over the State.

Stephen Reynolds, although newly hired and still completing Ph.D. requirements, brought with him a high level of skill in geologic mapping of complex areas, considerable knowledge of Arizona geology, coupled with mineral exploration experience.

William Davenport, who is the author of the most recent textbook on the extractive metallurgy of copper, joined the College of Mines as head of the Department of Metallurgical Engineering and the Bureau as Assistant Director of the Mineral Technology Branch. Dr. Davenport is widely known for his work in copper smelting technology.

Tom Young, of the Mineral Technology Branch, has had extensive experience in mineral processing at several of Arizona's copper mines and brings to the Bureau an extensive knowledge of Arizona's mineral processing problems and opportunities.

Joseph LaVoie, who has been a Bureau employee for many years, has developed a high degree of skill in graphic arts/drafting.

With this professional and support staff, the Bureau has a solid nucleus in metals, industrial minerals, mineral technology, regional geology, and geologic mapping.

We now have exceptionally good office space for professional and support staff as well as for students.

MAJOR LIMITATIONS

The major limitation of the Bureau is the small size of the staff--eight full time professional staff. The Geological Survey Branch functions as the State Geological Survey. Forty-seven states (all except Hawaii, Massachusetts, and Rhode Island) have a geological survey. Arizona is a large state. It is one of the leading mineral producing states. It is experiencing extremely rapid population growth. And the geology is extremely complex. Already we are experiencing land subsidence due to groundwater withdrawal, and the significance of seismicity is probably underestimated. The Bureau is charged by statute to investigate the geologic setting, mineral resources, and land-use limitations related to geology. To do this work we have only four state-funded geologist positions. Only six of the 47 state geological surveys receive a smaller appropriation than Arizona.

At this time we desperately need a state-funded position to address the "impact of things geologic" (applied geology) on use of the state's land. This new person, who would require a special type of education and experience, would also have responsibility for writing grant proposals and serving as principal investigator of funded projects. Federal agencies appear to have potential for providing funding in this area in the future; however, to capture these funding opportunities will require a serious effort on the part of the State to participate in this important area.

One other limitation is the lack of adequate space for storage of rock cuttings and cores. ARS Chap. 27 specifies that the Bureau is to maintain a repository of cuttings and cores. We constantly have opportunities to receive them gratis, but cannot accept all those offered because of lack of space. Rock cuttings and cores provide important knowledge of the subsurface. They are expensive to obtain, but our only expense would be in housing and maintaining the collection.

Likewise, the Mineral Technology Branch of the Bureau is far too small to be effective. With but one mineral processing specialist and one extractive metallurgy specialist, it is difficult to carry on even the most basic function of the Bureau--the rendering of technical assistance to members of the public on matters relating to the mining and processing of Arizona ores. Laboratory space for these activities continues to be substandard with the ventilation problem still unresolved.

FUTURE PLANS

1. Formulate specific plans for state geologic mapping projects with a timetable for completing the publication of the next edition of the state map. Establish a cooperative effort with the U.S. Geological Survey.
2. Continue compilation of mineral occurrences and production statistics with the objective of better understanding geologic origins; complete geothermal assessment project; do mineral commodity studies.
3. Establish a coordinated effort in applied geology including geological hazards and other aspects of geology influencing decisions on land usage. Seek state-funded position for appropriately qualified person to oversee this type of work.
4. Establish a research project in the extractive metallurgy of copper ores toward the solution of problems relating to Arizona's copper industry.
5. Re-orient educational geology efforts from giving talks to elementary students to working with groups of teachers.
6. Acquire additional space for storage of rock cuttings and cores.
7. Develop closer contacts with state and federal agencies, legislators, planners, and resource exploration geologists and managers.
8. Fill vacant geologist and metallurgist positions; develop cooperative projects involving both Mineral Technology and Geological Survey Branch staff, and other arms of the University.