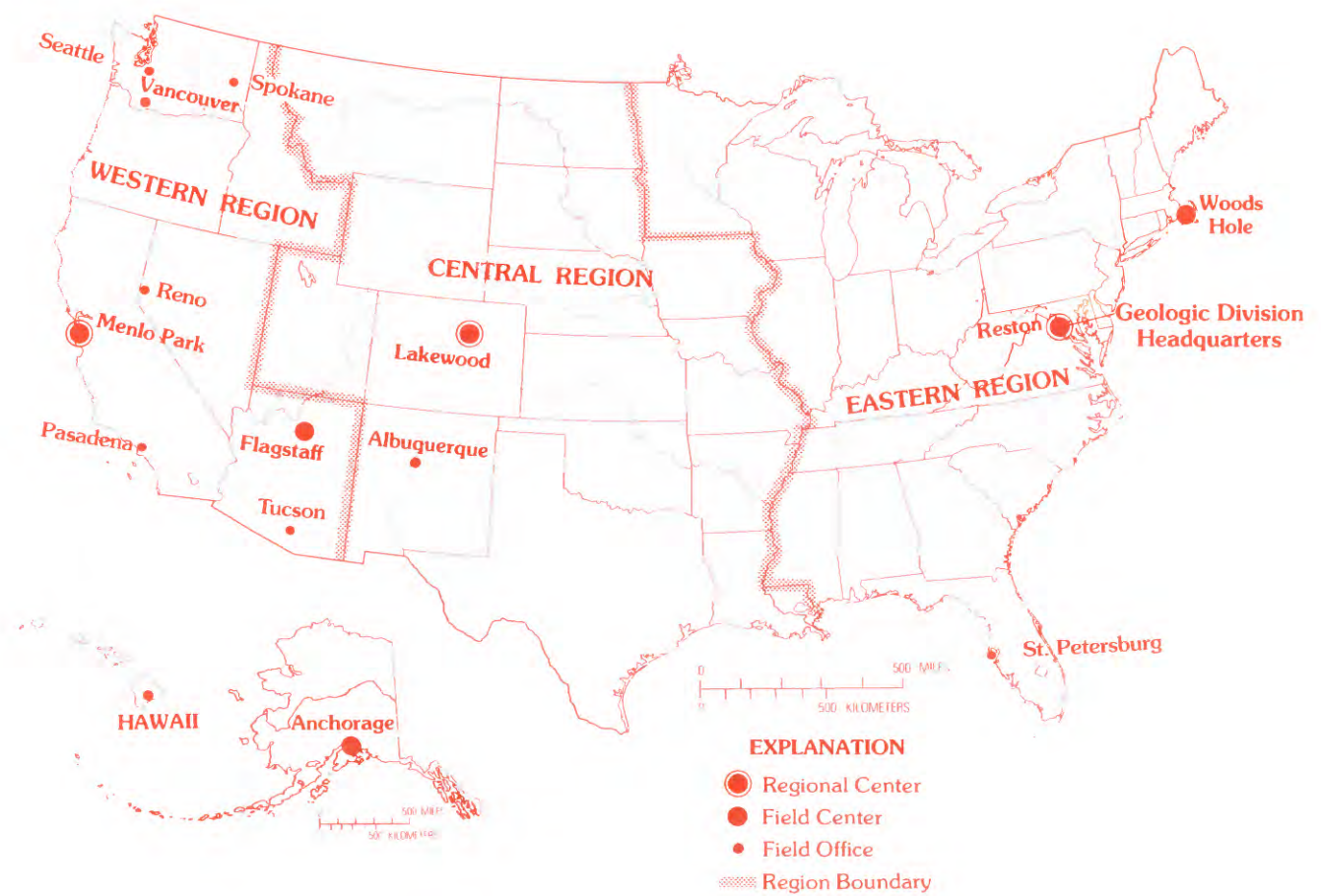


# Organization, Programs, and Activities of the Geologic Division, U.S. Geological Survey



U.S. GEOLOGICAL SURVEY CIRCULAR 1000



COVER: Locations and regional boundaries of major Geologic Division offices.

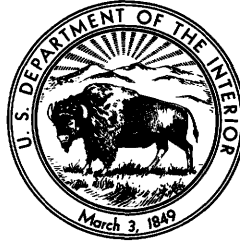
# Organization, Programs, and Activities of the Geologic Division, U.S. Geological Survey

By ROBERT E. DAVIS

A revised version of Circular 1000, originally published in 1985  
and reprinted in 1986, which has been updated to reflect  
changes in programs, budget, and personnel as of  
fiscal year 1989

U.S. GEOLOGICAL SURVEY CIRCULAR 1000

DEPARTMENT OF THE INTERIOR  
MANUEL LUJAN, Jr., Secretary  
  
U.S. GEOLOGICAL SURVEY  
Dallas L. Peck, Director



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# Organization, Programs, and Activities of the Geologic Division, U.S. Geological Survey

By Robert E. Davis

## Summary

This circular presents information about the organization, programs, and activities of the Geologic Division of the U.S. Geological Survey. A directory of mailing addresses, office locations, and telephone numbers for the major organizational units and field offices also is included, as well as a summary of authorizing legislation.

## INTRODUCTION

The U.S. Geological Survey (USGS) was established by an act of Congress in 1879 as an agency of the Department of the Interior (DOI). That Organic Act charged the USGS with conducting an "examination of the geological structure, mineral resources, and products of the national domain." Thus, the agency was defined primarily

as a scientific fact-finding and research organization, as contrasted to a developmental or regulatory one. It is now the principal source of scientific and technical expertise in the earth sciences within the Department of the Interior and the Federal Government. As the accompanying organization chart of the Department shows, the Director of the USGS currently reports to the Assistant Secretary—Water and Science. The USGS is headquartered at its National Center in Reston, Va., about 25 miles west of Washington, D.C.

The U.S. Geological Survey is organized into a directorate and five subordinate divisions. Three of these

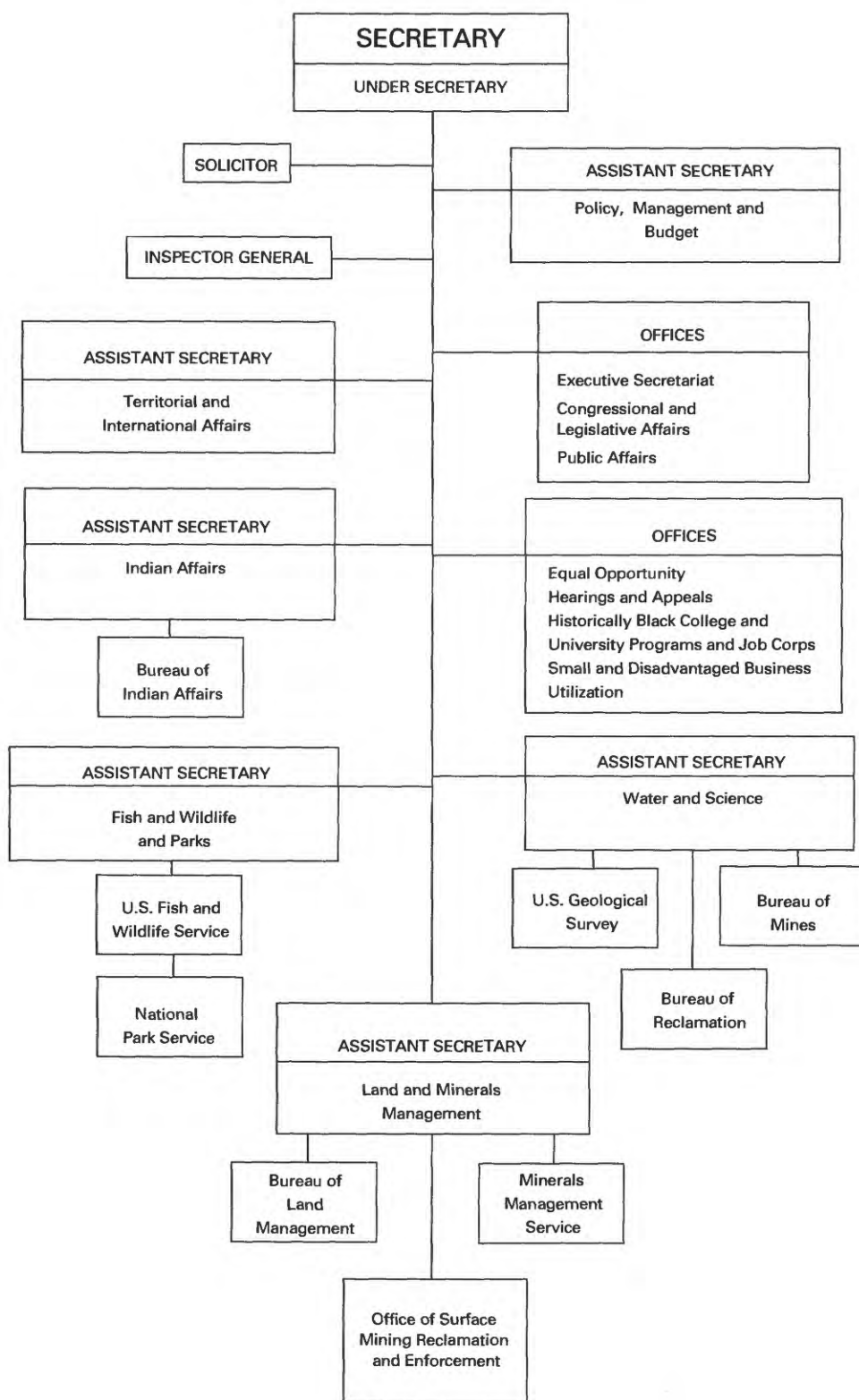
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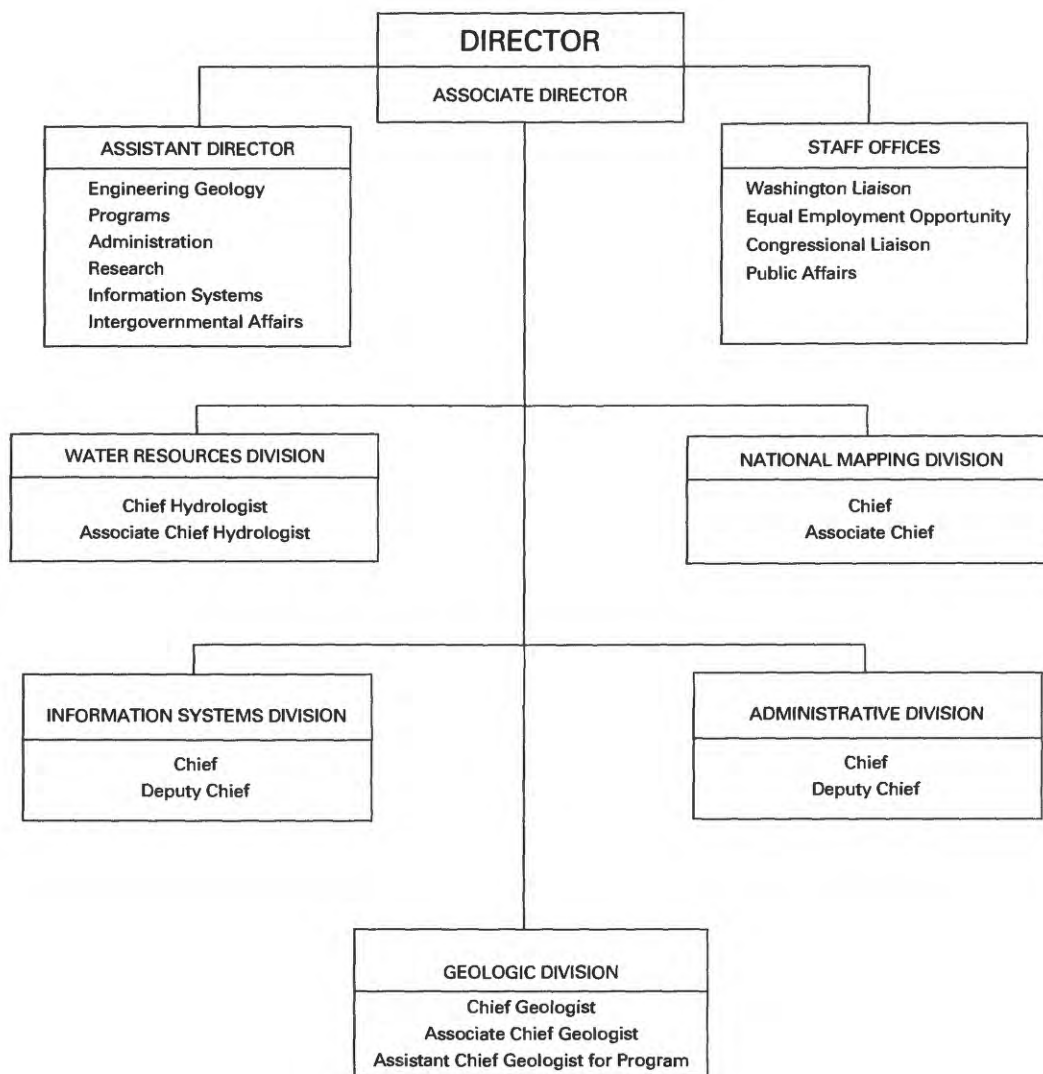
U.S. Geological Survey National Center, Reston, Va.



**U.S. DEPARTMENT OF THE INTERIOR  
GENERAL ORGANIZATION**



## ORGANIZATION OF THE U.S. GEOLOGICAL SURVEY



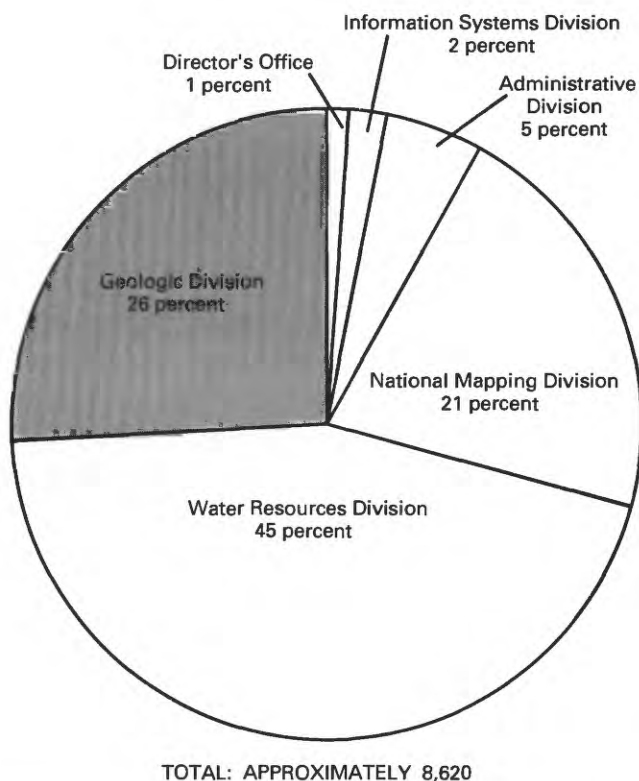
are major program divisions—Geologic, National Mapping, and Water Resources—and the other two are support divisions—Administrative and Information Systems. Each division has its own set of responsibilities in support of the overall agency mission.

- The Geologic Division provides geologic, geophysical, and geochemical information on land resources, energy and mineral resources, and geologic hazards of the Nation and its territories. The mission of the Geologic Division is described in more detail in the following section.
- The National Mapping Division provides geographic and cartographic information, maps, and technical assistance

and conducts related research responsive to national needs.

- The Water Resources Division provides information on the occurrence, quantity, quality, distribution, and movement of surface and underground waters that constitute the Nation's water resources.
- The Administrative Division provides finance, personnel, contract negotiation and administration, property and space management, organization and methods, management analysis, and other administrative services to the U.S. Geological Survey as a whole.
- The Information Systems Division provides guidance and advice to the Survey and to the Department of the Interior





Permanent full-time U.S. Geological Survey employees, by organization

on all matters relating to USGS information technology and automatic data processing.

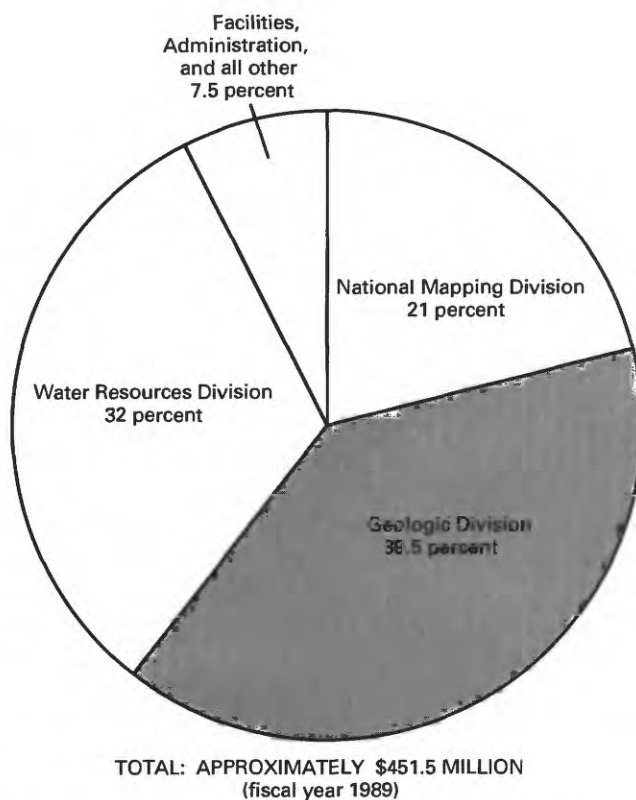
The agency employs about 8,620 permanent full-time scientific, technical, administrative, and clerical personnel, whose approximate distribution among the major organizational units is as follows: Director's Office, 60 employees (1 percent); Geologic Division, 2,290 (26 percent); National Mapping Division, 1,790 (21 percent); Water Resources Division, 3,880 (45 percent); Administrative Division, 460 (5 percent); and Information Systems Division, 140 (2 percent). The permanent full-time staff is augmented by about 1,730 part-time and temporary employees.

Funds for the agency come principally from direct appropriations (about \$451.5 million in fiscal year 1989) and from reimbursements from other agencies. The allocation of directly appropriated funds for fiscal year 1989 was approximately as follows: Geologic Division, \$178.2 million (39.5 percent); National Mapping Division, \$94.2 million (21 percent); Water Resources Division, \$145.3 million (32 percent); and facilities, administration, and all other activities, \$33.8 million (7.5 percent). Details of USGS funding for prior fiscal years can be found in the most recent "United States Geological Survey Yearbook."

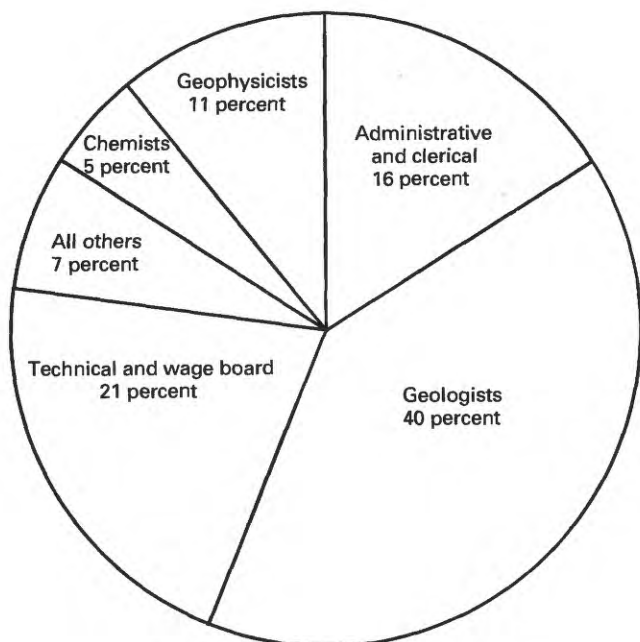
## MISSION

The Geologic Division conducts a broad spectrum of earth-science investigations, mainly in the United States and its territories and on its continental shelves and Exclusive Economic Zone (EEZ), to determine the geologic structure and the nature of geologic processes affecting these lands; to assess the energy and mineral resources of the Nation; to establish the geologic factors that bear on the use of the land and continental shelves and on the maintenance of environmental quality; and to understand the nature and mitigate the impacts of geologic hazards such as earthquakes, volcanic eruptions, and landslides. The Division carries out its mission responsibilities by means of a general range of activities that include

- Geologic, geophysical, and geochemical mapping to determine the composition and structure of rocks at and beneath the Earth's surface;
- Research into geologic principles and processes, including specialized research in many earth-science disciplines, to provide guidance for geologic interpretations;
- Development and assessment of new exploration techniques to aid in the increasingly difficult search for new sources of energy and mineral commodities;



Allocation of U.S. Geological Survey appropriated funds, by division



TOTAL: APPROXIMATELY 2,290

Permanent full-time Geologic Division employees, by occupation

- Collation and synthesis of geologic information on energy and mineral resources to develop a comprehensive background of knowledge upon which to base resource and resource-potential assessments; and
- Operation of seismological networks and geomagnetic and volcano observatories to monitor and aid in understanding geologic processes and events that have a potential for risk to life and property.

The Division carries out extensive basic research as an important component of all activities both in direct support of its mission and in order to maintain the capability necessary to respond to emerging national problems. The results of investigations are published in U.S. Geological Survey professional papers, bulletins, circulars, and geologic and related map series, in reports printed by cooperating agencies, and in outside technical and scientific journals. In addition, many reports and maps, mostly preliminary in nature, are released in the USGS open-file series and are available to users only on specific request. Selectively, some of these research results may be provided also in special formats for use in precollege earth-science education.

## AUTHORITY AND SOURCE OF FUNDS

Authority to carry out the activities of the Geologic Division derives basically from the Organic Act of 1879. Through the years, this initial authority has been refined by

numerous subsequent legislative acts relating to earthquake hazards, dam safety, nuclear safety, strategic and critical minerals, wilderness, and various aspects of energy, to cite but a few. Each of these pieces of legislation expands, more clearly defines, or re-emphasizes the basic responsibilities of the Survey as outlined in the Organic Act. A summary of pertinent legislation is included as a separate section at the end of this circular.

Approximately 75 percent of the Geologic Division's annual budget comes through direct appropriation from the Congress. The remainder comes largely through reimbursement from other Federal agencies, such as the Department of Energy, the Department of Defense, and the National Aeronautics and Space Administration, for work performed on their behalf and from organizations such as the Agency for International Development, the Department of State, the United Nations, and some foreign governments to support international geologic programs. Some support comes also from State agencies through cooperative activities.

## ORGANIZATION

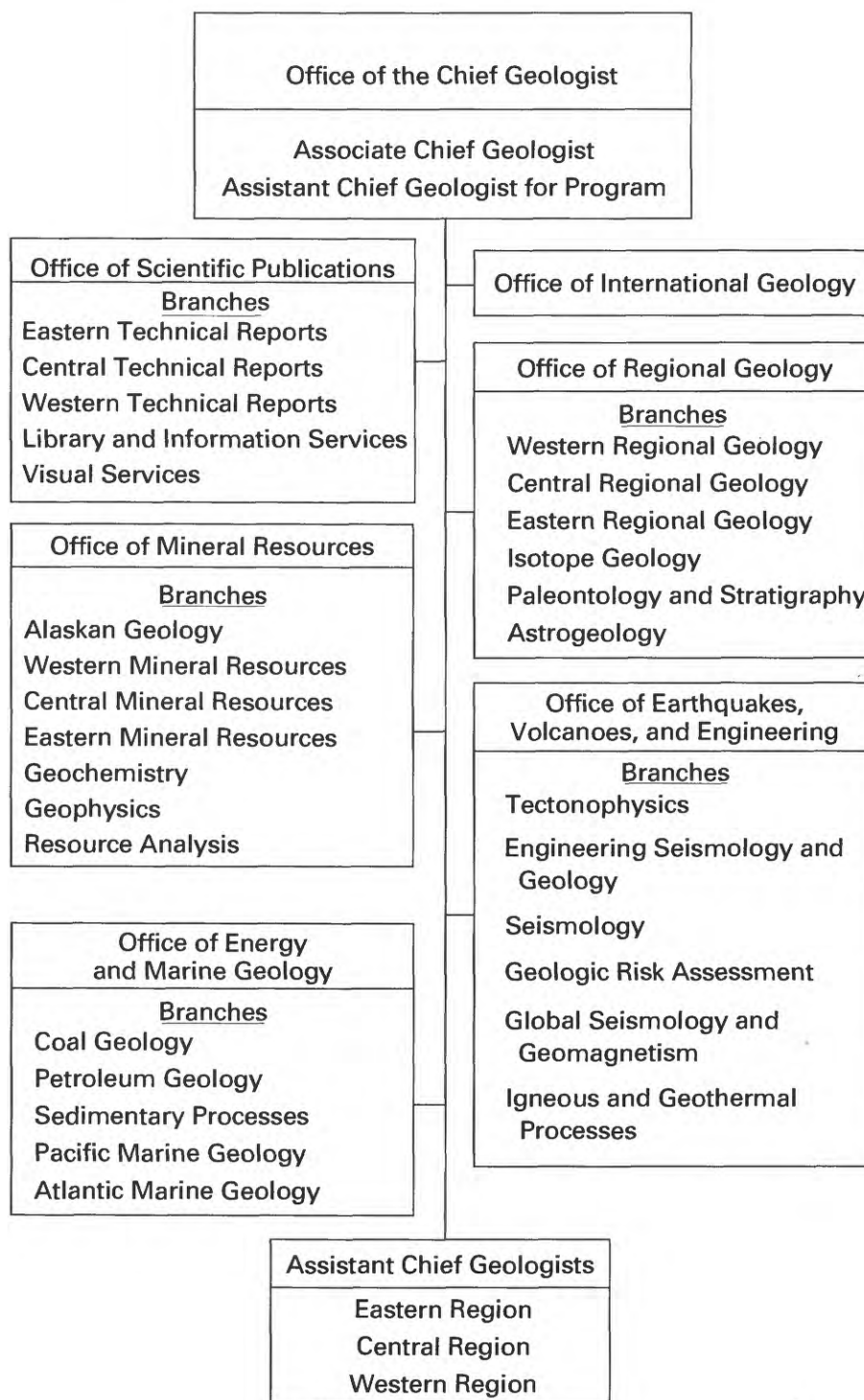
The permanent full-time staff of the Geologic Division comprises approximately 2,290 professional, technical, administrative, and clerical personnel. In addition, about 900 people are employed on a part-time or temporary basis. Of the permanent full-time staff, about 1,300 are geologists, geophysicists, or chemists. With more than 900 geologists, the Division ranks probably as the largest single employer of geologists in the United States.

The accompanying organization chart shows that the Geologic Division is organized largely along functional (programmatic) lines into 6 line offices and 29 subordinate branches. Overall management is centralized in a headquarters organization and is implemented at branch and project level by a field organization.

The **Headquarters Organization** is located at the USGS National Headquarters in Reston, Va., and comprises the Office of the Chief Geologist and the Offices of Mineral Resources; Energy and Marine Geology; Regional Geology; Earthquakes, Volcanoes, and Engineering; International Geology; and Scientific Publications. The chief of each office is responsible for the general management of a specified group of activities and the allocation of financial and personnel resources identified with those activities. Each office chief reports directly to the Chief Geologist.

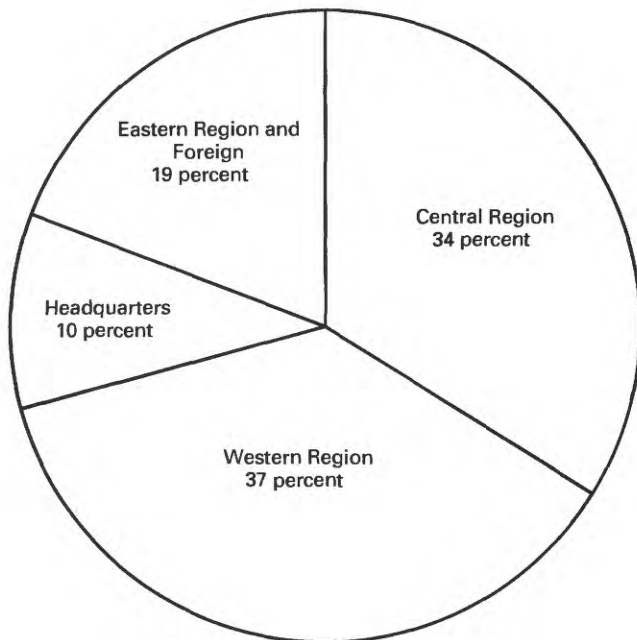
Program activities are carried out through the **Field Organization**, which consists basically of the 29 branches, variously headquartered at or near the Regional Centers in Reston, Va., Lakewood (Denver and Golden area), Colo., and Menlo Park, Calif., as well as at Field Centers in Woods Hole, Mass., Flagstaff, Ariz., and Anchorage, Alaska. Branch chiefs, who report directly to their respective office chiefs, are responsible for the design and coordination of scientific programs that meet branch

# ORGANIZATION OF THE GEOLOGIC DIVISION



objectives, for the conduct of program activities within the branch, and for the management of branch budgets and personnel.

Functional statements that describe the responsibilities of each office and branch are given below; headquarters location is listed for each branch. For many of the branches,



TOTAL: APPROXIMATELY 2,290

Permanent full-time Geologic Division employees, by location

some personnel and projects are located at centers or field offices other than the listed branch headquarters. The larger field offices are listed in the directory included elsewhere in this circular.

### Office of the Chief Geologist

The Office of the Chief Geologist consists of the **Chief Geologist**, the **Associate Chief Geologist**, and the **Assistant Chief Geologist for Program** who, with the assistance of immediate staff, exercise the general authority delegated by the Director for the initiation, planning, execution, and evaluation of programs. Matters related to personnel, policy and budget coordination, and administration are the responsibility of the Manpower Officer for Scientific Personnel, the Policy and Budget Officer, and the Administrative Officer and their respective staffs.

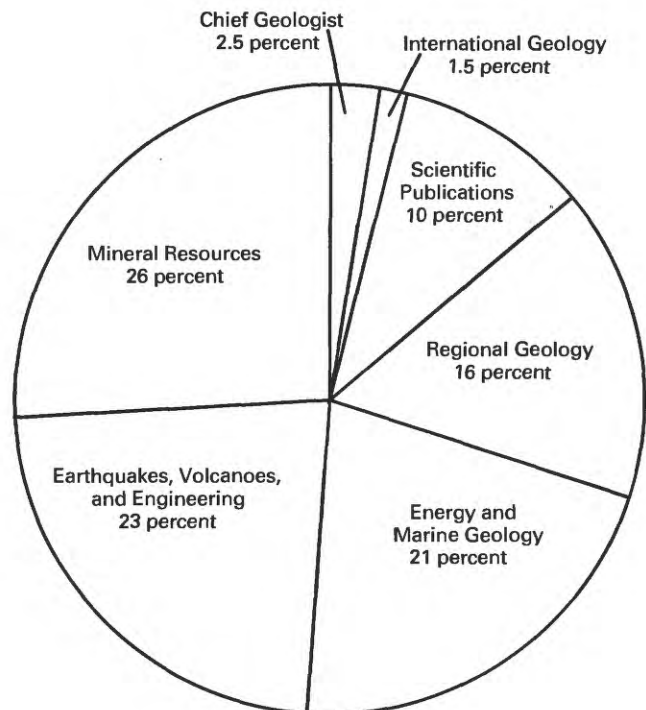
The Chief Geologist's Office also includes the **Assistant Chief Geologists for the Eastern, Central, and Western Regions**, who act for the Chief Geologist in furthering the general objectives, policies, and procedures of the Division. Each Assistant Chief Geologist serves as Chairman of a Division committee made up of branch chiefs and designated branch representatives located in the respective regions, as representative for the Chief Geologist on the Survey committee for the region, and as Geologic Division liaison with the Director's Representative for the region. In addition, the Assistant Chief Geologists serve as the Division's

principal liaison with and point of contact for the State Geologists in their respective regions.

### Office of Mineral Resources

The Office of Mineral Resources is responsible for assessing the nonfuel-mineral resource potential of the Nation through the use of geologic, geophysical, and geochemical studies; conducting research on the mode of occurrence and origin of mineral deposits; devising concepts and techniques to aid in the search for new deposits; and conducting geophysical investigations to determine the structure of rocks at and beneath the Earth's surface. The Division's principal onshore activities in Alaska and the general chemical laboratories of the Division are managed by this Office.

**Branch of Alaskan Geology** (Anchorage) makes geologic surveys and investigations to determine the geologic composition and structure of Alaska, to determine and appraise the energy and mineral resources in compliance with the Alaska National Interest Lands Conservation Act of 1980, to establish the geologic factors that bear on the use of the land with special emphasis on the engineering problems of frozen ground, and to reduce loss of life and property from earthquakes, landslides, and volcanic eruptions.



TOTAL: APPROXIMATELY 2,290

Permanent full-time Geologic Division employees, by office



tions. Activities designed to meet these objectives include geologic mapping; research into geologic processes, including specialized studies in geochemistry, tectonics, volcanology, and engineering geology; research into the types and models of mineral and hydrocarbon deposits; and collation and synthesis of geologic knowledge of energy and mineral resources. Although the headquarters of the Branch is in Anchorage, a large part of the workforce is in Menlo Park.

**Branches of Eastern, Central, and Western Mineral Resources** (Reston, Lakewood, and Menlo Park) assess mineral resource potential of lands in their respective regions by means of geologic, geochemical, geophysical, geochronologic, isotopic, and remote-sensing studies. The Branches conduct research on mineral deposits, using deposit types found within their regions, to improve understanding of their mode of occurrence and genesis and to contribute to new exploration models. Branch personnel also occasionally carry out land assessments and research outside their own regions, as required to fulfill nationwide program needs. The Branches maintain comprehensive files on mineral occurrences in their regions and use these data for studies relating mineral potential and ore-forming processes to petrogenesis and tectonics on a regional scale.

**Branch of Geochemistry** (Lakewood) conducts multidisciplinary research in geology, geochemistry, and analytical chemistry relevant to mineral deposit processes and exploration techniques, geologic framework studies, resource evaluation, environmental issues, and other fundamental geologic problems. This responsibility is met by maintaining a state-of-the-art research program on the geochemical cycles of elements in diverse geological environments; the geology, geochemistry, genesis, and weathering of a variety of mineral deposit types; the development and testing of geochemical exploration techniques; the development and maintenance of geochemical standards materials; and the development and testing of new analytical chemistry techniques. The Branch provides analytical chemical support to Geologic Division programs and the programs of other divisions as deemed in the best interests of the Survey. Analytical laboratories are located in Reston and Menlo Park, as well as in Lakewood.

**Branch of Geophysics** (Golden) conducts a broad range of geophysical investigations to aid in determining the resources, structure, and nature of rocks at and beneath the Earth's surface by means of gravity, magnetic, electrical, radiometric, borehole, seismic, and remote-sensing techniques. It provides support to other elements of the Geologic Division by carrying out studies related to resource assessments, geologic framework, and geologic hazards. The Branch also carries out research on new geophysical methods and instrumentation, which, when operational, can be used by industry to aid in the exploration for energy and mineral resources.

**Branch of Resource Analysis** (Reston) integrates the principles of economic geology, geochemistry and mineralogy, metallogenesis, mineral economics, and statistical analysis to develop techniques to assess the mineral resource potential of the United States. Another major supporting function of the Branch is the collection, storage, and analysis of data on mineral occurrences, production, and resources. The development and use of models of ore deposit occurrence and the identification of these in geologic terranes are central elements in the assessment process. The resulting assessments range from estimates of potential sources of supply for single and multiple mineral commodities to general assessments of the mineral resource potential of regions. Studies relating to the exhaustion of mineral commodities also are produced by means of many of the same techniques.

## Office of Energy and Marine Geology

The Office of Energy and Marine Geology is responsible for assessing the hydrocarbon, energy-mineral, and associated nonmetallic-mineral resource potential of the Nation and its continental margins and EEZ by means of geologic, geophysical, and geochemical studies; conducting research on the mode of occurrence and origin of hydrocarbons, energy minerals, and sea-floor nonfuel-mineral deposits; devising concepts and techniques to aid in the search for new deposits; and conducting research on the geologic framework of the Nation's offshore domains and on geologic processes that operate beneath the seafloor and along its margins.

**Branch of Coal Geology** (Reston) collects and analyzes geologic data about the quantity, quality, and minability of the Nation's principal coal deposits in order to develop an understanding of the formation, distribution, and economic resource characteristics of coal. It provides regional and national coal resource assessments and maintains a national coal-data system. In addition, the Branch assesses the geologic hazards and engineering geologic factors associated with coal extraction.

**Branch of Petroleum Geology** (Lakewood) conducts research on the origin and migration of petroleum, the geologic characteristics of source and reservoir rocks, the methodology of petroleum resource assessment, and the character and occurrence of unconventional hydrocarbon resources. It carries out geophysical investigations, particularly in seismic-data processing and interpretation, and uses these data to analyze potential oil- or gas-bearing geologic basins and other areas. Data and interpretations are used to make periodic regional or national assessments of domestic oil and gas resources.

**Branch of Sedimentary Processes** (Lakewood) conducts field and laboratory research on the nature, geochem-





U.S. Geological Survey Research Vessel *Samuel P. Lee* in McMurdo Sound, Antarctica

ical characteristics, and modes of occurrence of uranium and thorium minerals, oil shale, and sedimentary minerals such as clay, phosphate, potash, and saline minerals. The work involves geologic mapping, stratigraphic and structural studies, geochemical and petrologic investigations, and maintenance of computer-based resource-data banks.

**Branch of Pacific Marine Geology** (Menlo Park) conducts research on the geologic framework, mineral resources, and geologic hazards of the coastal zone and continental margins in U.S. Pacific and Arctic waters. To carry out this mission, it operates oceanographic research vessels to acquire marine geologic, geophysical, and geochemical data. It maintains a facility for processing and interpreting marine seismic records. Investigations are focused on the nature of the geologic framework of the Nation's EEZ, on the formation and character of ocean hydrocarbon and mineral resources, and on marine deposits and sedimentary dynamics related to seafloor character, hazards, and resources. The Branch cooperates with other Federal agencies in the geologic study of other oceanic areas of mutual interest.

**Branch of Atlantic Marine Geology** (Woods Hole) is responsible for offshore geologic investigations of the Atlantic and Gulf of Mexico coastal zone and continental shelf. These investigations are focused on the nature of the

geologic framework of the Nation's EEZ, on the formation and character of ocean hydrocarbon and mineral resources, and on marine deposits and sedimentary dynamics related to seafloor character, hazards, and resources. The work involves the collection and analysis of offshore geophysical data, study of sea-floor rocks and sediments, analysis of cores from offshore wells, and paleontologic research. The Branch cooperates with other Federal agencies in the geologic study of other oceanic areas of mutual interest.

### Office of Regional Geology

The Office of Regional Geology is responsible for investigations to determine the geologic attributes of rocks and surface materials in the United States and to increase our understanding of natural processes that shape the land surface. Results of these investigations are applied to land-use planning, assessment of geologic hazards, and assessment of mineral and fossil-fuel resources. Geologic maps at intermediate and large scales are fundamental products of these investigations. Other research includes paleontologic and radiometric studies to determine ages of earth materials and to further the development of new methods for age determination; astrogeologic studies, sponsored by the National Aeronautics and Space Administration and conducted at the Flagstaff, Ariz., field center, to

provide data on the surface geology, topography, and processes active on planetary bodies; and investigations on behalf of the Department of Energy and the Nuclear Regulatory Commission to define the geologic setting of, and identify the natural processes that will affect, existing and potential sites for nuclear testing, disposal of radioactive waste, and peacetime applications of atomic energy.

**Branches of Eastern, Central, and Western Regional Geology** (Reston, Golden, and Menlo Park) conduct multipurpose geologic mapping and regional geologic studies in the States in their respective regions. Principal activities of the Branches include geologic mapping of selected areas; regional studies to determine the larger features of stratigraphy and geologic structure; topical studies to understand geologic processes; syntheses of various types of geologic data in order to develop new hypotheses, theories, and principles for a better understanding of the geologic framework of the Nation; and preparation of technical reports and maps that make available to the public and to other Government agencies the results of the Branches' field and laboratory investigations. The Branch of Central Regional Geology has the additional responsibility of carrying out investigations and assessments of sites for the safe disposal of radioactive wastes and for underground nuclear testing.

**Branch of Paleontology and Stratigraphy** (Reston) does fundamental research in such fields as biostratigraphy and paleobiology. It evaluates the potential of various organisms for paleoecologic purposes and systematically studies fossils and stratigraphic sequences of rocks that contain them throughout the United States, its territories, and elsewhere in the world as a basis for correlation of strata and interpretation of geologic history. The Branch also

provides services in the field of paleontology and stratigraphy in support of geologic mapping and research to other units in the Survey and the Federal Government.

**Branch of Astrogeology** (Flagstaff) carries out the major part of the Survey's program of scientific research into the geologic nature and history of the other planets in our solar system. The purpose of this program is to develop an understanding of the processes involved in the formation and evolution of the planets and to characterize their surfaces and interiors. This program encompasses a wide variety of scientific and engineering disciplines including geology, geophysics, chemistry, mathematics, physics, computer science, electronics, cartography, and photogrammetry. The research involves development of many new theoretical concepts and techniques of scientific observation of the planets, data collection, and interpretation. The products of the research are used to advance basic knowledge, as well as to provide the guides for future planetary exploration by unmanned and manned spacecraft.

**Branch of Isotope Geology** (Lakewood) conducts research in geochronology, radiation, isotopic fractionation, and paleomagnetism for the purpose of developing new theoretical concepts as applied to geologic problems; new scientific instruments for measurement of isotopes; and new techniques for scientific observation and data interpretation. This research has a wide range of applications to programs within the Geologic Division including studies of geologic framework, mineral resources, and geologic hazards related to earthquakes, volcanoes, and landslides.

## **Office of Earthquakes, Volcanoes, and Engineering**

The Office of Earthquakes, Volcanoes, and Engineering manages the geologic, geophysical, and engineering investigations that include the assessment of hazards from earthquakes, volcanoes, and ground failure; research on the mechanism and occurrence of earthquakes and volcanic activity and the nature of the dynamic behavior of the crust and upper mantle; development of methods for predicting the time, place, and magnitude of earthquakes; evaluation of earthquake potential; assessment of risk from geologic hazards; acquisition of earthquake data needed for improvement of structural design of buildings to withstand strong shaking; determination of earthquake occurrence, location, and size for release to the general public; research on igneous and geothermal processes and the assessment of geothermal systems; engineering geologic studies on ground failure and construction hazards relative to highway construction, selection of damsites and other special-purpose sites, and urban development; and operation of the worldwide networks of standard seismographs, the geomagnetic observatories, and the volcano observatories.



Paleontologist studying microfossils in the laboratory



Monitoring activity at Mount St. Helens volcano, Washington

**Branch of Tectonophysics** (Menlo Park) obtains definitive geophysical data on the mechanics of crustal deformation, heat flow, and rock physics to better understand the nature of faulting and the mechanisms of earthquakes. These objectives are obtained by measuring and interpreting geodetic strain, elevation changes, and geochemical parameters and physical properties such as stress, temperature, pore pressure, and seismic-wave velocity and attenuation. These data permit the identification of short-term precursors of moderate to large earthquakes, which is necessary for developing the capability to predict earthquakes, and the evaluation and mitigation of man-induced seismicity.

**Branch of Engineering Seismology and Geology** (Menlo Park) acquires and disseminates data on strong ground motion for engineering design, develops the capability for predicting damaging shaking from earthquakes, and conducts research on surface faulting and earthquake-induced ground failure. Activities include analyzing data from strong-motion networks, studying earthquake-source

physics and seismic-wave propagation, numerically synthesizing seismograms, investigating the character and distribution of active faults, and determining the origin and mechanics of earthquake-generated landslides and liquefaction. Data and interpretations are used to make probabilistic assessments of earthquake recurrence, to determine the probable consequences of damaging earthquakes, and to improve the design of earthquake-resistant structures.

**Branch of Seismology** (Menlo Park) conducts research on earthquake mechanics, Earth structure, and seismic-source parameters; monitors regional earthquake activity; and develops instrumentation and collects observational data for the reduction of earthquake hazards. Activities designed to meet these objectives include the operation of seismic networks; collection and analysis of seismic-network, seismic-refraction, and seismic-reflection data; seismic monitoring of volcanic and geothermal systems; and the measurement of strain and tilt. These activities contribute toward the reduction of earthquake and volcanic hazards through the development of earthquake-prediction methodologies; the delineation of seismic-source zones, deep Earth structure, and tectonic processes; and an understanding of volcanic and geothermal systems.

**Branch of Geologic Risk Assessment** (Golden) conducts research on ground failure, the engineering properties of rock and soil, geologic site suitability, regional tectonics and seismicity, active geologic structures, seismic risk, and seismic-wave attenuation. Activities designed to meet the research objectives include geotechnical field and laboratory investigations, geologic mapping to complement engineering studies, investigation of active faults, documentation of regional variations in ground-motion attenuation, and the determination of tectonic histories. These studies lead to an understanding of the geologic processes and conditions that affect engineering, development, and construction; the delineation of seismic-source zones; and the mitigation of geologic hazards and risk.

**Branch of Global Seismology and Geomagnetism** (Golden) collects, analyzes, and disseminates information on the effects of earthquakes and monitors and interprets perturbations and anomalies in the Earth's magnetic field. The Branch operates global seismograph networks to detect and locate earthquakes, collects and interprets detailed information on earthquake mechanisms and seismic-wave propagation, and conducts research in global seismology and tectonics. It maintains a system of geomagnetic observatories, develops geomagnetic instrumentation, and conducts magnetic surveys. The Branch provides the public and the scientific community with information on earthquake location and damage, earthquakes that might produce seismic sea waves, and changes in the Earth's magnetic field.

**Branch of Igneous and Geothermal Processes** (Menlo Park) conducts basic research on the origin and





Geologist operating electron microprobe X-ray analyzer

composition of magmas, the chemical and physical interactions of magmas with ground water and rock, the nature and consequences of volcanic eruptions, and the origin and extent of geothermal resources. Activities include geologic, geochemical, and mineralogical studies of plutonic and volcanic rocks; experimental and field investigations and modeling of geochemical areas; and field investigations and seismic monitoring of active volcanic systems in Hawaii, the Cascades, and elsewhere. These data aid in the identification of potential volcanic hazards, the prediction of volcanic eruptions, the determination of ore-deposit models, and the identification and development of geothermal resources.

### Office of International Geology

The Office of International Geology manages and coordinates the Survey's international assistance in geologic studies and scientific-exchange programs on behalf of the Department of State and in cooperation with other agencies and governments and provides guidance and representation to domestic and international agencies in international earth sciences and resources.

### Office of Scientific Publications

The Office of Scientific Publications is responsible for planning, directing, and supervising the scientific-publications program of the Division including evaluating reports for appropriateness, completeness, and method of release; developing new concepts and techniques for preparation and release of scientific information; preparing final copy for the production of all USGS book publications; maintaining liaison with counterpart organizations in other

divisions, with the Government Printing Office (GPO), with DOI officials, and with commercial contractors on behalf of the USGS and the GPO; and preparing all general-interest leaflets and publications, exhibits, and other visual-information materials for the USGS. The Survey's library system is managed by this Office.

**Branches of Eastern, Central, and Western Technical Reports** (Reston, Lakewood, and Menlo Park) provide a variety of integrated consulting, editorial, graphics, and production services to facilitate publication of Division and Bureau research reports in the Eastern, Central, and Western Regions, respectively.

**Branch of Library and Information Services** (Reston) provides complete research and reference materials and information services to USGS scientists and other personnel, the Department of the Interior, other Federal and State agencies, universities, research organizations, and the general public. Facilities are located in Reston, Lakewood, Menlo Park, and Flagstaff.

**Branch of Visual Services** (Reston) provides a full range of editorial, graphics, photographic, and production services to all parts of the Survey in support of general-interest publications programs and exhibits that inform the public or special audiences about USGS activities.

## PROGRAMS AND ACTIVITIES

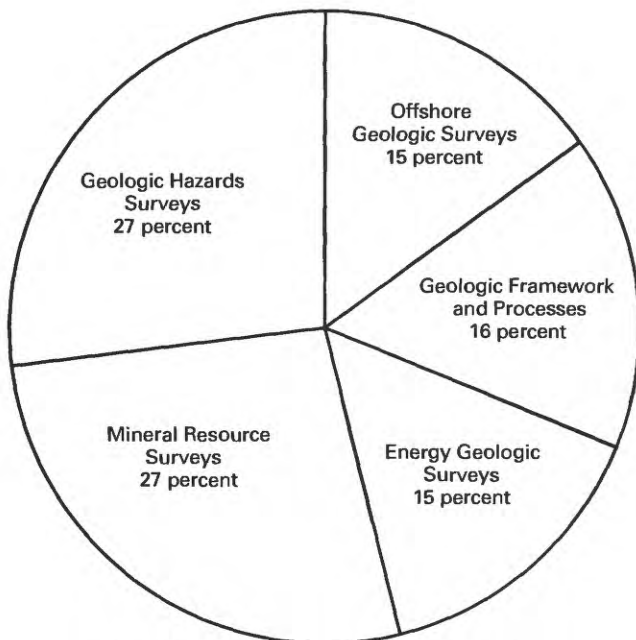
The programs of the Geologic Division generally may be categorized, depending on the source of funds, as **directly funded programs** or **reimbursable programs**, although a few are supported by some combination of funding sources. Additionally, the Division carries out certain **support activities** that are used not only internally but also by other parts of the Survey, by other Federal, State, and local agencies, and by the general public.

### Directly Funded Programs

For budgetary purposes the program elements that are supported by direct Congressional appropriation are grouped into five subactivities: (1) Geologic Framework and Processes, (2) Offshore Geologic Surveys, (3) Mineral Resource Surveys, (4) Energy Geologic Surveys, and (5) Geologic Hazards Surveys. Collectively, these subactivities constitute the budget activity **Geologic and Mineral Resource Surveys and Mapping**, which is a part of the U.S. Geological Survey's appropriation, entitled **Surveys, Investigations, and Research (SIR)**.

Program elements, their objectives, and activities in pursuit of those objectives are summarized in the paragraphs that follow.

**Geologic Framework and Processes** investigations are conducted to acquire basic information on the Nation's



TOTAL: APPROXIMATELY \$178.2 MILLION  
(fiscal year 1989)

Allocation of Geologic Division appropriated funds, by program

geologic framework and the processes that have shaped it; to determine the nature of the Earth's deep crust and upper mantle; to measure changes in the strength and direction of the Earth's magnetic field; to develop an understanding of climate change and its effects on land and water resources; and to address shoreline retreat and land loss along shorelines in the United States where shore erosion is significant.

**National Geologic Mapping Program.**—This program is designed to meet national needs for geologic maps by stimulating geologic mapping in all sectors; to improve coordination among Federal, State, academic, and private-sector producers and users of geologic-map information; and to develop new techniques and procedures that will improve the production, usefulness, and versatility of geologic-map information. These objectives are pursued through (1) mapping and related geologic, geophysical, and geochemical studies by multidisciplinary teams targeting specific high-priority regions and topics; (2) sponsorship of cooperatively funded mapping projects of mutual interest to the USGS and State geological surveys; (3) state-of-the-art research into Earth history and the age of Earth materials and the maintenance of analytical capabilities in isotopic and paleontologic studies; and (4) application of automated data-processing technology to geologic mapping and to the storage and retrieval of geologic-map information.

**Deep Continental Studies Program.**—The objective of this program is to determine the composition, structure, and dynamics of the Earth's deep crust and upper mantle for

the purpose of addressing critical problems that bear on the origin and evolution of the continents and the processes that produce mineral and energy resources and give rise to geologic hazards. Activities in pursuit of this objective include (1) multidisciplinary studies along transects that traverse major geologic features and their boundaries; (2) acquisition and interpretation of geologic and geophysical data obtained from deep drill holes, an activity closely coordinated with the National Science Foundation and the Department of Energy; and (3) investigations to determine the petrologic, isotopic, and structural character of deep crustal and upper mantle continental rocks.

**Geomagnetism Program.**—This program supports laboratories and observatories that measure changes in the strength and direction of the Earth's magnetic field. These data are used in the preparation and publication of navigational charts, topographic maps, and specialized magnetic surveys used by industry and by Federal and State agencies.

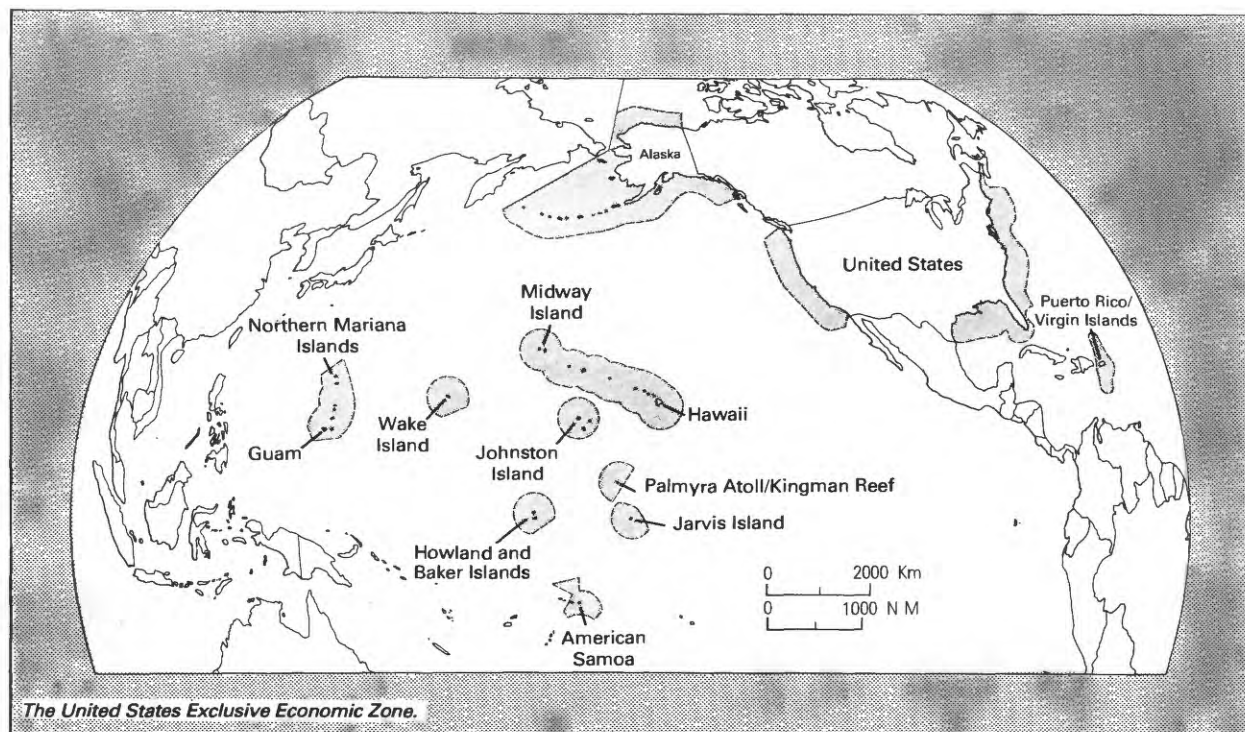
**Climate Change Program.**—The objectives of this program are to acquire a basic understanding of the causes of climate changes and the past and future impacts of these changes; to establish the long-term history of the rates, frequencies, and magnitudes of climate change in order to determine the effects of climate change on natural resources; and to create and improve techniques for delineating climate history. These objectives are met through (1) studies of continuous sequences of sedimentary rocks in which detailed climate variations are recorded by fossils and by geochemical and isotopic changes; (2) investigations of the effects of climate changes on continental margins; and (3) studies of times and magnitudes of past variations in atmospheric carbon dioxide through a variety of techniques.

**Coastal Erosion Program.**—The objective of this program is to provide geologic information about the nature, extent, and causes of coastal erosion and land loss, including loss of wetlands, as an aid to Federal, State, and local agencies in their decision-making with regard to prediction and mitigation of the effects of coastal processes. Activities, focused mainly in Louisiana and the southern Great Lakes, include geophysical and hydrographic surveys and detailed studies of sediment transport and deposition.

**Offshore Geologic Surveys** are conducted to provide basic geologic and geophysical information about the U.S. continental margins and adjacent sea-floor areas for the purpose of developing and enhancing our knowledge of the offshore geologic framework; the potential for the occurrence of petroleum and mineral resources; the geologic conditions that may affect the exploitation of those resources; and the formation of petroleum and mineral deposits in offshore areas and its application to the search for analogous onshore deposits of economic significance.

**Offshore Geologic Framework Program.**—The objective of this program is to create and enhance, on a



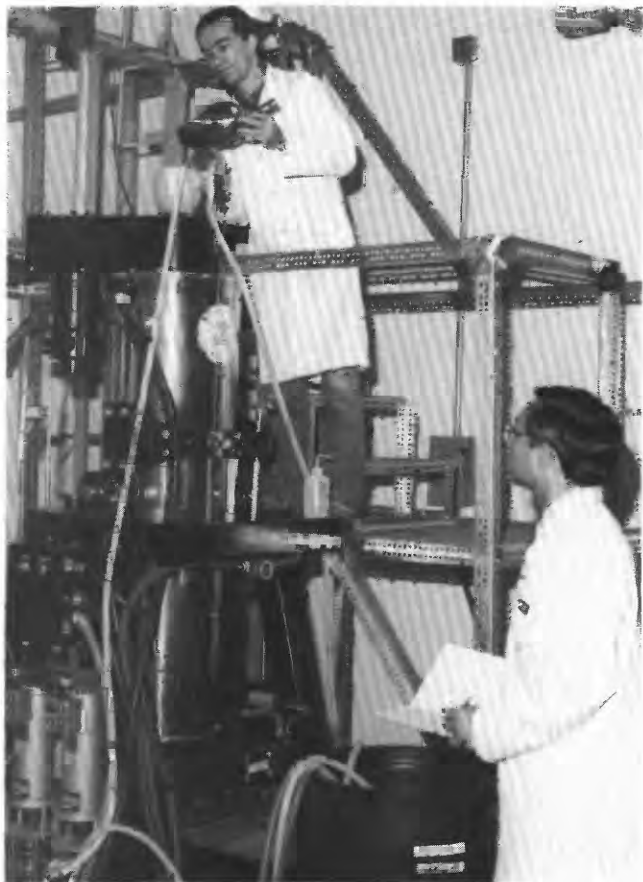


regional basis, an understanding of geologic settings and conditions of the offshore areas of the United States and its territories, including the Nation's EEZ. Activities to meet this objective include (1) studies of active geologic processes that modify the sea floor and coastal zone and that can affect the development of offshore resources; (2) studies of regional stratigraphy, structure, sea-floor seismicity, magmatism, and volcanism, all of which influence the formation of petroleum and mineral deposits; (3) studies leading to a better understanding of the processes that govern the genesis of petroleum deposits and of metallic and nonmetallic mineral deposits; and (4) surveys and mapping of the deep-water oceanic areas of the EEZ, which extends 200 nautical miles seaward of all U.S. shorelines, to provide knowledge of the geology and economic potential of these frontier areas.

**Mineral Resource Surveys** are conducted to assess the distribution, quantity, and quality of the mineral resources of the Nation, particularly on public lands, by studying the geology of known mineral occurrences and potentially mineralized areas; by developing and improving exploration techniques and mineral-occurrence models necessary in the continuing search for new deposits; and by enhancing our knowledge and understanding of domestic and world resources of nonfuel minerals. Particular emphasis is placed on strategic and critical minerals, those minerals that are largely or entirely imported and that are necessary to the economy of the United States.

**National Mineral Resource Assessment Program.**—The objectives of this program are to provide a comprehensive modern assessment of identified and undiscovered mineral resources of the conterminous United States, Alaska, and U.S. territories in order to determine those areas that have significant mineral potential; to provide mineral resource information for planning the use of public lands; and to provide information on how resource-management decisions, land-use policy, Congressional actions, and State and local government planning will affect the Nation's total resource base. These objectives are met by a broad range of investigations that include (1) compilation and synthesis of published mineral resource information on a statewide or multistate basis; (2) specific topical or areal studies designed to satisfy statutory requirements related to wilderness suitability decisions or to aid in determining the setting and character of mineral resources; and (3) multidisciplinary field studies by teams of geologists, geophysicists, geochemists, and mineral economists to produce quantitative probabilistic mineral resource assessments on a regional basis, as exemplified by the Alaska Mineral Resource Assessment Project (AMRAP) and the Conterminous United States Mineral Resource Assessment Project (CUSMAP).

**Development of Assessment Techniques Program.**—The objective of this program is to create concepts and techniques to improve the capability of identifying and evaluating mineral resources. Field and laboratory investi-



Geologists operating Magstream™ mineral separator

gations of known mineral districts, mineral provinces, and mineral-bearing environments are directed toward recognizing and understanding the processes that form mineral deposits. Activities include (1) multidisciplinary studies of topical problems in ore genesis; (2) studies of the factors that influence ore deposition in known mineral districts; (3) investigations aimed at recognizing and evaluating unconventional types of mineral resources; (4) geochemical studies of the trace-element distribution in selected mineralized areas; (5) laboratory studies of ore minerals and their host rocks; (6) generation of basic thermochemical data on ore-forming systems; (7) research directed toward increasing the understanding and interpretation of geochemical and geophysical information as applied to resource problems; (8) investigations to improve existing geochemical and geophysical technology; and (9) study of selected mineral districts to determine processes of ore formation and to define criteria needed to recognize undiscovered deposits.

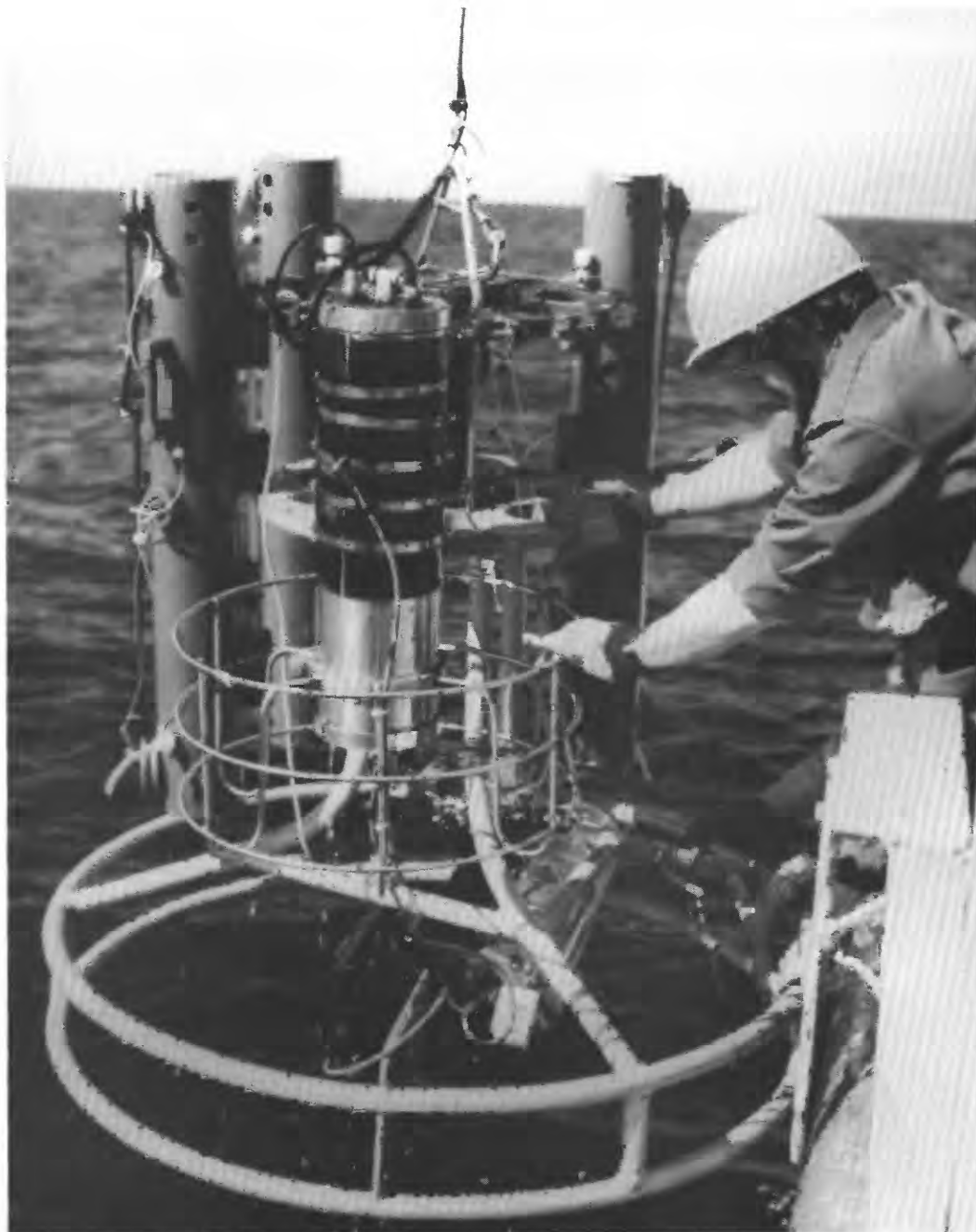
**Strategic and Critical Minerals Program.**—The objectives are to provide comprehensive information on domestic and world resources of the nonfuel minerals that are essential to a strong national economy and defense; to

create systems to store, analyze, and present this information in the form needed for mineral-policy planning; and to create expertise in strategic and critical minerals to assist in finding and developing adequate and dependable supplies of these commodities. Activities include comprehensive literature and field research to identify deposits from which these minerals may be produced and to identify areas that are geologically favorable for the discovery of as-yet-unsuspected deposits of strategic minerals.

**Energy Geologic Surveys** are conducted to improve understanding of the nature, distribution, and size of the Nation's energy-related resources as a prerequisite to the formulation of effective national energy policy and the optimum development of energy sources. Surveys of coal, oil and gas, oil shale, uranium and thorium, and geothermal resources all involve geologic, geophysical, and geochemical studies; construction of extensive data systems; creation and refinement of reliable assessment methodologies; and the conduct of independent, credible, scientifically based resource assessments.

**Evolution of Sedimentary Basins Program.**—The objectives are to conduct multidisciplinary studies of the sedimentary geology—history, settings, habitats, and processes—and the constituents of ancient and modern sedimentary basins; to integrate surface and subsurface geologic, geophysical, and geochemical information; and to provide the critical data that permit assessment of the energy and mineral resource potential of a given basin. Activities include (1) regional stratigraphic and sedimentologic studies of selected basins; (2) studies to determine sources of sediments and directions of regional transport and migration of fluids including oil and gas; (3) reconstructions of basin geometry, past thermal conditions, and paleohydrology; (4) geophysical studies, using seismic-reflection profiles, borehole measurements of rock properties, and field surveys to identify basement-rock character; and (5) operation of the Core Research Center and Library at the Denver Federal Center.

**Coal Investigations Program.**—The objectives of this program are to conduct comprehensive investigations of coal deposits in order to assess U.S. coal resources; to develop predictive models of the origin, distribution, and chemical composition of coal; to create and maintain a computerized National Coal Resources Data System capable of producing accurate and timely assessments of coal resources, quality, and availability; and to determine the characteristics of the environment of coal deposition as an aid to planning the efficient and orderly development of domestic coal resources. These objectives are met, commonly in cooperation with concerned States, through (1) field and laboratory studies and the portrayal of the results on regional-scale maps of coal basins; (2) acquisition of aggregated and point-source data on coal quantity and



Deploying a sediment-transport system on the Outer Continental Shelf

quality for entry into the publicly available computerized data base; and (3) regional geologic investigations pertinent to the development of coal-bearing regions to assist the Bureau of Land Management, Office of Surface Mining, Environmental Protection Agency, and State agencies in the formulation of coal-mining regulations.

*Oil and Gas Investigations Program.*—This program is designed to conduct fundamental and applied earth-

science research into the habitat, generation, migration, and entrapment of oil and gas and to use the acquired knowledge as a basis for reliable and credible oil and gas resource assessments for onshore public and private lands. These objectives are met by (1) field and laboratory studies aimed at understanding hydrocarbon generation and maturation and the geologic settings in which these processes occur and (2) studies that deal with the difficult problems concerning



the nature of stratigraphic traps, such as their origins, character, location in time and space, and detection. Other studies are aimed in new directions that may help in evaluating frontier areas or in finding petroleum previously overlooked in known areas of occurrence.

**Oil-Shale Investigations Program.**—The objectives of this program are to determine the geologic setting and the physical and chemical characteristics of domestic oil-shale deposits in order to provide an understanding of the oil-shale resources of the Nation, and the factors that affect their proposed exploitation, and to form a basis for making periodic assessments of this energy resource. Activities to meet these objectives include (1) quadrangle mapping, stratigraphic studies, and resource delineation; (2) compilation of stratigraphic, lithologic, geochemical, geophysical, and resource-evaluation data for inclusion in a computerized oil-shale inventory system; (3) studies of minerals that are potentially useful byproducts of, or that may be deleterious to, oil-shale processing; and (4) review of various resource-evaluation methods that have been used for estimating oil-shale yields of domestic and foreign deposits. Studies are focused chiefly on the rich deposits in Colorado, Utah, and Wyoming but also deal with organic-rich black shales of the Appalachian Basin and elsewhere.

**Uranium/Thorium Program.**—The objectives of this program are to conduct fundamental research and investigations to improve the understanding of the geologic setting and the regional and national distribution of uranium and thorium and associated materials, mainly radon gas; to develop techniques for increasing the discovery rate and improving the assessment of undiscovered resources; to administer the National Uranium Resource Evaluation (NURE) data base; and to study environmental hazards, such as the occurrence of radon, by means of geologic models. Activities include (1) studies of ore-forming processes, geochemical controls, and geochemical exploration techniques; (2) modeling studies of uranium and thorium in igneous and metamorphic rocks; (3) studies of uranium and associated metals in sedimentary rocks; (4) investigations of geophysical, biogeochemical, and mathematical techniques to detect characteristics of depositional patterns of uranium and thorium; (5) studies of resource assessment techniques; and (6) investigations to identify and model very young surficial uranium accumulations.

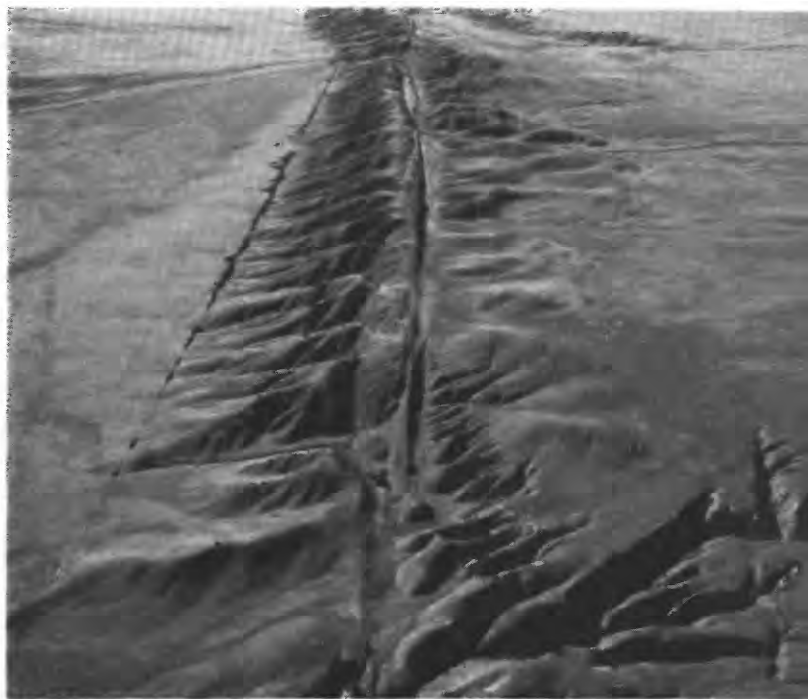
**Geothermal Investigations Program.**—This program is designed to provide a better understanding of the nature, distribution, and magnitude of the Nation's geothermal resources and of the geologic and hydrologic processes and conditions that produce and control geothermal systems, both in volcanic areas and elsewhere, in order that geothermal energy can be evaluated as an alternative energy source. Activities to meet program objectives include (1) fundamental research investigations to determine the geologic and hydrologic factors, particularly in the deeper

thermal regions of the Earth's crust, that control the characteristics, occurrence, longevity, and size of all types of geothermal systems; (2) multidisciplinary studies, both site-specific and regional, to identify and define the geologic, geophysical, geochemical, and hydrologic characteristics of all types of geothermal systems; and (3) evaluation of the geoenvironmental effects that may result from extraction and injection of fluids during exploitation of the resource.

**World Energy Resource Assessment Program.**—The objectives of this program are to provide geologic information and assessments on world energy resources, chiefly oil and gas, to be used by other agencies in national planning and decision-making processes relative to energy use, availability, ownership, international trade, and foreign policy. The objectives are met through literature investigations and studies of public information from multiple sources, with scientific support from the domestic energy resource programs.

**Geologic Hazards Surveys** are conducted to acquire data useful in delineating and forecasting hazards from earthquakes and volcanoes and in identifying engineering factors related to landslides and other ground-failure phenomena.

**Earthquake Hazards Reduction Program.**—The objective of this program is to mitigate losses from earthquakes, which can occur in many parts of the Nation, by providing earth-science data and evaluations essential for



The San Andreas fault, Carrizo Plain, central California



Collapse of the Cypress structure—a section of double-decked Interstate 880 in Oakland, Calif.—caused by the October 17, 1989, Loma Prieta earthquake

land-use planning, engineering design, and emergency-preparedness decisions. This objective is met through (1) seismologic and geologic analyses of current seismic activity, active geologic faults, and earthquake potential of seismogenic regions in the United States; (2) laboratory and theoretical studies, and field experiments in selected areas, to establish procedures and knowledge needed for the reliable prediction of the time, place, and magnitude of damaging earthquakes; (3) regional assessments of earthquake hazards, including potential ground shaking and ground failure, and identification of specific assessment techniques unique to each region; (4) installation and operation of national and global seismograph monitoring networks and the development and maintenance of computerized data bases on earthquake occurrence for use by the public, other Federal agencies, State and local governments, emergency-response organizations, and the scientific community; and (5) installation and operation of the national strong-motion monitoring network and the development of computerized data bases and data analyses on strong ground motion for use by other Federal agencies and the engineering community for the seismic-resistant design and construction of buildings, dams, and critical facilities. A significant part of the earthquake prediction and hazards

activities is carried on outside the USGS through a grants and contracts program. Data and information services are provided by the National Earthquake Information Service, in the Branch of Global Seismology and Geomagnetism, Golden, Colo.

*Volcano Hazards Program.*—The objective of this program is to reduce the loss of life, property, and natural resources that results from volcanic eruptions and related activity through (1) identifying potentially hazardous volcanoes and volcanic areas in the United States; (2) determining the kind, magnitude, and extent of possible future volcanic eruptions; (3) delineating zones of unusually high volcanic risk; (4) providing for early detection of precursory activity of potentially active volcanoes by maintenance of seismic, geodetic, geophysical, geochemical, and hydrologic monitoring networks; (5) determining volcano-induced flood-hazard potential by field investigations and modeling of hydrologic and geomorphic factors relative to eruption-induced erosion and filling of stream channels; and (6) collecting, compiling, and disseminating information on volcanic hazards to Federal, State, and local agencies.

*Landslide Hazards Program.*—The objectives are to reduce hazards to public safety and economic losses that



result from ground-failure events, to provide a better scientific and technological basis for land-use decisions, and to develop reliable quantitative methods for evaluating risks from ground failures. Activities include (1) regional assessments of the distribution of areas of potential landslides; (2) development of soil-mechanics techniques to determine relative susceptibility of slopes to failure; (3) investigations in rock mechanics, including instrumentation for monitoring slope movements and rock deformation, measurement of rock properties, and case studies of rock types with regard to their behavior when used as foundation and construction material; and (4) design and installation of near-real-time landslide warning networks in populous regions.

## Reimbursable Programs

In addition to those programs funded by direct SIR appropriations, the Geologic Division carries out a large number of activities on behalf of other Federal agencies (OFA), as well as some non-Federal domestic organizations, foreign governments, and international organizations. In general, these activities directly contribute to or otherwise complement the SIR programs of the Division, along with fulfilling the needs of the supporting agency. Collectively, funding for these programs totals about 25 percent of the Division budget. For convenience of discussion, these programs are grouped into two categories: (1) Other Federal Agency Programs and (2) International Activities.

**Other Federal Agency Programs** are those carried out by the Division on behalf of another agency and for which the Division is reimbursed by that agency. These activities range in level of effort from a fraction of a man-year per year, as required for selected seismic or geochemical monitoring or for a small number of chemical analyses, to several tens of man-years per year over a number of years, as typified by the Astrogeology Program and the Nuclear Waste Program, two of the Division's well-established, long-term OFA programs.

**Astrogeology Program.**—This program is carried out almost entirely on behalf of the National Aeronautics and Space Administration. Its objectives are to understand better the origin and evolution of the solar system and the individual planetary bodies, including the Earth; to formulate general theories to explain geologic processes that occur on the planets; to devise remote-sensing techniques to aid in geologic interpretation of planetary surfaces, including that of the Earth; and to insure that future exploration of the solar system is conducted in a manner that will optimize geologic return. Activities include (1) research in a wide range of topical geologic subjects; (2) research in radar technology, photogrammetry, and image processing; (3) studies in impact-cratering mechanics; (4) interpretation and management of remotely sensed data obtained from

spacecraft; and (5) compilation for publication of topographic, geologic, photographic, and air-brush map products derived from data obtained from spacecraft.

**Nuclear Waste Program.**—This program is funded in part by direct SIR appropriation and in part by the Department of Energy (DOE); the Water Resources Division has the lead responsibility for the program. The objectives are to evaluate new screening methods and different geohydrologic environments for siting repositories; to improve techniques for site identification and characterization and for prediction of the effects of geologic and hydrologic processes and events that could affect the future integrity of a repository; to provide advice to DOE on earth-science aspects of the program and review contractors' plans and products; and, through field investigations, to assist DOE in identifying and characterizing potential sites for nuclear-waste repositories. Activities for DOE involve (1) extensive geologic, geophysical, and seismic investigations of a potential repository site in Nevada and (2) studies to develop or improve geophysical, geomechanical, and geochemical techniques used for the characterization of potential repository sites.



Geophysicists measuring deformation along the San Andreas fault using laser-beam instruments; plane is monitoring temperature and humidity



Geologists measuring lava temperature in Hawaii

*Toxic-Substances Hydrology Program.*—This program also is being conducted in cooperation with the Water Resources Division. Its objectives are to provide the Nation with basic earth-sciences information needed by managers to improve waste-disposal practices and to help mitigate existing and future surface- and ground-water contamination problems. Specific Geologic Division activities include (1) developing geophysical techniques for characterizing and tracing plumes of contaminated ground water and for characterizing subsurface materials through which the ground water flows; (2) preparing maps showing the location, characteristics, and thickness of glacial and other surficial geologic deposits and using these maps to estimate the vulnerability of ground water to contamination; (3) studying the geochemical behavior of toxic elements in natural and contaminated environments; and (4) studying the factors that influence the distribution and fate of agricultural pesticides in the environment.

Examples of other OFA activities are summarized briefly below.

*Agency for International Development*—Studies in foreign geology; technical assistance to many nations (see International Activities); investigations of earthquakes in Africa, the Circum-Pacific, Latin America, and Southeast Asia; investigations of volcanic hazards and installation of early-warning volcano-eruption equipment in South America and the Far East.

*Bureau of Indian Affairs*—Geologic, geophysical, and geochemical field studies for the assessment of energy and nonfuel mineral resources on Indian lands.

*Bureau of Land Management*—Geologic, geophysical, and geochemical field studies for the assessment of mineral resource potential of selected BLM wilderness and roadless areas; Arctic environmental studies.

*Bureau of Mines*—Research investigations in borehole soundings and in borehole minerals-assaying technology.

*Bureau of Reclamation*—Operation, maintenance, and monitoring of seismic networks at Auburn Dam, New Melones, and Mount Shasta, Calif., Glen Canyon, Utah, and Delores River, Colo.; studies in seismic-refraction analyses.

*Central Intelligence Agency*—Military geology studies of critical areas.

*Department of Defense*

*Army Research Office*—Studies of recovery rates of arid lands used for military maneuvers; studies of world deserts; convening of the International Desert Studies workshop.

*Corps of Engineers*—Operation, maintenance, and monitoring of strong-motion networks at various dams in the Western United States; studies of sediment transport, deposition, and erosion in the marine environment.

*Defense Advanced Research Projects Agency*—Cooperative operation of various seismic monitoring networks for the People's Republic of China; global seismological studies; studies in military geology.

*Defense Nuclear Agency*—Evaluation of failure mechanisms and deformation processes in shock-loaded unconsolidated and moderately consolidated geologic materials by means of petrographic, petrologic, and solid-state techniques; study of structural deformations and failure mechanisms in 40,000 feet of drill core from large Flynn Creek, Tenn., impact crater; participation in DNA-sponsored dry field explosion trials; studies in military geology.

*Department of Energy*—Studies related to the safe storage or disposal of hazardous wastes (see Nuclear Waste Program); investigations of geochemical aspects of geothermal reservoir depletion at Cierro Prieto, Mexico, Larderello, Italy, and Klamath Falls, Oreg.; three-dimensional seismic studies of Newberry Crater, Oreg.; geodetic studies at the Hanford Site, Wash.; seismic-refraction surveys of the Columbia Basin, southeastern Washington; geologic and geophysical studies in support of the nuclear testing program at the Nevada Test Site; studies of rock stress, seismicity, and ground motion; research in tight gas sands and deep-source hydrocarbons.

*Environmental Protection Agency*—Studies of airborne geophysical techniques to develop methods for locating and tracing underground contaminants and toxic-waste plumes.

*Federal Emergency Management Agency*—Studies of landslides and mudflows; synthesis of scientific and technical earth-science information for the Central United States; basic research in earthquake hazards and earthquake prediction to support earthquake-preparedness program.



Rear of house in Boulder Creek, Calif., that collapsed as a result of a landslide caused by the Loma Prieta earthquake

*Fish and Wildlife Service*—Geologic, geophysical, geochemical, and remote-sensing investigations and hydrocarbon resource assessments of the Arctic National Wildlife Refuge, Alaska; mineral resource survey of the Kofa National Wildlife Refuge, Ariz.

*National Aeronautics and Space Administration*—See Astrogeology Program; volcanologic and morphologic studies of crater walls of Hawaii and Cascade volcanoes.

*National Institutes of Standards and Technology*—Evaluation of thermodynamic and thermochemical data for chemical components, minerals, and rock materials.

*National Oceanic and Atmospheric Administration*—Investigations of sea-floor stability, submarine sedimentary processes, offshore permafrost, and other aspects of the geology of the Outer Continental Shelf related to the orderly and safe exploitation of offshore resources; bathymetric surveys; assistance in monitoring carbon-isotope variations in atmospheric samples.

*National Park Service*—Volcanological studies and earthquake, geothermal, and geochemical monitoring at Yellowstone National Park, Wyo.; seismic monitoring at Mount Lassen, Calif.; baseline geochemical studies in national parks, monuments, and wildlife refuges in Alaska, California, South Carolina, Florida, and North Dakota; studies of effects of induced vibrations on anthropological sites at White Sands, N. Mex.

*National Science Foundation*—Fieldwork on the English Coast, Antarctica; studies of the Dufek intrusion, Ant-

arctica; geochemical investigations of the Sonoran Desert.

*Nuclear Regulatory Commission*—Development of ground-motion attenuation relationships; geologic and seismologic research in the vicinity of Charleston, S.C.

**International Activities**, in terms of total funding, constitute the largest reimbursable effort of the Division. Included is a wide variety of earth-science activities conducted principally, but not exclusively, in developing nations. Institution building and other technical assistance, national resource assessments, evaluation of natural hazards, cooperative research projects, representation and participation in multinational organizations, scientist exchange, and training of foreign scientists are major components of the international program. Proposals for projects may be initiated either within the Division as an extension of an ongoing domestic activity, at the request of another Federal agency such as the Department of State or the Agency for International Development, or at the request of a foreign government or an international organization.

Funds generally are provided at least in part by the entity that initiates the proposal, although funding arrangements vary greatly. For example, technical assistance to developing countries is undertaken usually at the request of, and with funds provided by, the Agency for International Development or a specific foreign government. Scientific cooperation and exchange projects, on the other hand, may



be at the initiative of the Geologic Division and might be funded in part by appropriated funds and in part by funds transferred from another agency or from a foreign government. Regardless of the source of a project proposal, projects are selected and designed so as to provide maximum benefits both to the United States and to the cooperating agency or country.

The largest of the current programs is the Mission to Saudi Arabia, wherein earth scientists and support personnel are engaged in studies of the geology, mineral resources, and natural hazards of the Kingdom of Saudi Arabia. This program is funded entirely by the Saudi Arabian government. Other activities are being carried out in countries in Asia, Europe, Africa, and Central and South America on behalf of the Agency for International Development and other agencies and international institutions.

## Support Activities

Support activities are centered largely around publications, library services, development and operation of data bases, and other activities related primarily to the presentation and dissemination of information. Although carried out mainly to support the research programs of the Geologic Division or to fulfill related needs, these activities also support other parts of the Survey and, in many instances, provide services to organizations and individuals outside the Survey.

## Publications

Since its inception, the USGS has published the results of its investigations in the form of thematic maps, written reports, and written abstracts that summarize oral presentations given by members of its research staff. Geologic Division personnel author, on average, about 3,400 such publications each year. Reports are published through a variety of media, including the USGS professional paper, bulletin, circular, and open-file report series and a large number of scientific and technical journals published by domestic or international professional societies. Thematic maps are published almost exclusively in one of the USGS map series.

Whatever the form of publication, each product initiated within the Geologic Division undergoes peer technical review and, except for open files and most outside journal articles, rigorous editorial review by the Division's publications staff. An author's branch chief is responsible for the scientific quality of each report and map, and the Office of Scientific Publications, through its three Technical Reports Branches, is responsible for editorial and other production aspects. The Office of Scientific Publications is responsible also for final preparation and printing of all reports published in the USGS book series, not only for the

Division but also for the rest of the Survey. Printing of USGS map-series products is the responsibility of the National Mapping Division.

Information on the kinds of reports published by the Survey and their availability is given in USGS Circular 900, "A Guide to Obtaining USGS Information," available free on request from Books and Open-File Reports, U.S. Geological Survey, Federal Center, Box 25425, Denver, CO 80225.

## Libraries

The U.S. Geological Survey's library system, administered by the Branch of Library and Information Services, ranks probably as the foremost earth-science library system in the world. With more than a million holdings in the main library in Reston, and large holdings in the Lakewood, Menlo Park, and Flagstaff branches, it not only is a major research facility of the USGS but also serves other Federal and State agencies, universities, industry, and the general public. Service is provided by a staff of experienced reference librarians at each location and through an extensive interlibrary loan system. In addition to the normal collections, the library system holds for reference field records, notebooks, manuscripts, and other background materials from completed projects, and the Photographic Library in Lakewood contains approximately 200,000 photographs taken during field studies dating back to 1869.

Further information on library facilities and services can be obtained by contacting the libraries at the telephone numbers listed in the directory section of this circular.

## Data Bases and Data Systems

As an adjunct to many program activities and as a major component of some others, information and data gathered are entered into computer-based data banks for storage and retrieval by the researchers who generated the data or by other users. Within the Geologic Division, about 150 such data bases and systems exist on a variety of computing systems. They cover a multitude of subjects and range from large information systems on earthquakes, energy and mineral resources, rock analyses, and geologic maps to small, specialized data files developed and used by only a small number of researchers to aid in their project work. Some files are available by direct access, whereas others require that information be requested from a contact person who is responsible for that particular file or system. A sampling of data bases and systems is given below with the name, acronym or abbreviation, and name of responsible branch or office.

*National Coal Resources Data System* (NCRDS; Branch of Coal Geology)—Information on coal quantity and quality in the United States.





Free access to the Library is an important aspect of the scientists' research efforts

*Mineral Resources Data System* (MRDS; Branch of Resource Analysis)—Set of records on mineral deposits and mineral commodities in the United States and, to a certain extent, the world.

*Geologic Names of the United States* (GEONAMES; Office of Scientific Publications)—List of rock stratigraphic names in good usage in the United States; distribution, age, and physical attributes are given for each entry.

*Index to Geologic Maps* (GEOINDEX; Geologic Inquiries Group, Branch of Library and Information Services)—Bibliographic and location data for all original published geologic maps in the United States and its territories.

*Hypocenter Data File* (HDF; Branch of Global Seismology and Geomagnetism)—Historical file of located earthquake hypocenters listing attributes (time, location, depth, and so on) of each earthquake.

*National Uranium Resource Evaluation Data Base* (NURE; Branch of Sedimentary Processes)—File of locations where uranium exploration has been carried out in the conterminous 48 States.

*Petroleum Data System* (PDS; Branch of Petroleum

Geology)—File of U.S. oil and gas production by fields and pools, chemical analyses of crude oil and natural gas, and production history (Texas only).

*Rock Analysis Storage System* (RASS; Branch of Geochemistry)—Spectrographic and wet-chemical analyses of material samples collected in the United States by Geologic Division geologists and analyzed by Division chemists.

Further information on these particular files may be obtained by contacting headquarters of the branches listed for the name and telephone number of the contact person responsible. A listing of many of the USGS data bases and systems can be found in U.S. Geological Survey Circular 817, "Scientific and Technical, Spatial, and Bibliographic Data Bases and Systems of the U.S. Geological Survey, 1983."

#### **Educational Support Program**

The Geologic Division provides scientific information, materials, and other support to precollege teachers and



Geologist studying rock outcrop in the field

teachers' colleges to enhance student awareness and understanding of earth science. Providing information in appropriate forms for use in precollege classrooms is an essential part of each Division program. The Regional Assistant Chief Geologists are responsible for development of educational support activities in their regions, in close cooperation with State Geological Surveys and State educational and scientific organizations. Education coordinators in the Offices of the Regional Assistant Chief Geologists develop teachers' workshops and facilitate scientist participation in teachers' association meetings, science fairs, classroom presentations, and career days. The Office of Scientific

Publications develops and provides educational publications, materials, films, and exhibits through the Geologic Inquiries Group and the Branch of Visual Services, as described below under Geologic Information Services.

#### **Geologic Information Services**

In addition to managing the library system, the Office of Scientific Publications and its branches also manage or provide other information-related services through a Geologic Names Unit in each Regional Center, the Geologic Inquiries Group, and the Branch of Visual Services. Telephone numbers for these organizations, the principal



Landslide in the Pacific Palisades, southern California

offices of which are located in Reston, are listed in the directory.

*The Geologic Names Units*, in the Office of Scientific Publications, are responsible for defining, recommending, and implementing policy and rules governing the use of stratigraphic nomenclature for the USGS in accordance with the "Code of Stratigraphic Nomenclature" of the American Commission on Stratigraphic Nomenclature, for reviewing nomenclature usage by USGS authors, for approving and adjudicating any proposed changes in Survey usage, and for compiling information and publishing reports documenting changes in nomenclature usage by the USGS. In addition, the unit in Reston is responsible for maintaining a computer-based lexicon of geologic names used in the United States.

*The Geologic Inquiries Group*, in the Branch of Library and Information Services, responds to technical and nontechnical inquiries on all aspects of geology, geologic

maps, and mapping directed to the USGS by other Federal, State, and local agencies, as well as from the general public. Teachers' packets of information on the earth sciences, tailored to specific purposes and grade levels, and limited numbers of State Geologic Map Indexes, pamphlets on various geologic topics, and other preprinted materials are also available from the Geologic Inquiries Group.

*The Branch of Visual Services* prepares display panels for exhibits at outside expositions and for internal USGS purposes, which illustrate specific work in geology, topographic mapping, water resources, and other aspects of USGS research, and is responsible for final preparation of most of the general-interest pamphlets and brochures published by the Survey. Exhibit panels may be requested for display at professional meetings and technical conferences. Movies on certain earth-science topics also are available free from the Branch for short-term loan to professional and scientific societies, educational institutions, and civic and industrial groups.

## DIRECTORY OF MAILING ADDRESSES, OFFICE LOCATIONS, AND TELEPHONE NUMBERS OF PRINCIPAL GEOLOGIC DIVISION ORGANIZATIONS AND FIELD OFFICES

### **Reston, Virginia**

Mailing address: [Name]

U.S. Geological Survey

[Mail Stop no.] National Center

Reston, VA 22092

Telephone: (703) 648 + 4-digit extension

FTS 959 + 4-digit extension

Switchboard: ext. 4000

Personnel locator: ext. 7470

Office hours: 7:45 a.m. to 4:15 p.m., Eastern Time

### **Office of the Chief Geologist**

Chief Geologist, B.A. Morgan

Mail Stop: 911

Room: 3A-414

Telephone: ext. 6600

Associate Chief Geologist, W.R. Greenwood

Mail Stop: 911

Room: 3A-410

Telephone: ext. 6601

Assistant Chief Geologist for Program, D.P. Russ

Mail Stop: 911

Room: 3A-416

Telephone: ext. 6640

### **Office of Mineral Resources**

Chief, G.H. Allcott

Mail Stop: 913

Room: 3A-400

Telephone: ext. 6100

### **Office of Regional Geology**

Chief, M.W. Reynolds

Mail Stop: 908

Room: 3A-424

Telephone: ext. 6960

### **Office of Energy and Marine Geology**

Chief, G.W. Hill

Mail Stop: 915

Room: 3A-312

Telephone: ext. 6472

### **Office of Earthquakes, Volcanoes, and Engineering**

Chief, R.L. Wesson

Mail Stop: 905

Room: 3A-114

Telephone: ext. 6714

### **Office of International Geology**

Chief, A.T. Ovenshine

Mail Stop: 917

Room: 3B-416

Telephone: ext. 6047

### **Office of Scientific Publications**

Chief, J.M. Aaron

Mail Stop: 904

Room: 3A-124

Telephone: ext. 6077

Geologic Names Unit

Telephone: ext. 4321

### **Office of the Assistant Chief Geologist, Eastern Region**

Assistant Chief Geologist, J.H. Medlin

Mail Stop: 953

Room: 4C-116

Telephone: ext. 6660

### **Branch of Eastern Mineral Resources**

Chief, K.J. Schulz

Mail Stop: 954

Room: 4C-124

Telephone: ext. 6327

### **Branch of Resource Analysis**

Chief, W.D. Menzie

Mail Stop: 920

Room: 3B-400

Telephone: ext. 6125

### **Branch of Eastern Regional Geology**

Chief, W.L. Newell

Mail Stop: 926A

Room: 3C-208

Telephone: ext. 6900

### **Branch of Paleontology and Stratigraphy**

Chief, John Pojeta, Jr.

Mail Stop: 982

Room: 4C-404

Telephone: ext. 5288

### **Branch of Coal Geology**

Chief, H.J. Gluskoter

Mail Stop: 956

Room: 4C-300

Telephone: ext. 6401

### **Branch of Eastern Technical Reports**

Chief, S.M. Cargill

Mail Stop: 903

Room: 2C-400C

Telephone: ext. 6147

### **Branch of Visual Services**

Chief, J.R. Keith

Mail Stop: 790

Room: BC-101A

Telephone: ext. 4357

### **Branch of Library and Information Services**

Chief, B.A. Chappell

Mail Stop: 950

Room: 4A-102A

Telephone: ext. 4305

Geologic Inquiries Group

Telephone: ext. 4383



## **Lakewood (Denver), Colorado**

Mailing address: [Name]

U.S. Geological Survey

Box 25046, DFC, MS [Mail Stop no.]

Lakewood, CO 80225

Telephone: (303) 236 + 4-digit extension

FTS 776 + 4-digit extension

Switchboard: ext. 7181

Personnel locator: ext. 7181

Office hours: 8:00 a.m. to 4:30 p.m., Mountain Time

### **Office of the Assistant Chief Geologist, Central Region**

Assistant Chief Geologist, H.A. Tourtelot

Mail Stop: 911

Room: 1525, Bldg. 25, Denver Federal Center (DFC)

Telephone: ext. 5438

### **Branch of Central Mineral Resources**

Chief, D.A. Lindsey

Mail Stop: 905

Room: 1993, Bldg. 25, DFC

Telephone: ext. 5568

### **Branch of Geochemistry**

Chief, D.B. Smith, Acting

Mail Stop: 973

Room: E1 317, Bldg. 20, DFC

Telephone: ext. 1800

### **Branch of Geophysics**

Chief, D.L. Campbell

Mail Stop: 964

Room: 359, Denver West #2, 1527 Cole Blvd.,  
Golden

Telephone: ext. 1212

### **Branch of Central Regional Geology**

Chief, D.L. Schleicher

Mail Stop: 913

Room: 314, Denver West #2, 1527 Cole Blvd.,  
Golden

Telephone: ext. 1258

### **Branch of Isotope Geology**

Chief, C.E. Hedge

Mail Stop: 963

Room: 5, D Annex, Bldg. 21, DFC

Telephone: ext. 7880

### **Branch of Petroleum Geology**

Chief, D.L. Gautier

Mail Stop: 934

Room: H 2909B, Bldg. 25, DFC

Telephone: ext. 5711

### **Branch of Sedimentary Processes**

Chief, W.E. Dean

Mail Stop: 939

Room: 2515, Bldg. 25, DFC

Telephone: ext. 1644

### **Branch of Global Seismology and Geomagnetism**

Chief, J.R.P. Masse

Mail Stop: 967

Room: 525, CSM Campus, 1711 Illinois Ave., Golden

Telephone: ext. 1510

### **Branch of Geologic Risk Assessment**

Chief, K.M. Shedlock

Mail Stop: 966

Room: 424, CSM Campus, 1711 Illinois Ave., Golden

Telephone: ext. 1585

### **Branch of Central Technical Reports**

Chief, L.F. Rooney

Mail Stop: 902

Room: 2405C, Bldg. 25, DFC

Telephone: ext. 5457

### **Branch of Library and Information Services**

Librarian, R.A. Bier, Jr.

Mail Stop: 914

Room: C-2002, Bldg. 20, DFC

Telephone: ext. 1004

## **Menlo Park, California**

Mailing address: [Name]

U.S. Geological Survey, MS [Mail Stop no.]

345 Middlefield Rd.

Menlo Park, CA 94025

Telephone: (415) 329 + 4-digit extension

FTS 459 + 4-digit extension

Switchboard: (415) 853-8300

FTS 459-8300

Personnel locator: call Switchboard

Office hours: 7:45 a.m. to 4:15 p.m., Pacific Time

### **Office of the Assistant Chief Geologist, Western Region**

Assistant Chief Geologist, W.R. Normark

Mail Stop: 919

Room: 106, Bldg. 1

Telephone: ext. 5101

### **Branch of Western Mineral Resources**

Chief, W.C. Bagby

Mail Stop: 941

Room: 110, Bldg. 1

Telephone: ext. 5400

### **Branch of Western Regional Geology**

Chief, R.W. Tabor

Mail Stop: 975

Room: 7273, Bldg. 7

Telephone: ext. 4909

### **Branch of Pacific Marine Geology**

Chief, D.A. Cacchione

Mail Stop: 999

Room: B 172, 3475 Deer Creek Road, Palo Alto

Telephone: ext. 3184

### **Branch of Tectonophysics**

Chief, W.H. Prescott

Mail Stop: 977

Room: 8226, Bldg. 8

Telephone: ext. 4860

**Branch of Engineering Seismology and Geology**

Chief, T.L. Holzer

Mail Stop: 977

Room: 8156, Bldg. 8

Telephone: ext. 5613

**Branch of Seismology**

Chief, W.H. Bakun

Mail Stop: 977

Room: 8297, Bldg. 8

Telephone: ext. 4793

**Branch of Igneous and Geothermal Processes**

Chief, R.L. Christiansen

Mail Stop: 910

Room: 1016, Bldg. 2

Telephone: ext. 5228

**Branch of Western Technical Reports**

Chief, J.B. Pinkerton

Mail Stop: 951

Room: 3220G, Bldg. 3

Telephone: ext. 5043

**Branch of Library and Information Services**

Librarian, N.L. Blair

Mail Stop: 955

Room: 507, Bldg. 5

Telephone: ext. 5029

**Flagstaff, Arizona**

Mailing address: [Name]

U.S. Geological Survey

2255 N. Gemini Drive

Flagstaff, AZ 86001

Telephone: (602) 527 + 4-digit extension

FTS 765 + 4-digit extension

Personnel locator: ext. 7151

Office hours: 8:00 a.m. to 4:30 p.m., Mountain Time

**Office of the Deputy Assistant Chief Geologist, Western Region**

Deputy Assistant Chief Geologist, E.L. Pfeifer

Room: 365, Bldg. 3

Telephone: ext. 7151

**Branch of Astrogeology**

Chief, H.H. Kieffer

Room: 102, Bldg. 1

Telephone: ext. 7015

**Woods Hole, Massachusetts**

Mailing address: [Name]

U.S. Geological Survey

Woods Hole, MA 02543

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FTS 837 + 4-digit extension

Switchboard: ext. 4155

Personnel locator: ext. 4155

Office hours: 8:00 a.m. to 4:30 p.m., Eastern Time

**Branch of Atlantic Marine Geology**

Chief, Bradford Butman

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Telephone: ext. 4211

**Anchorage, Alaska**

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U.S. Geological Survey

4200 University Drive

Anchorage, AK 99508-4667

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**Branch of Alaskan Geology**

Chief, D.J. Grybeck

Room: 204

Telephone: ext. 7403

**Hawaii**

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U.S. Geological Survey

Hawaiian Volcano Observatory

Hawaii National Park, P.O. Box 51

HI 96718

Telephone: (808) 967-7328

Office hours: 8:00 a.m. to 4:30 p.m., Hawaiian Time

**Hawaiian Volcano Observatory**

Scientist in Charge, T.L. Wright

Telephone: (808) 967-8819

**Vancouver, Washington**

Mailing address: [Name]

U.S. Geological Survey

Cascades Volcano Observatory

5400 MacArthur Blvd.

Vancouver, WA 98661

Telephone: (206) 696 + 4-digit extension

FTS 422 + 4-digit extension

Switchboard: ext. 7693

Personnel locator: ext. 7693

Office hours: 7:45 a.m. to 4:15 p.m., Pacific Time

**Cascades Volcano Observatory**

Scientist in Charge, E.W. Wolfe

Telephone: ext. 7806

## **Seattle, Washington**

Mailing address: [Name]

U.S. Geological Survey  
Geophysics Department  
University of Washington  
Seattle, WA 98195

Telephone: (206) 543-7010

FTS 399-0627

Office hours: 8:00 a.m. to 4:30 p.m., Pacific Time

### **Seattle Field Office**

Division Representative, C.S. Weaver

Telephone: (206) 543-7010

## **Spokane, Washington**

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U.S. Geological Survey  
U.S. Courthouse, Rm. 656  
W. 920 Riverside Avenue  
Spokane, WA 99201

Telephone: (509) 353-2641

FTS 439-2641

Office hours: 8:00 a.m. to 4:30 p.m., Pacific Time

### **Spokane Field Office**

Scientist in Charge, R.G. Worl

Telephone: (509) 353-2641

## **Reno, Nevada**

Mailing address: [Name]

U.S. Geological Survey  
Reno Field Office  
Mackay School of Mines  
University of Nevada-Reno  
Reno, NV 89557-0047

Telephone: (702) 784-5366

FTS 470-5366

Office hours: 8:00 a.m. to 4:30 p.m., Pacific Time

### **Reno Field Office**

Scientist in Charge, G.L. Raines

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## **Tucson, Arizona**

Mailing address: [Name]

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Gould-Simpson Building No. 77

Tucson, AZ 85721

Telephone: (602) 629-5500

FTS 762-5500

Office hours: 7:30 a.m. to 4:00 p.m., Mountain Time

### **Tucson Field Office**

Scientist in Charge, F.S. Fisher

Room: 408

Telephone: (602) 629-5501

## **Pasadena, California**

Mailing address: [Name]

U.S. Geological Survey  
525 S. Wilson Ave.  
Pasadena, CA 91106

Telephone: (818) 405-7811

FTS 961-7811

Office hours: 8:30 a.m. to 5:00 p.m., Pacific Time

### **Branch of Seismology**

Scientist in Charge, T.H. Heaton

Telephone: (818) 405-7814

## **Albuquerque, New Mexico**

Mailing address: [Name]

U.S. Geological Survey  
Albuquerque Seismological Center  
Kirtland AFB, East Bldg. 10002  
Albuquerque, NM 87115

Telephone: (505) 844-4637

FTS 844-4637

Office hours: 8:00 a.m. to 4:30 p.m., Mountain Time

### **Albuquerque Seismological Center**

Scientist in Charge, C.R. Hutt

Telephone: (505) 844-4637

## **St. Petersburg, Florida**

Mailing address: [Name]

U.S. Geological Survey  
Center for Coastal and Regional Marine Studies  
600 4th St., South  
St. Petersburg, FL 33701

Telephone: (813) 893-9800

Office hours: 8:30 a.m. to 5:00 p.m., Eastern Time

### **Center for Coastal and Regional Marine Studies**

Chief, R.B. Halley

Telephone: (813) 893-9800

## SUMMARY OF LEGISLATIVE AUTHORITY FOR CONDUCTING GEOLOGIC AND RESOURCE INVESTIGATIONS

The fundamental authorization for conducting geologic and resource investigations is the Organic Act of 1879, **43 USC 31**. The Organic Act authorizes the U.S. Geological Survey to conduct an

“...examination of the geological structure, mineral resources, and products of the national domain.”

Authority to perform work outside the “national domain” when it is determined to be in the national interest was provided by **43 USC 31(b)** and subsequent legislation.

In addition to this basic authorization, there is more recent legislative authority that is relevant to particular programs of the Geologic Division. Program-specific legislation may be grouped in accordance with the budget line items.

### Geologic Hazards Surveys

#### **42 USC 7701 et seq. (P.L. 95–124)**

The *Earthquake Hazards Reduction Act of 1977* sets as a national goal the reduction in the risks to life and property from future earthquakes in the United States through the establishment and maintenance of a balanced earthquake program encompassing earthquake prediction, hazard reduction, and research.

#### **42 USC 5201 et seq. (P.L. 93–288)**

The *Disaster Relief Act of 1974*, **Section 202**, states, “The President shall insure that all appropriate Federal agencies are prepared to issue warnings of disasters to State and local officials.” In addition, **Section 202(b)** states, “The President shall direct appropriate Federal agencies to provide technical assistance to State and local governments to insure that timely and effective disaster warning is provided.” The Director of the USGS through the Secretary of the Interior has been delegated the responsibility to issue disaster warnings “...for an earthquake, volcanic eruption, landslide, or other geologic catastrophe.”

#### **42 USC 4321 et seq. (P.L. 91–190)**

The *National Environmental Policy Act of 1969* requires the USGS to comply with **Section 102(2)(c)**, which pertains to review of Environmental Impact Statements (EIS’s) prepared by other agencies. The Survey reviews EIS’s on sites for nuclear powerplants and other critical facilities.

#### **43 USC 506 et seq. (P.L. 95–578)**

The *Reclamation Safety of Dams Act of 1978* requires the USGS to participate in direct interchange of scientific information with other agencies. Geologic data developed under Geologic Hazards Surveys are applicable to dam-safety analyses.

### Geologic Framework and Processes

#### **15 USC 2901–2908; 31 USC 25 (P.L. 95–57)**

The *National Climate Program Act of 1978* requires that the Climate Change Program contribute information on the long-term natural variability of climate to the National Climate Program. This information is necessary for understanding how the climate system works and for providing a basis for assessing possible effects of human activities on climate and the environment.

#### **42 USC 5845(c) (P.L. 93–438)**

The *Energy Reorganization Act of 1974* directs all other Federal agencies to “...(2)... furnish to the [Nuclear Regulatory] Commission...such research service as the Commission deems necessary and requests for the performance of its functions; and (3) consult and cooperate with the Commission on research and development matters of mutual interest and provide such information and physical access to its facilities as will assist the Commission in acquiring the expertise necessary to perform its licensing and related regulatory functions.” The USGS assists in the geologic mapping of areas where future nuclear reactor construction is anticipated and conducts topical investigations of various geologic hazards that could imperil safe operation of the reactors.

#### **22 USC 3201 et seq. (P.L. 95–242)**

The *Nuclear Non-Proliferation Act of 1978* provides that under Title V—United States Assistance to Developing Countries—the USGS assists through the Department of State and the Agency for International Development in evaluation of nuclear facilities sites in other countries.

#### **42 USC 4321 et seq. (P.L. 91–190)**

The *National Environmental Policy Act of 1969* requires the USGS to comply with **Section 102(2)(c)**, which pertains to review of Environmental Impact Statements (EIS’s) prepared by other agencies. The Survey reviews EIS’s on sites for nuclear powerplants and other critical facilities.

#### **P.L. 100–220**

The *Great Lakes Shoreline Mapping Act of 1987* requires the Director of Charting and Geodetic Services, in consultation with the USGS, to prepare a Great Lakes Shoreline plan.

### Mineral Resource Surveys

#### **50 USC 98 (P.L. 96–41)**

The *Strategic and Critical Materials Stockpiling Act of 1946* as amended by its Revision Act of 1979. **Section 8** of



the act supports the Survey's programs for exploration of domestic minerals, especially for strategic and critical minerals to complement the Federal mineral stockpile program.

#### **16 USC 1131 (P.L. 88-577)**

The *Wilderness Act of 1964* and numerous subsequent related acts require that the USGS and the U.S. Bureau of Mines assess the mineral resources of each area proposed as wilderness or established as wilderness if no prior mineral survey was done. The studies are to be on a planned and recurring basis.

#### **30 USC 21**

##### **(P.L. 91-631); 30 USC 1601 et seq. (P.L. 96-479)**

The *Mining and Minerals Policy Act of 1970* and the *Materials and Minerals Policy, Research, and Development Act of 1980* re-emphasize the Survey's responsibility to assess the mineral resources of the Nation.

#### **16 USC 1600 et seq. (P.L. 94-588, P.L. 95-306)**

The *National Forest Management Act of 1976 (as amended 1978)* and the *Renewable Resources Extension Act of 1978*. The USGS is a party in a five-agency agreement calling for inventory of all resources on Federal land. The main consequence of these acts to date has been the Forest Service RARE-II (Roadless Area Review Evaluation) wilderness reviews.

#### **43 USC 1701 (P.L. 94-579)**

The *Federal Land Policy and Management Act of 1976* specifically requires that the USGS and the U.S. Bureau of Mines do a mineral survey by 1991 of each area that the Bureau of Land Management recommends for wilderness study.

#### **16 USC 3141-3150, 3161**

The *Alaska National Interest Lands Conservation Act of 1980*. **Section 1001** of the act requires that the USGS assess the mineral potential of Federal lands north of 68° north latitude, east of the National Petroleum Reserve and west of the Arctic National Wildlife Refuge, and participate in a review of the wilderness characteristics of the area. **Section 1010** of the act requires that the Secretary of the Interior, who has delegated the responsibility to the USGS, expand the minerals data base for all Federal lands in Alaska. **Section 1011** of the act requires that an annual minerals report be presented to the Congress; the responsibility for preparing this report has also been delegated to the USGS.

#### **22 USC 5094**

The *Comprehensive Anti-Apartheid Act of 1986*. **Section 504 (b)** of the act calls for the President to develop a program that reduces the dependence, if any, of the United States on the importation from South Africa of chromium, cobalt, manganese, platinum-group metals, ferroalloys, and

other critical materials as defined in the Strategic and Critical Materials Stockpiling Act.

## **Energy Geologic Surveys**

#### **30 USC 201 (P.L. 94-377)**

The *Federal Coal Leasing Amendments Act of 1975* provides that no lease sale may be held on Federal lands unless the lands containing the coal deposits have been included in a comprehensive land-use plan. The act authorizes and directs the Secretary to conduct a comprehensive exploratory program designed to obtain sufficient data and information to evaluate the extent, location, and potential for developing the known recoverable coal resources within the coal lands.

#### **30 USC 1121 (P.L. 93-410)**

The *Geothermal Energy Research, Development, and Demonstration Act of 1974* provides that the Department of the Interior is responsible for the evaluation and assessment of the geothermal resource base, including the development of exploration technologies.

#### **42 USC 4331 (P.L. 91-190)**

The *National Environmental Policy Act of 1969* requires that proponents of major Federal actions sufficiently affecting the quality of human environment consult with and obtain the comments of any Federal agency that has jurisdiction by law or special expertise with respect to any environmental impact involved.

#### **16 USC 3141-3150, 3161 (P.L. 94-579)**

The *Alaska National Interest Lands Conservation Act of 1980*. **Section 1001** of the act requires that the USGS assess the oil and gas potential of Federal lands north of 68° north latitude, east of the National Petroleum Reserve and west of the Arctic National Wildlife Refuge, and participate in a review of the wilderness characteristics of the area. **Section 1002** of the act requires that the Secretary of the Interior submit a report to Congress concerning the oil and gas potential of the coastal plain of the Arctic National Wildlife Refuge. The USGS is authorized to submit an exploration plan if no other entity proposes an acceptable plan. **Section 1008** of the act authorizes the Secretary to conduct studies, or collect and analyze information obtained by permittees, of the oil and gas potential of non-North Slope Federal lands.

#### **42 USC 2210b, 2231 (P.L. 97-415)**

The *Nuclear Regulatory Commission Authorization Act* requires the Secretary of Energy to monitor and report to the President and the Congress on the viability of the domestic uranium industry. Under a memorandum of understanding between the Department of Energy and the Department of the Interior, the USGS provides information on domestic uranium resources to the Energy Information Agency.

## Offshore Geologic Surveys

### 16 USC 1451–1456 (P.L. 94–370)

The *Coastal Zone Management Act Amendments of 1976* provides that each department, agency, and instrumentality of the Executive Branch of the Federal Government may assist the Secretary of Commerce, on a reimbursable basis or otherwise, in carrying out research and technical assistance for coastal zone management.

### 43 USC 1865 (P.L. 95–372)

The *Outer Continental Lands Act Amendments of 1978* provides that the Secretary of the Interior shall conduct a continuing investigation, on the basis of data and information that he determines have been adequately and independently audited and verified, for the purpose of determining the availability of all oil and gas produced or located in the Outer Continental Shelf, including oil and natural gas resources. The Secretary has directed the USGS to provide

indirect support to the Minerals Management Service in meeting the objectives of the OCS Leasing Program.

### 30 USC 1419 *et seq.* (P.L. 96–283)

The *Deep Seabed Hard Mineral Resources Act of 1980* provides authorization for conducting a continuing program of ocean research that “shall include the development, acceleration, and expansion, as appropriate, of the studies of the ecological, geological, and physical aspects of the deep seabed in general areas of the ocean where exploration and commercial development are likely to occur....” The USGS provides geologic and mineral resource expertise in responding to the requirements of the act.

### 43 USC 1301 (P.L. 92–532)

The *Marine Protection, Research, and Sanctuaries Act of 1972* provides that the Secretary of Commerce must consult with the Secretary of the Interior prior to designating marine sanctuaries. The USGS provides information regarding the energy and mineral resource potential in areas being considered for designation as marine sanctuaries.