THE U.S. GEOLOGICAL SURVEY AT 100

by

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The principal source of information about the physical resources of the United States, the U.S. Geological Survey celebrates its centennial this year. In presenting this brief overview of its history, the author appraises the Survey's changing priorities and challenges under the various administrations.

The United States Geological Survey came into being on March 3, 1879 when President Hayes signed an appropriation bill that contained an item giving the Director of the Geological Survey the responsibility of administering a new organization which was to classify the public lands and to examine the geological structure, mineral resources and products of the national domain. Three years later, the Survey was directed to prepare a geological map of the U.S., and in 1894, to gauge the streams and determine the country's water supply.

For sixty years thereafter it remained a relatively small bureau, although it contributed notably to the economic development of the country and to its participation in World War I. Since the beginning of World War II it has expanded greatly, having grown from an organization of several hundred employees with an annual appropriation of \$3 million, to one of more than 13,000 employees and a budget request this year of some \$640 million.

As the principal source of information about U.S. physical resources, its concerns cover such aspects as the configuration and character of the land surface, the composition and structure of the underlying rocks, and the quality, extent, and distribution of water and mineral resources. It also plays a responsible role in the management of resources of federally owned lands.

The Survey has had nine Directors during the first 99 years of its existence, the present Director, H. William Menard, having been installed in office in April of last year. Each Director responded to the urgent problems of the day, and each directed the Survey into new endeavors to make the earth sciences of value in the public service; in so doing, each one has left a foundation on which succeeding Directors have been able to build.

The first Director

The year of the Survey's founding was close to a turning point in the history of the U.S. The Civil War and the period of reconstruction that followed had come to a formal close, and within the next two decades, a once isolated, rural and agrarian nation was transformed into an urban and industrial world power. 1879 was also a year of great monetary uncertainty, when knowledge of precious-metal resources was vital. The iron and steel industry too faced problems in obtaining suitable raw materials. Clarence King was therefore in a unique position to influence the history of the new Survey, particularly as the enabling legislation was brief and did not define in detail the duties of the new organization.

King chose to emphasize economic geology, then in its infancy. His immediate aim was to produce practical results

Dr. Linn Hoover, Secretary of the U.S. National Committee on Geology (left) welcomes an IUGS visitor (Prof. John Sutton, Chairman, IUGS Committee on Geology Teaching) to the U.S. Geological Survey.

S.F. Emmons' monograph (1887) on the Leadville, Colorado mining district, one of the first studies undertaken by the new U.S. Geological Survey, demonstrated the value of geology to the mining industry.

to aid the mineral industry, though ultimately he hoped to increase knowledge of the geological relations of mineral deposits.

Geological Map of the U.S.

John Wesley Powell, the Survey's second Director, called geology the most comprehensive of all sciences, although he held that its most fundamental connection was with topography. Immediately on becoming Director, he authorized independent topographic mapping, and by 1882, established a Topographic Branch within the Survey.

During his administration, geological work was largely directed toward preparation of a geological map of the United States. Though fundamental studies in stratigraphy and paleontology were emphasized, topographic mapping nevertheless remained the largest single element in the Survey's program.

Expansion of interests

When Charles D. Walcott became Director in 1894, he not only revived the mission orientation of the Survey's work as planned by King, but also broadened its scope: the Survey's investigations, it was felt, would aid not only the mineral industry but all industries and any practical objective that could be aided by a knowledge of the earth and its resources.

This was a period of great expansion for the agency. Its topographic mapping program was broadened to include classification and mapping of the forest reserves, subdivisional surveys, and boundary surveys. Engineering geology investigations were begun, mineral-resource studies were extended to non-metallic and fuel resources, and water-resource investigations were organized.

For the first time, Survey scientists and engineers made investigations outside the U.S. - in Nicaragua for a proposed canal, and, after the Spanish-American war, of the geology and mineral resources of the Philippines and the Caribbean countries.

The Reclamation Service (now the Bureau of Reclamation) was established as an adjunct of the Survey, and a program of testing the fuel value of coals and lignites that led directly to the establishment of the Bureau of Mines was begun.

As federal science became more and more utilitarian around the turn of the century, Walcott was also instrumental in

establishing the Carnegie Institution of Washington for the organization of research in fundamental science. The Geological Survey's work in geophysics and geochemistry was transferred to the Geophysical Laboratory of this new organization.

Public-land administration

During these early years, the Survey became intimately involved in public-land administration, and the practical nature of Survey investigations was particularly emphasized during the administration of George Otis Smith (Director from 1907 to 1930). It reflected the contemporary American

The first systematic training in stream gauging was given at the U.S. Geological Survey's camp at Embudo, New Mexico in 1888. The device shown was developed by Survey engineers especially to measure stream flow.

preoccupation with business and commercial interests. The Land Classification Board, established in 1908, developed into the Land Classification Branch in 1912, and became the Conservation Branch in 1925 when the Geological Survey took over from the Bureau of Mines the supervision of mineral and petroleum operations on federal lands.

During the first World War, the search for strategic minerals was extended to Latin-American countries, and following the War, Haiti and Santo Domingo were mapped topographically and geologically by the Survey.

Walter C. Mendenhall, who succeeded Smith, had been Chief Geologist and had emphasized the need for basic research, stressing that without science to apply there could be no applied science. But it was Mendenhall's fate to direct the Survey through the years of the Great Depression and the beginning of World War II, when practical work was demanded more than ever. In spite of the fact that the Survey's funds were severely cut during the Depression, it was able to make significant advances, not only in geology, but also in the use of aerial photography for mapping and the development of photogrammetry in cooperation with the Tennessee Valley Authority. It also began some fundamental water-resource investigations in cooperation with public works programs.

Research

During World War II, the Survey devoted all its energies to the war effort, but the bent toward research imposed by Mendenhall and the maturing of some of the younger men who had joined the Survey in the 1920's and 1930's, gave a new thrust to the investigations. New methods were devised to meet practical objectives. William E. Wrather, a petroleum geologist, became Director in 1943 at a time when petroleum supplies were critical; in 1944, Thomas B. Nolan, who had played a leading role in the strategic mineral investigations, became Assistant Director and eventually succeeded Wrather (1956). Under these two administrations the Survey's commitment to research was broadened and deepened. Survey investigations took on new dimensions and moved into new environments -- to polar regions, the sea bottom, and space. Under Nolan especially, the elimination of waste through duplication of work was emphasized, and the Survey was given responsibility for coordinating federal water-data collection and federal mapping and surveying.

The strategic-mineral investigations again led the Survey into other countries, particularly into Latin America. With the development of the technical assistance program after World War II, Survey scientists and engineers were soon engaged in missions and investigations in all parts of the world.

Recent Challenges

The eighth and ninth Directors, William T. Pecora and Vincent E. McKelvey respectively, faced the vocal concerns of a more socially conscious public, and in particular, the conflict between resource development and preservation of environmental quality. New problems in data management

and use proved challenging. Under Pecora's direction, the Survey took on the management and direction of an Interior Department program aimed at gathering facts about the Earth's resources from orbiting satellites, established a Computer Center Division, and a Data Center to make accessible the volumes of data from sources "outside the Earth". Under McKelvey, the Survey strengthened multidisciplinary studies to aid land-use and resource management and made special efforts to make its reports useful to and usable by planning and decision-making officials in these critical areas.

With the development of new technology and concepts, geological work abroad expanded to encompass areas such as mineral and energy resource assessment in developing countries, cooperative research in areas of concern to the domestic program that could best be studied in other countries, world-wide cooperation in seismic monitoring and natural disaster mitigation, special studies based on Landsat technology as well as technology transfer and training.

The Survey has made the occasion of its centennial to restate its belief that sound information about the Nation's land and its resources is essential to success in meeting resource needs wisely and in the preservation of environmental quality. More difficult tasks lie ahead, but there is a solid foundation of one hundred years of the advancement of earth sciences in the public service upon which to base future contributions.

Since 1953, the U.S. Geological Survey has been responsible for supervising drilling and producing operations on the Nation's outer continental shelf.

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