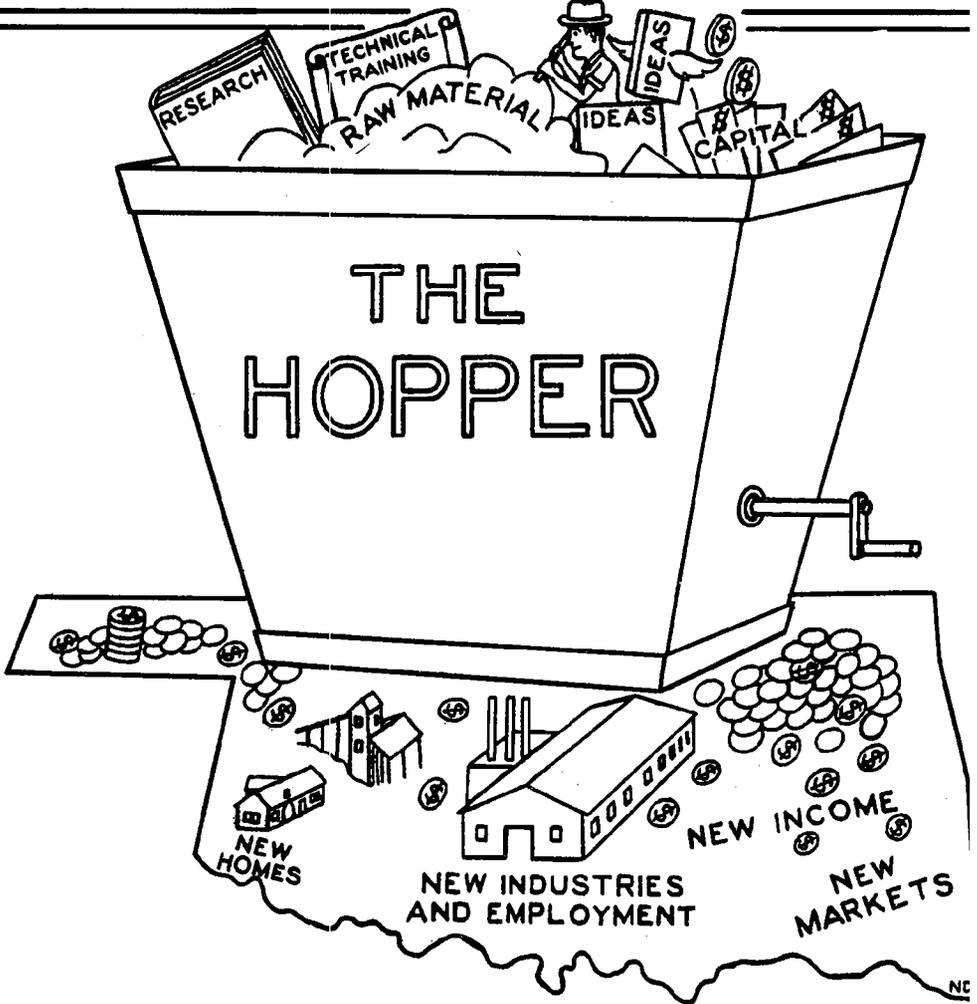


DEDICATED TO OKLAHOMA'S DEVELOPMENT



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GEOLOGICAL SURVEYS
AND THE
DEVELOPMENT OF OKLAHOMA

by
Virginia Butcher, Assistant Geologist
Oklahoma Geological Survey

The name Oklahoma is a Choctaw word whose literal translation is "red people". In common usage it is often translated as 'home of the red man' -- an appropriate descriptive term for the infant state. In this sense, the name applied to the new state could have as appropriately been Geohoma, 'home' of Geology. Here during the early part of the twentieth century great discoveries of oil were made, resulting in an unprecedented stimulation to the study of geology. Oklahoma became the leading producer of petroleum and gas, and during the 1920s more geologists were located in Tulsa than in any other city in the world! "Oklahoma" had truly become "Geohoma" -- the home of petroleum geology, and by being a pioneer in this important field it has furnished benefits that now extend far beyond the mere physical boundaries of the state. Within the skein of this fabulous background is interwoven a story of men and organizations, in which prominent roles are played by the Oklahoma Geological Survey and the School of Geology of the University of Oklahoma.

The territory now comprising Oklahoma was largely populated by two vastly different migrations. The first, the migration of the red man, was accomplished chiefly in the two decades from about 1820 to 1840. The Five Civilized Tribes were moved from the southeastern states of the Union to their new homes in the area known as Indian Territory. Other tribes of Indians, chiefly from the Plains region, were settled in other parts of the territory which was destined to become the 46th state in the nation. The period of 1870 to 1890

could be called the railroad building phase of development of the territory. This in turn opened the way for the second great mass migration -- the homesteading white man. The second migration was at its height during the period from 1889 to 1906, or approximately two decades -- about the same length of time required to move the Indian from his old hunting ground to the new one in Oklahoma.

Until the last decade of the nineteenth century comparatively little was known of the geology and geography of this area. The first scientist to visit the territory now included in the State of Oklahoma was an English naturalist, Thomas Nuttall, who spent part of 1819 in eastern Oklahoma and in 1821 published his "Observations on the Geological Structure of the Valley of the Mississippi", in which he described some of the geological formations. The first geologist to visit the state, Dr. Edwin James, a member of the Long Expedition to the Rocky Mountains, descended the Canadian and Arkansas Rivers on the return trip. His account of the expedition was published in 1822.

Executive Document No. 64, 1850, Thirty-first Congress, contains the reports and maps made by Captain R. B. Marcy concerning observations en-route from Fort Smith to Santa Fe while serving as Commander of a military escort for a company of emigrants bound for California gold fields. The orderly and scholarly manner in which he recorded data so impressed the authorities at Washington that in 1852 he was placed in command of an expedition to find the source of Red River. Reports of the Red River expedition contained the first published descriptions of the Wichita Mountains and the Gypsum Hills.

In 1853 an expedition under Lt. A.W. Whipple crossed the southern part of the Great Plains surveying a route for a railway to the Pacific. The geologist of the expedition, Jules Marcou, made

careful records of the interesting geological phenomena observed. His notes record easily recognizable descriptions of the coal fields of eastern Oklahoma, the northernmost exposures of the limestones near Ada, the easternmost red beds near Stratford, the Caddo County buttes, fossil oyster beds west of Arapaho, and the Antelope Hills near the Texas Panhandle.

In 1895 the United States Geological Survey started the work of making a topographic map and geological investigations of the Indian Territory. This work was virtually completed by 1899 and the results may have stimulated the legislature of adjacent Oklahoma Territory to establish the Oklahoma Geological and Natural History Survey. Under a provision of the law the professor of biology at the University of Oklahoma became Territorial Geologist. The sum of two hundred dollars per year was appropriated for the work of the Survey.

Dr. A. H. Van Vleet, professor of biology at the University, became Territorial Geologist. During the first year the appropriation was used for the purchase of camp equipment, including a team of horses, a buckboard, tent and other necessary articles. The first field party was sent out in June, 1900. Charles N. Gould, a graduate student of the University of Nebraska was secured as geologist for this field party. Paul J. White (later to become a petroleum geologist) served as botanist, and S. R. Hadsell (later to be Professor of English at the University) served as cook and teamster. The party spent the summer in the field, making a study of the gypsum and salt deposits in the western part of the Territory.

During the next few years, the Survey sent out field parties each summer. The work included some investigation in practically every county in the Territory of Oklahoma, and during 1905 and 1906, work extended into Indian Territory, where prelimi-

nary surveys were made in the oil fields. The Territorial Survey prepared three and published two Biennial Reports which contained a discussion of the geology and mineral resources of the Territory of Oklahoma. The reports also contain lists of plants, birds, snakes, and other animals.

During the last two decades of the nineteenth century and the first decade of the twentieth, four great reconnaissance geologists were mapping and writing reports of the area. Joseph A. Taff was especially assigned to work out the minerals of the Indian Territory in order to facilitate the allotment of land to the Indians. Robert T. Hill, Noah F. Drake, and Francis W. Cragin made general studies. The net results of the resulting information was to strengthen the demand of the post-Civil War white man to be allowed to homestead this virgin land and have freedom to exploit the indicated mineral and other natural resources of the area.

Hill's work in Oklahoma was chiefly in connection with coastal plains deposits of Lower Cretaceous age. He also wrote on the geology of the Arbuckle Mountains and of the red beds. His most important paper dealing with Oklahoma, published in 1894, was "Geology of Parts of Texas, Indian Territory and Arkansas adjacent to Red River." Cragin's work was in the Permian red beds in the northwestern part of the state. In 1897 he published his "Observations on the Cimmaron Series." Drake prepared the first geologic map of eastern Oklahoma, following a 6 months' study and mapping of the formations in the Creek, Cherokee, and Choctaw Nations in 1896. The material was utilized as Drake's doctor's dissertation at Stanford University.

Taff, in 1897, was detailed by the United States Geological Survey to work on the coal and asphalt fields of the Choctaw and Chickasaw Nations. The importance of coal had been known for one-fourth century, and played a part in selecting the route

of the first railroad. Taff's task continued with certain interruptions, until 1908. He mapped and described the stratigraphy and structure of a considerable part of the Oklahoma coal fields, as well as the Arbuckle and Wichita Mountains and the Muskogee and Tahlequah quadrangles. He described and named more than 30 of the geological formations in eastern and southern Oklahoma.

In 1900 the first class in geology was offered at the University of Oklahoma. The Department of Geology was organized by Charles N. Gould who offered two courses each semester of that first school year, with an enrollment of four students the first semester and six the second semester. He served as head of the department until 1908 when he became director of the Survey.

From this modest and unpretentious beginning has grown the present impressive School of Geology, one of the largest and most outstanding in the United States. On November 30 and December 1, 1951, the new building to house the School of Geology and the Oklahoma Geological Survey was dedicated and named Gould Hall in honor of Charles Newton Gould, whose name for the first forty years of the twentieth century was virtually synonymous in the Mid-Continent area with the term 'Oklahoma Geology'. Dr. V.E. Monnett, under whose skillful guidance the school has grown to such proportions as to justify the building of one of the world's largest single buildings devoted to geology, has been director of the school since 1925.

At the present there are 223 undergraduates majoring in geology, and 63 graduate students working toward completion of requirements for either Master's or Doctor's degrees. (No geological engineers are included in these figures.) In the peak year of 1950, 1,500 students were enrolled in classes in geology at the University of Oklahoma, and in the same year 313 geologists were graduated,

a far cry indeed from the beginning enrollment in 1901. Dr. Monnett places the number of graduates of the School of Geology at about 1,800. Men have come here from all parts of the world to study geology, and the graduates themselves are to be found wherever the earth is explored for oil.

The Oklahoma Geological Survey was established by the first legislature, and organized in July, 1908. Through the efforts of Professor Gould and Professor J.S. Buckanan, a member of the Constitutional Convention, 1907, a provision was written into the Constitution calling for the establishment of a Geological Survey. It is believed that Oklahoma has the distinction of being the only State whose Geological Survey was established by Constitutional mandate.

On July 25, 1908, Dr. Gould was appointed Director of the new State Survey. He served in this capacity from 1908 to 1911 at which time he resigned to enter private work. D.W. Ohern succeeded, and served as Director from 1911 to 1914. During the period from 1914 to 1923 the director was C. W. Shannon, under whom the first comprehensive state-wide reports on oil and gas in Oklahoma were published. At this time Oklahoma was the leading producer of petroleum and gas in the United States, and Tulsa confidently signed herself as the Oil Capitol of the World.

This lush period of Survey activity was abruptly ended by veto of Survey appropriations in 1923, and the Survey remained closed until July, 1924, when C.N. Gould was again appointed Director. Dr. Gould's second term of office ended in 1931 when the Survey was again closed owing to lack of appropriations. When opened in 1935 the present regime of the Geological Survey was established under the directorship of Robert H. Dott.

During 1923-1924 and 1931-1935 when the Survey

was inactive Professor Charles E. Decker of the University School of Geology served, without remuneration, as Custodian of the Survey property. Dr. Decker kept intact the property of the Survey, answered inquiries for information, and took care of sale of publications.

During the 1923-1924 period of Survey inactivity, about 150 Oklahoma geologists subscribed a fund which was given to the National Research Council, and matched by the United States Geological Survey for compiling a geologic map of the state. The work was done by Hugh D. Miser, of the United States Geological Survey; much of the information was contributed by oil companies. The map was published by the Federal Survey in 1926.

The work of the Survey during its second period of activity under Dr. Gould's direction was characterized by continued filling-in of certain geological information, detailed studies on the outcrops of formations that produce oil underground, the assembly of geological information on petroleum in Bulletin 40, and the education of petroleum geologists through field conferences.

In 1935 the legislature made a small appropriation for the Geological Survey, the University Board of Regents appointed the present Director, Robert H. Dott, and the Survey again opened its doors on July 1. At that time there was an awakening among state leaders to the need of bringing Oklahoma's economy into better balance through an increase in manufacturing to provide payrolls, raise the per capita income, and to stabilize the population. Inspired by this interest in industrial development and aware of the importance of the rôle of minerals and fuels to such a development, the program of the Oklahoma Geological Survey since 1935 has emphasized this phase of the work in the belief that no other organization is in a position to make extensive study of the resources of indus-

trial minerals.

An Industrial Research Laboratory investigating the utilization of the state's mineral materials was established as a necessary supplement to field work. The first project was the testing of impure limestone shown by analysis to be in the proper range of composition for making rock wool. Eighty samples from 27 counties made satisfactory rock wool. Results were published in 1939, and in 1940 a group of business men in Tulsa built a plant to use the rock recommended from Grady County.

The drought and dust storm conditions of the mid-1930's demonstrated the great need for much more information on ground water especially in the Panhandle counties. In 1937 a cooperative arrangement was made with the Ground Water Division, United States Geological Survey, on a matched-fund basis, for investigating the ground water resources of the Panhandle, beginning in Texas County. As more funds became available, and the needs for additional water supplies by municipalities have grown, this work has been extended to other areas.

Military installations, war industries, and increased civilian populations in the adjacent areas made heavy inroads on water supplies, and created serious problems in some instances -- especially in communities dependent on ground water supplies. The Survey was called upon many times, and generally was able to make recommendations that aided in solving or reducing the problems.

In 1940-1941 the United States Bureau of Mines at the instigation of and in financial cooperation with the Oklahoma Geological Survey undertook a series of tests to determine whether Oklahoma coals, individually or in blends, would make satisfactory metallurgical coke in byproduct ovens. The favorable results of these tests were available at the time the erection of a blast furnace in East Texas

was under consideration by the Defense Plant Corporation. Fluxing stone, another requisite for the blast furnace operation, is also a part of the mineral reserves of the state. As a result of investigations by the Survey a dolomite quarry was opened near Troy, Johnston County. Since the opening of this quarry Oklahoma dolomite as well as coal has been contributing steadily to the production of pig iron in the Southwest.

Contrary to many predictions, the close of the war and attendant disarmament and demobilization did not bring on depression, but rather, one of the greatest periods of industrial expansion in the nation's history. One of the marked characteristics of this expansion has been the migration of industries to the Southwest seeking the natural advantages of abundant raw materials, fuels, and a rapidly growing market. Many new industries have come to Oklahoma; and glass manufacturing probably has grown to a greater extent than any other, with three new, large plants and considerable increase in capacity among others already established. The growth of this particular industry probably has been encouraged by a Survey report on a re-investigation of the glass sands resources of the Arbuckle Mountains. Enlargement of plant capacity also has taken place in the cement, cement block, brick and tile, pottery, lime, sand and gravel, crushed stone, and dolomite industries.

Investigations by the Survey of mineral industries that may develop in the future include titanium-bearing iron ores, clays and slates, vein quartz, cellular products from volcanic ash, utilization of oil field brines, etc.

In 1947, a project was started in collaboration with the United States Geological Survey for the preparation of a new Geologic Map of Oklahoma to take the place of the map that was published in 1926. Dr. Hugh D. Miser, of the Federal Survey, is

in charge of compiling data and preparing this new one, and a considerable portion of the activities of members of the State Survey staff has been devoted to this project. The cooperation of oil companies, geology departments of universities and colleges, and graduate students working on theses and dissertations has been invaluable. Mapping by graduate students has been chiefly in areas in which oil geologists have had little interest, principally in the Ozark region of northeastern Oklahoma and in the Arbuckle Mountains. It is confidently predicted that when this map is completed it will be the best of its kind in the entire country. (see: HOPPER, Vol. 11, No. 7)

The two series of publications -- Bulletins and Circulars -- that were started in 1908 have been continued by the Survey. In addition, a new series, Mineral Reports, designed for brief preliminary reports of current investigations is published in mimeograph form. Another innovation is THE HOPPER, which was started in 1941 as a means of reporting Survey activities, talks given at the Oklahoma Mineral Industries Conference, items from trade journals, and similar sources.

Geological Survey work is an obvious example of applied science. It is equally obvious that such application must start with extensive, accurate basic data on geology, the distribution, structure, character, and quality of rocks and minerals. All forms of economic exploitation of mineral resources, including the mineral fuels, are aided through knowledge of the basic geology of the state. Therefore the Survey's program has endeavored to maintain a balance between basic geology, investigations in the field of industrial minerals, and ground water investigation.