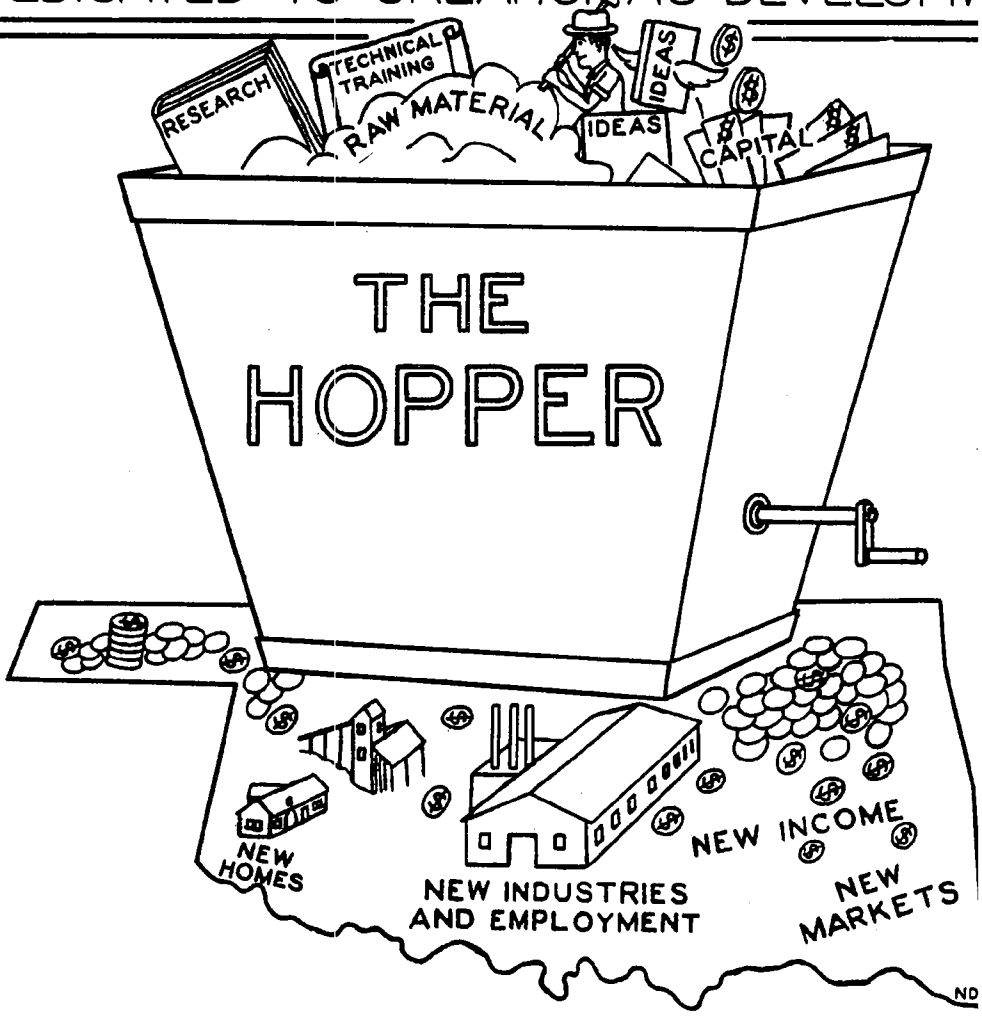
DEDICATED TO OKLAHOMA'S DEVELOPM



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OKLAHOMA GEOLOGICAL SURVEY:
Functions, Objectives, Activities

Every public institution has a purpose--functions and objectives--that its creators had in mind that would justify the expenses involved in its establishment and maintenance. The broad functions of the Oklahoma Geological Survey are to accumulate information on the geology and mineral resources of the State. This includes all phases of geology, including the whole range of minerals, including ground water and the mineral fuels, and disseminating information through the publication of reports and other methods. The objectives are to gain basic knowledge of the geology and resources of Oklahoma, assist industry in locating mineral raw materials, provide information to municipalities and others on availability of ground water, and cooperate with other governmental units by giving assistance on problems involving geology.

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--hence, the Survey's program endeavors to maintain a balance between basic geology, industrial minerals, and ground water investigations. Inasmuch as basic geological information is equally applicable to all forms of economic exploitation, the Survey's program is contributing to the development of all the State's mineral resources, including petroleum.

During the present biennium, much of the energy of the Survey staff, supplemented by members of the University faculty and graduate students working under their supervision, has been devoted to mapping and stratigraphic work to gather all possible basic data for a new and revised geologic

map of Oklahoma. The older map, published in 1926, has been out of print for several years and there has been an urgent demand for a new and revised edition. Fortunately, Hugh D. Miser of the U. S. Geological Survey agreed to head up the task of compiling the data for the new map. Dr. Miser compiled the colored geological map of Oklahoma published in 1926, and his familiarity with southwestern geology and experience qualify him above anyone else for preparing the new Oklahoma geologic map.

Recent Industrial Developments in Minerals

The Survey's contribution to industrial development is shown by new industries established, existing industries expanded, or old industries revived, as a result of Survey work. For the period since the Survey re-opened in 1935, the following examples may be cited:

1. Lime. In 1936, the State's lime industry was faced with the alternative of finding new deposits of limestone or going out of business. The Survey was able to recommend a deposit near Marble City, Sequoyah County, and a lime-burning plant was built at Sallisaw in 1940. The capacity of this plant has since been increased to four times the original, in order to take care of new business.

2. Rock wool insulation. A plant for making rock wool insulation from impure limestone was built in Sand Springs in 1940, following publication of a Survey report describing rock wool possibilities in Oklahoma which was based on field work and laboratory experimentation carried on during 1938 and 1939. Capacity of the plant was expanded a few years ago to meet expanding business.

3. Coke. Though coke for domestic heating was manufactured during the territorial period and as late as 1908, nothing was known definitely about the possibilities of using Oklahoma coal for making

coke that would be suitable for smelting iron ore, until the Survey initiated a project with the U. S. Bureau of Mines in 1941. It was found that if used in proper blends, low-volatile coal from Le Flore and Haskell Counties and high-volatile coal from the McAlester district make satisfactory coke. This information was an important factor in the decision to build the plant of the Loan Star Steel Company at Daingerfield, Texas. During and since the last war, Oklahoma low-volatile coal has been shipped to Utah and California for blending with western coals to make metallurgical coke. During 1942-1944, the coal beds and associated rocks in Northern Le Flore and Haskell Counties were mapped under a cooperative project between the Oklahoma and U. S. Geological Surveys to determine the extent and distribution of the coking coals of that area.

4. Glass sand. The glass industry of Oklahoma was established in 1904 because of the attraction of natural gas for fuel, and its permanence was insured through the discovery by the Oklahoma Geological Survey of suitable sand in the Arbuckle Mountains. Oklahoma Geological Survey Bulletin 10 on glass sand, published in 1913, was followed by the opening of a quarry the same year. Growth of the glass industry resulted in increased interest in glass sand. A re-investigation of the deposits of the Arbuckle Mountains was made and a report published in 1945, in which prospective new areas were shown, assuring ample reserves of sand for the expansion of the glass industry in Oklahoma. Glass manufacturing probably was the fastest growing industry in Oklahoma, following the war, with three new plants, and enlargement of most of the older ones. A recent press report stated that one-fifth of the automobile glass used in the country is made in Oklahoma from Oklahoma glass sand.

Other recent innovations in the Oklahoma glass industry is the production of ground silica at one

of the glass sand plants, and the use of Oklahoma limestone and Oklahoma dolomite in several of the glass plants.

5. Dolomite. Deposits of high-quality dolomite in the Arbuckle Mountains have been known for many years, and when a potential demand for this material was created by the erection of the blast furnace at Daingerfield, Texas, detailed investigations were made by the Survey to show the quality and availability of large deposits. The material was not used during the war, but a quarry was opened in 1948. Since that time, Oklahoma-produced dolomite has been shipped regularly to Daingerfield and to glass plants in Oklahoma and Texas.

6. Art objects from mineral materials. An interesting contriubtion to the cultural development of the Southwest during the past fifteen years has been the establishment and growth of several enterprises using mineral materials for making art objects principally pottery and alabaster. One pottery has developed markets all over the United States, and in some foreign countries, and several others are finding ready sales for their ware in the local, state, and regional markets.

In a brief investigation, a member of the University faculty found several deposits of alabaster, the fine-grained variety of gypsum, that because of pleasing colors and texture, could be made into attractive ash trays, vases, lamps, and other art objects. An enterprising person in Woods County began working alabaster from his neighborhood, first as a hobby, and later developed it on a commercial basis.

Within recent years, numerous hobbyists have become interested in the art of cutting semi-precious and precious gem stones, and Oklahoma has its share. A few varieties of semi-precious stones have been found in gravels brought down by rivers

from the Rocky Mountains.

7. Salt. Though salt making from saline springs was actively carried on in both Indian and Oklahoma Territories, it was mainly for local domestic and stock use. More recently, a plant was constructed to manufacture salt by bringing rock salt from deep wells in solution in water and, then, evaporating the water to recover the salt. This plant located at Sayre has been producing several thousand tons of salt per year. Another operation is utilizing solar evaporation to recover salt from Salt Springs near Vinson in southwestern Oklahoma.

8. Choteau Powder Plant. Choteau Powder Plant, built during the war, was a large scale munitions operation and some of the facilities have been attracting post war industries to northeastern Oklahoma in recent months. The Oklahoma Geological Survey was one of the sources furnishing basic information which probably influenced the decision to locate the plant at Choteau.

9. Cadmium, Indium, and Germanium. For several years, the important minor minerals, cadmium and indium, have been recovered as by-products of zinc smelting. During the past few years, processes have been worked out for recovering germanium from Tri-State zinc-ore. Although, total production does not add to a large quantity, the material is extremely important and Oklahoma zinc-ores now constitute one of the chief sources for this element.

10. Iron Ore. Although deposits of iron ore have been known in both the Arbuckle and Wichita Mountains for a good many years, they appeared to offer little opportunity for commercial development. Some use has been made of the low-grade hematite ores of the Wichita Mountains as a paint pigment. This use does not require a very large quantity of ore.

Several years ago, it was found that iron ore could be used successfully in making cement that would generate low heat on setting. This was especially important in the construction of massive masonry structures, such as dams. Several deposits of brown iron ore in the Arbuckle Mountains were examined by Survey geologists. For several years, brown iron ore of the Arbuckle Mountains was mined and sold to cement plants for making these low heat cements.

11. Titanium. Deposits of magnetite containing titanium minerals in the Wichita Mountains are being investigated by the Survey. Titanium has become an important mineral in industry, and the investigations include efforts to determine whether the titanium minerals may offer commercial possibilities.

12. Perlite. The light-weight aggregate industry, a new industry in Oklahoma, utilizes mineral material shipped in from other States. The Oklahoma industry is importing perlite from other States and expanding it by heat treatment to give a light-weight product.

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Potential New Industries

The program of the Geological Survey endeavors to keep pace with technological advances and national industrial trends that may change the outlook for utilization of some dormant Oklahoma mineral. The timeliness and quick results of the research on rock wool materials, coking coal, dolomite, and glass sand are indicated in the preceeding discussion. Several other investigations have been made or are in progress that are believed to offer similar possibilities.

1. Volcanic ash. Light weight materials have come into prominence in recent years in the building industry, reducing costs of construction somewhat and affording fireproofing and acoustical benefits not inherent in more orthodox materials. Pumice and volcanic scoria are the only natural materials having the desired properties, and are restricted in their distribution. Cinders have been used extensively, and about 15 years ago, bloated clay was introduced. All these products are used as coarse aggregates for making light weight concrete and building blocks. More recently, expanded perlite and vermiculite have attained great popularity as light aggregate for plaster. Another product, produced under the trade name of foamglas, has found a market for uses where light weight sheets and blocks are desired.

Experimentation in the Survey's Industrial Research Laboratory demonstrated that volcanic ash may be expanded at moderately high temperature, and will produce sheets and blocks comparable in many respects to foamglas; and that if introduced into the flame of an inspirator type burner, the ash will "pop" or expand in the same manner as perlite. It has one distinct advantage over perlite, in that perlite must be ground to small particle size before it goes into the furnace, whereas volcanic ash needs no preparation.

2. Titanium. Within the past ten years, pigment industry has seen a very great expansion in the use of titanium dioxide by the paint and paper industries. Titania white, as it is called, is a brilliant white, and has hiding powers comparable, if not superior, to white lead, and today makes up a large volume of the white pigments used in paints and paper.

Investigations are in progress in the Wichita Mountains, southwestern Oklahoma, to ascertain whether the deposits of titanium bearing magnetic

iron ore, and the black sands derived by the weathering and erosion of these ores, are in sufficient quantity to warrant commercial development. Results to date are sufficiently encouraging to justify carrying the investigation to completion.

3. Oil field brines. Salt water found in oil fields, and the bane of the oil producer, contains several materials, including magnesium, that are important in the chemical and other industries. Experimentation in the Survey's Industrial Research Laboratory indicates that several well established processes now in use elsewhere, could be applied to Oklahoma oil field brines, and a material that is now a dead expense converted into a new basic industry, with possibilities for numerous subsidiary industries.

Current Projects
Oklahoma Geological Survey

Gerald W. Chase, of the Survey staff, is completing mapping of the basic rocks of the Wichita Mountains and their contained titanium-bearing iron ores in the Roosevelt and Meers areas of the Wichita Mountains.

William E. Ham and his assistant, Myron McKinley, both of the Survey staff, have nearly completed subdividing and mapping the formations of the Timbered Hills and Arbuckle groups of rocks in the Arbuckle Mountains, and, insofar as time permits, will revise the mapping of Simpson and younger formations on the margins of the Arbuckles.

In the Ozark region, Professor George G. Huffman and Mr. Miser have supervised about fifteen graduate students from the University of Oklahoma in a study of the middle and upper Mississippian rocks.

Problems of the Pennsylvanian are being investigated by Malcolm C. Oakes, of the Survey staff and graduate students under his supervision, by Professor Carl C. Branson, University of Oklahoma, and John H. Warren, of the Survey staff.

Oakes has traced the boundary between the Virgilian and Missourian series from the Kansas-Oklahoma State line to the Arbuckle Mountains.

John Warren is currently engaged in revising the mapping of the Fort Scott limestone in Craig and Rogers Counties. The work of Branson and Warren has brought to light certain inaccuracies in older mapping of importance to stripping of coal in that area.

All these projects bear directly on the preparation of the new geologic map, but not to the exclusion of economic geology, or the applied phases of the Survey's work.

Ground water investigations are conducted in cooperation with the U. S. Geological Survey with Dr. Stuart L. Schoff in charge.

THE FIRST 50 YEARS

Half a century ago there was instituted in Oklahoma a publicly supported program for exploration, research, and development of geology and mineral resources--a program that has contributed greatly to the State's development. The Oklahoma Geological Survey is starting its second half-century of existence as an organization supported by public funds for the study of geology and mineral and ground water resources. It started in 1900 when Charles Newton Gould assumed duties as staff geologist with the Department of Geology and Natural History of the Territory of Oklahoma before joining the faculty of the University of Oklahoma.

Mineral production in Oklahoma and Indian Territories, combined, for 1900 consisted of coal, clay products, coke, gypsum, granite, limestone, petroleum, and salt, valued in that order, with a total value of $3,272,000; in 1949, the list of minerals produced in Oklahoma included 24 commodities, with a total value of $482,253,000, representing a fifty-fold increase based on the worth of the 1950 dollar as $0.33 of the 1900 dollar.

Population of the two territories in 1900 was 790,391, compared with the 1950 population of Oklahoma of 2,233,351. Again using the 1900 dollar for direct comparison, the per capita new wealth created by mineral production rose from $4.14 to $62.50 during the period.

Oklahoma's growth toward economic maturity is shown most significantly by the rise in manufacturing, measured by Value Added by Manufacturing, which increased from about $8,000,000 in 1900 to $340,500,000 in 1947, or fourteen-fold, using the 1900 dollar for comparison. Minerals played no small part in this development, in fact, they played two roles, both highly important, as fuel and as raw materials. Fuel and electric energy derived from fuel are requisite for all manufacturing. The importance of minerals' second role may be judged by the fact that Value Added by Manufacturing using mineral raw materials accounted for about 5 percent of the total in 1900, and almost 40 percent in 1947.

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