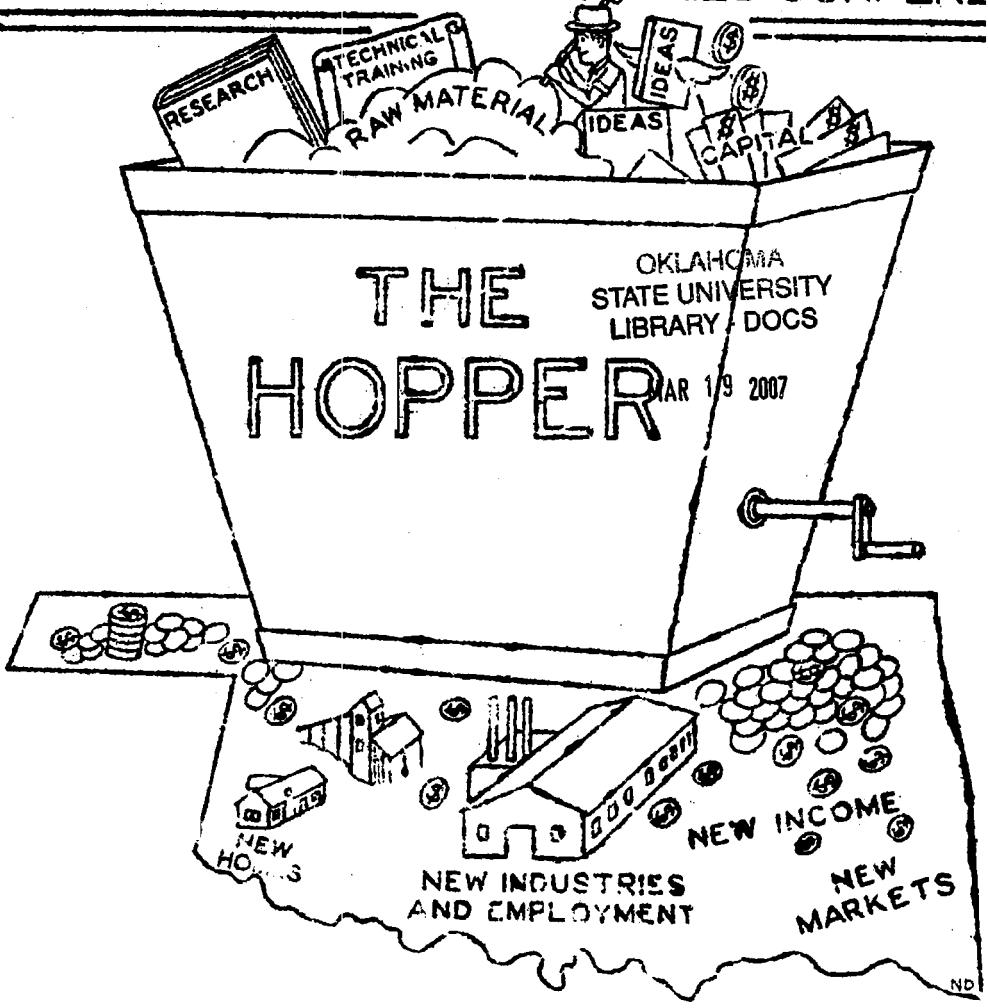
OKLAHOMA MINERAL INDUSTRIES CONFERE



PUBLISHED IN THE OFFICE OF THE
OKLAHOMA GEOLOGICAL SURVEY
NORMAN, OKLA.

Vol. VIII, No. 2 February, 1948

SOME RESULTS OF RECENT MINERAL SURVEY OF FORTY-SEVEN OKLAHOMA COUNTIES

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(Address before Oklahoma Industrial and Mineral Industries Conference, Nov. 17, 1947. Tulsa, Okla.)

The survey of the forty-seven Oklahoma counties has not been completed as yet, but many interesting facts have already been unearthed. The survey is sponsored by the Public Service Company of Oklahoma, who are underwriting the cost of the entire project.

The Midwest Research Institute of Kansas City, Missouri, which I represent, received the following instructions from Mr. R. K. Lane, president of the Public Service Company of Oklahoma:

"To conduct research relative to the natural resources in the forty-seven counties in which the Public Service Company serves electricity. To also determine the practicability and economic feasibility of installing manufacturing plants to utilize the natural resources available in these counties."

These instructions obviously include a study of both agricultural and mineral resources. On investigation it was found that information pertaining to the agricultural resources was being adequately handled in each county by county agents, soil conservationists, and triple "A" representatives; therefore our study in this field would include only special problems relating to agriculture.

The field of mineral resources, however, is a different problem. The mineral resources, outside of petroleum and natural gas, which are taken care of by the petroleum industry, have been and are

still being neglected by the state and its residents.

The state of Oklahoma has an excellent Geological Survey, but financial support for this organization has never been commensurate with the tremendous potentialities of the state's undeveloped mineral resources, with the magnitude of the job of properly investigating these resources and their utilization, nor with actual mineral production. The following comparison of the value of mineral production in 1945 of three states and their annual appropriation to their geological surveys should clearly demonstrate this point:

	State mineral production 1945	Appropriation to Geological Survey	Appropriation per million dollars mineral prod.
Missouri	$ 74,171,000	$168,000	$2,265
Illinois	332,489,000	500,000	1,504
Oklahoma	282,859,000	50,000	177

Another reason for the survey is probably known to all of you. Oklahoma, like other states in Mid-America, has an unbalanced economy. There is an abundance of natural resources, but an obvious deficiency in manufacturing. It is hoped through this survey that the type and quality of part of the natural resources of the state will become better known and provide a source of raw material for an expanding industry. Your industrial train tour of eastern industrial centers had an identical purpose.

The third reason for the survey should be of interest to all Oklahomans, but especially to agriculture producers. Mineral resources are different

from agricultural resources in that they cannot be replenished once they are used. Petroleum, natural gas, lead, and zinc, for many years, have been a major source of income to the state government. In 1945 Oklahoma's petroleum, liquefied petroleum gases, natural gasoline, and natural gas production were valued at over $248,000,000.00, or 87.7 percent of the total mineral production. The same year the lead and zinc production was valued at over $18,000,000.00, or 6.4 percent of the total.

What are the future prospects for these resources which now compose 94.1 percent of Oklahoma's mineral production?

For the past several years Oklahoma's petroleum reserves have remained near the billion barrel mark, or in other words, new discoveries are only equalling withdrawals. It is only reasonable to assume, therefore, that this source of revenue will become a dwindling one.

What of zinc and lead? The Tri-State area of Oklahoma, Missouri, and Kansas, from which Oklahoma's entire production is derived, contains 60 million tons of rock carrying 1.6 percent metallic content. This could be mined in five years if a sufficiently high price were offered for the lead and zinc.

In 1945 the value of the products from these resources totalled over $264,000,000.00, and therefore were a major source of revenue. What will be the source of revenue to compensate for these exhausted resources in 1965?

Unless new mineral deposits are found or new uses discovered for known deposits and unless new manufacturing industries are created within the state to process your raw materials, the farmer and rancher and small business man will have to shoulder most of this additional burden.

Since the future prosperity of Oklahoma, as far as mineral resources are concerned, depends upon coal and industrial minerals, these resources have been given special attention.

In the short time allotted to me, and simply to illustrate the type of work our survey is doing, I have decided to discuss briefly two or three mineral resources which I believe hold great promise in the future industrial development of the state.

The first of these is anorthosite. This is a dark basic igneous rock essentially composed of lime-soda feldspar or labradorite, with lesser amounts of ferro-magnesium minerals.

Anorthosite is known to occur in four areas in the United States. These areas are located in Idaho, Wyoming, Upper New York, and in the Wichita Mountains of Oklahoma. A process for extracting alumina from anorthosite has been developed by means of sintering with lime and soda and subsequent leaching of the alumina from the sinter with an alkali solution. The residue from the process consists mainly of dicalcium silicate (a portland-cement mineral) and smaller quantities of soda ash and potash. In order to make this alumina extraction an economic possibility, uses must be developed for the by-products, dicalcium silicate, soda ash, and potash.

During the war the U. S. Bureau of Mines built a pilot plant at Laramie, Wyoming, utilizing this process for extracting the alumina from the Wyoming anorthosite. It was planned to utilize the dicalcium silicate residue in the manufacture of portland cement at the adjoining Monolith Portland Cement Plant. The war ended before the plant began operating, and of course all work on the project ceased.

Since dicalcium silicate is only one of several minerals developed by the burning of limestone and clay to make portland cement, I am unable to see the economics of producing one of the minerals separately and adding it to a mixture that already contains sufficient lime, alumina, and silica to produce all the portland cement minerals in their proper proportions.

Preliminary research by an eastern agricultural school indicates that the dicalcium silicate is highly adaptable for use as an agricultural lime. In addition to lime, it also contains available silica, which is essential to the growth of bearded grains. Therefore, it is suggested that dicalcium silicate, which would be produced during the alumina extraction from Oklahoma anorthosite, should be used as soil sweetener and soil builder. The soda ash produced by the process is in constant demand by industry, but would be especially valuable to Oklahoma's glass industry. The potash produced by the process has a wide field of applications, and could be readily adapted as a soil builder for Oklahoma's agriculture.

The area of outcrop of anorthosite is very large and it is at present being mapped by the Oklahoma Geological Survey. The latter could supply anyone interested in this material with the location of the highest grade raw material.

Clays and shales are the second mineral resource which I wish to discuss with you.

Clay is defined as an earthy deposit of extremely fine texture, which is usually plastic when wet and becomes hard and stone-like on being heated to redness. Chemically it is composed of hydrous aluminum silicates, while mineralogically it consists largely of clay minerals (of which there are several varieties) and quartz with minor amounts of feldspar. Shales are consolidated clays.

Clays and shales may be classified according to their origin, chemical and physical properties or uses. To the geologist the classification based on origin is the most important. The classifications based on chemical and physical properties or on uses are of most interest to the technologist. One of the latter classifications would group clays into the following eight types:

(1) Whitewear clays, including Kaolin, China, and Ball clay.
(2) Refractory clays including plastic, flint, burley, and diaspore clay.
(3) Pottery clays.
(4) Vitrifying clays, including paving brick, sewer pipe, and roofing tile clays and shales.
(5) Brick clays including common brick, terra cotta, and drain tile clays and shale.
(6) Gumbo clays or burnt-ballast clay.
(7) Slip-clays (used to make natural glaze on surface of clay wear).
(8) Bleaching clays.

Clays and shales are inexhaustible in Oklahoma, and the most abundant natural resource. Modern technology, however, has not discovered methods of utilizing all of Oklahoma's clays.

The areas studied in our survey, however, do contain large clay and shale deposits which laboratory tests have proven to fit them into five of the eight types listed in the preceding classification. These are pottery, vitrifying, brick, burnt-ballast, and slip clays. We have also found clays, which on completion of our laboratory investigations may fit into the remaining three divisions in this classification, namely: whitewear, refractory, and bleaching clays.

There is one type of Oklahoma clay that is not included in the above classification, in fact it

has not been previously identified in the state. I refer to haydite clay. Haydite is an artificial pumice produced by heating a definite type of clay in a rotary kiln. The resulting porous mass forms a lightweight aggregate that is utilized in place of sand and gravel in the manufacture of lightweight concrete blocks. These blocks are one-half the weight of the ordinary block, and also have insulating properties and do not absorb as much moisture as ordinary concrete blocks.

Natural pumice is widely used for this purpose on the west coast, but on this side of the Rockies there aren't any deposits of natural pumice, and therefore we are compelled to manufacture it. The patents on the manufacture of this material expired in 1945. The present haydite plants, numbering seven, are all in northern United States, most of them around the Great Lakes. The closest plant to Oklahoma is that of Carter-Waters at Kansas City.

We have examined and tested many Oklahoma clays for haydite-making possibilities, and have discovered numerous deposits suitable for this purpose. There is a wide-open market in southern United States for this product with the only competition existing in the northern part of the country. Oklahoma has the raw materials, as well as cheap fuel and adequate transportation, and as I have stated, ready markets are available for the manufactured product. All that is required is for some Oklahoman or group of Oklahomans to be sufficiently far-sighted to invest $250,000.00 in this project rather than sink it in an oil test that may prove to be a dry hole.

The limitations of time prevent me from discussing many other Oklahoma mineral resources that merit immediate exploitation. In passing, however, I should mention "calcite" or calcium carbonate that is being mined on a small scale in the Wichita Mountains in northern Comanche County. This material

is presently being sold as agricultural lime. Our laboratory tests show that hand-picked samples of this material run over 99.5 percent calcium carbonate, and as low as .0051 percent Fe. Raw material of this grade should not be wasted by selling it as a low-priced commodity such as agricultural lime. The deposit should be thoroughly explored and probably core-drilled. If it is found that a large tonnage is available, it should be utilized by industries requiring a raw material of high purity, such as the glass industry.

In this modern era of high speed trains, a hard resistant ballast that does not powder is essential. I examined an exposure containing sixty feet of chert in a railroad cut in northeastern Oklahoma. This rock, due to its extreme hardness, is ideally suited for ballast, in fact it is being mined in Missouri for this purpose.

The inexhaustible deposits of limestone, dolomite, gypsum, and granite, and large volcanic ash deposits, should be discussed as we have made some interesting observations regarding these resources in Oklahoma, but time does not permit.

In closing I should like to stress the fact that the industrialization of a state requires large reserves of domestic mineral resources, and the corollary is also true that the largest returns received by the mineral industry are secured by the state which processes its own raw materials. A prosperous agricultural and mineral industry and an expanding manufacturing industry are interdependent and inseparable functions of a growing state.

Oklahoma is in the envious position of possessing sufficient fuel and water to sustain its growing industries. It has a dependable power supply. From a distribution standpoint, its central geographic location with respect to the rest of the United States is ideal. It has an equable climate,

and its recreational facilities are well-known. I do not hesitate to state that Oklahoma's natural resources are not only abundant, but varied, and capable of sustaining a population several times its present size, and a future industrial expansion beyond your fondest dreams. The impetus to industrialization, however, must originate within the state, and the interest then spread from there to the four corners of our country.

I agree with Roger Babson that the area enclosed in his magic circle, which includes the whole state of Oklahoma, is the richest in time of peace and the safest in time of war.

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LIMESTONE FOR THE GLASS INDUSTRY

Oklahoma is now supplying limestone for at least part of the requirements of the glass industry in this region. The high grade St. Clair limestone, which has been quarried for several years at Marble City for use in making burned lime by the St. Clair Lime Co. at Sallisaw, is the first Oklahoma limestone to be quarried and ground on a large scale for the glass industry.

Homer Dunlap, of the St. Clair Lime Co., reported that this limestone is going to glass plants in Oklahoma, Arkansas, and Texas. Limestone from Marble City had been shipped to more than half-dozen glass plants in the three states. Mr. Dunlap reported the better grade stone is being quarried selectively and prepared for the glass industry, and that the product runs exceptionally low in iron.

Oklahoma raw material producers are in position to supply a much greater portion of the raw material ingredients for glass manufacturing than ever before. These are in addition to abundant low cost fuel for heat and power.

HELVITE, AN ADDITION TO THE LIST OF OKLAHOMA MINERALS

A mineral that has not been previously listed as occurring in Oklahoma, and now added to the list of Oklahoma minerals, is helvite. This is a beryllium mineral found in the Wichita Mountains during wartime investigations, and recently reported.

Early in 1944 when the investigation of mineral materials was at its height, attention of the U. S. Bureau of Mines representatives, at that time working on the clay deposits of Kiowa County, was called to several old prospect pits within the area of the Wichita Mountains Wildlife Refuge, and the material which had been exposed by the explorations. Results of the findings of this side investigation have only recently been released, the information having been held confidential.

The ores from an old dump were found to contain galena (lead sulfide), sphalerite (zinc sulfide), magnetite (magnetic iron oxide), feldspar (alkali aluminum silicate), and helvite (a complex beryllium mineral). The mineral that is new, as far as occurrences in Oklahoma is concerned, is helvite. It represented approximately three percent of the ore sample and indicates that the ore sample would contain about 0.35 percent beryllia. The occurrence of beryl, another beryllium mineral, was reported in early bulletins.

Beryllium is a silver-white metal that is virtually non-corrodible. It has a specific gravity of 1.85 and a melting point of 1350°C. Its presence in alloys in small amounts imparts strength and hardness. Its alloys with copper and aluminum are especially noteworthy and important. Beryllia and the salts of beryllium are used in special glasses and in other ceramics.