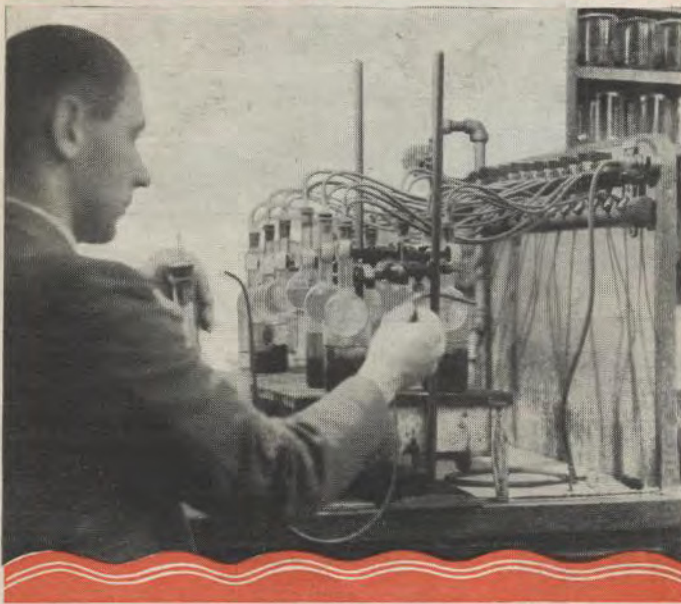


# "BUG-MEN" *Lead Hunt*

## Searching for Oil With A Microscope



Samples Containing "Bugs" Being Boiled with Acids to Loosen the Tiny Fossilized Shellfish for Microscopic Examination

**T**INY bugs, dead millions of years, recently led to the discovery of a great California oil field, whose millions of barrels of sticky "black gold" brought sudden wealth to many producers. These tiny fossil bugs are today locating new sands far below the producing levels of nearly dead fields. They infallibly tell drillers when to set casing, when to abandon hopeless drilling projects and when to spend thousands of dollars more to reach their goal.

In years past, several dry wildcat wells were drilled near Venice, Calif., but not until oil men applied the newly developed

science of micro-paleontology to the old samples of shale and sand from these "dusters," was there definite promise of an oil structure.

Locating the oil structure is the greatest problem in prospecting for oil. Level fields or lofty mountains may cover buried hills and valleys. The layers of which the earth's crust is composed have been lifted, twisted, and folded by the earthquakes and convulsions that have occurred since these strata were deposited on ocean beds in long

forgotten ages. When these layers are arranged so that they form a subterranean hill, or anticline, the prospect of oil is favorable.

Although many methods of mapping this underground topography have been devised, the one used by "Duke" Curtice, a Los Angeles oil operator, in the discovery of the Venice field is not only the newest but perhaps the most effective. Micro-paleontology, or "bug hunting," depends on the fact that in each layer of the ground certain kinds of bugs predominate. These bugs, the fossilized remains of microscopic shellfish, may be identified and

# for BLACK GOLD



Above, Geologist Studying Walls of Excavation to Find Types of "Bugs" Predominating; Below, Magnified Bugs

their types traced to determine the underground structure.

"We were making a subsurface contour map of the whole Los Angeles basin," said Mr. Curtice, "when it became apparent that there was a strong likelihood of an oil structure on the west side of the basin. Immediately we redoubled our efforts in

this locality. From hundreds of outcrop and well samples, we picked thousands of bugs, examined them under the microscope and classified them. Correlation of the findings from several oil wells, together with what little surface information we could get, gave us a fair, but not a complete, picture of the subsurface conditions.

"On the basis of the information we had, we estimated the location of the structure, leased 850 acres and drilled a test well. Although we went to about 7,000 feet, we did not strike oil. We were 'off the structure.'

"But we were not disappointed," the oil man continued. "During the drilling of the first well, we took a great many core samples. From these we were able to obtain enough information to complete our picture.



Above, "Bugs" and Sand Classified for Reference; Right, Microscopic Slides Containing Bugs

"We moved our location exactly one mile west, drilled a well, and brought it in with an initial production of 2,600 barrels."

Micro-paleontology was here the cause of the most phenomenal example of town-lot oil production ever seen in the industry. But many other uses are being found for this new science: locating productive zones, showing depth of new oil sands, determining the geologic age of formations, identifying structure, showing faulting and extending productive area of old fields. In many ways these tiny bugs are leading to riches.

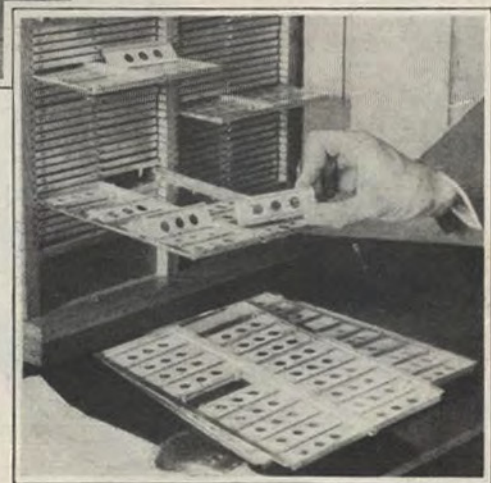
One of the valued services rendered by the "micro man," or paleontologist, to the oil company, is predicting the depth of the oil sand. In the Signal Hill and Dominguez, California, districts a few years ago, this sort of information would have meant success instead of failure, riches instead of poverty for many drillers. Many of the wells drilled in that district were abandoned as dry when later information showed the prospectors' bits were within two or three hundred feet of producing

sand. Thanks to the bug man and his microscope, such a catastrophe cannot happen again.

These subsurface surveyors are able to chart the underground seas of liquid gold with such marvelous accuracy that the companies depend on them for drilling locations, underground geologic structure and a great mass of information necessary to successful operations.

But such confidence has not always been placed in the micro men. One well in the Coalinga, California, district was supposed, from surface indications, to be on the crest of an anticline. If this had been true, they would drill through the thin layer of Pleistocene formation and strike the Pliocene at a shallow depth.

"At 1,500 feet our bugs showed



conclusively that we were still drilling in the Pleistocene, which proved absolutely that we were not on an oil structure. There was no hope that we would ever strike oil," the paleontologist said, "but the operators had no confidence in our results. At a cost of several thousand dollars, they drilled 3,000 feet deeper before they had enough."

Another operator drilling a well in the Los Angeles basin was advised before he spudded in that he was off the structure. The micro men had sufficient evidence

from near-by wells to show that the new location was not over an oil-bearing structure. This operator drilled to a depth of 8,000 feet at a cost of more than \$150,000 before he was convinced that the opinion of the bug men was correct.

The unbelievable accuracy with which this new science can predict the depth of a particular formation is used frequently as an indication of when to set casing. In order to avoid reducing the size of the hole, it is desirable to set the casing as late as possible before drilling into the oil sand. By means of micropaleontology, the depth of the oil sand is often predicted within ten feet.

In the North Belridge field in San Joaquin valley, California, paleontologists were puzzled by the absence of the so-called valvulineria zone which was always encountered a few feet above the producing sand in many other California oil



Core Samples from Wells Containing "Bugs"; Pencil Points to a Fault Shown in a Core



fields. By examination of the bugs taken from the relatively shallow wells of the North Belridge district, the micro-fossil men decided that the valvulineria zone should be considerably deeper than any of the wells.

Since the old shallow wells were producing little oil, a test was made. The Belridge Oil company's No. 15 was drilled to a depth of about 4,850 feet, 3,000 feet deeper than any well in the district. At

this depth presence of characteristic micro-fossils indicated the valvulineria zone. The driller knew that in a few more feet the producing sand would likely be found. Casing was set at 5,000 feet, and the well was drilled into the sand. With a production of several thousand barrels of oil and more than twenty million cubic feet of gas, this well opened an era of unprecedented production. Within a few weeks, somnolent old North Belridge was buzzing with activity. Not only were many of the old shallow wells immediately deepened, but dozens of new wells were started to tap this newly discovered reservoir of liquid wealth.

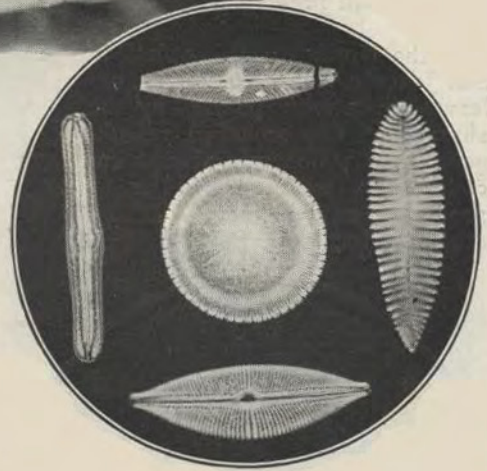
The Seal Beach, California, field might never have been developed had the services of subsurface men not been available. After carefully surveying the surface geological features of the district, a large oil company obtained land and drilled two or



Above, Paleontologist Hunting for "Bugs"; Right, Magnified Varieties of the Tiny Diatoms

three wildcat wells. Although the surface indicated the presence of a good structure, the wells, one after the other, proved to be dry holes. Other companies drilled a few wells, on the advice of geologists who depended upon the same surface indications, but these also were "dusters."

Finally, after all the others had become discouraged and had given up their holdings, one company, which had been doing a great deal of micro-fossil research, entered the field. They carefully surveyed the subsurface formations by means of micro-paleontology and found that the old wells were on the wrong side of the fault along which oil was expected. This company drilled on the other side of the fault, brought in a good well and reaped a reward which many times over repaid them for their research.



The photos in this article are of the West Coast operations unit of The Texas Oil Company (later Texaco) in Los Angeles. The person shown indoors is Wilbur Rankin, and the one outdoors is his boss, Boris Laiming. Laiming was raised in the Kremlin and was a law student when he fled the Russian Revolution and eventually found work on geologic surveys. In the mid-1920s, he was one of the pioneers of industrial (applied) micropaleontology. He initiated the company's "paleo lab" and remained in charge of it for many years. Their collection was donated to UCMP c.1994.