MICROBIOLOGY

Microbes Sort Metals

Microbes that prefer specific minerals and metals in their diet may prove to be a useful, low-cost labor force for chemically separating 'twin' metals

➤ MICROBES are being tested as agents for separating metals so alike they can be considered virtually chemical "twins," a scientist at the U.S. Bureau of Mines reported.

Dr. Walter N. Ezekiel said that microbes successful in the job of separating chemically similar metals would be a low-cost labor force that can help reduce the price of such important elements as zirconium and hafnium.

A three-man team is exploring this use for such microorganisms as bacteria, yeasts and molds, Dr. Ezekiel told the Society for Industrial Microbiology meeting in College Park, Md.

Microbes require very little in the way of working conditions, mainly the right nutrients and environment. Since specific microorganisms prefer definite minerals or metals in their diet, they appear promising for a low-cost separation process.

Various microbes and different nutrient solutions are now being tested at the Bureau of Mines Laboratory on the University of Maryland campus. The experiments are a follow-up of previous research showing that microbes could be used to separate columbium and tantalum, two elements as closely related chemically as zirconium and hafnium.

The tests are made by injecting a culture of the selected microbes into a solution containing a concentrate of zirconium and hafnium, then checking later to see whether the organisms have consumed more of one metal than the other.

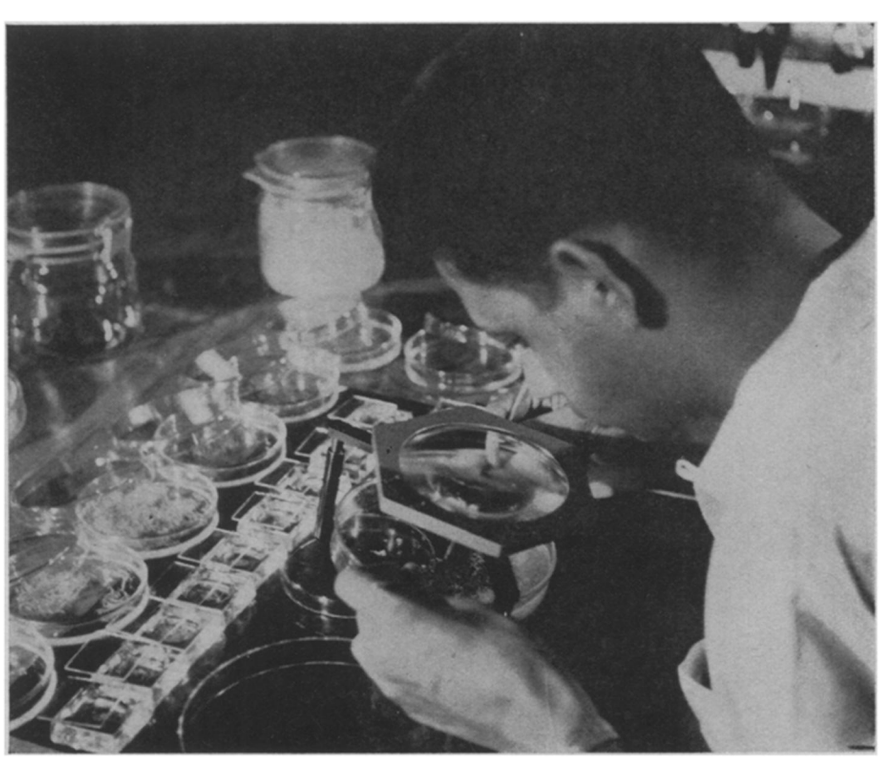
The microbes do not feed directly on the metallic elements, but take them in at the same time as they absorb such essential nutrients as sugar. The preferred metal is either ingested directly or is in some way attached outside the cell wall.

Dr. Ezekiel reported that either zirconium or hafnium has been extracted in amounts varying from zero to close to 100% by the use of different microbes living on nutrient solutions of varying proportions. He said that for several strains of bacteria, the metal extraction ranged from around 25% to 60%.

These microorganisms are of the type known as *Proteus vulgaris* and other common laboratory bacteria. In the same family of such enterobacteria is *Escherichia coli*, the species of organism constituting the greater part of the intestinal flora of man and other animals.

Both zirconium and hafnium are valuable in atomic energy fields. Zirconium is a structural material for nuclear reactors, and hafnium is used for making the control rods for reactors.

Both elements are relatively costly. Zirconium sells for about $5.00 a pound, and hafnium is about $75.00 a pound, compared with about six cents a pound for the average grade of steel. The high costs of separation by methods now in commercial use are mainly to blame for the high prices.



UNESCO/MINISTRY OF INFORMATION, GOVERNMENT OF INDIA

OCEAN STUDY—A scientist at the Indian Ocean Biological Centre, Cochin, India, examines samples of plankton taken from the Ocean. Oceanographers with the International Indian Ocean Expedition, held under the auspices of the United Nations Educational, Scientific and Cultural Organization, are exploring the Ocean's resources.

OCEANOGRAPHY

Sound Waves Used To Map Ocean Floor

➤ RELATIVELY large land areas underwater may be "seen" and mapped with the aid of side-looking sonar, a device that may become as valuable for charting the ocean floor as aerial photography is for mapping the land.

Side-looking sonar (SLS) could be used to quickly produce detailed and accurate maps of coastal shelves, lake bottoms, harbors and rivers. Routes for pipelines or shipping channels, for example, could be plotted using SLS to provide data about the lay of the underwater land.

SLS scans the ocean floor much as a slanted beam of light would sidelight the landscape. Pulsed, high-frequency sound waves are sent out by a transmitter housed either in a research vessel or in a "fish" that is towed behind it.

The pulses are aimed at the ocean floor a few degrees below the horizontal in a direction perpendicular to the ship's course.

As sound hits the bottom, it is reflected in a pattern that describes the contours—hills, channels, plateaus—and can be used as a map.

One of the shortcomings of SLS, reported Joachim G. Stephan of the Battelle Memorial Institute, Columbus, Ohio, who is developing the photogrammetric method of making an ocean "road map," is that it cannot produce three-dimensional images, which are mathematically possible but not technically practical at this time.