

GEOPHYSICS

Possible Lava Source

Evidence indicates that a 300-mile thick region of hot viscous material, extending completely around the earth, may be the source of lava in active volcanoes.

► SCIENTISTS have found the first direct evidence of the existence of a layer, beginning some 60 miles below the earth's surface, which may be the source of lava for active volcanoes.

The layer is believed to be viscous in nature, that is, having the consistency of soft, hot glass. It is a 300-mile-thick region in the upper mantle and extends entirely around the earth.

"It probably is tapped by tubes from active volcanoes and is their source of lava," Dr. Don L. Anderson, geophysicist at the California Institute of Technology in Pasadena, Calif., said.

The plastic flow of this layer may also have direct bearing on earthquake origins, Dr. Anderson added.

Dr. Anderson developed evidence of this layer's existence from a two-year analysis of seismic data, including that of the 1960 Chilean earthquake.

The presence of this viscous layer was first predicted by the late Dr. Beno Gutenberg, a former director of the institute's seismological laboratory. He noticed that this region did not transmit earthquake waves as rapidly as the layers above and below. The harder the material, the faster the waves will travel through it and the less will be the energy loss.

In the study, supported by the U.S. Air Force Office of Scientific Research and the Advanced Research Project Agency, Dr. Anderson used earthquake waves in three different approaches to explore the earth's interior.

In the first approach, earthquake waves

that bounced back and forth from the earth's core to the surface were studied. The rate at which the waves' strength faded indicated the rate at which the energy of each wave was converted into heat by plastic processes, Dr. Anderson said.

The second group of experiments were with the earthquake waves at the earth's surface and near surface. Results showed the region of the mantle's upper 250 miles possessed high temperatures and weakness. This region has both solid-like and liquid-like properties "and would likely be the focus of any large scale motion in the mantle," Dr. Anderson explained.

Data received from the Chilean earthquake was used in the third approach. A complex computer analysis of the earth tremors showed the existence of a "soft" upper mantle and a hard lower mantle.

Dr. Anderson pointed out that in the mantle's lower 1,400 miles, the material acts more like steel, while the earth's upper 360 miles behaves more like soft glass.

The main shock of the Chilean quake caused the earth to ring like a bell for two weeks. But had the earth been a perfect, solid "bell," the quake's main shock would have caused the earth to ring indefinitely.

High temperature, about 2,200 degrees Fahrenheit, causes the viscous layer, Dr. Anderson explained. At greater depths the pressures increase faster than the corresponding temperatures required to melt the rock, at least until the region below the mantle in the molten outer core is reached, he said.

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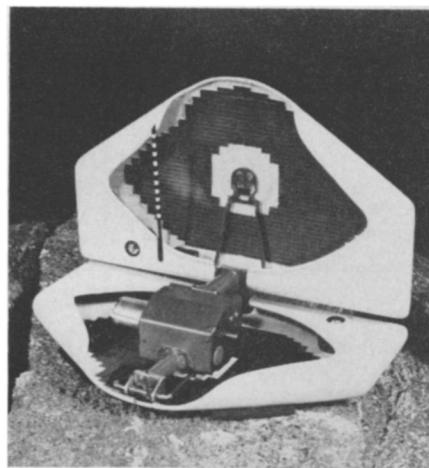
have to be transported to places where it is needed.

Use of osmosis to separate fresh from salt water by forcing the water through a membrane under pressure has received renewed attention with the recent development of a suitable filter material.

Use of the new membrane, developed by researchers at the University of California, is said to cost only about half as much as heating salt water to steam and collecting the salt-free vapor.

Other means for separating water from salt brine include adsorption by electrodes of carbon, freezing and chemical reaction with propane gas.

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Space General Corp.

TUMBLING EXPLORER—The rugged mobile "clamshell" developed by Space-General Corp., equipped with television cameras, is designed to move, turn, and take photographs on the moon or planets.

SPACE

Flip-Flops on the Moon—The Only Way to Travel

► A "CLAMSHELL" that flips end over end—and takes television pictures at the same time—may be the first lunar explorer.

Aptly named TEX, for Tumbling Explorer, it places one of its clamshell-like body panels on the ground and pulls the other panel up over itself. The second panel then flips over on the ground and hauls the first along.

Designed for rocky terrain where wheeled or treaded vehicles cannot go, TEX is efficient but slow, with a maximum speed of considerably less than a half mile per hour. However, it performs several duties while tumbling along.

In addition to photographing the moon's surface beneath its very "feet," TEX carries a device called a penetrometer, a sort of needle that stabs the surface repeatedly to measure soil consistency.

Designed by Space-General Corporation, El Monte, Calif., TEX lives on sunlight, through a bank of solar cells fastened inside its "shells."

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TECHNOLOGY

Desalinization Methods

► WHEN THE UNITED STATES and Russia meet to discuss the desalting of sea water, one of the many problems they will face, aside from the diplomatic ones, will be evaluating the many processes available to do the job.

The decision is a vital one. Consumption of fresh water in the United States alone will soon exceed the currently available 515 billion gallons a day, approaching an estimated 880 billion gallons by the year 2000.

President Lyndon B. Johnson announced that the first Soviet-American meeting will be July 14.

Cost is a prime factor in water conversion. The world's commercial fresh water units, even though they produce less than 0.007 of one percent of U.S. needs and an even smaller fraction of world requirements, cost more than \$20 million to operate.

Atomic energy, definitely on the agenda for the July talk, is among the most important tools for desalinization.

As far back as September 1963, the International Atomic Energy Agency made recommendations for study of combination nuclear power plants and water desalting stations.

Engineers at Oak Ridge National Laboratory, Tenn., have estimated that huge nuclear reactors and billion-gallon-a-day distilling plants could produce fresh water for as little as one-fiftieth of a penny per gallon, a saving of 60% or more over present installations.

Other sources of power for water conversion include solar radiation, for use in arid lands where the sun's intensity is high, and electricity, perhaps from a hydroelectric plant, though the purified water would then