niques are reliable and accurate.

"Some of the artifacts found by the French scientists appear to be manufactured by humans," says anthropologist Tom D. Dillehay of the University of Kentucky in Lexington, who recently observed the work at Pedra Furada. At a Chilean site, Dillehay has uncovered preliminary evidence of human occupation in sediments containing charcoal dated at about 33,000 years old.

Most archaeologists have held that people first reached the Americas from Asia sometime between 11,500 and 20,000 years ago by crossing a land bridge that connected Siberia and Alaska across the Bering Straits. At that time, the last ice age created massive continental glaciers and considerably lowered worldwide sea levels.

Recent South American discoveries that predate North American sites have caused some researchers to speculate that people first arrived in South America after voyaging across the Pacific Ocean and then spread northward.

Guidon and Delibrias do not, however, subscribe to this notion. "The present findings testify to the presence of man in the north of South America 32,000 years ago," they write, "and strongly suggest that the migration from Asia to North America occurred earlier."

Bryan agrees. "If you assume a Bering Straits entry, and I believe this to be a reasonable speculation, then there should be even earlier sites of human occupation in North America," he contends. He and his colleague Ruth Gruhn are now in Nevada looking for such sites.

A Bering Straits crossing 32,000 years ago is plausible, says Dillehay. "But we have to be cautious," he says. "You can't establish a theory of human origins in the Americas based on just one site."

*— B. Bower*

# Milestone for man-made geothermal well

Scientists from Los Alamos National Laboratory (LANL) have plumbed more than 2½ miles into a New Mexico mountain and brought up enough heat to run a small commercial power plant. In the first month-long test of this "hot dry rock" geothermal energy system, which ended June 18, the engineers pumped 290 gallons of water a minute into the system, heating it to 375° F.

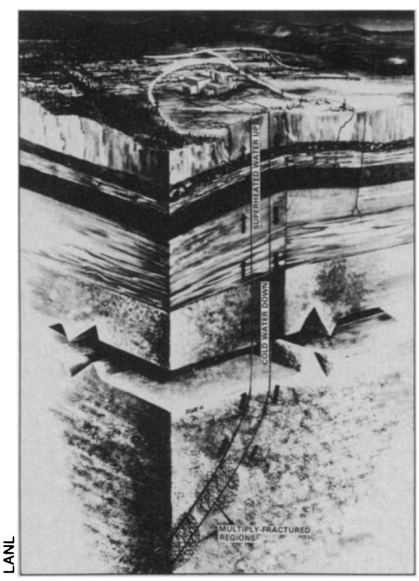
"This is a major milestone," says Michael Berger, head of LANL's Energy and Technology Office. "It is a successful test of the world's largest man-made geothermal energy system."

The promise of such systems is that they can be built almost anywhere, not only in places where there are underground steam fields. "Anywhere in the country, if you drill deep enough, you can find hot rock," Berger says.

The idea behind hot dry rock systems, first proposed in 1970, is to tap into the hot rock, use hydraulic pressure to crack open a reservoir of fractured rock and then pump water through to extract the heat.

The LANL scientists first tested the idea in the mid-1970s by digging a small system about 8,500 feet deep. They were able to heat water to about 316° F and to use this heat to run a power plant and produce a small amount (60 kilovolt-amperes) of electricity.

They built the second system — the one just tested — to see whether the idea would work on a scale large enough to be commercially useful, and they have found it does. In the May-June test, water heated in the system's 4-billion-cubic-foot reservoir carried about 10 megawatts of thermal power, and LANL scientists think they could double that by plugging leaks in the wells and letting the system operate longer, which would allow the reservoir to fill completely. Twenty megawatts of thermal power could produce about 4 megawatts of electricity, enough to supply a town of 4,000, Brown says. So far, however, the scientists have not run the larger system through a power plant.



LANL

*In a hot dry rock geothermal system, water is pumped through fractures more than 2 miles deep.*

They also are looking into the possibility of using the water as process heat for industry. In a study for the Orelda company, for example, LANL scientists showed they could use the heat to boil water for making Tater Tots.

A year-long test of the system may begin next summer, Brown says.

*— M. Murray*

# Surprise quake spurs new ideas

Last week's earthquake in the Aleutian Islands intrigues seismologists more for where it didn't happen than for where it did. The earthquake, an aftershock of a quake on May 7, failed to break through a seismic gap — an area where no earthquakes have occurred for many years and where scientists have been expecting accumulated seismic strain to trigger a major rupture. Scientists are using such unexpected events to refine their models for understanding and predicting the movement of the earth's crust.

The June 18, magnitude 6.3 aftershock stopped at the western edge of the earlier, magnitude 7.7 rupture, ending at the eastern wall of submerged Adak Canyon. Carl Kisslinger of the University of Colorado in Boulder says both the main earthquake and the recent aftershock seem to have run up against an asperity — a hard spot along a fault that holds strong when the rest of the fault breaks, like a knot in a pine board being sawed in two.

The recent earthquakes in unexpected places, the increased volcanic activity in the Pacific basin (SN: 5/17/86, p. 309) and the existence of at least two large seismic gaps in the Gulf of Alaska (SN: 2/15/86, p. 104) tantalize seismologists but elude attempts to establish a clear pattern that would explain the upsurge in activity. According to Klaus Jacob of Lamont-Doherty Geological Observatory in Palisades, N.Y., an active background of ordinary seismic movement in the area makes pinpointing significant events difficult. "We're not sure whether we can call it a pattern," he says of the recent events.

They do, however, give scientists an opportunity to refine crude models of plate tectonics to better explain why earthquakes continue to occur in unexpected places. Jacob speculates that, although seismologists used to view plate boundaries as uniform, the boundaries may actually be thinner under oceans than under continents. The oceanic part of the North American-Pacific plate boundary, where the Adak quakes occurred, may accumulate strain more quickly than regions under the continent. If this is the case, "the time between major earthquakes would be shorter on the average than previously thought," Jacob says. Events at the edges of these boundaries could forebode a future rupture, he concludes.

Kisslinger, too, expects more movement in the Adak region. "Based on what we know about this region," he says, "I would expect eventually that the region out to the west [of Adak Island] will break in one or two substantial earthquakes, but we have no way of knowing when."

*— T. Kleist*