

# EARTH SCIENCES

## DSDP plunges to new depths

The *Glomar Challenger* nearly reached the end of its 24,000-foot rope on its last voyage. While drilling in the Mariana Trench near Guam, the *Challenger* set a Deep Sea Drilling Project record, playing out 23,155 feet of drill string. The recently completed Leg 60 also marked the deepest water (23,104 feet) in which the ship has worked. The previous record, set in January 1972 during drilling in the Indian Ocean, was 22,192 feet of drill string in 20,483 feet of water.

Leg 60, like Leg 59, was searching for information on the formation of island arcs and back arc basins such as the Mariana island-ridge system. The Mariana Trench marks the point where the Pacific ocean plate is consumed beneath the continental crust. Volcanic rocks more than 45 million years old, possibly representing early stages of arc building, were recovered between the island arc and trench.

## Challenger's deep sensitivity

Ever onward and downward, the DSDP will try for another first next November. The *Challenger* will drop a package of seismic sensing equipment into a hole drilled 1,500 feet into the ocean bottom. Though downhole instrumentation — physical study of DSDP holes — is no new trick for the project, this will be the first time sensors will remain in a drill hole for longterm data collection. The 15-foot package will be wired to a recorder on the ocean bottom that can be brought to the surface for data recovery.

The sensors will monitor earthquake activity and sea floor spreading as well as gather information about the ocean's rigid lithosphere (crust and upper mantle) and the underlying, partially molten athenosphere. Placing sensors in the drill hole instead of on the sea bottom will eliminate much of the background noise caused by currents and soft sediments. Researchers expect that at some frequencies signals received by the downhole sensors will be ten times clearer than those picked up by bottom sensors. Just to be sure there will be something to wiggle the recorder's needles, the site chosen is in the Gulf of California, a young ocean basin still being formed by rifting of the continental crust of the Baja peninsula from mainland Mexico.

## A hot time at the old springs

Yellowstone National Park's Old Faithful might not be. It's slowly deserting the United States and heading for Winnipeg, Canada, according to Lawrence W. Braile of Purdue University. Old Faithful and Yellowstone's other hot springs and geysers are caused by a "hot spot" — a jet of partially molten material that rises through the mantle and is associated with seismic and volcanic activity. Braile's research shows that the Yellowstone hot spot migrated during the last 15 million years across southern Idaho northeastward to its present location in northern Wyoming. The movement cut a V-shaped wake — the Snake River Plain — through the Rockies as the crust heated, uplifted and thinned. The wake — about 100 miles wide at the Oregon-Idaho border and about 30 miles wide near Yellowstone — filled with volcanic material from the hot spot.

To determine the structure and evolution of the crust, Braile studied the characteristics of seismic waves caused by blasts in mines and quarries. From the waves' arrival times, he found that the crust making up the river plain is about 25 miles thick at its western boundary and gradually thins to about 10 miles thick at Yellowstone. Braile hopes that further experiments with data from carefully placed explosions will determine whether the hot spot is following a fracture in the earth's crust or only seems to move as the North American plate slides west across it.

# BIOLOGY

## Toward the universal nitrogen-fixer

A symbiotic relationship with nitrogen-fixing bacteria allows leguminous crops to grow without nitrogen fertilizer, and plant geneticists hope to extend such partnerships to other plants, such as wheat, corn and rice. However, the bacteria (rhizobia) are particular about which legumes they will partner. Different fast-growing strains pair with clover, pea, alfalfa and bean plants. The slow-growing rhizobia join up with soybeans, cowpeas and mungbeans.

Now researchers at the University of California at Davis report they have genetically changed a bacterium's allegiance. An alteration of a fast-growing strain has produced a slow grower that makes nitrogen-fixing nodules on soybean and mungbean roots. The variant could no longer effectively nodulate clover. Fergal O'Gara and K.T. Shanmugam report experiments in the May PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES that indicate the new strain can still carry out the early stages of symbiosis in clover. The successful change in specificity shows that a fast-growing rhizobium contains, though it does not express, all the genes necessary to nodulate both clover and soybeans effectively. O'Gara and Shanmugam conclude, "Understanding the control of expression of these genes could eventually lead to construction of 'universal' rhizobial strains which would nodulate all legumes as well as some of the non-legumes."

## Life-style of future food

At least eight countries are already harvesting krill, a tiny shrimp-like animal that may become a major human protein source. The crustacean is a staple in the diet of whales, seals, penguins, squid and fish, so unregulated krilling could destroy the balance of Antarctic sea life. But little information is available on the krill life-cycle to help regulators set reasonable limits.

Krill are now being maintained for the first time in aquaria at Palmer Station on the Antarctic Peninsula, Mary Alice McWhinnie of DePaul University reports to the National Science Foundation. During an extensive study, McWhinnie discovered many new aspects of krill life. For instance, they eat small animals and even other krill, in addition to aquatic plants. Thus they can probably continue growing year-round. They can live at any depth and seem to survive at least three years. The females spawn an average of 2,000 to 3,000 eggs and do not die after spawning, but instead shed their skins, continue feeding and revert to a "younger-maturity" stage.

## Planned parenthood for pups

The pill is going to the dogs, the Upjohn Co. hopes. The Food and Drug Administration has just approved Upjohn's dog oral steroid contraceptive, trade named Cheque. The drug will be available through veterinarians at a cost of about 5 cents per day and is claimed 90 percent effective. Future breeding plans appear the major reason why owners don't spay female dogs.

## Who can own a bacterium?

Last October the U.S. Court of Customs and Patent Appeals allowed the Upjohn Co. to patent a microorganism used to produce an antibiotic (SN: 10/15/77, p. 247). The ruling seemed to open the way for patents on new forms of life. Now the Supreme Court has nullified that decision and sent it back to the patent court. The patent court was instructed to reconsider its ruling in light of a recent Supreme Court decision denying a patent to the inventor of computer software where a mathematical formula was the only novel feature.