earth sciences

Metals from the ocean floor

The revelations arising from the geophysical theory of plate tectonics are starting to produce a much better understanding of how and where important minerals are formed. Areas of particular interest are the boundaries of crustal plates. One such major boundary is the undersea Mid-Atlantic Ridge, where two crustal plates are spreading apart from each other and new crust is being formed.

Analyses of manganese-rich rocks dredged from the median valley of the ridge indicate that metal-concentrating processes in the ocean basins are many times more efficient than previously believed. This is the conclusion of geophysicist Peter A. Rona of the National Oceanic and Atmospheric Administration laboratories in Miami and geochemists at Texas A&M University who performed the analysis.

The samples suggest the accumulation of unusually pure manganese over a comparatively short period of time in the median valley. "The sample," says Rona, "is a two-inch-thick deposit of manganese which has accumulated about 100 times faster than the manganese nodules known to cover large areas of the sea floor, and purer than any manganese deposit ever sampled from the sea floor."

The scientist believes the sample to be the first mineral deposit discovered in the median valley of a mid-oceanic ridge that is formed by hydrothermal activity. It suggests "that similar processes could be forming other significant metal deposits there as well."

Volcanoes and the stable crust of Mars

Mariner 9's photos of Nix Olympica, the enormous volcano on Mars, indicate that the formation of volcanoes on earth does not necessarily require the motion of the outer crust.

From study of the structure and massive size of Nix Olympica, Michael H. Carr of the U.S. Geological Survey estimates that the volcano could have been accumulating for as long as a billion years.

"The probable long accumulating time implies that the Martian crust was stationary with respect to the mantle for long periods of time," argues Carr in the July 10 JOURNAL OF GEOPHYSICAL RESEARCH. "Astonishing rates of volcanism would be required to build Nix Olympica if Martian crustal plates were moving with respect to the [underlying] magma source."

The conclusion has important implications for the origin of shield volcanoes on earth, Carr notes. In some hypotheses the melting zone over which a volcano develops is caused by interaction between the moving crustal plate and the mantle beneath. Other hypotheses invoke localized convection in the mantle to create the melting zone; plate motion is incidental and not necessary for a volcano to originate. Carr notes that the development of shield volcanoes on Mars without the help of plate tectonics supports the hypotheses in which plate motion is not required.

Video tape recordings of lightning

Scientists in New Mexico studying lightning have found that television video tape is proving to be a useful tool for recording lightning flashes, especially in daytime. Recordings by William P. Winn and colleagues of 110 lightning flashes during the summer of 1972 revealed that for flashes with two or more channels to the ground, the channels occurred more nearly simultaneously for flashes to a mountaintop than for flashes to the surrounding plains. Their report is in the July 20 JOURNAL OF GEOPHYSICAL RESEARCH.

natural sciences

How the snapping shrimp snaps

The snapping shrimp (*Alpheus californiensis*) is well known for its mode of defensive and aggressive behavior. It possesses one enlarged claw which can snap shut like a cocked trap. Though this behavior has been known for several years, the mechanism has not been well understood. Now biologist Roy Ritzmann of the University of Virginia reports in the Aug. 3 SCIENCE that the snapping mechanism is due not entirely to muscular action but also to the cohesive forces of water and the presence of two identical disks located in the dactyl and propus sections of the claw.

Through electrophysiological recordings, Ritzmann found that the dactyl stays open until enough tension builds up in the propus to snap shut the dactyl. He found that an amputated claw can be cocked open manually and still require quite a bit of force to close it, about 200,000 dynes. He discovered that both the propus and dactyl disks are responsible for holding open the claw. If a small scratch is made on the surface of either disk or the disks are disaligned, the shrimp's ability to keep his claw open is impaired. The disks are held together by the cohesive forces of the water and will open only when enough tension has developed in the closer muscle to overcome the cohesive forces of the water.

Opportunistic life on the sea floor

A species that has a high reproductive rate and population density, grows rapidly, matures early and utilizes a transient habitat is classified as an opportunistic species. The first recorded finding of an opportunistic species living at deep sea level is reported by malacologist Ruth D. Turner of Harvard University in the June 29 SCIENCE.

Wood-boring bivalve mollusks belonging to the genus *Xylophana* were discovered on panels of wood lowered by the research submarine Alvin to the depths of 1,830 meters and left for 104 days. When extracted from the water, the wood was so riddled it was falling apart. The rate of attack was surprisingly fast. Earlier experiments made in the Bahamas and off San Miguel Island, Calif., at a similar depth and longer exposure produced wood panels not nearly as riddled.

Turner reports that at the time the panels were implanted (June 14, 1972) no wood was observed in the immediate area. She postulates that either the larvae have the ability to delay metamorphosis, detect wood at a considerable distance and actively swim toward it or that the larvae have the ability to delay metamorphosis and settle when bottom currents carry them to the vicinity of wood. She believes that the breeding season of the mollusks may be tied to the rainy season in the tropics and the spring runoff in higher latitudes—times when large amounts of wood are flushed into the sea.

How big is the white shark?

The maximum length of 36.6 feet attributed to the white shark by A. Gunther in 1870 and others is a gross exaggeration, according to John E. Randall of the Bernice P. Bishop Museum at Honolulu, Hawaii. He writes in July 13 SCIENCE that reexamination of the jaws and teeth of the specimen referred to by Gunther, and comparisons with the jaws of white sharks of known length, reveal a length of about 17 feet. The largest white shark reliably measured was found near Cuba; it measured 21 feet. Bites on whale carcasses found off southern Australia suggest that white sharks can be as long as 25 to 26 feet, but not 36 feet.