A novel look at sediments

Think of a James Michener novel — *Hawaii* would be appropriate. Through the eyes of one character and his descendents, Michener records the ravages of history on the islands and their people.

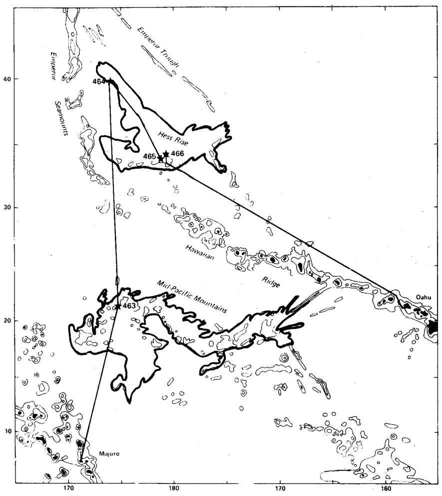
The most recent leg of the Deep Sea Drilling Project geologically adapted Michener's literary device — through the "eyes" of two submarine mountain ranges, scientists traced 120 million years of ocean ecology as the ridges traveled from the south Pacific across the equator to their present location near the islands Michener described. The 62nd expedition of the *Glomar Challenger* marked a turning point for the DSDP: A move away from geological/geophysical studies focusing on sea-floor spreading and plate tectonics and toward paleoenvironmental studies — studies of changes in the ocean ecology with time as reflected in the sediments.

The main characters in Leg 62 were the Hess Rise and the Mid-Pacific Mountains. According to expedition co-chief scientist Tracey Vallier, the ranges were formed at the Pacific mid-ocean ridge far south of their present location. The Pacific plate carried the rises and gradually moved northwest, crossing the equator and sinking as it moved. The goal of Leg 62, led by Vallier and Jorn Thiede of the University of Oslo, was to use the sedimentary record to track the ocean environment from the tropics to the temperate zones and from shallow to deep waters.

Reef debris, gas-pocketed basalts and the remains of organisms that used volcano-produced silica indicate the rises' shallow-water birthplace in the southern hemisphere. Heavy minerals, such as copper and pyrite, pinpoint the "last gasps" of dying volcanoes, Vallier says, and in 10 million to 20 million years the once-active ranges sank. Their fall was heralded by the appearance of pelagic, or open ocean, organisms.

As the plate drifted slowly northward, the rises approached the oxygen- and nutrient-rich equatorial zone; huge thicknesses of carbon-rich sediment attest to the abundance of life in the water. The high carbon content, up to 10 percent in some sediments, Vallier says, shows that the ocean bottom was by then so deep no bacteria could live on the bottom to utilize the abundant life sifting down.

About 70 million years ago, accumulations of highly siliceous organisms formed limestone and chert, and marked the passage into colder and less-populated waters. Sediments from this period in one core show a distinct boundary between two geologic eras, the Cretaceous and Tertiary. Such boundaries, found at only three or four other sites, are distinguished by the sudden mass extinction of several "marker" species.



Leg 62: Tracking ocean ecology.

Unfortunately, the story ends there — most sediments younger than 50 million years were eroded away, Vallier says. The high relief of the rises or the sweep of strong bottom currents generated near Antarctica may account for their loss. Leg 63, now exploring the sedimentological record in the northern Pacific, may add a sequel. □

Antiviral drug approved by FDA

Last year, an experimental drug called Vira-A (adenine arabinoside) was found, in a National Institutes of Health-sponsored study at 15 medical centers, to dramatically reduce both death and brain damage among patients with a rare but deadly viral disease — herpes encephalitis (SN: 8/20/77, p. 116). The use of Vira-A has now been approved by the Food and Drug Administration.

FDA approval of Vira-A is noteworthy for two reasons. For one, it is the first time that the FDA has okayed a drug for treatment of a life-threatening viral disease. For another, Vira-A is the first drug that the FDA has ever approved to treat viruses internally rather than on the surface of the body. (It is the third drug to treat viruses by either method.)

The reason that the FDA has been slow to approve antiviral drugs is that the drugs have trouble killing viruses without also harming the cells that the viruses infect. (In contrast, antibiotics often kill bacteria in the bloodstream, although on occasion they, too, can harm host cells.) Nonetheless, medical scientists are now finding or designing drugs, such as Vira-A, that can attack viruses selectively (SN: 3/20/76, p. 186). Consequently, the FDA's approval of Vira-A suggests that the FDA might also approve some other antiviral drugs in the near future, particularly drugs for widespread public health problems such as the common cold, flu, hepatitis and herpes genital infections. □

Laser fusion from zeta to omega

In considering the possibility of inducing thermonuclear fusion by imploding pellets of fusionable fuels, it is easy to see that energy can be transported by beams of laser light or electrons or maybe even light ions. If that energy can be delivered to the fuel pellet in an efficient way, calculation can be made to show that an implosion will occur, the pellet will get hot and dense, and fusions will occur. Exactly what is the best way to make this happen is a complicated question over which the difference of opinion can at times be strong. It may be for this reason that in funding a program of experiments in this field, the Department of Energy has chosen to pursue different approaches in different laboratories.

One of those laboratories, the Laboratory for Laser Energetics of the University of Rochester, recently dedicated its latest and largest piece of equipment, which will hit a target with six laser beams delivering a total of 3 or 4 terawatts of power. The instrument is called ZETA (the sixth letter of the Greek alphabet) and is the first stage of a much larger 24-armed 30-terawatt system to be called OMEGA (the 24th, and last, Greek letter). At the moment, the most multiple laser fusion system is the Lawrence Livermore Laboratory's 20-armed Shiva. (It is curious to see how Indic mythology comes naturally in California, while in upstate New York, where the landscape is sprinkled with classical allusions, they recite the Greek alphabet.)

As Moshe Lubin, director of the LLE points out in a recent statement, the programs of the different laboratories are not competitive so much as complementary. Rochester concentrates on symmetric irradiation of targets; Livermore on an opposed-beam geometry. Los Alamos is developing carbon dioxide lasers, which have a particular commercial promise, and Sandia Laboratories is studying the feasibility of delivering the energy by electron beams. One difference is that Rochester is a users' facility, not restricted to members of the staff, but open to qualified scientists who can use the equipment. Rochester's work is also unclassified, which cannot be said of everything done at the other laboratories.

Lubin has frequently stressed the importance of the mechanism by which the energy is coupled from the laser beams to the target, and the first experiments for ZETA reflect this. They will study targets of different structure under different energies and pulse conditions. One purpose is to see how the energy gain that occurs at low energies scales to higher energies. There is a predictive computer program that they want to test. Tom Bristow and Jacques Delettrez are the shot leaders for the first series. □