CHALLENGER: LEG 8

Equatorial current history

Maps of the biological productivity of the Pacific Ocean show bands of organically rich waters around the rim of the ocean and poorer areas in the center. The major exception is a long, tapered spike of productivity extending far westward into the equatorial Pacific from the coasts of South and Central America.

This is the area of the Pacific equatorial current system, where the tradewinds help push water across the ocean in two broad westward-flowing currents, separated by a countercurrent that returns some of the water to the east.

On the ocean floor beneath this current system, like a permanent three-dimensional shadow, is an area of thick organic sediments, produced over millions of years by the skeletons of tiny marine animals that make the current their abode. They find it an especially hospitable place because upwelling and vertical mixing in the area of the currents brings water rich in nutrients up to the surface.

Scientists have known about this equatorial marine graveyard for some time, but for the most part they have no direct samples from anyplace beneath its upper 20 or 30 meters.

Leg 8 of the scientific ship Glomar Challenger's voyage in the Deep Sea Drilling Project (SN: 11/1, p. 394) was planned to help fill the gap. Over a 55-day period ending this month, the vessel drilled eight holes into the bed of the central equatorial Pacific in a large region northeast of Tahiti and southeast of Hawaii, going down as far as 558 meters.

Six of the holes were drilled in an almost straight north-south line across the equator along the 140th Meridian. This is the first time in the project that so many holes have been drilled across one geologic set of conditions—although as Dr. Joshua I. Tracey Jr. of the U.S. Geological Survey points out, six cores along a section 1,300 miles long hardly gives a detailed picture of the ocean bottom. He and Dr. George A. Sutton of the University of Hawaii were co-chief scientists for the expedition.

Emerging from Leg 8 is a picture of the composition, thickness and rates of accumulation of sediments beneath the current system during the last 40 million years.

A marked change of sediment accumulation over geologic time was revealed. Accumulations during the upper Oligocene and lower Miocene epochs of the Tertiary, 15 million to 30 million years ago, were higher than during the late Tertiary, in the last few million years.

In the lower part of one core, the rate of sediment buildup was estimated at 24 meters per million years. In the upper part of the same core accumulation rates had dwindled to 4 meters per million years.

The average rate of accumulation during the early Tertiary was found to be 7 to 10 meters per million years, compared with a rate of 1 to 4 meters per million years in recent times.

"As a generality," says Dr. Tracey, "the rate of accumulation was two to four times faster during the lower Tertiary than during the upper Tertiary. Oceanographic conditions were apparently quite different then."

The decrease in sediment accumulation during the Tertiary might be related to the emergence of the Isthmus of Panama, closing off the Atlantic Ocean's equatorial link to the Pacific and thus greatly altering what may have been an even larger current system at that time, Dr. Tracey speculates. The Atlantic tradewinds would no longer be able to push water through between North and South America.

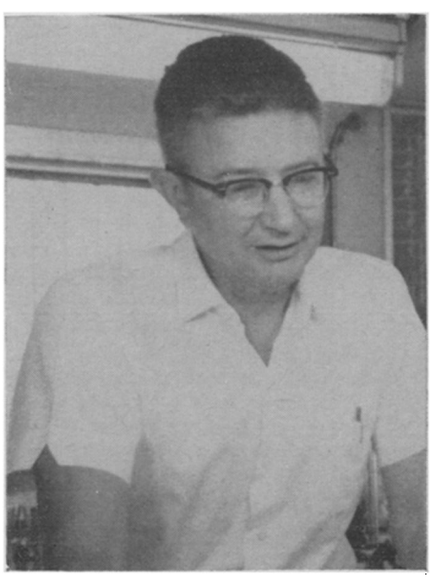
Or it might be related to geologic changes along the coastal regions at the time. But at this stage these suggestions are only conjectures.

One thing that makes interpretation difficult is that rates of sediment accumulation do not necessarily directly relate to changes in biological productivity. Much of the organic material deposited is dissolved under certain conditions, and those conditions may have changed. The accumulation rate is thus the difference between the deposition rate and the rate of dissolution by seawater.

Of sediments deposited more recently, over the past several million years, the Challenger found rough correspondence to patterns of deposition today.

Leg 8 scientists found that they could in effect group the sediment layers into three categories. At the top of the cores are mixed zones containing alternating beds of ooze created by organisms whose skeletons are composed of carbonates and of silica. Then comes the area in which carbonate sedimentation was extensive and rapid. Below this, primarily in the Eocene, about 60 million years ago, are layers of chert or cherty limestone—hard rock nodules that have stopped the Challenger's bits many times in the past year and a half.

Thirty-six feet of chert core was recovered. Dr. Tracey is eager to have the sections studied in detail because the hard rock tends to preserve the very fine structure and texture of sediments deposited.



Scripps Institution of Oceanography

Tracey: Ocean conditions changed.

FOUNDATION TAX

Tougher in principle than in fact

For the last six months, educational and scientific research organizations that depend on charitable grants from foundations and private donors have been in a state of alarm over the threatened Federal tax restrictions on foundations (SN: 10/11, p. 326).

The clause that had aroused the most alarm in the tax bill passed by the House in August was a provision placing a 7.5 percent tax on the investment income of foundations. As Federal funds for a broad spectrum of research become more and more limited, many research groups have been turning to private foundations for help; spokesmen for the major foundations speculated that the House-approved tax might reduce foundation support of research projects by as much as $100 million per year.

However, the restrictions on foundations in the tax bill that Congress passed early this week appear to be less stringent, and foundation officials are moderately, though not totally, relieved.

The final version of the tax bill reduces the levy on foundations to 4 percent of their net investment income.

Foundations thus scored a victory in a critical area, although it appears they simultaneously lost a philosophical battle on the tax issue. David Z. Robinson, former assistant to the President's science adviser soon to be-