Maps and minerals from the sea rift

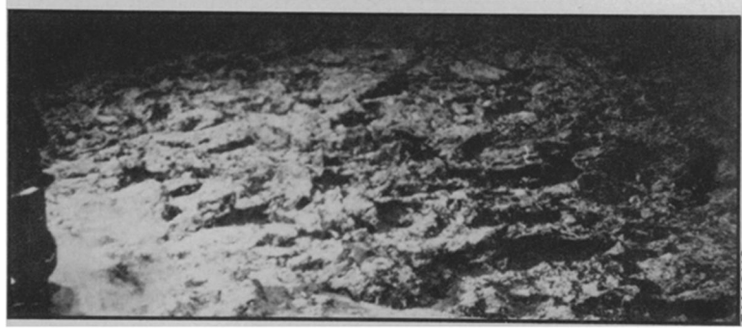
Nearly two miles below the waves of the Atlantic, nosing about like huge, curious fish, the undersea vessels of Project FAMOUS (SN: 6/1/74, p. 349) are exploring one of the birthplaces of the sea bottom. Archimède and Cyana, from France, and Alvin, from the United States, are now well past the halfway mark in a series of dives that one French official calls "the first time that methods of classifical field geology are being employed to study the deep ocean floor."

Along the Mid-Atlantic Rift, where two plates of the earth's crust are gradually moving apart, new material is being forced up from below to replenish what would otherwise be an ever-widening gap. Besides charting and sampling the deep frontier, the submersibles have found that seawater percolating down into the fissures of the rift is carrying back up unexpectedly rich payloads of minerals.

The project is concentrated in an area of the rift about 350 miles southwest of the Azores. Where Archimède is diving, the rift valley is about 18 miles wide, with a rough central floor less than two miles across bordered by a pair of raised ridges, which are in turn flanked by deeper channels. Along the central floor runs a ridge that the researchers have labeled Mount Venus, about 2.5 miles long, half a mile wide and 270 yards high. On the eastern side of the ridge, Archimède has found that new crustal material seems to be accreting at an average rate of about 1.5 centimeters per year.

The ridge itself contains some of the youngest material in the part of the rift covered by Project FAMOUS. Thus the researchers say it is tempting to assume that the boundary between the crustal plates lies directly along the ridge. It seems, however, that the gap is actually considerably wider than the ridge, with signs of faulting indicating that the facing edges of the plates may be as much as five miles apart. Yet most of the newly created crust seems to form in a "very narrow ribbon" that follows the axis of the rift.

Woods Hole



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At the Mid-Atlantic Rift, Alvin samples a tubular lava extrusion (left), Cyana photographs a rich deposit of ore bearing iron and manganese (below), and Mount Venus straddles the axis of Archimède's rift site (bottom of page).

One of the most exciting finds of the project has been the unexpectedly rich deposits of minerals such as manganese and iron. Such deposits would not be surprising directly on the rift axis, as they would be pushed up by the upwelling activity that is constantly adding new material to the sea floor. But substantial deposits have been found in rocks dredged up not from the rift itself, but from the fracture zones caused by shearing as opposing sections of the sea floor move in opposite directions. Without direct subterranean pressure, the heavy, mineral-rich rocks leave the geologists baffled as to what brings them to the top of the ocean floor.

In addition, the other French submersible, Cyana, has found ore deposits, also largely manganese and iron, lying on top of the bottom sediments, apparently having spread out from vents that carry warm water currents up through the sediments. This suggests that cold seawater percolates down through the fracture zones, where the underlying lithosphere is much cooler than it is beneath the rift axis. The cooler lithosphere apparently allows the water to stay down longer, gathering its mineral deposits, before it is heated enough to flow up and out through the vents.

FAMOUS is primarily a research project, a first close look at the least-known part of the world. With increased interest in exploitation of the resources of the sea floor, however, it holds the potential of paying for itself many times over in clues for future ocean prospectors. □