Challenger sails on

The bottoms of the world's oceans contain a great deal of information about the biological and geological history of the planet. But the ocean bottoms are large, and a systematic survey takes time. For the past few years, the research ship Glomar Challenger has crisscrossed the world's oceans drilling samples of the bottom as part of the Deep Sea Drilling Program (SN: 7/4, p. 20). Recently the ship completed the 12th leg or trip of the program, a survey of the North Atlantic that began at Boston and ended at Lisbon.

So great has been the success of the program so far that the sponsors, the Joint Oceanographic Institutions for Deep Earth Sampling, are about to recommend a six-year extension of the program. According to Dr. Melvin N. A. Peterson of the Scripps Institution of Oceanography at La Jolla, Calif., the JOIDES faced the question whether they should attempt a new project that would drill deeper or extend present projects. They decided to continue with the present drilling capability because the amount of information that it has so far uncovered leads them to believe, says Dr. Peterson, that there is "so much to be done with what we now have."

They will therefore recommend to the National Science Foundation, which funds the program, that it be extended with present drilling capability, which will be upgraded only as necessary. They would like to go on for six more years, but at this point they are not sure whether they will ask for an entire six-year extension at once or ask for a smaller amount of time and then come back again.

Among the places they would especially like to investigate in an extension of the program are the polar seas. Leg 12 indicated that drilling in these areas is feasible. It went to latitudes up to 60 degrees north, and in 52 days lost only half a day due to inclement weather, although winds ranged up to 35 knots and the waves were up to 15 feet high. A ship with the capabilities of Glomar Challenger could do the job in the Arctic or Antarctic regions, says Dr. Peterson.

Drilling would be contemplated only in areas where a ship could go. Drilling through the ice is not part of the program. The procedure, says Dr. Peterson, would be to select specific targets and wait on the edges of the polar ice packs till weather conditions opened up a channel.

Sediments under the polar seas are thought to be 300 million to 400 million years old, or twice the age of the Atlantic and Pacific, where Glomar Challenger has previously searched. Geologists are eager to discover the information that these sediments can give about the history of the planet. Specific targets have not yet been chosen, though JOIDES members hope to work out a detailed program soon.

The capability of the project is illustrated by the conclusions drawn from the two months of Leg 12, in which nine sites were drilled in depths ranging from 3,500 feet to 16,000 feet of water. The maximum penetration of the drill was 3,000 feet below the sea floor.

From two drillings in the Labrador Sea, scientists recovered what they call solid evidence that the glaciation of the continents began at high latitudes about 3 million years ago, rather than 1.8 million, which was the previous figure. Sediments immediately below the glacial ones showed microscopic animals and plants characteristic of subtropical climates, and this is taken to indicate that a branch of the Gulf Stream flowed along the coast of Newfoundland before the glaciation started. According to Drs. Anthony S. Laughton of the National Institutes of Oceanography at Wormley, England, and William A. Berggren of Woods Hole Oceanographic Institution in Woods Hole, Mass., this is the first time that deep-sea cores have cut through the boundary and shown the contact between glacial and preglacial sediments.

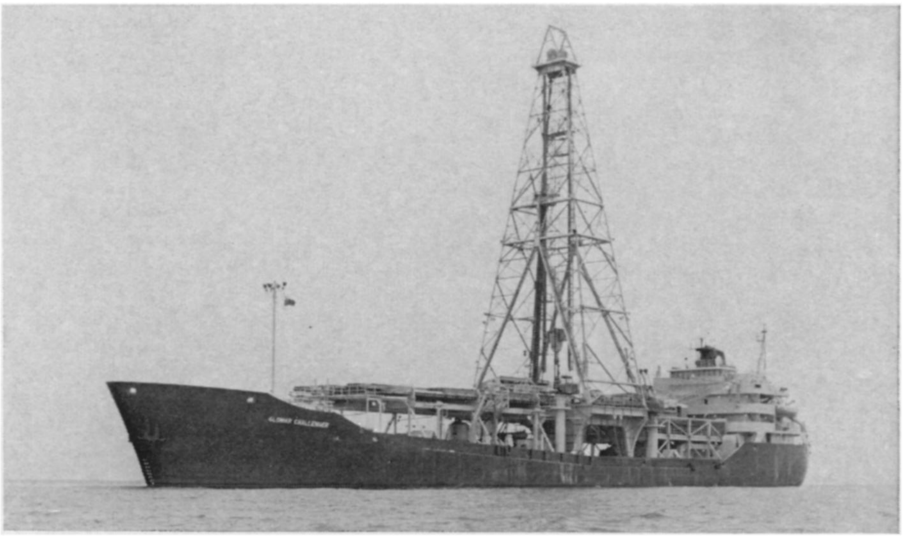
According to the theory of continental drift, Europe, Greenland and North America broke apart 100 million years ago and have been gradually drifting apart ever since. Leg 12 found evidence that sections of these continents, which were above water at the time of the break, later sank into the sea.

One of these regions is northeast of Newfoundland. It sank 6,000 feet at a rate of about four inches every 1,000 years, and what remains of it is now an isolated seamount 50 miles wide at the foot of the continental slope.

The other, much larger, area is the so-called Rocktail Plateau, which is 300 miles across and once linked Greenland with northwestern Europe. Sixty million years ago the Rockall Plateau broke away from Greenland, but it remained a relatively shallow ocean area until 15 million years ago. Then it sank 5,000 feet in 5 million years. The central part of the plateau sank 7,000 feet, and then accumulated a blanket of sediments. All that now remains above water is the small Rockall Island, which lies northwest of Ireland.

One of the most important results of Leg 12 is that it demonstrates that sediment in the North Atlantic is deposited by mechanisms that contrast with those of the central Atlantic and the Pacific. In the latter areas the sediment comes mainly at a steady vertical rain of decaying plankton and very fine clay. In the north Atlantic, sediments that come largely from erosion of the land are distributed by turbidity currents that flow along the bottom. Turbidity currents can distribute sediments over thousands of miles of ocean bottom.

A specific finding of Leg 12 is that thick sediments on the flanks of the Reykjanes Ridge southwest of Iceland, were brought there by such a turbidity current; thus they do not need to be explained by a change in the rate of sea-floor spreading as some geologists have thought. Another core shows that the abyssal plain of the Bay of Biscay has apparently been receiving turbidity current deposits for 65 million years. About 10 million or 12 million years ago, the rate of sedimentation was particularly high, and this is ascribed by Drs. Laughton and Berggren to the active phase of the building of the Alps. □



Scripps Institution of Oceanography

Glomar Challenger: Six more years of drilling the bottoms of the oceans.