

Current studies being conducted on Argo (ship)

June 12, 1966

TOKYO--American and Japanese marine microbiologists have begun long hours of intensive study of tiny bacteria taken from deep ocean-bottom sediments in the Japan-Bonin Trench, some 500 miles southeast of Japan.

During the May 30-June 5 cruise of the University of California, San Diego's Scripps Institution of Oceanography, a triple gravity corer was used for the first time by a Scripps oceanographic expedition to bring the sediments to the surface.

Triple mud samples were brought up to the deck of Argo, a Scripps research vessel, from depths of 5,061 fathoms (9,253 meters or about 30,350 feet), 5,272 fathoms (9,628 meters or about 31,600 feet), and 5,188 fathoms (9,489 meters or about 31,100 feet), Dr. Claude E. ZoBell, the cruise's chief scientist, reported. Dr. ZoBell is professor of marine microbiology at Scripps Institution.

In addition, 65 miles off Honshu Island, shallow-water sediments were brought up in single-core operations and seawater samples were taken to measure temperature, salinity, and bacteria content.

Argo docked Sunday, June 5, at Tokyo's Takeshiba Pier, after five full days at sea in a cruise designated Deepac X. This was Leg IV of Scripps' 30,000-mile Zetes North Pacific Ocean Expedition that started last January from San Diego.

The ship departs Friday, June 10, for ocean-bottom geophysical investigations en route to Honolulu., in Hawaiian waters, and between Honolulu and San Diego, where she will arrive August 7.

Although bad weather plagued the scientists last week, they achieved all the cruise's operational goals, Dr. ZoBell said.

We were especially pleased with the operation of the triple gravity corer, which was developed by Fred Dixon, Scripps' principal marine technician in charge of shipboard operations during the cruise," he said.

"Its use permitted us to take nine core samples of sea-bottom sediments from three core drops instead of the three we normally would have taken with a single corer."

It was Dr. ZoBell and Dixon, aboard Argo, near Guam, in the Challenger Deep of the Mariana Trench, who in 1964 took a single-core ocean-bottom sample at 5,600 fathoms (10,248 meters or about 33,600 feet), the greatest depth from which any such sediments have been taken.

This occurred during Scripps' Dodo Expedition, part of the five-year International Indian Ocean Expedition. Dr. ZoBell is still conducting research based on the micro-organisms taken in the Challenger Deep operation.

The triple gravity corer used in the Deepac X cruise consists of three 150-pound single corers welded together to lend weight needed to get it to ocean bottom without tangling the steel cable from which it is suspended and which is let down by winch from Argo's aft end.

A six-foot metal cylinder encasing a two-inch diameter plastic tube was screwed to the bottom of each corer. At depth, the three cylinders pierced the sea bottom, filled with mud and water, and were winched back up to the deck. The mud and water samples were taken into the Argo's laboratory and carefully transferred to sterile vials and test tubes for subsequent analysis by the scientists when they return home.

Aboard Argo from Scripps Institution, besides Dr. ZoBell and Dixon, were Mrs. Jean ZoBell, first assistant microbiologist; Leslie L. Hittle, graduate research microbiologist; Jan Lawson, marine technician; and Nelson Fuller, public information officer.

From the University of Tokyo's Ocean Research Institute were Dr. Nobuo Taga, associate professor of marine microbiology; Dr. Humitake Seki, research associate; and Koichi Ohwada, graduate assistant. Dr. Akira Kawai and Isao Sugahara, associate professor of microbiology and graduate assistant, respectively, represented Kyoto University's Research Institute of Food Science.

Dr. M. Dale Arvey, of the National Science Foundation's Tokyo office, was aboard, as were three representatives of the Japan Broadcasting Corp. (NHK-TV), Hideki Tanaka, producer; Tsuneji Tsukagoshi, announcer; and Satsuki Yoshikura, cameraman.

They obtained footage for a film documentary on oceanographic research, to be shown in Tokyo later this month.

Prior to the cruise, on May 28, more than 300 Japanese and American scientists and friends attended an open house aboard Argo, visiting with the scientists who were to make the cruise and studying the equipment they would use.

On May 27, more than 30 members of the Tokyo Science Writers Association attended a press conference at the American Embassy. They heard cruise plans from Dr. ZoBell and, from Victor Vacquier, UCSD geophysics professor, preliminary findings of ocean-bottom geophysical work accomplished in April and May east of Japan by American and Japanese scientists aboard Argo, with Vacquier as chief scientist.

During the Deepac X cruise, Scripps Institution scientists were concerned with taking deep-sea sediments and measuring the depth of previously unexplored deep-sea basins. One of these, an extension of the Ramapo Deep, was shown to be more than 25 miles long, with very little deviation from 5,000 fathoms (9,840 meters or about 30,000 feet).

"We also now know that bacteria are present and alive in the great ocean deeps, but we must do further research to learn whether bacteria are active at such depths." Dr. ZoBell said.

"We hope to show to what extent bacteria serve as food for deep-sea animals and to illustrate in what fundamental respects deep-sea bacteria differ from surface-dwelling bacteria which, like man, cannot tolerate high pressures."

The research of Dr. Kawai and Sugahara from Kyoto University centered on the role of marine bacteria in the "nitrogen cycle" in sea-bottom muds.

"Sea animals depend upon plants and bacteria for life-building proteins," explained Dr. Kawai. "We are therefore interested in the natural cycle whereby the nitrogen in proteins is successively converted into ammonium, nitrites, and nitrates through action by bacteria. These three compounds are essential nutrients for ocean plant life.

In a direct bearing upon the nitrogen cycle, Dr. Kawai demonstrated during the cruise the presence of nitrates which had previously been undetected in sediments at great ocean depths.

Included in research of Dr. Taga and his associates from the University of Tokyo was the determination of the occurrence of vitamins B-1, B-6, and B-12 in seawater and deep-sea sediments.

"We will also investigate the form, shape, size, and chemical structure of cell walls of deep-sea bacteria, determine the amount of carbon dioxide in deep-sea sediments, and make a qualitative determination of amino acids in such sediments," Dr. Taga said.

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