OCEANOGRAPHY

Solving Mysteries of the Sea

Discovery of giant mountains and canyons and different types of sea animals, some never before seen, is the reward of scientists dragging the ocean for its secrets.

By MARTHA G. MORROW

➤ DAVY JONES is beginning to tell some of his secrets. For instance, scientists recently have learned that:

The Gulf Stream, considerably narrower and swifter than previously supposed, meanders like a great river.

Soft, unconsolidated sediment, 3,000 feet thick in places, has been found to overlie the solid floor of the ocean in some regions.

Giant undersea waves, up to 650 feet high, exist in the ocean but move slower than surface waves.

Surface waves can travel so fast they sometimes outrun the wind that is pushing them along.

And here are deep-sea long shots that may some day pay off:

Discovery of new oil fields through knowledge of the process by which petroleum is formed.

Long-range weather forecasting for coastal regions through studies of ocean currents.

Physicists, biologists, geologists and chemists making the ocean their specialty must be a particularly hardy sort. They spend many months at sea; their laboratory is a tossing, pitching vessel. Then follow years of tedious research, during which the data and samples gathered at sea are examined and analyzed.

Find Uncharted Mountain

The auxiliary ketch Atlantis is the pride of the privately-endowed Woods Hole Oceanographic Institution at Woods Hole, Mass. Recently a hitherto uncharted mountain rising 6,000 feet above the ocean floor east of Bermuda was discovered by scientists sailing the Atlantic in this ship, one of a fleet of eight boats belonging to the institution.

The chief floating laboratory of the Scripps Institution of Oceanography of the University of California at La Jolla, Calif., is the E. W. Scripps, formerly a movie star's luxury yacht. Three additional vessels are being equipped to supplement this craft; two are ex-Navy vessels, one a former fishing boat.

Cruising the Pacific Ocean, the E. W. Scripps has been instrumental in exploring deeply-submerged mountain peaks and ocean-covered canyons with sheer rock walls a mile or so high. One of these, off Monterey, Calif., is larger than the Grand Canyon.

As man cannot lower himself to the depths these ocean experts wish to explore, a number of ingenious devices have been constructed for sampling the ocean.

One of the newest instruments as well as the most intricate records simultaneously the temperature and degree of saltiness of sea water, and the depth at which the instrument is operating. Connected to a recorder in the ship, it makes possible rapid determination of those variables vital to establishing surface and sub-surface ocean currents. The device cannot, however, be lowered more than several hundred feet.

Samples of sea water, to be analyzed for iron, oxygen, salinity and alkalinity, are collected in Nansen bottles. In operation a half-dozen or so of these metal tubes, with both ends open, are hooked to a wire at pre-determined intervals.

Recording Water Temperature

When the bottles have reached the desired depth in the ocean and sufficient time has been allowed for their accompanying thermometers to record the water temperature, a small weight is sent sliding down the wire. This "messenger" starts a chain reaction which closes and inverts each bottle and breaks the mercury thread in such a way that the temperature of the water at various depths can be read later.

Another way to obtain water temperature is to lower a bathythermograph or diving thermometer. This is used while the vessel is proceeding at normal speed. It records the temperature of the water against depth on a smoked glass slide, easily read.

Life in the sea is collected in silken nets, of cloth similar to that used for sifting flour. Some of the tow nets can be opened and closed at a given depth to keep the microscopic plant and animal life found there from being mixed with that living at another depth.

So many different types of animals exist in the sea that a net, dipped deep in the ocean, frequently yields a species never before seen. Marine scientists keep prying into the private life of all kinds of sea life, from bacteria to whales.

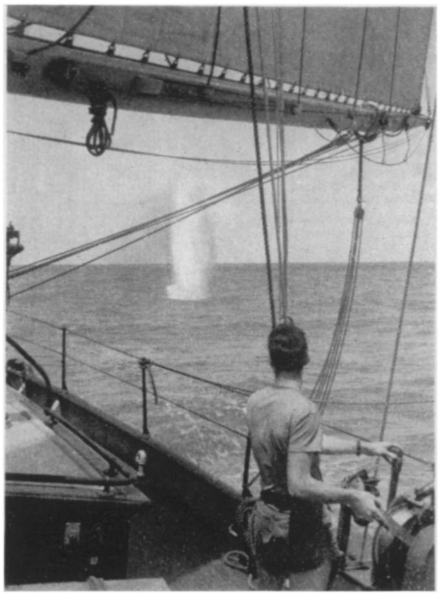
The bottom of the ocean is explored in a number of ways. Solid samples of sediment, for instance, are grabbed by an "orangepeel" dredge. Lowered with its jaws open, when it reaches the bottom this instrument automatically closes.

Cores are punched from the ocean bottom in much the same way than an apple is cored. Allowed to fall free as it nears the bottom, the coring tube is driven into the sediment by ballast, weighing up to 1,000 pounds.

One instrument stamps out short cores three feet long, another brings up sections up to 15 feet in length. The thin cross-section of sediment it brings up enables us to trace a million or so years into the history of the ocean, and of the world. From the remains of microscopic animals once living in the ocean, scientists can tell at what period the water was shallow, at what time deep; when warm and when cold.

Long cores of sediment up to 72 feet were obtained recently by a Swedish expedition on the research vessel Albatross. This instrument utilizes the high water pressure at great depths to force the sediment upward into the tube, while the tube in turn is pressed into the sediment by a heavy weight. Recently, cores up to 37 feet long have been secured by American oceanographers.

The gloomy appearance of the ocean and some of the sea animals that live three and a half miles down have been snapped by an underwater camera. The camera consists essentially of a fairly cheap instrument in a pressure-proofed housing, a trigger mechanism and a flashlight. When the trigger, hung below the camera, touches bottom, a flash bulb goes off. Sea spiders, brittle stars, sponges or whatever else may be present are photographed in their native habitat. The vertical cliff walls of the submarine canyons have also been snapped.



EXPLORING THE OCEAN FLOOR—By exploding a small bomb astern the Atlantis, ship of the Woods Hole Oceanographic Institution, and timing the returning echoes, the thickness of the sedimentary carpet on the ocean floor can be determined.

LIFE UNDER THE SEA—Rockfish, gorgonians and sea-cucumber are shown in this underwater photograph by Frank Haymaker taken at a depth of 110 feet.

More accurate charting of the location and velocity of ocean currents far out of sight of land has been made possible chiefly through the use of war-born Loran. This radio-navigation aid is particularly good in giving an accurate picture of a vessel's changes in position as she drifts or sails along. By tacking in and out of the edge of a current, an oceanographic vessel can determine the course of a current.

A trick used by oil geologists on land has been adapted to the sea. The thickness of the sedimentary carpet underneath the ocean can be determined by exploding a small bomb astern the ship. The first weak echo of the explosion is returned by the top of the sediment, the second strong one comes from the firmer rockbed beneath. Since sound is assumed to travel through the sediment 4,500 feet a second, the thickness of the sediment can be estimated by recording the time interval between the two echoes.

Bottom Surprisingly Rough

The bottom of the ocean is surprisingly rough, with many flat-topped sea mountains rising steeply from the surrounding muddy plains. In fact the plains are proving to be rather rare. In some places the sedimentary deposits are thousands of feet deep, in others the bedrock is practically nude. Findings such as these pose many questions to oceanographers.

Since oceans cover some 71% of the earth's surface, knowledge of their actions is important in peace as well as in war. The Oceanographic Division of the Hydrographic Office, Department of the Navy, has been set up as a clearing house for such material. On Naval expeditions planned for other studies, the office sees that someone with a knowledge of oceanography goes along. If something new is reported about the ocean, those who may best use the data are notified.

Step by step men are being trained to explore various phases of the ocean. Advanced courses in oceanography are given at Scripps Institution of Oceanography of the University of California, Yale University's Bingham Oceanographic Laboratories, the University of Washington at its Oceanographic Laboratories and New York University. Numerous scientists come each summer to the Woods Hole Oceanographic Institution for specific research.

Problems on underwater acoustics are studied at the U. S. Naval Electronics Laboratory at San Diego, the U. S. Navy Underwater Sound Laboratory at New London and the Naval Research Laboratory at Washington, D. C. The U. S. Fish and Wildlife Service specializes in biology of the sea.

Gradually the shape and character of the ocean bottom, and the action of the waters within the seas, are being revealed. Some day we may know much more about the history and origin of the earth because of studies of that larger portion of the earth hidden beneath the waves.

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Vermiculite, a mineral that expands greatly and permanently by heat treatment, is widely used in making light-weight concrete; it is found in several places in America, but the principal supply comes from Montana.

INVENTION

Foul Ball Indicator Will Mechanize Close Decisions

➤ BASE hit or foul ball? In a few weeks now, fans will be advising umpires to go and have their eyes examined, after calling a close one just inside or just outside the foul line.

To take this wrangle-causing uncertainty out of baseball a Washington inventor, Allen K. Nelson, has devised what he calls a foul-ball indicator. It consists of a post, to be set at the far end of the outfield on the foul line, with a pair of cross-arms from which a series of free-swinging rods are suspended. Half the rods are thus in "fair" territory, the other half in "foul".

Electrical connections from the rods are so arranged that if a batted ball hits one of the rods on the "fair" side it will cause a green lamp to light up, while if the impact is against a rod on the "foul" side a red stop-signal will be flashed to the batter —and he'll have to wait for a better one to take a bite out of.

U. S. patent 2,461,836 has just been granted on this invention.

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