

Probing Deeper, Higher, Farther

by Barbara Tufty

With the use of satellites, rockets and deep earth drilling cores, and with high-speed computers to store and tally information, man is probing deeper in-



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to the earth, higher in the sky and farther over land than ever before. Unexplored sources of the earth's water and minerals are being discovered and monitored by constantly circling satellites. Huge "arrays" of delicate seismic instruments are "listening in" to the earth's faint tremors deep in its interior—releasing information on the earth's inner structure and enabling scientists to come closer to predicting an imminent earthquake or volcanic eruption.

Deep-sea equipment withstanding higher pressures and corrosion are permitting oceanographers to live longer in the sea, discover new mountain regions, probe life histories of sea creatures, and record more details of the oceans' temperatures, currents and pressures. Upon the frigid polar caps, research is being stepped up to measure the structure of snow and ice, clock the movements of glaciers, measure radiation and cosmic waves.

By probing deeper into the earth's sediment, man is probing farther back in time. From microscopic fossils and ooze from drilling cores, man is investigating ancient records of past ice ages and the evolution of plants, animals and man. On the earth's surface, new archaeological "digs" are unearthing ancient fragments of bones, mud huts and tools that give information on man's activities many thousands of years ago.

During the year:

Project EROS was announced by the Department of Interior: a satellite to collect resource and environment data on such things as distribution of minerals and water supplies, and extent of water pollution, agricultural crops and forests.

A new kind of helium "whistler," a lightning-caused radio wave in the audible range, was discovered from satellite observations far out in the earth's atmosphere.

Radar waves are bounced back to

ultra-sensitive receivers in a new method for probing the structure of invisible layers in the earth's atmosphere.

The earth's atmosphere shakes like a huge bowl of jelly once every four or five seconds after it has been struck by a nuclear explosion or a barrage of particles from the sun, geophysical research showed.

The world is approaching a peak of a "heat wave" due to end about the year 2400 or 2500, after which the world will enter a period of bitter cold.

Poisonous chemical hydrogen cyanide may have been the principal ingredient of earth's primitive atmosphere, not the methane-ammonia mixture suggested by many scientists.

The United States continues to delay development and application of knowledge about the oceans, at a time when Russia has surpassed Great Britain and Japan as an oceanographic power.

For the first time, an oceanographic civilian schooner has been permanently equipped with satellite navigation equipment that accurately calculates the ship's position at all times.

An 800-mile-long trench, up to 15 miles wide, has been discovered in the ocean floor between the Hawaiian Islands and the Aleutians, the northernmost of a series of major fracture zones in the Pacific Ocean.

A fountain of fresh water gushed 30 feet above sea level from a hole drilled into the ocean floor off Florida.

Construction began on Dr. Jacques Piccard's undersea vessel, PX-15, designed to drift silently for several weeks with the 1,500-mile Gulf Stream while scientists observe the biological, chemical, and physical aspects of the ocean.

Neon gas, mixed with oxygen, could provide a safe and useful atmosphere for divers beneath the sea.

An undersea "road" covered with a "pavement" of manganese oxide was discovered extending to depths of 3,000 feet beneath the ocean off the coast of Florida, Georgia and South Carolina.

Plans are underway for an undersea rescue vehicle designed to withstand deep ocean pressures, as part of the Navy's five-year, \$200 million program called Deep Submergence Systems Project.

The Indian Ocean contains the hottest, saltiest water in the seas, as well as the fastest midsea current and the

coldest surface water in the tropics, according to scientists with the International Indian Ocean Expedition.

Thousands of luminous fish and sea creatures following their life cycle in relation to light, temperature and food are responsible for the rising and sinking layers in the ocean, a mystery first noticed by sonic equipment during World War II.

A plan for international study of ocean tides to learn more about the earth's electrical field was endorsed by the Intergovernmental Oceanographic Commission, under the auspices of UNESCO.

Geophysical, oceanographic, hydrographic and meteorological data will be compiled and stored in enormous amounts with the 510 computer installed aboard the modern nine million dollar vessel Oceanographer, now part of ESSA's Coast and Geodetic Survey fleet.

Warnings about exhausting the resources of the sea were heard at the Second International Oceanographic Congress in Moscow.

The changes of species of plankton have been shown in deep sea cores to coincide with reversals in the earth's magnetic field.

The radius of the earth was measured from satellite observations to the most accurate figure yet obtained—3,963.203 miles.

A new radio sounding device recorded depths of ice and rock beneath the Antarctic plateau along an 830-mile distance in the second stage of a three-year study.

Volcanoes in various parts of the world showed signs of activity: Mt. Taal in the Philippines; Mt. Kelud in Java; Mt. Redoubt in Alaska, and a volcano in Sudan that has been inactive for "many centuries."

A new method of using pulsating amplified light rays (lasers) beamed along the sides of active fractures in the earth may help scientists predict earthquakes.

A 10-year program of earthquake research to set up new arrays of equipment for measuring the strain and tilting around active earthquake-prone areas was recommended by a special panel on earthquake prediction.

A series of earthquake shocks, starting on Aug. 19, killed nearly 3,000

people and wiped out 29 villages in the Erzurum region of Turkey.

A National Earthquake Information Center was established to disperse information on earthquakes occurring around the world.

A new scientific base, called Plateau Station, was set up on a 13,000-foot ridge on Queen Maud's Land in Antarctica, as part of the program sponsored by National Science Foundation and the U.S. Navy.

Rocks are cracked and broken by complex behavior of water molecules within the rocks, not by freezing and thawing processes, a new theory suggested.

The size and shape of the earth are being measured with the help of the Passive Geodetic Explorer Satellite.

A 10-year project to represent precisely the earth's geometric figure and gravitational potential was completed. The new "Standard Earth," based on 40,000 observations of artificial satellites, estimates intercontinental distances to an accuracy of less than 50 feet.

The largest diamond ever found in a meteorite was discovered in a fragment from the Arizona Meteorite Crater.

A 100,000-year-old glacier, on the October Revolution Island, part of the Arctic islands, was reported retreating in northwestern North America by Soviet scientists and U.S. geologists reported several spectacular forward surges of glaciers.

The world may contain 900 trillion

tons of organic matter rich in oil, with an energy potential about 18,000 times the amount the world consumes each year, according to calculations.

During a period of 25 million years, about 270 million years ago, the continents may have "sprinted," not drifted, at a rate of about one-half to three-fourths of a foot per year.

A volcanic eruption may have sent a raging river of melted glacier ice over a valley near Ross Island in Antarctica several centuries ago, cutting deep channels in bedrock, geologists reported.

An 80,000-year-old piece of coral from the Bahamas indicates that a huge thaw may have occurred during the last Ice Age.

Evidence of lead pollution of the atmosphere is being found in ice layers of the North and South Poles.

Geologists concluded that the pumping of waste fluids into a deep disposal cell at the Rocky Mountain Arsenal near Denver, Colo., appears to be a significant cause of a series of minor earthquakes that have occurred in that area since 1962.

Drastic shrinkage and disappearance of some permanent lakes on Long Island, N.Y., are definitely related to the five-year Northeastern drought, which was relieved, if not broken, by autumn rains.

Archaeology and Paleontology

With an ingenious method of using cosmic ray detectors, archaeologists

hope to discover whether or not any unfound burial chambers exist in the ancient pyramids of the Pharaohs, now that an agreement has been signed by the Governments of the United States and the United Arab Republic condoning use of the method. The group will go into the Great Pyramid at Giza first.

Fragments of pottery dating back to 3000 B.C. with specialized decorations were unearthed on the coast of Ecuador, indicating that the Japanese landed in America thousands of years before any European.

The oldest village in the world with mud walls still standing was unearthed in southern Kurdistan in Iran, judged to have been built by people of the New Stone Age nearly 10,500 years ago.

Huts of a village estimated to be about 9,500 years old were unearthed at Tell Mureybat, a large mound on the Euphrates River, 200 miles from Damascus, Syria.

The largest single piece of carved jade ever found in Middle America, shaped in the form of a jaguar's head, was unearthed in an ancient Mayan tomb at Tikal, Guatemala.

A dinosaur skeleton 25 feet long, found in the Big Horn Basin of Wyoming and Montana, is about 11 million years old and considered one of the "missing links" in dinosaur evolution.

The largest camping site yet known of 10,000-year-old Ice Age hunters has been found on the outskirts of Albuquerque, N. Mex., including two lodge type houses.

CONSERVATION

Resources Becoming Critical

In today's world where increasing numbers of people are overflowing their cities, crowding into newly developed lands and facing a growing threat of famine, man is becoming forcefully aware of the importance of conserving the world's natural resources. Consolidated efforts, perhaps even too late, are being planned to save our water—save our land—save our air—save our wildlife and in essence, save our earth.

Of these vital resources now being polluted, used up or killed, water is probably of prime importance. Federal, state, city governments and private industries are making sharper attempts to clean lakes, rivers and other water courses; to determine methods of reusing these waters; and to locate new sources of fresh water. Efforts are also being made to protect the oceans from

becoming polluted or misused, and to investigate methods for extracting fresh water, minerals and protein food. The growing problem of food supply is forcing more careful use of arable land and greater strides in creating useful crops and forests that resist ravages of insects, drought and air pollution. The realization that polluted air can cause disease, death and accidents is tightening controls over automotive exhausts, industrial smokestacks and building incinerators. Along with the need to conserve the essential resources rides an awareness that wildlife and forests, beaches and rivers of natural beauty should also be conserved in order to nurture the spiritual needs of mankind.

During the year:

One of the hottest controversies of conservation raged over the proposed plan to build one or more power dams

over the Grand Canyon, thus destroying much of its scenic beauty and historical value. The plan died in Congress, but increasing demands for water in that area will create new proposals.

Water shortages and growing pollution problems became more critical in many regions of the United States, causing the Committee on Water, sponsored by the National Academy of Sciences-National Research Council, to call for new methods of water planning with long-range projects.

The President transmitted to Congress legislation which would authorize federal participation in the development of the world's largest water desalting plant. The plant would produce 1,800 megawatts of power and 150 million gallons a day of water.

A scientist of the Lamont Geophysical Observatory proposed damming off