GEOPHYSICS

Earth Found Pear-Shaped

➤ THE EARTH is very slightly pear-shaped, not bulging at the equator.

Studies of the orbital flight of Vanguard I show the earth's sea level is 50 feet higher than expected in the north polar regions and 50 feet lower than expected in the south polar regions. Accenting the pear shape is the fact that outside the polar areas sea levels in the Northern Hemisphere are 25 feet lower than thought, and 25 feet higher in the Southern Hemisphere.

These new results of the shape of the earth from satellite observations were reported by Dr. John O'Keefe of the National Aeronautics and Space Administration. He presented the mathematical basis for these findings to the American Physical Society meeting in New York.

The new shape was found by Drs. O'Keefe, Ann Eckels and R. Squires of NASA, based on orbital flight information supplied by Joseph W. Siry, at the Vanguard satellite section of the Naval Research Laboratory, Washington.

Changes in the perigee height of Vanguard I, when it is nearest the earth, first led the scientists to suspect the earth was not shaped like a bulging ellipse. If it had been, the perigee height of Vanguard should have been the same whether the satellite was over the Northern or Southern Hemisphere.

Orbital information showed, instead, that its perigee height was lower than expected over the Northern Hemisphere and higher over the Southern Hemisphere, thus proving the earth was not symmetrical on either side of the equator.

Whatever the reason for the pear shape, the forces causing it are still at work. Otherwise, Dr. O'Keefe said, studies of such ancient formations as the pyramids would have shown changes that are not now evident.

The combination of narrowing in the Arctic regions and a broad base for earth in the Antarctic area means earth's subcrustal mantle must have a much larger mechanical strength than previously believed in order to support the pear-like shape. The change in shape will undoubtedly lead to a better understanding of the earth's structure.

Science News Letter, February 7, 1959

ELECTRONIC NERVE—A network of electronic nerve cells is assembled by L. D. Harmon of Bell Telephone Laboratories, who initiated a project of simulating the functions of nerve cells with a simple transistorized circuit. This array of cells imitates some functions of nerves in the human eye.

ASTRONAUTICS

Design Space Capsule

➤ A 2,500-POUND, ten-foot capsule forms the chief unit of a new system intended to launch a man into space and recover him safely.

The system, developed by Northrop Aircraft, Inc., as project BROOM (Ballistic Recovery of Orbiting Man) and described to the Institute of the Aeronautical Sciences meeting in New York by R. C. Hakes, supervisor of astronautics, can utilize existing boosters, available subsystems and currently known materials and processes.

The launching system, said Mr. Hakes, is comprised of a two-stage liquid rocket with a third-stage solid propellant rocket and a small fourth-stage vernier rocket. All are existing units and would have a total launch weight of 267,000 pounds.

The launch system is capable of putting a 2,500-pound capsule into an orbital altitude of 400 nautical miles. Northrop, however, decided on a 225-mile circular orbital altitude for the BROOM capsule.

In addition to being ten feet long, the cone-shaped capsule has a base diameter of 89 inches and terminates in a 20-inch spherical radius. A pressurized pilot's compartment contains an air conditioning unit, the pilot's instrument display and control consoles, an astro tracker, and an earth-viewing telescope.

The pilot's seat is in a fixed position contoured for maximum acceleration tolerance. The pilot sits in a semireclined position with his knees flexed, so that accelerations will be applied from chest to back.

The inner structure of the capsule is aluminum honeycomb that floats within a protective glass-fiber skin and an insulating material on the conical sides. In the tip of the nose cone is a retrorocket for slowing down the capsule during reentry. It can be jettisoned.

For control during flight, the BROOM system uses three infrared horizon trackers to establish the vertical or horizontal plane, and a single-star astro tracker to determine direction on the plane.

Reentry is initiated by firing the capsule's retrorocket from a ground computer. The pilot can also fire the rocket.

Northrop scientists studied both glide and ballistic recoveries. A glide path, which would encompass the earth twice from the firing of the retrorocket until the landing, is slower and makes for maximum deceleration and an easier landing. A ballistic recovery, in which descent is direct at a 145-degree angle from the firing point, can be achieved with a lighter vehicle and in a much shorter time.

Directional control during retrothrust is accomplished by having the entire retrorocket assembly gimbal, or pivot freely. After ejection of the retrorocket, small lateral control jets hold the vehicle on its flight path.

Final descent is made with a reefed parachute, released at about 45,000 feet altitude.

Since the BROOM project is for the recovery of man from an orbiting satellite, Mr. Hakes said, human factors are major considerations in all areas.

Science News Letter, February 7, 1959

BIOPHYSICS

Scientist Perfects Electric Artificial Nerve Cell

➤ A SIMPLE electronic device that can become fatigued and react in other ways similar to a living nerve cell in the human eye and ear has been constructed by scientists at the Bell Telephone Laboratories.

But the similarities to biological nerves are at best vague and approximate, Leon D. Harmon, initiator of the project, explained.

The inexpensive electronic cell is mounted on a three-by-four inch printed-circuit card. Using several cells, scientists have recently begun attempts to follow nature further. Cell by cell, they are building electronic systems that imitate some of the simple workings of nerve networks in the eye and ear.

The electronic cell delivers a series of electrical pulses when stimulated, similar to a living cell. It also fails to respond under conditions where a biological cell would not respond, and can show fatigue like a living nerve cell—that is, slow down under prolonged stimulation.

The electronic nerve cells have been assembled with photocells to imitate the simple functions of real nerves in the retina of the eye: "on" receptors, or sense organs, that pulse with increasing light; "off" receptors that pulse on decreasing light; and "during" receptors that pulse on steady light.

The cells can even "see" a rapidly flickering light as a steady one, just as the human eye sees a series of picture flashes in a movie without flicker.

Science News Letter, February 7, 1959

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