

PHYSICS

Earth Has Hydrogen Halo

New calculations indicate that the earth is surrounded by an invisible halo of hydrogen which begins at about 600 miles above the planet's surface and extends 20,000 miles.

► THE EARTH is surrounded by an invisible halo of neutral hydrogen extending some 20,000 miles or more in space.

Each atom in the halo follows a path like that of a ballistic missile, Dr. S. F. Singer, University of Maryland physics professor, reported. He told the American Physical Society meeting in Washington, that the outermost layer of the earth's high atmosphere, termed the exosphere, starts at 300 miles above the surface.

The higher in the atmosphere a particle is, the longer the distance it can travel before it hits another particle. Scientists say its "mean free path" becomes larger with increasing altitude. For instance, at sea level the concentration of air atoms and molecules is ten raised to the 19th power, or one followed by 19 zeros, in each cubic centimeter. At a height of 300 miles, Dr. Singer calculated, the concentration is only 10,000,000, or one followed by seven zeros, in a cubic centimeter.

At the 300-mile altitude, the "mean free path" has become so long that particles moving in a generally upward direction have a good chance of not hitting any other atmospheric atoms at all and could go out into space.

Whether a particle does or not depends

on its velocity. If its velocity is less than the approximately seven miles per second needed to escape earth's gravitational field, it will go out to a very high altitude, then fall back toward the earth. Its path will resemble that of the first Pioneer rocket, which did not escape from earth.

If its velocity is more than seven miles a second, the atom will escape into space and be forever lost to the earth.

Dr. Singer has calculated from a new theory the concentration of particles to be expected in the exosphere. He finds that heavy atoms like oxygen cannot extend very far out. At about 600 miles above the surface, hydrogen takes over as the most important constituent of the exosphere because it has the lowest atomic weight. The earth is therefore surrounded by a neutral hydrogen halo that moves with it as the earth revolves around the sun.

The density distribution computed by Dr. Singer differs considerably from previous calculations, and shows in general a much slower decrease of density with altitude than previous models. Dr. Singer suggested that the temperature at 300 miles is 1,500 degrees absolute, or about 3,200 degrees Fahrenheit.

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ASTRONAUTICS

Moon Rocket Planned

Vega, a three-stage, 1,000-pound moon rocket, is being developed by the National Aeronautics and Space Administration. It could be used to put equipment into orbit.

► THE NATIONAL Aeronautics and Space Administration is developing a satellite-launching rocket capable of sending about 1,000 pounds near the moon.

The three-stage vehicle, known as the Vega, would also make it possible to put several tons of equipment in a 300-mile orbit around the earth. Dr. Homer E. Newell, NASA's assistant director for space sciences, reported plans for Vega and other future launching rockets at a symposium on problems in space exploration.

The symposium was sponsored by NASA, the American Physical Society and the National Academy of Sciences-National Research Council. Dr. Newell said the Vega will use a modified Convair-Atlas as the first stage. The second stage will be a modified General Electric engine that was used as the Vanguard first stage. The third stage will be a Jet Propulsion Laboratory rocket using storable propellants.

Dr. Newell also reported that NASA is developing a four-stage solid propellant satellite vehicle capable of carrying about 150 pounds into a 300-mile orbit. Called the Scout, this rocket will be much more economical than existing vehicles, and is expected to be used in the U. S. program for cooperation with other nations in space research.

NASA has recently offered to launch a satellite for the Committee on Space Research (COSPAR) of the International Council of Scientific Unions, Dr. Newell said.

Future rockets beyond the Scout and Vega, Dr. Newell reported, include the Centaur, Saturn and Nova. Centaur is similar to the Vega except that the second stage will use high energy propellants.

The first stage of the Saturn vehicle, being developed by the Army Ballistic Missile Agency, will use a cluster of existing rocket

engines to give more than a million pounds of thrust. The Nova rocket will be based on a single chamber rocket of more than a million pounds thrust being developed by the Rocketdyne Division of North American.

The U. S. space science program, Dr. Newell said, depends upon the available rockets and their performance capabilities. With the vehicles now under development, it will be possible to undertake not only satellite missions in earth's vicinity but probe missions to the moon and nearer planets and space exploration out to many, many millions of miles.

To accomplish this, Dr. Newell stressed that it is "absolutely essential" to have the support and participation of the scientific community. The NASA space science program is divided into seven categories: atmospheres, ionospheres, energetic particles, electric and magnetic fields, gravitational fields, astronomy and bio-sciences.

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PALEONTOLOGY

"Living Fossil" Found Off Baja California

► A RARE "living fossil" has been hauled out of the sea by a research party from Scripps Institution of Oceanography off the tip of Baja California.

The creature, known as Neopilina, is a small single-shelled mollusk that lives at great ocean depths. Fossilized shells of similar mollusks have been found only twice previously, in New York State and in Sweden. (See SNL, Dec. 27, 1958, p. 408.)

This latest Scripps discovery included three specimens hauled from a depth of 8,600 feet near Cape San Lucas. News of the discovery was radioed to the Institution by Dr. Francis P. Shepard, leader of the Scripps Vermilion Sea Expedition.

The structure of Neopilina shows it is much like the annelids, or segmented worms. This indicates a possible relationship to the annelids.

From previous studies of the fossils alone, prior to the discovery of the living form, scientists had deduced that Neopilina must have had soft parts at the time it was known to have lived 300,000,000 years ago.

The newly found mollusks verified these scientific deductions.

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GENERAL SCIENCE

New Wing for Academy To Be Given By Society

See Front Cover

► A NEW WING will provide housing for the many scientific activities of the National Academy of Sciences and its National Research Council in the fields of biology and medicine.

The photograph on the cover of this week's SCIENCE NEWS LETTER is an architect's drawing of the new annex. A gift from the Equitable Life Assurance Society of the United States will make possible its construction. The Society is celebrating its 100th anniversary.

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