

## GEOPHYSICS

# Sun to Earth Energy Link

Discovery of a layer of "excited" oxygen molecules in the ionosphere may lead to better long-range weather forecasting. This is the fourth main layer found.

► A HITHERTO unknown layer of "energetic" oxygen molecules in the earth's upper atmosphere, has been discovered by Dr. Joseph Kaplan, University of California at Los Angeles physicist.

It may prove to be one of the most important links in the chain along which solar energy passes in its journey from sun to earth, he says.

Lying in the ionosphere near the regions of the colorful aurora borealis and the softer greenish glow of the light of the night sky, this layer of "excited" molecules may be an important factor in the sun-powered earth's weather factory, thinks Dr. Kaplan. It also may perform a vital function in the extensive processing that solar energy undergoes before it reaches the earth.

Further investigation in this unexplored region may pave the way for accurate long-range weather forecasting, states the U.C.L.A. physicist. Learning what this region does with the enormous amounts of energy thrown out during sunspot activity may enable meteorologists to chart our weather months in advance.

Strangely enough, this new layer was first discovered not by rockets probing the vast reaches of the upper atmosphere, but in a bottle in a secluded laboratory at U.C.L.A.

Several years ago Dr. Kaplan first noted in a specially designed quartz bottle, in which gases were excited by electrical discharges, a new form of nitrogen molecule. Recently he discovered in the same bottle a similar form of oxygen. He called these molecules "energetic" or metastable nitrogen and oxygen molecules.

Considering the conditions under which these molecules were produced, he reasoned that a layer of such molecules existed in the upper atmosphere where these conditions were duplicated.

Current spectroscopic studies of the upper atmosphere by Dr. A. B. Meinel at the University of California Lick Observatory indicated verification of Dr. Kaplan's discovery.

The new layer is the fourth main layer to be discovered in the ionosphere, the region of the atmosphere that bounces back radio waves. Previously discovered layers are the E layer and the F1 and F2 layers, whose average heights are 70, 125 and 150 miles, respectively.

At present there is no way of knowing exactly where the new layer is located. "However, our knowledge of the conditions it takes to produce these particular molecules leads us to believe that it is located just below the ionosphere's E layer and just above the ozone layer, probably about 60

miles above the earth's surface," Dr. Kaplan says.

Temperatures at this height are almost zero degrees Centigrade, and the infra-red intensity is much more than had been previ-

ously supposed at this altitude.

Until the discovery of the new layer the ozone layer beneath was credited with being the sole shield that protected us from lethal ultraviolet rays. Now it is thought that much of the ultraviolet radiation is transformed to infra-red radiation in the newly-discovered layer above the ozone.

"We are now branching out from the laboratory phase of study of this new layer," Dr. Kaplan says. "As we probe it with rockets and other research tools, we may find that it is the missing link needed to fill out the puzzling chain of solar-terrestrial relationships."

Science News Letter, November 12, 1949

## BIOCHEMISTRY

# Cobalt Essential to Life

► COBALT is one of the most essential elements in the very fundamentals of life processes and the cobalt-containing anti-pernicious anemia vitamin B-12 is the most powerful factor in the health of living things ranging from man to the green scum on ponds.

This was indicated by Dr. S. H. Hutner, of the Haskins Laboratories, New York, to the American Philosophical Society in Philadelphia.

In experiments with one-celled algae he

has shown that cobalt enters into the molecules of the B-12 vitamin, which in turn is concerned with the manufacture of desoxyribonucleic acid that is used by the bearers of heredity, the minute genes, which provide the life chain in reproduction.

We know much less about the metals requisite for life in trace amounts than we know about the organic constituents of living things, Dr. Hutner said. Iron, manganese, zinc, and copper, in addition to cobalt, are known to be necessary to both ani-



**INSTRUMENT MAST FOR FLIGHT DATA**—This needle-nosed "spear" probes the atmosphere ahead of high-speed research planes to give instant telemetered readings of air speed, yaw, angle of attack and temperature. It was developed by G. M. Giannini & Co., for Northrop Aircraft, Inc., and is undergoing tests now, being the first all-electric instrument mast to be designed for this use.

imals and plants, while molybdenum, boron and possibly other metals are needed by plants and possibly by animals.

The green alga known as *Euglena gracilis* corresponds to human beings in

its need for various elements, Dr. Hutner said, and it can be used as a test animal for assaying the amount of vitamin B-12 and the effectiveness of liver extract.

Science News Letter, November 12, 1949

#### NUCLEAR PHYSICS

## Giant Atom Smasher

### See Front Cover

➤ A GIGANTIC machine with powder-puff nuclear punch has demonstrated for the first time in actual practice that multi-million dollar cosmic ray atom-smashers being financed by Uncle Sam will deliver the goods.

The machine is a quarter-scale model of the 6,000,000,000 volt bevatron now under construction at University of California Radiation Laboratory with Atomic Energy Commission funds.

Though only a model and capable of firing protons to only 6,000,000 electron volts, this machine is the biggest atom smasher yet. It has a near-oval magnet and accelerating chamber 25 feet in diameter, as shown on this week's cover of the SCIENCE NEWS LETTER. The path over which protons travel in one trip around the chamber is 100 feet, by far the longest in atom-smashing history.

Prof. Ernest O. Lawrence told University regents that the machine operates with efficiency "equalling our most optimistic advance estimates." The model proves that the revolutionary principles incorporated in the bevatron are practicable. Further experience gained will speed up the shake-down of full scale machine by many months. It will also make it possible to start the machine at 3,500,000,000 electron volts instead of 1,400,000,000 electron volts. The conversion to 6,000,000,000 electron volts will be only one stage further. The

completion of the full scale machine is four years away.

The model simulating the conditions of the big machine operates as follows: A ten-ton cyclotron, reminiscent of early ones, acts as injector, firing 20 bursts of protons a minute into the chamber at three-second intervals. An electrode in the chamber speeds protons up each time around. As protons gain energy, magnet strength is increased to keep them from straying out of their orbit. Also the frequency of the electrode pushes is slowed down to match a slight lagging tendency of the protons at higher energy. During the two-tenths of a second the protons are in the chamber they make 150,000 trips around the chamber, traveling 10,000 miles. Each burst of protons contains 100,000,000 particles.

The full scale machine is now being constructed. It will duplicate in the laboratory the cataclysmic atomic disintegrations now achieved only in the medium energy range of cosmic rays. And it will give physicists a better handle on the still mysterious force which holds nuclei together. A 3,000,000,000 electron volt accelerator is also being built at Brookhaven.

Science News Letter, November 12, 1949

#### PHYSICS

## See Atoms and Sun As Future Energy Sources

➤ THE atom and the sun will be the source of our energy in the future, when the

world's coal and oil supplies are exhausted, Dr. Farrington Daniels of the University of Wisconsin, predicted.

Speaking before the University of Michigan chapter of the Society of Sigma Xi, national society for the encouragement of scientific research, he stated that direct use of sunlight as a power source, though simpler politically than the use of atomic energy, was more difficult technically. Dr. Daniels recommended coordination of all the research work on utilization of solar energy.

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