GEOPHYSICS

Rockets Seed Chemicals

Rockets are not only useful to launch earth satellites, they can be used now to give scientists important information about temperatures in the earth's outer atmosphere.

➤ USING ROCKETS to spread chemicals high in the earth's atmosphere not only creates luminous, man-made clouds but may be a method of measuring temperatures far above the earth's surface.

Chemical seeding to learn about the air's composition and structure was recommended to the National Academy of Sciences meeting in New York by Dr. Joseph Kaplan, University of California physicist who heads the U.S. program for the International Geophysical Year, or IGY.

(Dr. Kaplan once suggested that a rocket put in orbit around earth some 60 or 70 miles out could be powered by the chemical energy stored there. The possibilities of such a "low altitude" satellite are now being intensively studied by the Air Force. Information on conditions in the upper atmosphere gained during IGY is considered essential to development of the solar-powered rocket. See SNL, July 13, p. 20.)

The chemical make-up of the earth's atmosphere, Dr. Kaplan told the Academy meeting, results mainly from the sun's radiation hitting gases in the air. One important key to reactions taking place there is the night airglow, a very faint light first discovered by astronomers on long-exposure photographs. Dr. Kaplan reported airglow studies made jointly with Dr. C. A. Barth, also of the University of California at Los Angeles.

The airglow is too weak to be detected by the eye. It is rather uniformly distributed over the entire planet, but varies in intensity with time and with position in the sky as observed from one point.

The ratio of sunlight to moonlight to airglow is about one million to one to one-millionth. Heights of the layers emitting airglow vary from about 30 to 600 miles. The region is known as the chemosphere.

Many of the reactions taking place in this region produce the faint airglow. During the day, sunlight splits the molecules, including the oxygen, into atoms. At night, the atoms recombine, releasing energy available for causing night airglow. Main radiations are from oxygen and sodium atoms and the hydroxyl, which is an ion of water.

When chemicals are thrown into the upper atmosphere by rockets, the artificial cloud produced is the same as airglow. Both nitric oxide and sodium have been used for rocket seeding.

Laboratory studies of airglow reactions have also been made, Dr. Kaplan said. They showed some radiations still not yet found in the atmosphere were part of the man-made airglow.

Science News Letter, November 30, 1957

TECHNOLOGY

Powerful Radar Revealed

See Front Cover

➤ A POWERFUL research radar station that has successfully detected both Russian sputniks "at remote distances" is in operation on Millstone Hill in Westford, Mass.

Designed primarily as a research tool for the nation's ballistic missile defense program, the detection and tracking device was described as "a very large and high-powered long-range radar," by Dr. Julius A. Stratton, acting president of the Massachusetts Institute of Technology, before the MIT Club of New York.

It first picked up sputnik II on the morning of Nov. 7 at 12 minutes past five, Dr. Stratton said, and from the observations made, scientists were able to measure the range, elevation, bearing and doppler frequency of the Russian satellite.

A product of MIT's Lincoln Laboratory in Lexington, the long-range radar is also expected to gather valuable information on the operation and applications of high-power long-range radar, as well as yielding a better understanding of the radio effects of meteors and the aurora.

Its development required new tools and new techniques. One such tool was the development of a special transistorized digital computer to process the radar return signals on a real-time basis at very high speeds. The radar's antenna also required special attention. The high degree of precision required, Dr. Stratton explained, made it necessary to paint the surface of the tower white to get a maximum reflectivity of the sun's rays—otherwise, the minute bending of the tower by uneven heating from the sun could throw the antenna out of position.

The hill-mounted detector consists of a parabolic reflector, 84 feet in diameter, mounted on a concrete and steel tower 90 feet high. The radar sweeps the sky with a horizontal capability of 360 degrees and a vertical elevating capability of 90 degrees.

The photograph on the cover of this week's SCIENCE NEWS LETTER shows the radar installation, including the tower, parabolic reflector, and associated research buildings.

The powerful radar, in addition to its function as a test tool for defense against missiles, will be used to gather information for the U.S. International Geophysical Year program and will support cooperation between the Air Force and the Defence Research Board of Canada.

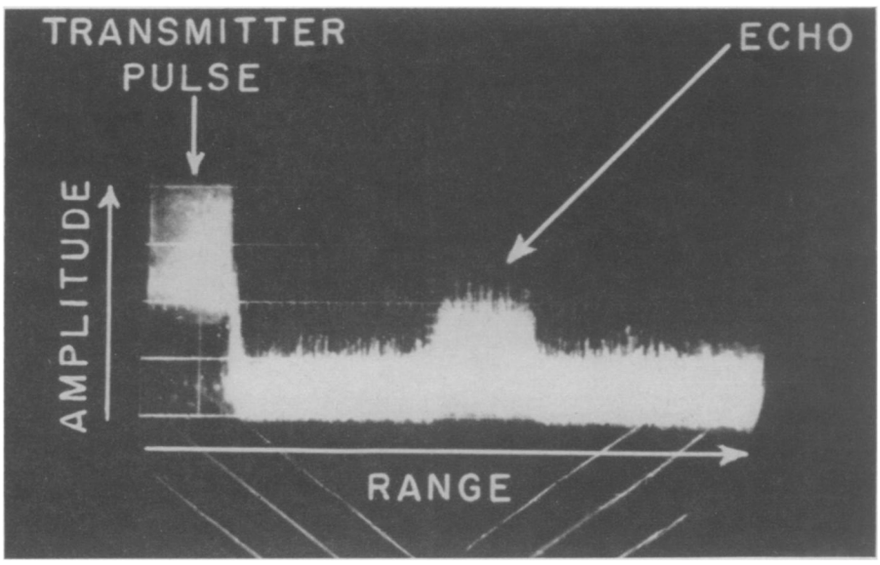
Science News Letter, November 30, 1957

● RADIO

Saturday, Dec. 7, 1957 1:30-1:45 p.m., EST

"Adventures in Science" with Watson Davis, director of Science Service, over the CBS Radio network. Check your local CBS station.

Dr. Margaret Mead, anthropologist, associate curator, American Museum of Natural History, New York, will discuss "Science Education for our Children."



ROCKET ECHO—The radar echo from the third stage rocket of the Russian satellite sputnik I, reproduced here, originated 595 miles from the Millstone Hill, Massachusetts Institute of Technology Lincoln Laboratory site in Westford, Mass., where the powerful radar station is located.