

## ASTRONOMY

# Junk Stirs Up Moon Dust

► **STONE AND IRON** fragments falling on the moon from space "kick up" between 1,000 and 10,000 times their own mass in surface fragments that make second hits and again raise more dust, studies show.

Although these objects falling on the moon are of all sizes, most of them would be so small as to be invisible. However, this perpetual "kicking up" of lunar debris could approach a steady-state cloud that would be something close to a greatly diluted dust storm, Dr. Donald E. Gault of Ames Research Center, National Aeronautics and Space Administration, Moffett Field, Calif., said at Stanford, Calif.

Experiments, reported by Dr. Gault to the American Geophysical Union meeting at Stanford University, support the theory that impacts of fragments hitting the moon must have created a layer of dust on the surface, but Dr. Gault said he does not believe this dust would be deep enough to be hazardous to astronauts landing on the moon.

The invisible dust cloud would not be a direct hazard to moon travelers either, nor could the fragments puncture a space capsule. He said the fragments might conceivably erode and damage glass or plastic windows of spaceships or moon bases during long periods. They might also damage fabrics or other materials used for moon

suit. Dr. Gault said that the many projected moon bases to be constructed with huge plastic or glass domes would be vulnerable to moon dust damage. This should be taken into consideration when planning materials for any kind of moon structure.

The scientist explained that in his experiments to figure how much debris is being ejected by meteoroid impact, he used a hydrogen gas gun shooting projectiles at a target. The gun fired metal glass and plastic objects into sand and rock targets at a maximum speed of 33,000 feet a second, which represents the lowest speed range of meteors such as those falling on the moon.

Dr. Gault said only very few of the meteoroids get up enough speed, when bouncing back, to escape the moon. However, according to measurements of the Mariner II Venus probe, there is 10,000 times more space dust close to earth than in interplanetary space, and some of this must come from escaped moon particles. Dust thrown off from the moon could also contribute to the gegenschein, believed to be sunlight shining on dust located in the night sky opposite from the sun; to the zodiacal dust, and to the Kordelewski clouds—two nebulous areas reported seen ahead and behind the moon's orbit.

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## GEOPHYSICS

# Clues From Sputnik Chunk

► **A 20-POUND CHUNK** of burned-up iron from the Russian satellite, Sputnik IV, has given American scientists more clues to short-lived radioactivity formed in metals in space than all meteorites ever fallen on earth.

Dr. Ernest Anderson of Los Alamos Scientific Laboratory, reporting to the American Geophysical Union meeting at Stanford University, told *SCIENCE SERVICE* that by studying satellite fragments scientists will eventually find out the intensity of cosmic rays near the earth, which could be harmful to astronauts traveling in space. Meteorites give this information from farther out in space.

Therefore, scientists are very eager to have the public keep an eye open for such falling fragments and send them to scientific laboratories as soon as possible so the scientists can make measurements of these short-lived radiations.

Dr. Anderson said that in studying the Sputnik fragment by gamma ray spectroscopy he discovered radioactive isotopes not found naturally on earth, such as manganese 54, iron 55, argon 37, and tritium.

He said the iron on earth is shielded by the atmosphere from cosmic rays which turned the metal of the fragment into radioactive isotopes when bombarded by the rays while the satellite was in orbit.

Since these radioactive metals do not exist

on earth, their presence proves that this fragment did indeed come from space, Dr. Anderson said.

Another speaker, Dr. J. P. Shedlovsky, Carnegie Institute of Technology, assured *SCIENCE SERVICE* that the fragment was not a meteorite but a genuine piece from a satellite since it contained a man-made bolt with a metal thread.

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## GEOPHYSICS

# X-Ray Behavior Same Around the World

► **SCIENTISTS** have found for the first time that X-rays from electrons striking the earth's atmosphere behave the same way over Alaska as they do a thousand miles south of Melbourne, Australia.

A team of scientists from the University of California at Berkeley flew two balloons simultaneously at 20 miles' altitude to study electrons coming from the earth's radiation belts, which produce the X-rays.

The two points where the balloons were flown on March 5, 1962, are connected magnetically. Lines of magnetic force come out of the Southern Hemisphere over Macquarie Island in the Southern Pacific and loop back to earth over Fairbanks, Alaska.

Scientists studying electrons, which produce auroras and other geophysical disturbances, wanted to determine whether particles behave the same way in the Northern and Southern Hemispheres.

Since the aurora and other geophysical events are magnetically controlled, the scientists believed the effects would be similar, Dr. D. S. Evans told the American Geophysical Union meeting at Stanford University.

He said they found that the X-rays were essentially of equal intensity in both regions and showed the same time variations as they come in—heavier at some times than at others.

The experimenters included Drs. K. A. Anderson, C. D. Anger and R. R. Brown, all of the physics department at Berkeley. The expedition in the Southern Hemisphere was assisted by the Australian National and Arctic Research Expeditions, and in the Northern Hemisphere by the Geophysical Institute of Alaska.

Next November the teams will leave again for the same locations to send up more balloons to explore the pulse beats of the X-rays, which occur on the average every eight to nine seconds. The scientists want to find if the "beat" occurs at the same time in the two hemispheres. To do this, their clocks are exactly synchronized.

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## ASTRONOMY

# Venus Rotation Revealed By Radar Bounce

► **THE PLANET VENUS** may be rotating in a direction opposite from that of the earth.

This information was revealed at a meeting of the American Geophysical Union at Stanford University by Dr. Richard M. Goldstein, supervisor of the radio research group at the California Institute of Technology Jet Propulsion Laboratory. He said that he and R. L. Carpenter of the lunar and planetary section bounced radar beams off the planet in an experiment conducted for the National Aeronautics and Space Administration between Oct. 1 and Dec. 17, when Venus was in close proximity to earth.

The radar signals were sent by an 85-foot-diameter parabolic antenna. It took some six to eight minutes for the signals to strike the surface of Venus and bounce back to earth. By studying the return signal it was possible to tell something about the surface characteristics of Venus, its distance and rotation rate. A rough surface will scatter the signal and a rotating body will spread or broaden the return signal.

Scientists at JPL who are analyzing the echoes of signals bounced off Venus during the experiment say that there are several indications that point to a retrograde rotation of Venus. Moreover, the rate of rotation is very slow, perhaps once every 250 earth days.

This conclusion, however, is based on the assumption that Venus, which is continually hidden from view by a dense cloud-cover, is rotating on an axis that is perpendicular to the plane of its orbit.

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