PHYSICS

Atomic "Ghost" Discovered

The xi zero, or neutral cascade hyperon, has been discovered, thus completing observation of presently predicted particles of ordinary matter.

➤ AN ATOMIC "ghost" that can be detected only by markings left by other nuclear particles has been discovered by a group of scientists in the University of California's Lawrence Radiation Laboratory.

The newly discovered particle is the xi zero, or neutral cascade hyperon, one of the "strange" fleeting fragments of matter found only in cosmic rays and in beams produced by the most powerful atom smashers, in this case the giant bevatron at Berkeley.

Discovery of the particle completes the list of presently predicted particles of ordinary matter. A few predicted antiparticles remain unobserved.

The xi zero has a mass some 40% greater than the proton, or about 1,326 Mev. It has no electrical charge, so it was invisible in the 15-inch hydrogen bubble chamber in which it was found. It has a lifetime of about one ten-billionth of a second.

Among 70,000 photographs taken in the bubble chamber during several weeks, the scientists found only one containing the xi zero.

The discovery was a difficult feat. The scientists had to filter the bevatron beam to obtain a nearly pure beam of negative K particles.

In the discovery photograph, the scientists saw the track of a negative K particle enter, then stop. At some distance were two V-shaped tracks, made by other charged particles. In between was a gap, through which neutral particles, created by the interaction of the negative K with a proton, traveled to the points at which they decayed into the V's.

The double V is common in bubble chamber pictures taken at the bevatron. But one V was so askew that it could not have been made by a particle traveling direct from the negative K-proton decay. The scientists deduced that one particle generated by the negative K-proton decay was the xi zero, that it traveled off at an angle, decayed into a neutral lambda hyperon, which in turn decayed into the visible V.

The discovery is outstanding in that it was dependent upon observation of two interconnected invisible "tracks" between sets of visible tracks in the photograph. Analysis of single invisible "tracks" has been common.

The particle had been predicted by Dr. K. Nishijima, a Japanese physicist, and Dr. Murray Gell-Mann of California Institute of Technology.

The scientists who performed the work, reported in the *Physical Review Letters* (March 1), are Drs. Luis W. Alvarez, Myron L. Good, William Graziano and Stanley G. Wojcicki, of the University of California, Berkeley; Philippe Eberhard, visiting physicist from the Centre Nationale de la Recherche Scientifique de France, and Harold K. Ticho of the University of California, Los Angeles.

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ASTRONAUTICS

Artificial Planet Launched

➤ THE UNITED STATES launched its first artificial planet, now in perpetual orbit around the sun, on March 3 at 12:10 a.m., EST. The 13.4-pound cone-shaped capsule joined Russia's Lunik in a sun-circling path.

Some 41 hours after launching, the new space vehicle passed within 37,000 miles of the moon, about 17,000 miles further from it than had been planned. The project was carried out by the National Aeronautics and Space Administration with the Army's assistance.

Pioneer IV, which will be officially named Artificial Planet Two, was the last of a series of five lunar and space probes authorized by President Eisenhower last March. The probes were planned to be part of the U. S. participation in the International Geophysical Year.

The new baby planet's orbital period is 392 days. Its elliptical path through the solar system cuts slightly inside the earth's orbit at perihelion and far outside it at aphelion.

Artificial Planet Two will reach perihelion on March 17, when it will be 91,744,000 miles from the sun and 1,168,000 inside the earth's orbit. On Sept. 29, it will be at aphelion, some 105,829,000 miles from the sun and 12,917,000 miles outside our orbit.

The plane of its orbit is very close to the ecliptic, differing only by about one-fifth of a degree.

The new tiny planet's radio, now dead, enabled it to be tracked by large antennas more than 400,000 miles into space. The payload contained two Geiger counters, one shielded with four millimeters of lead to measure the more energetic particles in the Van Allen belts.

In addition to the radiation experiment, the performance of the radio equipment on the probe was tested, because with Pioneer III scientists found some discrepancy between the observed values of signal strength and the calculated values. The tests will determine whether there is an instrumental defect or something unknown in space affecting the propagation of radio waves.

The probe also contained two photoelectric cells designed to operate when the image of the moon was a certain size. The sensor device did not work since the satellite did not come within the necessary 20,000 miles of the moon.

A de-spin mechanism worked perfectly, slowing the capsule from 324 revolutions per minute down to 13.

The rocket that tossed the artificial planet into space was traveling at 24,791 miles an hour when its payload was ejected at an altitude of 150 miles above the earth's surface. The rocket's last stage is also now circling the sun, as is the rocket that boosted Lunik into a solar orbit.

Although this speed was more than needed to overcome the earth's gravitational pull, it was less than scientists had expected to attain before the launching.

Whitish and black striping on the gold-plated cone kept the temperature inside at about 110 degrees Fahrenheit.

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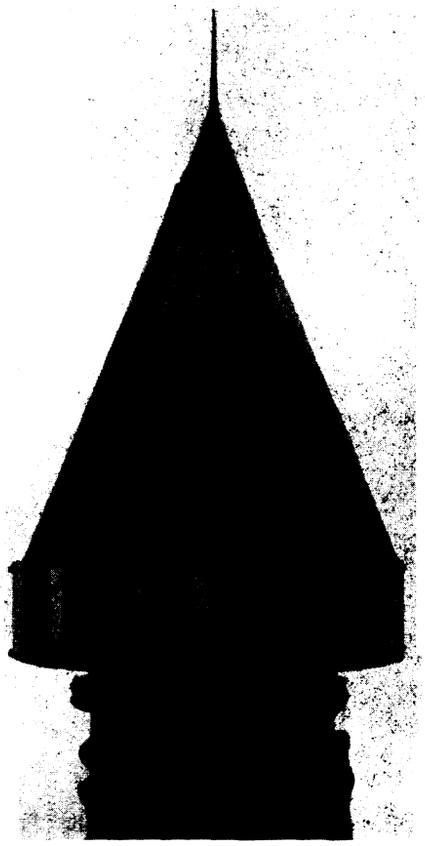

"PLANET" PAYLOAD—The payload of Pioneer IV is covered with a fiberglass cone painted in a striped pattern for temperature control in space. The cone is washed with gold to provide electrical conductivity, so that it can serve as antenna for the probe's radio transmitter. The sleeve at bottom holds the payload to the fourth-stage rocket motor, before they separate automatically at a little less than five minutes after launch. Separation is necessary so that the scanning lens on the bottom of the payload can see out into space.