PHYSICS

Primary Clue to Matter

Lifetime of the neutral pi meson, the shortest of any nuclear particle, has been measured, Ann Ewing reports from the International Conference on High Energy Physics.

➤ THE SHORTEST lifetime of an elementary particle—only a quarter of a millionth of a billionth of a second—gives a primary clue to the structure of matter.

This new figure, which links the nuclear mesons directly with the electromagnetic field for the first time, was reported to the tenth annual International Conference on High Energy Physics at the University of Rochester, N. Y., by Dr. A. V. Tollestrup of California Institute of Technology.

The fleeting lifetime was found by Dr. Tollestrup and his co-workers and by Dr. R. G. Glasser and his group at the Naval Research Laboratory in Washington. The scientists examined photographic emulsions to find the tracks necessary to measure the lifetime of the neutral pi-meson. The emulsions were exposed to beams of K-particles in the giant six-billion-electron-volt atom smasher at the University of California at Berkeley.

Disintegrating atoms leave their tracks in the emulsions, and scientists glean much of their information about nuclear structure by studying these tracks.

The lifetime of nuclear particles is one of their principal properties.

Pi-mesons as a separate class of nuclear particles were first suggested in 1947, and the first examples were spotted experimentally within two weeks. Besides a positive and negative pi-meson, scientists have known for about ten years of the neutral pi-meson and have been trying to pin down its lifetime.

The new measurement gives theoretical physicists a new universal constant and now they must figure out why its exists or relate it to another constant. When the neutral pi-meson breaks up or decays, two photons of light are produced. These high energy photons, or gamma rays, are purely electromagnetic in character.

Thus the new measurement links mesons and the electromagnetic field for the first time.

The neutral pi-meson is the only one of the 30 particles now known to break up in this fashion. Its lifetime is also shorter by a factor of a million than any of the other known particles.

The possible existence of another new particle called "D" for Dubna where it was first spotted by the Russians was being debated by physicists at the conference. Only four examples have so far been found, so its status as a particle is rather shaky.

In fact some physicists suggest the "D" should stand for "Dubion," to symbolize its dubiousness.

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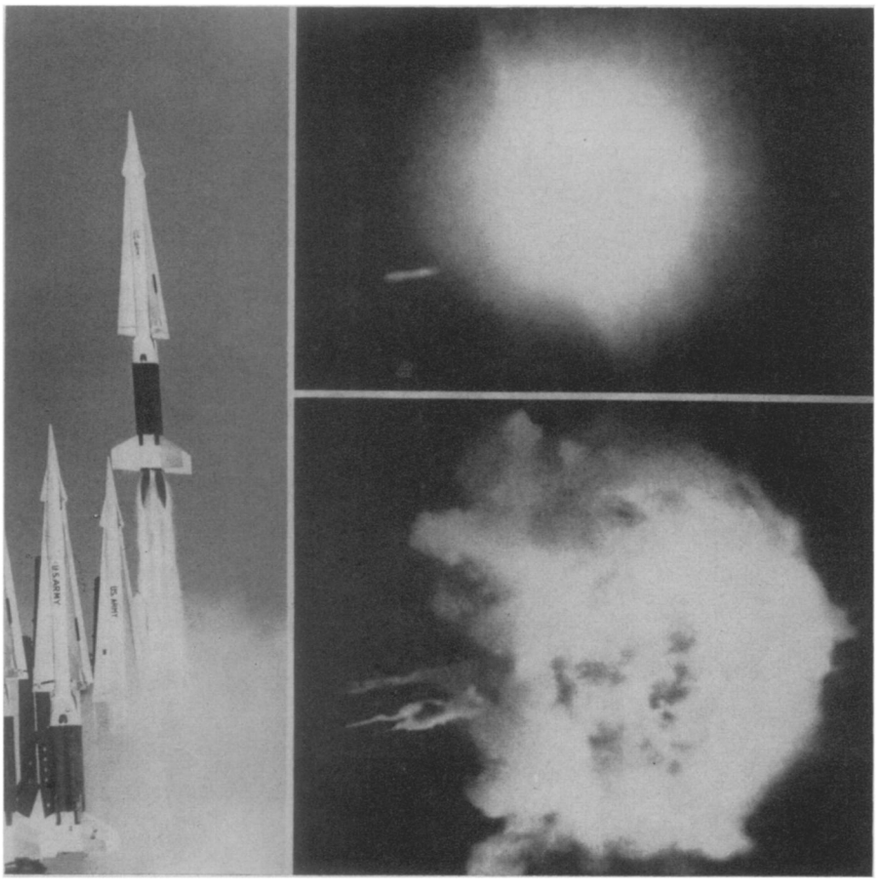

MISSILE-KILL—The Nike-Hercules air defense missile takes off (left) and "kills" another Hercules 11 miles above White Sands Missile Range, N. M. The defense missile explodes (upper right) as it intercepts the target missile—small object at left in picture. "Kill" occurs in lower right picture. Tests were conducted by U. S. Army personnel, and Bell Telephone Laboratories and Douglas Aircraft engineers.

Super A-Smashers Urged

➤ ATOM SMASHERS having super high energies can and should be built to probe more deeply into the atomic nucleus, an international group of 30 physicists meeting informally in Rochester, N. Y., agreed.

The five Russian scientists attending the informal meeting reported for the first time that construction has started on a 70 billion electron volt accelerator near Moscow. When completed in a few years, this machine will be the world's most powerful, more than twice as powerful as any now operating.

The atom smashers agreed upon as "feasible and desirable" by the international group are, however, in a much higher energy class, some 300 billion electron volts. This is 100 times more powerful than either the Brookhaven National Laboratory or CERN accelerators.

Estimated cost for the 300 Bev machine and its required equipment is $300 million. The question of how such a machine should be financed was not considered by the group.

Informally some scientists have suggested that it be built and operated under an international cooperative program. Dr. J. Robert Oppenheimer, director of the Institute for Advanced Study in Princeton, N. J., backs such a plan.

Besides the five Russian scientists and one Polish physicist attending the informal meeting, representatives of the United States, Germany, and United Kingdom, Italy and CERN (an international unit of 13 European nations) attended.

Dr. Robert Wilson of Cornell University, Ithaca, N. Y., who is chairman of the informal group, said the 300 Bev machine could be used as a very high-powered microscope to look deep inside the now-mysterious center of an atomic nucleus.

Dr. Wilson said he personally pictured a nucleus as a fuzzy object surrounded by a diffuse cloud of mesons. As one looks deeper inside the nucleus, the meson population becomes more and more dense. The structure of the deep interior is the current puzzle in nuclear physics.

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