PHYSICS

Find Rare Pi Decay

Experimental proof that a pi meson decays directly into an electron, found by an international team of scientists, confirms theory concerning its behavior.

➤ THE DIRECT BREAK-UP of the nuclear particle known as a pi meson into an electron has been found by an international team. The physicists used the 600,000,000 electron volt particle accelerator, a synchrocyclotron, at CERN, the 13-country cooperative nuclear research center in Geneva.

The two high energy accelerators at CERN, one of which is still under construction, were planned specifically to study the properties and interactions of the so-called elementary particles, one example of which is the neutron of atomic bomb fame. Another is the pi meson, which was discovered in 1947 by the tracks it left in photographic emulsions exposed to the cosmic rays that continually bombard earth from somewhere in space.

The pi meson was observed to decay, or break up, in about a hundred-millionth of second into a mu meson. The mu meson itself decays in about a millionth of a second into an electron.

Not long after the discovery of the pi meson, it was predicted on very simple and straightforward grounds that every so often the pi meson should decay directly into an electron, instead of by way of a mu meson. The prediction was that this direct decay should occur once in every 10,000 break-ups.

Experiments at the Universities of Columbia and Chicago searching for these rare, direct decays resulted in no observations of such a process. The tests further showed that, if direct decay occurred at all, it must be less than once in every 100,000 decays.

The discovery, two years ago, that parity was not conserved in certain processes in nuclear physics, produced a very great simplification in scientists' understanding of nuclear reactions. One of the major difficulties still remaining was the negative result concerning the electron decay of the pi meson.

Several groups of physicists throughout the world therefore searched again for the direct decay, and the CERN group was successful. Studies by the CERN physicists not only demonstrated that this decay occurs, but possibly with about the expected frequency.

The group responsible illustrates the international character of CERN laboratory, since it consists of T. Fazzini and G. Fidecaro from Italy, A. W. Merrison from the United Kingdom, H. Paul from Austria and A. V. Tollestrup from the United States.

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GEOPHYSICS

Sun's Activity High During Current IGY

➤ THE SUN'S ACTIVITY has been the highest in history during the current International Geophysical Year.

Final figures are not yet available, but preliminary calculations show that the sun reached the highest point in the sunspot cycle in November, 1957.

The International Geophysical Year (IGY), was scheduled from July 1, 1957, to Dec. 31, 1958, to include the period of maximum solar activity. The sun has cooperated by engaging in the greatest sunspot activity ever recorded.

The sun signaled its cooperation in the IGY by bursting forth in a great solar flare on June 28, 1957. Particles flung spaceward from this giant eruption started arriving at the earth two days later, in time to usher in the IGY with brilliant displays of northern and southern lights.

The smoothed sunspot number for last November was 202.2, rivaled closely last February by 201.4. Not until year's end will scientists know during which month between November and February the maximum was reached. (See SNL Dec. 7, 1957.)

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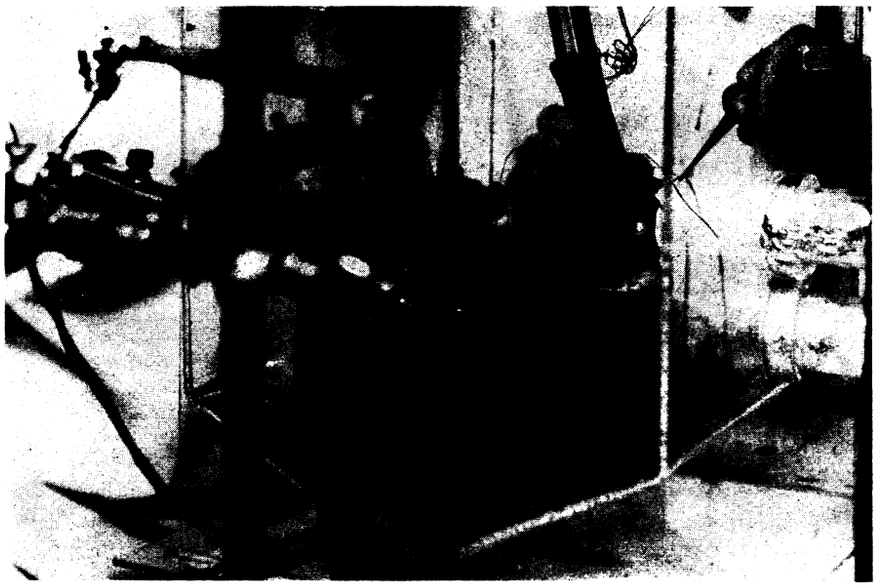

ISOLATED HEART—An isolated animal heart is able to be kept alive for 18 hours while researchers study the heart itself. This eliminates the other influences of the body.

CARDIOLOGY

Isolated Heart Kept Alive 18 Hours to Study Muscle

➤ ONE OF heart surgery's most dangerous problems has been solved.

An isolated animal heart, free from the influences of the rest of the body, was kept alive for 18 hours in order to study the heart muscle more easily.

The heart was kept alive by connecting it with the circulatioin of a donor dog, Drs. Baruch Bromberger and Paolo Caldini, both of the cardiopulmonary laboratory of the National Jewish Hospital at Denver, said.

While the heart was suspended for observation, the team studied ventricular fibrillation, the quivering of the heart muscle that fails to pump blood to the body because there is no coordinated contraction of the heart. This condition poses one of the greatest dangers of heart surgery. It often occurs in heart surgery performed under hypothermia, and is sometimes fatal.

They had noted that the level of magnesium ions in the blood returning from the heart was lower during hypothermia, indicating an increased concentration of magnesium in the cold heart.

By injecting exact measurements of magnesium into the isolated heart, they found that only a minute amount of magnesium was enough to cause ventricular fillibration, even at normal temperatures.

Under hypothermia, the tests were even more enlightening. The heart's tolerance for magnesium was 50% less than at normal temperatures.

They tested a drug nicknamed TEA. In repeated experiments, both with the isolated heart and with intact animals, TEA allowed defillibration.

The investigating team tested several disputed drugs to establish their effects upon the heart muscle itself. Among those drugs tested were norepinephrine, a blood pressure raiser, and quinidine hydrochloride, a reducer of heart beat. Subsequently they discovered that tetraethylammoniumchloride, or TEA, coupled with electric shock, could eliminate the danger of fibrillation during hypothermic surgery.

Dr. Bromberger reported his experiments at the recent World Conference on Cardiology at Brussels, Belgium.

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