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FIRST MESON RAY PUT IN PRODUCTION

Artificial Creation in Berkeley of Cosmic Beam Held Major Key to Atom's Mysteries

2 YOUNG SCIENTISTS' WORK

Research Means Determining of the Ultimate Particles of Matter, Why They Exist

By LAWRENCE E. DAVIES
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BERKELEY, Calif., March 8—Artificial production for the first time of the meson, a cosmic ray constituent scientists look upon as a major key to unlocking the remaining mysteries of the atom's core and to determining the ultimate particles of matter and why they exist, was announced today at the University of California.

The new milestone in fundamental nuclear research was reached by two young scientists working with the world's largest atom-smasher, the 4,000-ton cyclotron, in the Berkeley Radiation Laboratory. They not only produced and observed the mesons, constituting the "cosmic cement" which is believed to hold together the nucleus of the atom, but measured their mass, which they put at 313 times that of the electron.

Dr. Ernest O. Lawrence, inventor of the cyclotron and director of the laboratory, announced the momentous achievement at a press conference in the presence of Dr. James B. Fisk, Director of Research for the Atomic Energy Commission.

No Practical Application Seen

No practical applications, such as fission, are in sight as a direct result of the liberation of the cosmic ray particles in the laboratory, and Dr. Fisk refused to conjecture as to its future in atomic energy developments, but he hailed the laboratory-produced meson as of "overwhelming importance for the handle it provides in working to understand fundamental forces."

"The meson is a fine thing," he added, with a smile. "I'm sure it's here to stay."

The type of meson, sometimes known as mesotron, observed at Berkeley possesses energies of about 4,000,000 electron volts. This is extremely low compared with the energies up to billions of electron volts with which the earth is bombarded constantly by mesons produced when primary cosmic rays from interstellar space collide with atmospheric nuclei.

Dr. Lawrence said this meant that far more powerful atom smashers must be built to "exploit fully the realms of nuclear knowledge which lie still deeper within the atom."

But the Berkeley Radiation Laboratory finds itself able to "custom make" mesons of the lower energies at will, producing as few or as many as are needed for observation.

In producing mesons, which really involved in a sense the changing of energy into matter, or a reversal of the process resulting with the explosion of the atomic bomb, the big cyclotron fulfilled one of the principal objectives Dr. Lawrence and his associates had in mind when they built it.

Young Physicist First Saw Trace

But when Dr. Cesare Mansueto Giulio Lattes, a 23-year-old Brazilian physicist attached to the laboratory, excitedly announced the night of Feb. 21 that he had found the track of a meson on a photographic plate, associates were highly skeptical and Dr. Lawrence proved to be a stubborn "man from Missouri" before he eventually was convinced the goal had been achieved.

Dr. Lattes, an assistant Professor of Physics at the University of Sao Paulo, arrived in Berkeley on Feb. 12 with his bride, coming here on a Rockefeller Foundation Fellowship after working with a group at Bristol, England, which was studying cosmic rays with photographic emulsions.

Dr. Eugene Gardner, 35, a research physicist in the Berkeley Radiation Laboratory, who had worked at Oak Ridge on the Manhattan Project, had been studying atomic disintegrations for more than a year by bombarding photographic emulsions in the big cyclotron.

Techniques developed at Berkeley and at Bristol were compounded, with the result that meson tracks were observed on the first plates exposed as the two men set out with the specific aim of trapping a meson. They put the emulsion plates adjacent to targets of carbon or beryllium, against which the cyclotron hurled a beam of projectiles made up of 380,000,000 electron volt alpha particles, the nuclei of helium atoms.

A meson was produced when a proton in the target nucleus crashed head-on into a proton from the alpha particle of the target nucleus. This resulted in the conversion of one of the protons into a neutron and a negative meson. All of the mesons observed at Berkeley so far have been the negative heavy type.

Carbon, beryllium, copper and

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uranium all have been used as the target in the production of the artificial mesons. So successful have the bombardments been that fifty to two hundred meson tracks constitute the average found on a single emulsion plate.

Whereas Dr. Lattes said that eight persons work a year to get 100 negative meson tracks in the British experiments with nature as the laboratory, one person has observed twenty-seven tracks in ten minutes of observation at Berkeley.

Dr. Lattes last year exposed emulsion plates in the Bolivian Andes for three months in connection with the Bristol group's work, but it was disclosed that the first plate exposed by him and Dr. Gardner here, for a thirty-second period, "yielded 100 times as many mesons per plate as were obtained in the Andes in forty-five days."

"This," reporters were told, "is 10,000,000 times as many mesons per second in the cyclotron as on a mountain top."

This, Professor Lawrence said, means that use of the meson for the first time under controlled laboratory conditions "will enable scientists to study, more or less on their own terms, the critical nuclear processes in which the meson is involved."

Although Berkeley now can produce the mesons in relative abundance, Dr. Lawrence said that "we were just lucky" to get over "the threshold" of the minimum energy required for the collision of proton with proton that brought them forth.

They were "just detectable" at 300,000,000 electron volts. When the energy went up to 380,000,000 the yield of mesons increased a hundredfold. Dr. Lawrence left to the imagination of his audience what could happen if the Atomic Energy Commission or some other "angel" would provide him with funds for an atom smasher capable of producing energies into the billions of electron volts.

Both the Berkeley Laboratory and the Brookhaven National Laboratory, whose director, Dr. Philip Morse, and two assistants were present, have plans in the drawing board stage for such projects, Dr. Lawrence said, adding that "we're confident of our ability to get up there into the regions of some billions of volts."

Professor Lawrence, Professor Robert R. Serber, nuclear physicist in charge of the theoretical work in the radiation laboratory, and other veteran staff members generously gave the spotlight to Drs. Gardner and Lattes at the large press interview.

Dr. Serber, however, summarized what were termed "the significant implications in connection with meson production." They were set forth as follows in the university's announcement:

1. It proves the idea is right that there is an intimate connection between nuclear particles and mesons and between nuclear forces and mesons.

2. With the means now provided to create and observe mesons under controlled conditions in the laboratory, it may be possible to determine what are the ultimate particles of matter, why only these particles exist and what their properties are. Dr. Serber said, for example, that it was a simple matter to determine the masses of the mesons, which was of some uncertainty. The mass can be calculated by the radius of its flight in a magnetic field from target to emulsion and the range of its penetration into the emulsion.

3. The study of mesons will be particularly important in determining the nature of the sub-atomic force which holds nuclei together, a force unlike any other known to man.

4. Techniques will probably be developed, in time, which will enable scientists to study mesons as thoroughly as neutrons and protons. Such techniques would entail the use of specialized Geiger Counters, for example.

The names meson and mesotron have been used interchangeably for the cosmic ray particle now produced artificially. Dr. Luis Alvarez, a Berkeley phycisist, suggested that the name mesotron be retained for the light meson found in nature through cloud chamber experiments by Dr. Carl Anderson of the California Institue of Technology, and that meson be reserved for the heavy meson, such as that observed in the laboratory here and in nature by the Bristol group.