LETTERS TO THE EDITOR

Prompt publication of brief reports of important discoveries in physics may be secured by addressing them to this department. Closing dates for this department are, for the first issue of the month, the eighteenth of the preceding month, for the second issue, the third of the month. Because of the late closing dates for the section no proof can be shown to authors. The Board of Editors does not hold itself responsible for the opinions expressed by the correspondents.

Communications should not in general exceed 600 words in length.

The Simultaneous Emission of Three Particles from an Excited Nucleus

In an attempt to observe the half-life of the radioactive isotope of sulphur of mass 31, which is of the type discussed by Wigner,[1] having one more proton than neutron, sulphur was bombarded by very energetic neutrons. When the neutrons from lithium, with energies up to 24 Mev, were allowed to fall on either pure sulphur or carbon disulphide, radioactivities of half-life 12.7 sec. and 2 min. 17 sec. were observed. When neutrons from beryllium, with energies up to 13 Mev are employed only the shorter period of 12.7 sec. is found and there is no indication of the longer-lived activity. This 12.7-sec. activity was shown by the cloud chamber to emit electrons while the 2-min. 17-sec. emitter gives only positrons.

In order to identify the activity chemically a quantity of carbon disulphide with free sulphur in solution was given short bombardments. The activated atoms were extracted by shaking with dilute sulphuric and nitric acids and then separately precipitated as either a phosphate or a sulphate. The strong positron emitter of 2-min. 17-sec. half-life was shown to be an activity in phosphorus and hence undoubtedly the well-known previously reported[2] activity attributed to phosphorus of mass 30. It could be made from the abundant sulphur isotope of mass 32 only by an $(n, 2nP)$ reaction or an $(n, 3n)$ reaction followed by the emission of a positron. This is thus the first well-established case of the simultaneous emission of three heavy particles from a nucleus, a process not unexpected at the high energy of the incident neutrons.

The activity of 12.7-sec. half-life being a negative emitter cannot be due to sulphur of mass 31 but is undoubtedly attributable to a phosphorus isotope of mass greater than 31. The activity due to sulphur 31 as predicted must have a half-life exceedingly short since it could not be detected with the technique here employed.

The rapid chemical separations were very kindly made by Mr. W. H. Sullivan and Mr. A. F. Voigt of the Department of Chemistry. This investigation was made possible by a grant from the Horace H. Rackham Fund.

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[1] E. P. Wigner, Phys. Rev. **56**, 519 (1939).
[2] I. Curie and F. Joliot, Comptes rendus **198**, 254 (1934), *et sub.*

Photon Production of Mesotrons

The photographs of Fig. 1 show two views of a large Wilson cloud chamber containing five horizontal lead plates each one cm thick. The photograph to the left is taken at 30° to the left of normal while that on the right is taken at 30° to the right of normal. Because both tracks penetrate several lead plates without producing shower particles they cannot be electrons. Since it is very unlikely that a photon would have sufficient energy to produce two protons, the conclusion is that the two penetrating particles are mesotrons, and that we have evidence of the production of a pair of mesotrons by a photon.

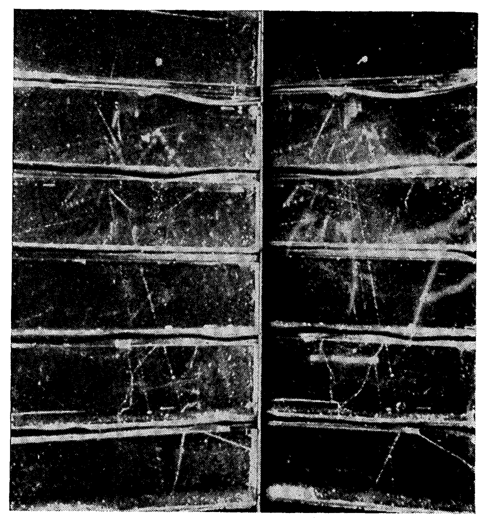

FIG. 1.

This picture was made in the Mt. Evans laboratory at an altitude of 14,170 feet. The dimensions of the chamber are $18\times12\times5$ inches deep, and the chamber was counter-controlled though the picture obtained could not have been controlled by the counters. A rough estimate indicates that heavily ionized tracks were obtained in about one picture out of 80. These could be identified as protons or mesotrons in many cases.

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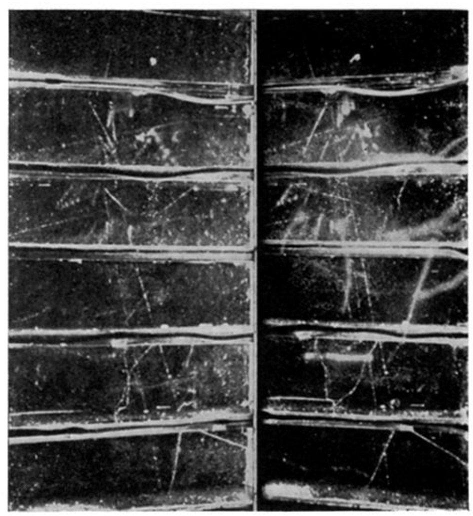

FIG. 1.