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Physics General

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Summary of the Research Progress Meeting

June 17, 1948

Margaret Foss Feldon

Berkeley, California

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Margaret Foss Folden

Potassium 43. R. Overstreet

Attempts have been made to establish 8-1/2 hour Ca^{41} by the reaction of α's on argon.

$$A^{40} (\alpha, 3n) Ca^{41}$$

No calcium fraction was found in this bombardment. Potassium was obtained by the reaction:

$$A^{40} (\alpha, pn) K^{42}$$

The yield, 1 millicurie per microampere hours, was good and this reaction has been found to be very useful in the preparation of potassium for biological research. Reaction conditions have been improved so that practically no chemistry is involved in the preparation. As an example, an aluminum bell jar illustrated in Figure 1 is now used instead of a copper bell jar. Following the preparation, it is a simple matter to wash down the walls of the bell jar, on which 9% of the activity resides, the rest in the plug.

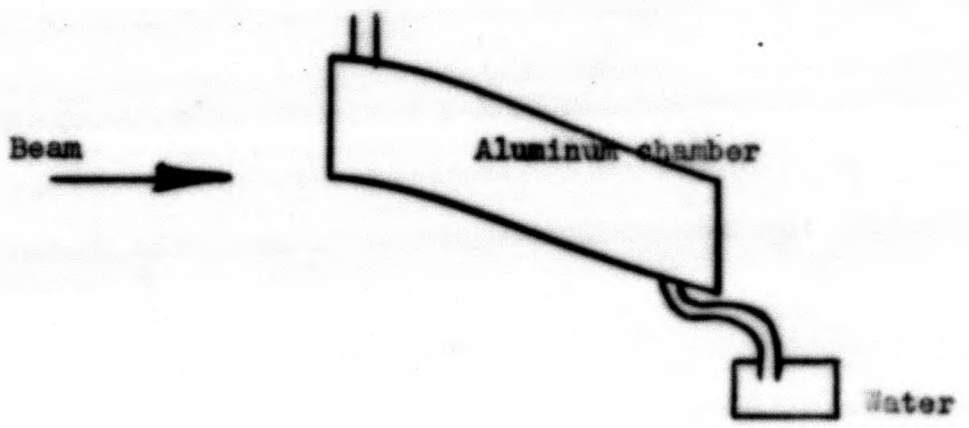

Figure 1.

S-83-2

Following purification of the potassium with Zn, Cu, Na, K, Rb, and Cs carriers, an examination of the decay curves was made but the 12.5 hour decay period of K^{42} was not obtained. At 5.5 hours after the bombardment, a 14.8 hour half life was found and 150-350 hours after bombardment, a 22.4 hour half life was determined. Three β^- energies of unknown potassium were measured in the magnetic spectrograph, giving values of .25, .81, and 3.11 Mev. The latter corresponds roughly to the 3.45 Mev energy of K^{42}.

Al and Pb absorption curves on the age of potassium were run. The Al curve shows a β^- component with a range of 80 mgs/cm^2 corresponding to about .3 Mev and at a range of 250 mgs/cm^2 corresponding to about .7 Mev. The lead absorption curve shows half value thickness of 3.5 mgs/cm^2 with a .4 Mev energy.

Since the potassium was produced from argon, the possible isotopic assignments are:

A (α,p)	A (α,pn)
K^{43}	K^{42}
K^{41} s	K^{40} s
K^{39} s	K^{38}

Since no positron emitter is present, K^{38} is ruled out, which leaves K^{43} as the leading possibility. This problem cannot be checked by cross bombardments, however. This may be possible with an n,p reaction on Ca^{43}.

The yield of K^{43} is 22 percent. Plans are therefore being made to prepare enough to separate this product from K^{42}.

Recoils: A. Ghiorso.

Experiments have been conducted to make use of recoils to do away with some of the chemistry involved in the bombardment of heavy elements.

A copper stopping block and a platinum foil, 2" by 1/4", with a film of thorium oxide were used as illustrated in Figure 2.

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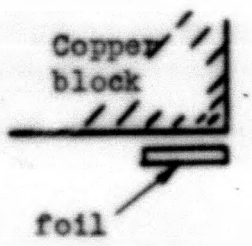

Figure 2

Bombarding to

$$D^{+} \longrightarrow Z^{A} \longrightarrow Z + 1^{A} + K$$

Th^{232} (d, 7n) Pa^{227} (5 α activities)

In a 45 minute bombardment at 180 Mev, 4 x 10^{6} d/cm. were obtained. Less than 1% landed on the foil free from target atoms, or less than 5 counts out of 15000.

It was also remarked that the target may be placed in the position shown in Figure 3 so that each deuteron passes several times through the thin foil.

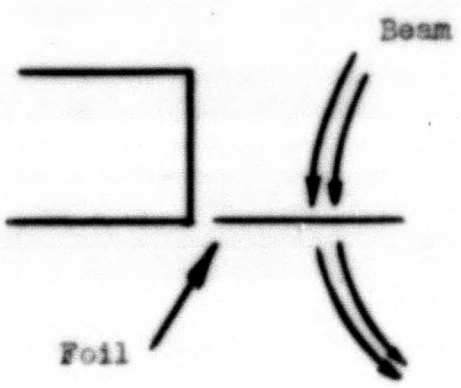

Figure 3.

S-83-A

M.I.T. Accelerator Conference. E. Panofsky.

A report was made on various accelerators described at the conference. These included TRE in England, Slater's accelerator at M.I.T., Skagg's work on betatron injection, Trump's Van de Graaf machine at M.I.T., and the 12 Mev Los Alamos machine.

Cosmic Rays. Prof. Louis Le prince - Ringuet, France

Professor Leprince-Ringuet displayed a number of photographs of stars obtained at Montblanc. The first example shown in Figure 4 was taken at 4,400 meters, exposed three weeks; some fading resulted.

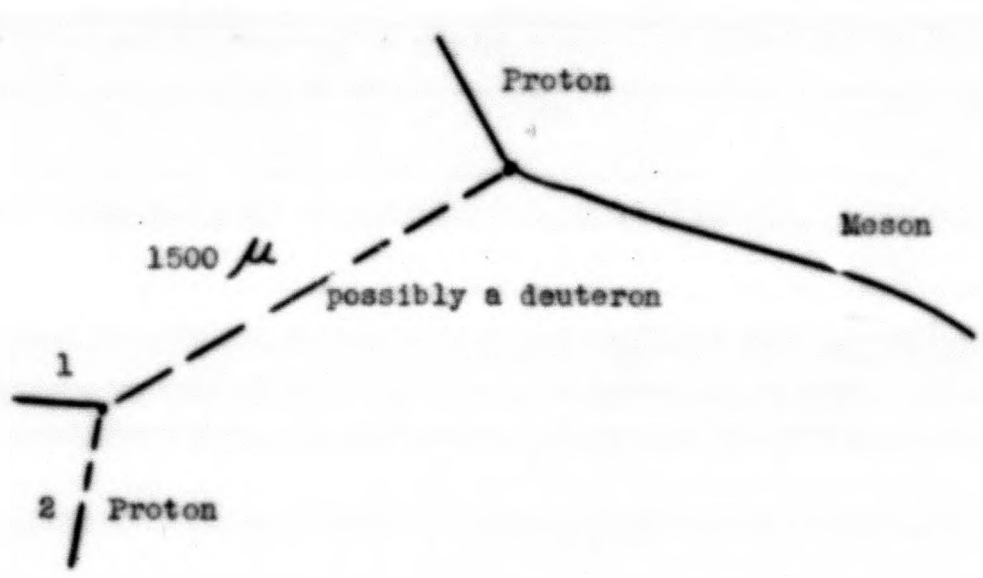

Figure 4.

The ratio of masses is 2.0/2.1. The emission of a deuteron in the star is an experimental fact.

Figure 5 shows a simultaneous emission and two gradually widening tracks, both ending in the emulsion. The ratio of masses is 2.00 and fading cannot be considered because of the simultaneous emission.

5835

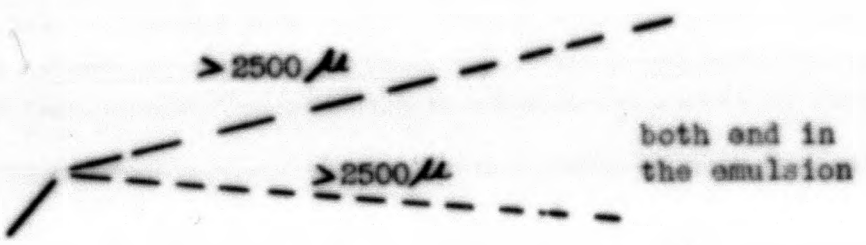

Figure 5.

Figure 6 showed a track which was thought to be a very heavy meson.

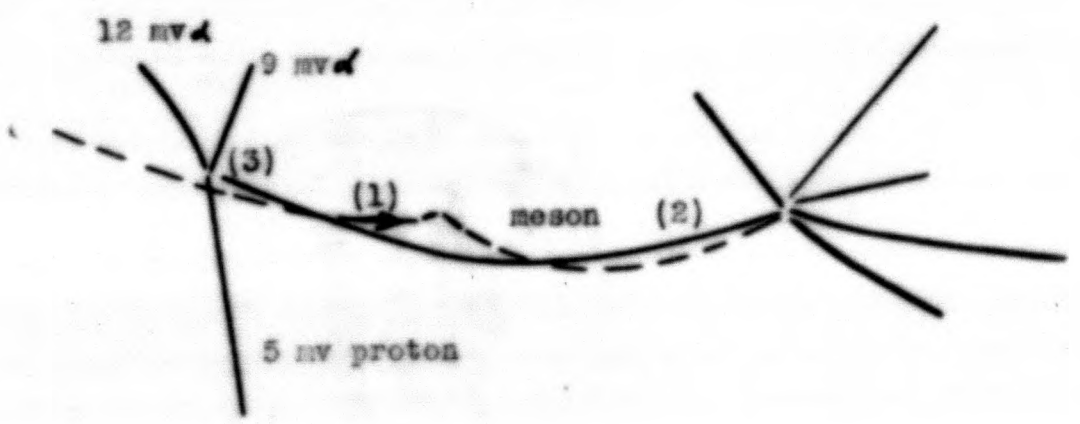

Figure 6.

Track 1 which stopped in a star is the one which could possibly be a very heavy meson. Grain counting shows the mass to be between a meson and a proton. It is probably a heavy meson with a mass of > 700 em.

Another photograph was shown of a disintegration with 34 prongs emanating in all directions. Forty-four charges were ejected which nears 47, the mass of silver, the heaviest element in the plate.

583.6

END