TABLE I. Ratio of $e^-/e^+$ scattering by platinum.

| Kinetic energy (Mev) | $e^-/e^+$ exp (percent) | $e^-/e^+$ (unscreened theory) (percent) |
|---|---|---|
| 0.7 | 3.15± 5 | 2.74 |
| 1.0 | 3.13± 4 | 2.90 |
| 1.3 | 3.60±10 | 2.98 |

having suffered a mean scattering of 57.6°, were predominantly single scattered particles. The equipment was best adapted to studying the ratio of electron to positron scattering as a function of $Z$ and the energy. Therefore comparison with theory was made by assuming that the theoretical ratio,[6] $e^-/e^+$, for polystyrene of 1.08 was correct and then using this datum to normalize the apparatus. For heavy nuclei it is necessary to take into account the screening of the nucleus by the atomic electron shells. Calculations for the scattering of electrons by heavy atoms have been made by Mohr,[7] but we know of no similar calculations for positrons. For 1.0-Mev electrons on platinum one finds from Mohr's theory that the screened nucleus should scatter more strongly than the unscreened by a factor of 1.12. However, positrons will behave somewhat differently because of a tendency to remain farther from the nucleus. There may also be other differences between electrons and positrons in a screened field. Pending the working out of calculations for positrons in a screened field, we can only compare our ratio $e^-/e^+$ with theory using a Coulomb field. Table I shows that our results agree only approximately with unscreened calculations. Presumably the discrepancy is to be explained by neglect of screening. The experimental errors quoted are just the statistical errors caused by a limited number of counts; we assume that our equipment behaves the same for positrons and electrons.

It is a pleasure to acknowledge the help of the Oak Ridge National Laboratory in providing the $Ce^{144}$, and we are particularly indebted to Mr. Dean Cowie of the Department of Terrestrial Magnetism for kindly providing the $Ga^{66}$. We also appreciate the help of Dr. Fulbright and Dr. Goeckermann in preparing the sources. One of us (H.J.L.) is indebted to the DuPont Company and the Hercules Powder Company for fellowships early in the course of this work.

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## The Reaction $C^{14}(n,\gamma)C^{15}$

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HUDSPETH, Swann, and Heydenburg have recently reported[1] the production of $C^{15}$ by the reaction $C^{14}(d, p)C^{15}$. They bombarded both "normal" $BaCO_3$ and $BaCO_3$ containing about 40 percent $C^{14}$ and obtained a $\beta$-emitter from the latter with an energy of 8.8 Mev and a half-life of 2.4 seconds. This they assigned to $C^{15}$. Using this data they have calculated the mass of $C^{15}$ to be at least 15.01434 a.m.u. If this transition does not go to the ground state of $N^{15}$ the mass will then be correspondingly greater. The reaction $C^{14}(n, \gamma)C^{15}$ should accordingly take place with an energy release greater than 2 Mev.

We have attempted to prepare $C^{15}$ by the above reaction. If there is to be no doubt as to the proper assignment of the activity, the active and inactive $BaCO_3$ must be shown to be chemically identical, since the short half-life precludes any chemical separation after the irradiation. To ensure chemical identity both the active (6 atom percent $C^{14}$) and inactive $Na_2CO_3$ were reduced to elemental carbon using the same technique and the same reagents.[2] This reduced the impurities present and guaranteed, if not purity, at least the presence of the same impurities. Both active and inactive samples of elemental carbon were bombarded with neutrons in the rapid action "rabbit" of the Chalk River NRX pile. We have been unable to detect any activity which could be ascribed to $C^{15}$.

Lithium was bombarded under identical conditions and the resulting $Li^8$ observed. This is a $\beta$-emitter with a half-life of 0.88 second and a maximum energy of 12.7 Mev. Using the value of 33 millibarns[3] for the reaction $Li^7(n, \gamma)Li^8$, we have set limits for the capture cross section of $C^{14}$. If the half-life of $C^{15}$ is 2.4 seconds, then the cross section of $C^{14}$ for thermal neutron capture must be less than 1 microbarn.

A full report of this work is being submitted to the Canadian Journal of Research.

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## Low Energy Electrons at the End of μ-Meson Tracks

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ELECTRON sensitive nuclear track plates (Eastman NTB-3) were exposed to cosmic radiation in the stratosphere by means of meteorological balloons. A systematic search has been made for meson tracks which stopped in the emulsion. 158 mesons were found which fulfilled this requirement. Of these, 36 are $\sigma$-mesons, 14 are $\pi$-$\mu$-decays, and 4 are $\pi$-$\mu$-$e$-decays. The remaining 104 mesons show no associated tracks other than electron tracks. Low energy electrons (10 kev$<E<$60 kev) are observed to originate from the ends of 17 of these tracks. Figure 1 shows an example of such an event. The number of low energy electrons from mesons is in rough agreement with the results of Occhialini[1] and of Franzinetti.[2] In three cases, two low energy electrons are observed to originate from the end of the same meson track. No low energy electrons and high energy decay electrons have been observed from the end of the same track. The spectral energy histogram of 20 low energy electrons, originating from mesons, is shown in Fig. 2.

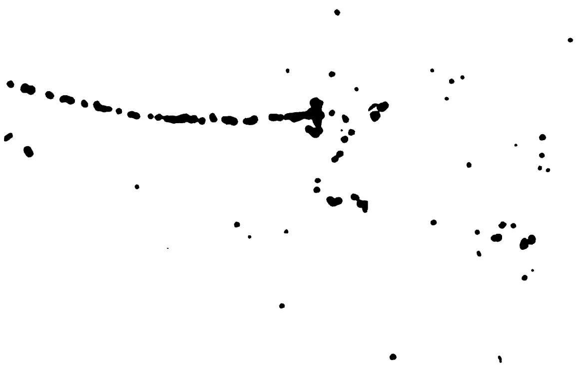

FIG. 1. Mosaic of a meson and two low energy electrons. The meson entered the emulsion from the left. The electron at the very end of the meson doubled back upon itself giving a false impression of the grain density. The electron to the right and below the meson has an energy of 45 kev.