referred to in reference 2; therefore, it is felt that the present values of σ_i and σ_d and, hence, of σ_i/σ_d are more nearly correct.

The author wishes to thank T. Holstein for his continued interest and helpful discussions of this problem.

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[4] Using Eq. (5) we find the ambipolar diffusion coefficient of argon ions in helium to be $D_a{}^A p=905$ (cm²/sec)-(mm Hg). These measurements are discussed in detail in Part II of reference 1.
[5] The gases used were Airco reagent grade helium, neon, and argon (impurity $\sim 1:10^4-10^5$). The vacuum system used pumped to 10^{-9} mm Hg and exhibited a rate of rise of gas pressure of $\sim 10^{-10}$ mm/min. See D. Alpert, Rev. Sci. Instr., to be published.

The Energy of the Metastable State of Ba^{135}

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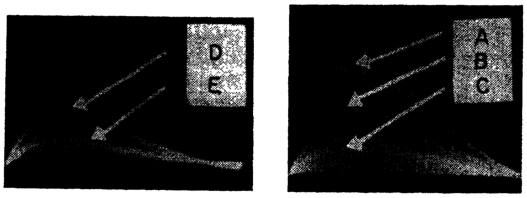
Up to the present time the only information existing in the literature on the radiations from the metastable state of Ba^{135} arises as a result of absorption measurements.[1-3] The energy of the gamma-ray has been reported to be 0.3 Mev and that of the internal conversion electron 0.28 Mev. Ba^{135} lies in that region of the chart of nuclides, running roughly from Ag^{111} to Ba^{137}, in which a large number of isomeric states are found, owing to the fact that the $s_{1/2}$, $d_{3/2}$, and $h_{11/2}$ shells are being filled competitively. Since there appear to be certain regularities in the energy of filling the $h_{11/2}$ shell,[4] it was considered important to obtain an accurate value for the energy of the metastable state of Ba^{135}. The energy of the gamma-ray from Ba^{135} was measured with the help of a scintillation counter and that of the internal conversion electrons in a magnetic lens spectrometer.

The Ba^{135} was made by the bombardment of barium with 11.5-Mev deuterons in the Indiana University cyclotron. After chemical separation for barium the only periods found were the 85-min period of Ba^{139} and the 28.7-hr period of Ba^{135}. The 38.6-hr period of Ba^{133} was not seen.

The gamma-rays were investigated with the help of a scintillation spectrometer consisting of a NaI(Tl) crystal and an RCA 5819 photomultiplier tube. The pulses from the photomultiplier were fed through a cathode follower and then to a linear amplifier. The amplified pulses triggered the sweep of a Tektronix Model 514D oscilloscope. Time exposures[5] of the pulses displayed on the oscilloscope were taken with a camera using Eastman Panchromatic Super XX film. The exposure times varied from 10 seconds to several minutes depending on the intensity of the source.

The instrument was calibrated using the gamma-ray from Cs^{137} at 0.660 Mev and the linearity of the instrument was checked by measuring the 1.12-Mev gamma-ray of Zn^{65}, the 1.33-Mev gamma-ray of Co^{60}, and the two gamma-rays of Os^{185} at 0.878 and 0.648 Mev. The latter two gamma-rays arise from orbital electron capture and were measured in a magnetic lens spectrometer by Bunker, Canada, and Mitchell,[6] and with a scintillation spectrometer using a differential pulse height sorter by Miller and Wilkinson.[7] The photographs in the present experiments show strong photo- and Compton peaks for a gamma-ray of 0.620 Mev and a weaker photopeak for a line at 0.870 Mev, together with a strong x-ray line at 60 kev coming about as a result of *K*-capture.



(a) (b)

FIG. 1. (a) Photoline of the 267-kev gamma-ray in Ba^{135} appears at D, and the corresponding Compton distribution appears at E; (b) the photoline and the Compton distribution for the 660-kev gamma-ray in Cs^{137} appear at A and B, respectively. The line at C is due to backscattering of the 660-kev gamma-ray.

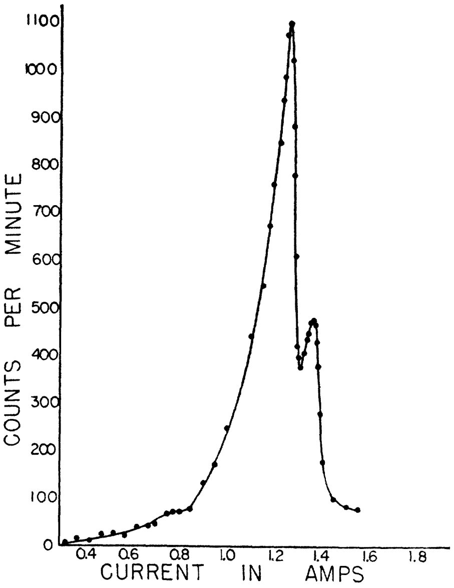


FIG. 2. Internal conversion electrons from Ba^{135}.

A photograph showing the results of the Ba^{135} investigation is given in Fig. 1(a) together with a photograph of Cs^{137} [Fig. 1(b)] for comparison. A photopeak and a Compton peak for a line at 0.270 Mev are clearly seen.

A "beta-ray" source of Ba^{135}, rather thick on account of the low intensity, was investigated in the magnetic lens spectrometer. The results are shown in Fig. 2, in which are seen a *K*- and an *L*-peak corresponding to the *K*- and *L*-conversion for a line of energy 0.267 Mev. The decay of these lines was followed in the spectrograph, and it is certain that they arise from the 28.7-hr Ba^{135}.

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On the Structure of Te II*

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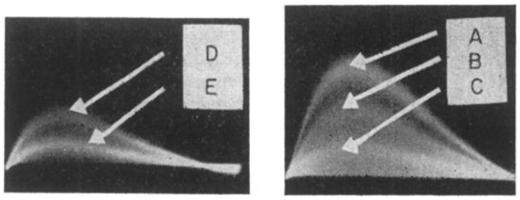
Of the spectra of all atoms, those of tellurium are among the least known. On the basis of new measurements of lines from a hollow-cathode source (JSR) and an electrodeless discharge (FAP), vacuum-arc Zeeman-effect data (JCvdB), and new hyperfine structure data (KM and JSR), we have made some progress in finding and interpreting the energy levels in the first spark spectrum, as shown in Table I.



(a) (b)

FIG. 1. (a) Photoline of the 267-kev gamma-ray in Ba^{135} appears at D, and the corresponding Compton distribution appears at E; (b) the photoline and the Compton distribution for the 660-kev gamma-ray in Cs^{137} appear at A and B, respectively. The line at C is due to backscattering of the 660-kev gamma-ray.