show that the 5*f* levels of the heavy elements lie deep within the electronic structure. A crude calculation of the spin-orbit interaction for 5*f* electrons in uranium gives a value of 40,000 cm^{-1} for the energy. This is larger by factors of ten to one hundred than the crystalline field-orbit interactions which have been estimated in the case of the rare earths. Assuming the correctness of our present theoretical knowledge of the heavy elements, it is doubtful that 5*f* electrons are sufficiently accessible to crystalline field effects to give rise to a quenching of the orbital moment.

The magnetic susceptibility of uranium tetrachloride, UCl_4 has been measured by Bommer[4] who found a Weiss-Curie law obeyed above 300°K. The magnetic moment calculated from his data is 2.71 Bohr magnetons, and is in agreement with the "spin-only" formula also.

The magnetic behavior of the halides of tetravalent uranium is in pronounced contrast with that of the oxalate, sulfate, and acetylacetonate[5] whose magnetic moments are in agreement with the existence of a $^3H_4$ state, corresponding to trivalent praesodymium among the rare earths.

It is a pleasure to acknowledge the help and criticism of Dr. S. A. Goudsmit in writing this letter, and the opportunity to make some of the measurements while the author was a member of the Institute for Nuclear Studies at the University of Chicago.

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The Disintegration of Cs^{137}

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In a previous letter[1] it was reported that Cs^{137} (33 yr.) has a simple beta-spectrum with an end-point energy of 0.550 Mev and a gamma-ray of 0.663-Mev energy, partially internally converted (12 percent).

Subsequent coincidence-counting experiments revealed no beta-gamma-coincidences. However, coincidences were found between conversion electrons and the associated

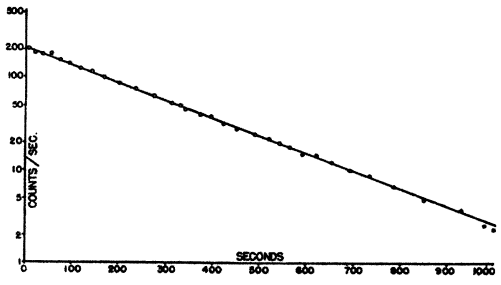

FIG. 1. Decay of Ba^{137} excited state.

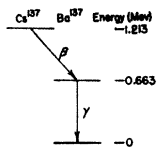

FIG. 2. Decay scheme of Cs^{137}.

x-rays. A critical absorption experiment to determine the x-ray energy was performed by placing aqueous solutions containing Sn, Sb, Te, and I between the source and one of the counters. The x-rays were found to be characteristic of Ba, indicating that the gamma-rays are emitted from the excited Ba nuclei which follow the beta-decay of Cs.

The large internal conversion coefficient and lack of beta-gamma-coincidences led to an investigation of the life of the Ba^{137} excited state. Sulfate ions were added to a solution containing the active cesium, which was then placed in contact with solid $BaSO_4$ (barite). The $BaSO_4$ was washed and examined for activity. The half-life of this gamma-activity, plotted in Fig. 1, is 158±5 sec.

The simple decay scheme of Fig. 2 is proposed. The long lifetimes of the Cs^{137} and excited Ba^{137} nuclei indicated that large spin changes are involved in both beta- and gamma-transitions. The spin of the ground state of Ba^{137} is known to be $\frac{3}{2}$. Although it is probably impracticable to measure directly the spin of the excited Ba nucleus, at least it would seem feasible to measure the spin of Cs^{137} directly by the atomic beam method used by Zacharias to measure K^{40}.[2] One millicurie of Cs^{137} contains about 5×10^{16} atoms, more than enough for such a determination.

We wish to thank Dr. H. Primakoff for the suggestion concerning the measurement of spin. This work was supported partly by the Office of Naval Research.

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A Note on Ethylene Self-Quenching G-M Counters*

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Investigations have been made on the effects of various quenching gases in varying percentages and total pressures on the characteristics of argon-filled G-M counters. Four polyatomic gases, alcohol, ether, ethylene, and cyclopropane, were used with argon in percentages of 10, 20, 30, and 40 and with total pressures from 6 to 14 cm. Four cylindrical G-M counters each with a different cathode (aluminum, gold, brass, and magnesium) were filled simultaneously with each of the filling mixtures, in turn, under conditions which were as nearly as possible identical and reproducible. This insured that for each counter the only variable was the gas filling.

After each filling, all the counters were examined for plateau slope and length, threshold, dead time, and multiple