higher excitation energies by using more energetic bombarding particles. However, since it is apparently a general rule that the width of a virtual state increases with increasing excitation energy, and since broad states are difficult to detect, it does not seem very probable that a state will be found at higher excitation energy.

The predicted existence[1,2] of two states in He^4 has not been confirmed by experiment. The calculations leading to this prediction were performed in 1936. It would be interesting to repeat these calculations using more recent estimates of the ground-state wave function.

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Nuclear Moments of Am^{241} and Am^{243}†

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The following values have been derived from measurements of hyperfine structure in the spectrum of americium: $\mu_{241}=+1.4$ nm, $Q_{241}=+4.9\times10^{-24}$ cm², $\mu_{241}/\mu_{243}=+1.00\pm0.01$, $Q_{241}/Q_{243}=+1.00\pm0.01$.

HYPERFINE structure in the americium spectrum has been measured in high orders of a 30-foot spectrograph and values derived for the dipole and quadrupole moments of Am^{241} and Am^{243}. Although the Am I and Am II term analyses are still quite incomplete it appears fairly certain that the low terms in each case are analogous to those of Eu as previously suggested.[1] Many of the strong spark lines with wide hfs have patterns indicating comparable splittings in both upper and lower states, from which the ground $5f^77s\ {}^9S_4$ and ${}^7S_3$ structures can be determined directly. Within experimental error both terms obey the interval rule exactly for $J=4$ and $J=3$, respectively, giving another confirmation of the presence of S states from an f^7 core.

TABLE I. Hyperfine structure and nuclear moments of Am^{241} and Am^{243}.

Am II $5f^77s$	$A({}^9S_4)=+(79.5\pm1.0)\times10^{-3}$ cm^{-1}
	$B({}^9S_4)=-(0.027\pm0.02)\times10^{-3}$ cm^{-1}
	$A({}^7S_3)=-(88.1\pm0.9)\times10^{-3}$ cm^{-1}
	$B({}^7S_3)=+(0.002\pm0.01)\times10^{-3}$ cm^{-1}
	$\sigma(5f^7)=-(4.3\pm0.7)\times10^{-3}$ cm^{-1}
	$a(7s)=+(666\pm6)\times10^{-3}$ cm^{-1}
Am I $5f^77s7p$	$A({}^{10}P_{9/2})=+(57.8\pm0.1)\times10^{-3}$ cm^{-1}
	$B({}^{10}P_{9/2})=-(0.12\pm0.01)\times10^{-3}$ cm^{-1}
	$A({}^{10}P_{7/2})=+(48.0\pm0.1)\times10^{-3}$ cm^{-1}
	$B({}^{10}P_{7/2})=+(0.054\pm0.001)\times10^{-3}$ cm^{-1}
	$\mu_{241}=+1.4$ nuclear magnetons
	$Q_{241}=+4.9\times10^{-24}$ cm^2
	$\mu_{241}/\mu_{243}=+1.00\pm0.01$
	$Q_{241}/Q_{243}=+1.00\pm0.01$

On the other hand the intense arc lines λλ 6054 and 6405 have simple flag patterns with considerable deviation from the interval rule, corresponding to $J=9/2$ and $7/2$, respectively, and supporting the assumption that these lines are transitions from $5f^77s7p\ {}^{10}P_{9/2}$ and ${}^{10}P_{7/2}$ to the unsplit $5f^77s^2\ {}^8S_{7/2}$ ground state. Following the treatments of Schmidt[2] and Casimir[3] we derive the values shown in Table I, where

$$\Delta T=\tfrac{1}{2}AK+B[K(K+1)-(4/3)I(I+1)\cdot J(J+1)],$$
$$K=F(F+1)-I(I+1)-J(J+1),\quad I=5/2.$$

The values of A and B were calculated from measurements on the Am^{241} exposures. While the Am^{243} exposures were too light to permit a complete evaluation of the A's and B's, corresponding intervals in Am^{241} and Am^{243} patterns were measured and compared to obtain the ratios of the moments.

The dipole moments were calculated from the Goudsmit-Fermi-Segrè formula assuming $n^3=10$ and $d\sigma/dn=0$; this procedure introduces an uncertainty of perhaps 10–20 percent in addition to the uncertainties in the splittings listed in Table I. There is a further uncertainty in the case of the quadrupole moments owing to possible perturbations from other terms, although this appears unlikely because both P terms give essentially the same value. No Sternheimer correction was applied to the Q's. The uncertainty in the use of the conventional formulas for so heavy an atom is impossible to estimate.

The dipole moments correspond to an odd $f_{5/2}$ proton, but the quadrupole moments have the wrong sign for a single particle, and equal Q's are somewhat unexpected.

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