LETTERS TO THE EDITOR

Prompt publication of brief reports of important discoveries in physics may be secured by addressing them to this department. Closing dates for this department are, for the first issue of the month, the eighteenth of the preceding month, for the second issue, the third of the month. The Board of Editors does not hold itself responsible for the opinions expressed by the correspondents.

Communications should not in general exceed 600 words in length.

Nuclear Spin and Magnetic Moment of Li^6

The spin of the Li^6 nucleus and the h.f.s. separation, $\Delta\nu$, of the $^2S_{\frac{1}{2}}$ state have been measured by the atomic beam method of zero moments. The apparatus was that used in the work of K^{41}.[1] As in the case of potassium a study was made of the beam intensity as a function of the current in the tubes producing the inhomogeneous magnetic field. The resulting curve was analyzed for the determination of the spin and $\Delta\nu$.

One zero moment peak due to Li^6 was found in the region indicated by the measurements of Fox and Rabi.[2] No other peaks were found, which suggests a spin of 2/2 or 3/2. However, on the basis of this evidence alone a spin of 4/2 or greater could not be excluded, since the Li^7 background for currents lower than that corresponding to the Li^6 peak could mask any additional zero moment peak.

By extending the method of analysis used to determine the spin of K^{41} [1] and Rb^{87} [3] it was found possible by means of the Li^7 peak data to calculate the Li^7 background in the neighborhood of the Li^6 peak and thus obtain a difference curve due to the Li^6 zero moment atoms alone. The intensity and shape of this resultant Li^6 peak is in excellent agreement with the expected intensity and shape for a spin of 2/2, as is shown in Table I. The ratio of the currents at which the Li^6 and Li^7 peaks occur was found to be

$$I_P(\mathrm{Li}^6)/I_P(\mathrm{Li}^7)=0.193\pm 0.8 \text{ percent}.$$

This yields

$$\Delta\nu(\mathrm{Li}^6)/\Delta\nu(\mathrm{Li}^7)=0.290\pm 0.8 \text{ percent}.$$

Taking the value 0.0267 cm^{-1} for the $\Delta\nu$ of Li^7 as given by Fox and Rabi[2] we obtain

$$\Delta\nu(\mathrm{Li}^6)=0.0077\pm 0.0001 \text{ cm}^{-1}.$$

The ratio of moments for the two isotopes of lithium is given by

$$\mu_6/\mu_7=[\Delta\nu(\mathrm{Li}^6)/\Delta\nu(\mathrm{Li}^7)]\times[\{2I/(2I+1)\}_6/\{2I/(2I+1)\}_7]=0.258\pm 0.8 \text{ percent}.$$

Using the value 3.28 for the moment of Li^7 as calculated by Breit and Doerman[4] we obtain 0.85 nuclear magnetons for the magnetic moment of Li^6.

TABLE I.

	Expected			Observed
	2/2	3/2	4/2 or greater	
Peak intensity in percent	2.86	2.15	1.72 or less	2.7±.2
Half width of Li^6 peak / Half width of Li^7 peak	1.63	1	.77 or less	1.6±.2

It is of considerable interest to note that this value is the same as that reported for the deuteron.[5]

We are indebted to Professor I. I. Rabi and others of this laboratory for their interest and assistance.

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S. Millman

Columbia University,
July 18, 1936.

[1] Manley, Phys. Rev. **49**, 921 (1936).
[2] Fox and Rabi, Phys. Rev. **48**, 746 (1935).
[3] Millman and Fox, Phys. Rev. **50**, 220 (1936).
[4] Breit and Doerman, Phys. Rev. **36**, 1262 (1930).
[5] Kellogg, Rabi and Zacharias, Am. Phys. Soc., Rochester meeting, 1936.

The Electric Moment of the $^1\Sigma_+$ to O^+ Transition in the Continuum of Cl_2

In the course of a theoretical discussion of the continuous spectrum of chlorine, Gibson, Rice and Bayliss[1] evaluated the matrix component of the electric moment giving the value as $4.77\times 10^{-10}\times 0.016\times 10^{-8}$ e.s.u. cm. Mulliken[2] has since pointed out that there is an error in this calculation, as it does not agree with the value $4.77\times 10^{-10}\times 0.067\times 10^{-8}$ e.s.u. cm, obtained from the formula

$$D^2_{n''n'}=(3hC/8\pi^3)\int(k_\nu d\nu/\nu).$$

(In this formula we follow the notation of Gibson, Rice and Bayliss; in particular note that our $k_\nu N$ is equal to Mulliken's k_ν.) We have found that the discrepancy was due to an arithmetical error in our calculation, and we now obtain $4.77\times 10^{-10}\times 0.073\times 10^{-8}$ e.s.u., which would seem to be in sufficiently good agreement with Mulliken's value. This correction has no effect on the rest of our calculations.

It may be of interest to remark that Mulliken's formula for $D^2_{n''n'}$ may be shown by comparison with the formulas of Gibson, Rice and Bayliss to be equivalent, at sufficiently low temperatures where v'' is always zero, to $\Sigma^2_{E'FE'J''J'}=1$, where the summation is taken over all states of the continuum. This relation can be proven, in a manner similar to that used in the proof of spectroscopic stability,[3] by taking into account the fact that the vibrational eigenfunctions corresponding to the continuum form a complete orthogonal set.

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July 17, 1936.

[1] Gibson, Rice and Bayliss, Phys. Rev. **44**, 198 (1933).
[2] Mulliken, Phys. Rev. **46**, 562 (1934).
[3] See Van Vleck, *Electric and Magnetic Susceptibilities*, p. 137.