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 twentieth of the preceding month; for the second issue, the fifth 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.

Evidence for the Existence of Li^5

It has been suggested by Oliphant[1] that if a nucleus with mass 5 exists it must either be He^5 or Li^5, the first being the more probable. I have recently obtained evidence indicating the existence of Li^5. The mass spectra for lithium ions emitted thermally from an impregnated platinum source show a distinct peak in the mass number 5 position.

The mass spectrograph was in general the same as that described previously.[2] The accelerating potential placed on the source was 990 volts, the distance between the source and the slit was 4 mm and the operating pressure was 3×10^{-6} mm Hg. The platinum disk source was impregnated with lithium by heating to redness in contact with Li_3PO_4 for about one hour, after which the disk was scraped clean of all adhering salt.

The presence of a general background was inappreciable below the 5.5 position, while at 5.8 it was about one-third the height of the peak at 5. It seems improbable that the observed peak could have been due to any abnormality in the background. The sharpness of the peaks excludes the possibility of He^5 ions being formed in the space between the source and slit; no peak was observed for mass number 4. The thermionic emission of a doubly charged boron ion is highly improbable, especially since no peak at the 10 position was detected. The most reasonable explanation of the observed peak for mass number 5 is, therefore, that it is due to Li^5.

The abundance ratios obtained for the various lithium isotopes were independent of the magnitude of the resolved current. A ratio of $Li^7/Li^6=11.60$ was again observed while the ratio for the new peak was $Li^7/Li^5=20{,}000\pm1000$. These values are for the positive ion ratios and are uncorrected for a possible isotope effect of free evaporation.

A. KEITH BREWER

Bureau of Chemistry and Soils,
Washington, D. C.,
March 28, 1936.

[1] M. L. Oliphant, Nature **137**, 396 (1936).
[2] A. Keith Brewer, Phys. Rev. **47**, 571 (1935).

Nuclear Spin of Iodine from the Spectrum of I_2

The recent work of Tolansky[1] on the hyperfine structure of the iodine arc spectrum has indicated a value of 5/2 for the nuclear spin. Previously, he had estimated[2] a value of 9/2 while de Bruin[3] had given 3/2. Inasmuch as Tolansky's conclusion is based largely on the application of the interval rule in perturbed levels, it seemed desirable to confirm it by measurement of the alternating intensities in the molecular spectrum. No alternation has been hitherto detected except in the resonance-fluorescence spectrum in the presence of a foreign gas, where alternate lines are missing.[4] This, however, tells us nothing about the nuclear spin, nor about the statistics obeyed by the nucleus.

We have measured the frequencies and the intensities of the resolved lines in some of the long wave-length absorption bands of the O_u^+, ${}^1\Sigma_g^+$ system. A 120-centimeter absorption tube, containing iodine in vacuum at 80°C, was used to photograph the spectrum in the first order of the 21-ft., 30,000 line/in. grating. The bands lying in the region of maximum sensitivity of 144 U plates are quite free from overlapping. Measurements of the frequencies in the 4,9 and the 3,9 bands, and application of the combination principle, confirmed Loomis' assignment[5] of rotational quantum numbers.

The 3,9 band is very good for intensity measurements, since here the P and R branches are well separated. The plates were calibrated with a "step-slit," and the peak intensities were read from microphotometer curves taken with the Zeiss instrument. A consistent alternation was at once apparent, lines of *odd* "K" being strong. Since the lower state is ${}^1\Sigma_g^+$, this shows that the nucleus obeys the Fermi-Dirac statistics, as expected for ${}_{53}I^{127}$. The ratio of the absorption coefficient of each strong line to the average of the two adjacent weak lines was taken throughout the P and R branches, and the average ratio in each branch determined. Twenty-seven ratios in the P branch gave 1.382 ± 0.022 and twenty-two in the R branch 1.369 ± 0.025. Since the spin is expected to be half-integral, the possible values of $g_s/g_a=(I+1)/I$ are 1.67, 1.40, 1.29 for $I=3/2$, 5/2 and 7/2. We conclude that the nuclear spin is 5/2, in agreement with Tolansky. The measured ratio is expected to be slightly low because of the effect of superimposed faint lines from other bands.

L. A. STRAIT
F. A. JENKINS

University of California,
March 24, 1936.

[1] S. Tolansky, Proc. Roy. Soc. **A152**, 663 (1935).
[2] Tolansky, Nature **127**, 855 (1931).
[3] de Bruin, Nature **125**, 44 (1930).
[4] R. W. Wood and F. W. Loomis, Phil. Mag. **6**, 238 (1928).
[5] F. W. Loomis, Phys. Rev. **29**, 119 (1927).