At the low temperature we expected on the basis of the Planck expression that the bands due to the higher frequencies of rotation would be less pronounced or decreased in a greater ratio than those due to the lower frequencies. The investigation appears not to confirm the Planck expression for the temperature chosen.

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TWO NEW LINES IN THE ALUMINUM SPECTRUM AND THEIR POSSIBLE SERIES RELATIONS.

BY G. D. SHALLENBERGER.

WHEN a high potential vacuum spark, which has been described by Millikan,[1] is applied to Al electrodes, two unidentified lines are obtained in the spectrum of this element. They are at λ 4150.6 and λ 2907.4 respectively. Both are strong, well-defined lines. The one with the longer wave-length has the higher intensity rating. It is of about the second or third order of magnitude, while the shorter line is of about the fourth or fifth, as compared with the other Al lines. The assigned wave-lengths are probably correct to .3 or .4 of an Ångstrom unit. It is hardly possible that these lines are due to impurities; since elements which have lines near these positions have other stronger lines elsewhere which did not appear on our plates and the lines of the elements which are present as impurities are faint.

While these lines are apparently not to be placed in any of the simple series, there are however some interesting numerical relations:

I.

λ	ν	Remarks.
1. { 2907.4	34,394.97	A new line
4150.6	24,092.90	A new line
	10,302.07	Frequency difference
2. { 3082.3	32,443.3	$(2, p)-(3, d)$ an arc line
4513.0	22,158.2	An enhanced line
	10,285.1	Frequency difference

Although the frequency differences between these two pairs are almost equal, it is difficult to see why the arc line λ 3082, which belongs to the first subordinate series, should be linked with the enhanced line λ 4513.

II.

1. The frequency of the line at 4150.6 is closely represented by the equation

$$v = (2, p_2, \pi_2) - B(1) - (3, p_2, \pi_2),$$
$$v = 24{,}066.32 \text{ calculated},$$
$$v = 24{,}092.9 \text{ observed}.$$

[1] Astrophysical Journal, 52, p. 47, 1920.

2. The frequency of the line at 2907.4 is fairly well represented by the equation

$$v = (2, p_2, \pi_2) - B(1) - (5, p_2, \pi_2),$$
$$v = 34{,}451.4 \text{ calculated},$$
$$v = 34{,}395.99 \text{ observed}.$$

The above symbols have the following values as given in Seriengesetze der Linienspektra by Dr. B. Dunz.

$$(2, p_2, \pi_2) = 48{,}279.51,$$
$$B(1) = 8{,}882.19,$$
$$(3, p_2, \pi_2) = 15{,}331.00,$$
$$(5, p_2, \pi_2) = 4{,}945.96.$$

While the agreement between calculated and observed values is not as close as might be desired the similarity in meaning of the two equations is suggestive.

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The Aspherical Nucleus Theory Applied to the Principal Series of Helium.

By Ludwik Silberstein.

The quantum theory of spectrum emission combined with the assumption of a non-spherical, axially symmetrical nucleus, is applied to Fowler's principal series of helium, corresponding to the fixed total quantum number $n' = 3$ and the variable ones $n = 4$, 5, etc. The theoretical 'main' components, *i.e.*, those corresponding to the passage of the electron from a circular-equatorial to a circular-equatorial orbit, are correlated with the strongest components observed by Paschen in the first five groups or members of the series and with the centres of the next two members observed (but not split) originally by Fowler. The two constants appearing in the general formula, the modified Rydberg constant N and the coëfficient of asphericity σ are thus determined. The differences between the calculated and the observed wave-lengths are all within the error limits. The finally adopted values are $\sigma = 9.334 \cdot 10^{-4}$ and $N = 109723.22$. The latter, combined with a previously obtained value of N for hydrogen, gives for the ratio of the mass of the hydrogen atom to that of the electron the value 1817. The fine-structure depending on σ, through the product $N\sigma$, is then investigated and discussed numerically in the case of the first two members of the series, the groups 4686 and 3203. The distribution of the theoretical components shows, especially in the case of the first group, some similarity to Paschen's observations, although there are superabundant theoretical components.

Eastman Kodak Company.