

LETTERS TO THE EDITOR.

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Resonance Radiation and the Quantum Theory.

In the *Philosophical Magazine* for September, 1916, Dr. Silberstein has made an attempt to explain the resonance radiation of iodine vapour on the basis of classical dynamics by assuming that the resonator is non-Hookean—i.e. that its restitutive elastic force is not simply proportional to the displacement. On this theory, the principal lines in the resonance series should appear at constant frequency-intervals, and to support this view Dr. Silberstein has given a tabular statement of the frequencies and their differences, based upon the work of Prof. R. W. Wood. A critical examination of the figures shows, however, that the frequency-intervals are by no means constant, but have a decided tendency to decrease on the long wave-length side. This has, indeed, been remarked upon by Prof. Wood himself (*Phil. Mag.*, October, 1912). I find on calculation that it is *not* the frequencies themselves, but *their square-roots*, that show constant decrements in the series. The following table, prepared from Prof. Wood's data (*loc. cit.*, p. 684) for the mercury green line excitation, demonstrates this clearly :

Serial No. <i>n</i>	Frequencies \sqrt{n} $10^{10} \times$	$\sqrt{o} - \sqrt{n}$		$\sqrt{o^{\frac{1}{2}}} - \sqrt{n^{\frac{1}{2}}}$	
		\sqrt{o} $10^{10} \times$	n	$\sqrt{o^{\frac{1}{2}}}$ $10^5 \times$	$n^{\frac{1}{2}}$
0	54937.5	...	—	...	—
1	54279.0	...	658.5	...	141.0
2	53646.9	...	645.3	...	138.5
3	53013.0	...	641.5	...	137.0
4	52386.0	...	637.8	...	137.7
5	51759.0	...	635.7	...	137.6
6	51144.0	...	632.3	...	137.3
7	50523.0	...	630.7	...	137.4
8	49911.0	...	628.2	...	137.3
9	—	—	—	—	—
10	48696.0	...	624.1	...	137.2
11	48096.0	...	621.9	...	137.1
12	47493.0	...	620.4	...	137.2
13	46902.0	...	618.1	...	137.2
14	—	—	—	—	—
15	45726.0	...	614.1	...	137.1
16	45147.0	...	611.9	...	137.0
17	44562.0	...	610.3	...	137.1
18	43983.0	...	608.6	...	137.4
19	43419.0	...	606.2	...	136.9
20	42855.0	...	604.1	...	136.9

The constancy of the figures in the last column over twenty lines seems altogether too striking to be accidental, and rather suggests an analogy with Moseley's law for the high-frequency spectra of the elements, according to which the square-roots of the frequencies of the K and L characteristic radiations increase by equal steps with the atomic number of the element—that is, on Sir E. Rutherford's theory, with the charge on the nucleus. If, in the same element, we imagine a configuration (permanent or quasi-stable) of the atom, in which the electrons revolve in successive concentric rings, the effect of the nucleus and all the other electrons on any one electron may be approximately represented by a single nucleus of proper equivalent charge; and a mechanism in which this equivalent charge, corresponding with the successive electrons in the atom, varies by successive equal steps would, on the quantum theory, exhibit the phenomena of resonance radia-

tion, as in the case of iodine vapour. It seems possible that this idea may find application in the fuller development of Bohr's theory of spectral series.

T. K. CHINMAYAM.
210 Bow-Bazar Street, Calcutta, October 15.

An Optical Phenomenon.

In addition to the accounts in NATURE referred to by Mr. J. W. Giltay in your issue of November 22, the phenomenon mentioned by me in NATURE of October 18 had previously been far more fully described by Dr. John Aitken in a paper "On a New Variety of Ocular Spectrum" in the *Journal of Anatomy and Physiology*, vol. xiii., p. 322; and, as stated in this paper, the phenomenon noticed by Mr. C. Carus Wilson (NATURE, October 25), when travelling by train in a rear coupé compartment, was described by Prof. Silvanus Thompson in the report of the British Association for 1877. Dr. Aitken experimented with rotating discs divided into about twenty-four sectors, white and black alternately, and with endless bands of paper with black bars painted across them. A convenient way of viewing the apparent motion was to look at a sheet of mottled paper, after looking at the rotating disc or moving band, when the markings on the paper appeared to move in a contrary direction to the exciting impression. Though some of the mottlings seem to flow past the others, it was found by Dr. Aitken that a straight line drawn across "the spectral stream" did not appear to be bent, as one might have supposed would be the case. If, after viewing the rotating disc, another similar disc or the drawing of a wheel is looked at, the second disc or the wheel appears to rotate in a contrary direction to the first; but if the second disc is larger than the first, or the spokes of the wheel are extended to a greater size than the rotating disc, "this extension will entirely destroy all appearance of rotation, and the wheel will appear at rest. Do not these last experiments suggest that the seat of illusion is deeper than the retina?"

C. J. P. CAVE.

December 3.

THE CONTROL OF THE NON-FERROUS METAL INDUSTRIES.

BEFORE the war the world's markets for the majority of the non-ferrous metals were very largely controlled by a group of German metal companies engaged primarily in buying metals and acting as selling agents for producers. How complete this control was few people knew. The outbreak of war disclosed it in all its formidableness. The most important of these concerns was the Metallgesellschaft of Frankfort-on-the-Main. This place was the centre of certain German financial interests which had combined to establish the Metall Bank and the Metallurgische Gesellschaft. In one way or another this great organisation had established financial interests in metal undertakings, not only in Germany and Austria, but also in the U.S.A., the United Kingdom, and various parts of the British Empire.

This enormously powerful group of companies controlled the world's metal markets, of which Frankfort became the centre. Their connections with other undertakings and their ramifications were exceedingly complicated and difficult to control. In some instances there was a direct financial connection; in others the connection was