not exist in the infra-red region of frequency. We are, of course, here not discussing the low-frequency or elastic solid vibrations in which the discrete atomic structure is not explicitly involved.

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[1] Raman, C. V., Ind. J. Physics (1928).
[2] Raman, C. V., *Proc. Ind. Acad. Sci.*, A, **18**, 237 (1943).
[3] Krishnan, R. S., *Proc. Ind. Acad. Sci.*, A, **19**, 216 (1944).

X-Ray Crystallography of Kojic Acid

At a time when its identity was uncertain, specimens of the compound isolated by M. A. Jennings and T. I. Williams[1] from *Aspergillus effusus* were examined in order to determine its molecular weight. The compound was later shown to be kojic acid. It forms monoclinic needles elongated along [100] and showing the forms {100}, {010} and {021}. The following data for the unit cell were obtained from X-ray oscillation photographs: $a = 3\cdot85$, $b = 18\cdot4$, $c = 8\cdot84$ A.; $\beta = 74°$, correct to about $\pm$ 1 per cent.

Absent spectra indicate that the space group is $P\,2_1/c$ and the density determined by flotation in an ethylene dibromide-bromobenzene mixture is $1\cdot559 \pm 0\cdot006$. The space group allows any even number of molecules in the cell, and if four molecules are assumed the molecular weight is 142 ± 3. This value is in good agreement with the formula $C_6H_6O_4$ (mol. wt. 142) and with the quantitative analysis and cryoscopic determination of F. Traetta-Mosca[2].

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[1] *Nature*, **155**, 302 (1945).
[2] *Ann. Chim. Applicata*, **1**, 477 (1914).

Long Duration of the Balmer Spectrum in Excited Hydrogen

Lord Rayleigh has reported recently[1] the results of a new experimental determination of the duration of the emission of hydrogen Balmer lines, H_α, H_β and H_γ. Hydrogen (pressure $0\cdot2$ mm. mercury) was excited by an electrodeless discharge in a tube having the form of a square ring connected with a side tube, through which it was exhausted. Each discharge (of very short duration) produced a luminous jet squirting out of the discharge space, along the tube. The light emitted by the jet contained the Balmer lines in question. From the measurements of the speed of the jet (by means of a revolving mirror) and of the decay of luminosity at various distances along the tube, the durations of these lines were determined. In some conditions they appeared to be roughly one thousand times greater than the values calculated theoretically as well as those given by previous experiments. As Lord Rayleigh states, the difference of behaviour of the lines is not very marked, and not always noticeable.

Since, presumably, one of the purposes of Lord Rayleigh's paper was to rouse discussion, I should like to put forward a possible explanation of his unexpected results. The mean duration of lines is not always identical with the mean life in initial states of corresponding transitions. This would be the case only if no transitions from higher levels to the initial level of the line (cascade transitions), no recombination of ions, no transfer of excitation energy from atoms or molecules in metastable states, no 'imprisonment' of radiation, etc., took place. From these possibilities the first two, namely, cascade transitions and recombinations of ions, seem to be not excluded in Lord Rayleigh's experiments. Thus the most probable cause of the prolonged duration of the H_α, H_β and H_γ lines seems to be the recombination of atomic hydrogen ions.

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[1] Rayleigh, *Proc. Roy. Soc.*, A, **183**, 26 (1944); cf. also *Nature*, **155**, 84 (1945).

Vibration in Telegraph Wires

Two winters ago while motoring over a route traversed daily for many years, we observed this phenomenon for the first time. Hence the conditions giving rise to it must be rather exceptional. The vibration was so striking and unusual that we stopped the car to exclude the possibility of adventitious optical effects from that source. The time was about 9.15 a.m.; the air clear and 'frosty'; the sun brilliant; and the wires heavily loaded with ice. There was a barely perceptible breeze blowing *across* the road.

On the left side of the road were the usual telegraph wires, and on the right a group of four thicker insulated wires carrying lighting current. Both sets, although obviously under very different degrees of tension, were vibrating with considerable amplitude. The effect was general over several miles of road. Ultimately the right-hand wires changed direction and ran off sharply at right-angles to the road (that is, parallel to the wind stream). No vibration could be observed in this stretch. Later we ourselves turned right (that is, down wind) and here the standard telegraph wires also ceased to show any vibration.

In attempting an explanation several factors were reviewed. (1) The physical effect of temperature on the vibrating system, as defined by the 'sonometer' formula, can be ignored, as a drop of 40° C. only affects the rate by about $0\cdot1$ per cent. (2) From the dissimilar behaviour of the wires orientated across and parallel with the wind stream, we may safely presume that this cross flow is an essential factor. (3) Genesis from some random specific 'air velocity vibration resonance' correlation may be excluded, as two entirely dissimilar sets of wires were simultaneously in vibration.

In view of the above, we reached the conclusion of Gilbert *et al.*[1] that the vibration is initiated and maintained by the differential pressure effects resulting from an air flow across a wire of non-circular section; that this abnormal source of energy explains the abnormally high amplitude; that the visual effect is aided and intensified by the greatly increased thickness of the wires, and by the loading of the wires reducing the vibration rate below the threshold at which the persistence of vision obscures observation[2].