Nature (*London*) **128** 795 (1931)

Atoms and molecules as Fitzgerald oscillators

In his studies on the polarisation of scattered radiations, Bhagavantam,[1] besides recording numerous cases in which the displaced lines in the spectrum of the light transversely scattered by liquids exhibit complete depolarisation, also discovered in the case of sulphur trioxide liquid an anomalously polarised line. The depolarisation of this line exceeded unity; in other words, the horizontal component, instead of being weaker, as in normally polarised lines, was actually stronger than the vertical component. Critical and systematic investigations undertaken by S Venkateswaran definitely confirm the existence of such anomalous polarisation in the spectra of light-scattering by various organic liquids, and indicate that it is by no means an unusual phenomenon.

The maximum depolarisation which a rotating electric dipole or Hertzian doublet can yield is 6/7 or 3/4 according as the incident light is common or plane polarised. It would seem, therefore, that we have to seek in some new direction for an explanation of the large depolarisations and anomalous polarisations so frequently encountered in light-scattering. It is proposed in this note to put forward, with all reserve, the suggestion that an atom or molecule scattering light may, in certain cases, function as a Fitzgerald oscillator or magnetic doublet. As electrons and nuclei in atoms and molecules are known to possess magnetic moments, there is nothing inherently improbable in this idea, and it offers an immediate explanation of anomalous polarization in light-scattering. For what is normal polarisation for an electric oscillator is anomalous for a magnetic oscillator and *vice versa.*

A test of this idea is furnished by working with *polarised* incident light, and finding how a variation of its plane of polarisation affects the intensity of the given line in the spectrum. The conditions for maximum and minimum intensity for a Fitzgerald oscillator are the reverse of what they would be for a Hertzian doublet, the intensity of the line being a maximum when the magnetic force instead of the electric vector in the incident light is perpendicular to the direction of observation, and a minimum in the converse case. Venkateswaran has found liquid thiophene to be an excellent example of a substance which simultaneously gives normally polarised, unpolarised and anomalously polarised lines, and is, therefore, very suitable for the experiments. Polarising the incident light, and varying its plane of polarisation, he has discovered that normally polarised lines

[1] *Indian J. Phys.* (1930) **5**, 59 and 603.

show maximum intensity, while anomalously polarised lines give minimum intensity, and *vice versa.*

The hypothesis that atoms and molecules may function as magnetic oscillators appears, therefore, to receive support from experiment. It should be remarked, however, that anomalous polarisation may also be explained as due to radiation from electric quadrupoles.

C V RAMAN

210 Bowbazaar Street, Calcutta
28 September