well (Fig. 1), ascribed by Oldenberg (rather doubtfully) to the union of Cl^+ and Cl^-. The arrows indicate the approximate positions of the middle band of the new spectrum about 385 $\mu\mu$; about a dozen of these bands can be made out on the photographs, the interval being about 10 $\mu\mu$; they fade off in intensity about equally on either side of the brightest band, but on the ultra-violet side they begin to exhibit a structure, which, however, cannot be studied with the low dispersion at our disposal.

The new spectrum appears to resemble somewhat, but not to be identical with, one described by L. and E.

FIG. 1.

Bloch (*Comptes rendus*, **184**, 744 ; 1927) obtained by passing an oscillatory electrodeless discharge through a tube containing sodium chloride.

The explanation first considered was that the heat of the flame produces chlorine atoms inside the zone of combustion and hydrogen atoms outside. The union of these atoms produces sufficient energy to give rise to radiation in the ultra-violet region, and if this is absorbed by the chlorine molecule might give rise to a resonance spectrum. But the bands are produced in the outer zone of the flame, which points to the molecule of hydrogen chloride as the emitter. The fine structure is being examined with the help of Prof. Curtis of Newcastle.

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Changes in Nitrocellulose when Exposed to Light.

LORD RAYLEIGH mentions (NATURE, Oct. 27) that celluloid containing malachite green changes to a red colour when exposed to sunlight. He rightly remarks that this change is caused by the nitrocellulose and not by the camphor present in the celluloid. Berthelet and Gaudechon (*C.R.* **153**, p. 1220 ; 1911) found that oxides of nitrogen are liberated when nitrocellulose is exposed to ultra-violet light. It has also been known for some time that 'solarised' nitrocellulose becomes acid.

The production of the deep red colour is apparently due to the nitrogen oxides liberated, since it can be shown that malachite green (= Victoria green) acquires a deep red coloration with nitrous acid. Nitric acid produces a greenish-yellow colour in dilute solutions. Both colours fade on standing.

It may be of interest to mention that the wavelength most effective (per quantum absorbed) in causing acid decomposition of nitrocellulose is about $\lambda = 3100$ A., and does *not* correspond to the greatest absorption power of nitrocellulose. A more detailed account of the photochemical decomposition of nitrocellulose was given in a recent paper by DeVore, Pfund, and Cofman at the last meeting of the American Chemical Society, and will be published in the near future.

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The Average Life Period of an Atom.

THE unwary reader of Dr. J. H. J. Poole's letter (NATURE, Dec. 22, 1928, p. 960) would not gather that I had suggested any explanation of the heat conducted out of the earth that is not of radioactive origin. On the theory I have given at various times it is original heat, a relic of the earth's primitive fluid state. When Dr. Poole says, "We can only attribute the remaining 13 per cent to the apparently stable elements," he indicates that he has not read the theory that he appears to be quoting. Allowance for heat due to other sub-atomic changes would decrease the amount due to radioactivity more than that due to original heat.

Dr. Poole also says that "it is only by assuming a rather arbitrary distribution of radioactivity with depth that we can ensure that the earth as a whole is cooling." The upward concentration of radioactive matter is not assumed in order to ensure that the earth as a whole is cooling, but in order to co-ordinate the facts of the temperature gradient in the earth's crust, the radioactivity of surface rocks, and the law of heat conduction. When this is done, the cooling of the earth follows as a consequence : it is not a hypothesis. The alternative hypothesis mentioned by Dr. Poole begins by rejecting the law of heat conduction.

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Ultra-Violet Raman Spectrum of Water.

So far, the study of the Raman effect has been confined to the visible region of the spectrum only. By the use of an all-quartz apparatus similar to that of glass used by Prof. Wood (*Phil. Mag.*, Oct. 1928), I was able to obtain the effect in the ultra-violet region for water in two hours. Fig. 1 shows that for every bright line in the mercury arc spectrum, there is a

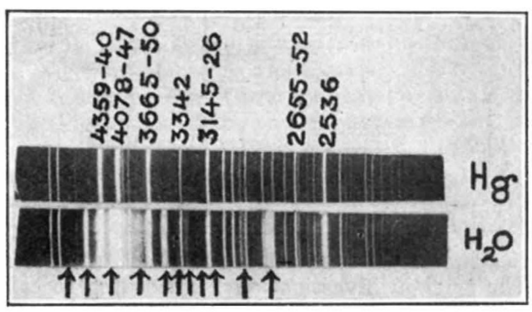

FIG. 1.

Raman band in the spectrum of the light scattered by water. There are altogether eleven bands clearly noticeable in the spectrum, which are marked with arrows. Measurements of the wave-lengths of these Raman bands have shown that water has an absorption band at $2{\cdot}97 \pm 0{\cdot}05$ μ, in close agreement with the values ranging from $2{\cdot}95$ μ to $3{\cdot}06$ μ from previous infra-red absorption measurements.

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Dec. 10.