Raman Effect in Paramagnetic Crystals.

VARIOUS crystalline sulphates have been examined for their Raman spectra by the same method as that used for crystalline nitrates and described previously (NATURE, Mar. 22, p. 463). The results indicate what appears to be a very remarkable influence of the paramagnetism of the cation on the intensities of the Raman lines. This appears very clearly when we compare the spectra of ferrous sulphate crystals ($FeSO_4$, $7H_2O$) with those of other isomorphous sulphates, for example, magnesium or zinc. In the latter substances, a strong line appears with a frequency shift of about 980 cm.$^{-1}$. This frequency is characteristic of the SO_4^{--} ion, though its exact value shows considerable variations with the cation present in the crystal. In the spectrum of the ferrous sulphate crystals, however, the line fails to appear even when exposures are given of such duration that the feeble continuous spectrum accompanying the mercury lines comes out strongly on the plate. With aqueous solutions of ferrous sulphate, however, the SO_4^{--} line appears feebly.

That the disappearance of the SO_4^{--} line with ferrous sulphate crystals is connected with the paramagnetism of the substance is indicated by the fact that in other paramagnetic sulphates, as, for example, those of copper and manganese, the characteristic SO_4^{--} line appears only weakly. A similar weakening of the line due to NO_3^- inactive frequency is also noticeable on comparing the nitrates of copper and manganese with the nitrates of other metals. The observations indicate that when the substance is in solution, the influence of the paramagnetism of the cation weakens or disappears.

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Submarine Cable Interference.

THE description given by E. T. Burton [1] of his measurements of audio frequency interference is of great interest, and would be more so if quantitative values of the interference levels had been given. The similarity between the natural interference experienced on an untuned aerial and a cable is to be expected, but details of the depth and armouring of the cable would be valuable to estimate approximately the attenuation of the higher frequencies. Mr. Burton does not state whether a local earth was used, or a sea earth contiguous to the main cable; nor the length of the latter, if used.

An attempt at correlating the 'intermediate frequency' interference with the strength of the aurora borealis might meet with success; this suggestion is supported by (*a*) the partial correlation with magnetic disturbance, (*b*) the higher level at night, and (*c*) the interference level being on the increase when observations were apparently discontinued in September 1929. Extremely heavy and rapidly varying earth currents were observed at the Horta end of the Bay Roberts-Horta (1928) cable during the evening of Sept. 8, 1928, simultaneously with exceptional aurora at Bay Roberts.

The practical importance of interference measurements on submarine cables lies in the limit set by the interference level to the smallness of the received signals, and hence to the permissible amplification, both at low frequencies for telegraphy and at audio frequencies for telephony. The recent suggestions for a loaded trans-Atlantic telephone cable [2] will depend for their success on the degree to which natural and artificial interference can be eliminated, as for example by long, resistance-terminated sea earths, or by screening the cable by a high-permeability alloy. This will be realised when it is stated that an overall amplification of the order of 150 decibels will be required at about 2200 to 2500 c.p.s.[3]

The programme of tests on the La Panne-Lisbon cable, to be laid by the Telegraph Construction and Maintenance Co., Ltd., for the Italcable Co. later this year, includes the recording of telegraph frequency interference (from 0 to 200 c.p.s.) at La Panne. Should sufficient time be available, I hope to extend these observations to cover the audio frequency range. At this location, with a long length of cable in shallow water down the Channel, it is anticipated that the industrial interference will be very heavy; but the character and intensity of natural interference may be similar to that obtained at Trinity Bay.

A. L. MEYERS.

Telegraph Construction and Maintenance Co., Ltd.,
18 Wharf Road, London, N.1,
July 15.

[1] E. T. Burton: NATURE, **126**, p. 55; July 12, 1930.
[2] K. W. Wagner: *Elektrische Nachrichten-Technik*, **6**, p. 125; April 1929. H. C. Channon: *Jour. I.E.E.*, **67**, p. 500; April 1929. See also *Jour. Am. I.E.E.*, **48**, p. 635; August 1929.
[3] N. W. McLachlan: *Electrician*, **103**, p. 704; Dec. 6, 1929.

The Green Ray.

THE extract from a letter to NATURE by R. W. Wood (vol. 121, 1928, p. 501), in Sir Napier Shaw's recently published "Manual of Meteorology", vol. 3, suggested to me that an observation of the green ray I obtained last spring might be worth recording.

Wood remarks that the ray is more likely to appear when the horizon at which the sun sets is markedly colder than the air close above it.

While descending in clear weather as a passenger in a motor-car into a valley in Kincardineshire I watched the artificial sunset due to the obscuring of the sun by a hill some three miles away, the country being several inches deep in snow; the sunset occupied about five seconds; the last-disappearing edge of the sun turned from orange through yellow to a grass green. In spite of the rapid sunset which should have been unfavourable for seeing any green ray, the sharp increase of temperature with height usual above a snow surface appears to have produced a sufficiently high dispersion.

O. F. T. ROBERTS.

The University,
Aberdeen, July 3.

Plasmoidal Discharges in Gases.

IN the issue of the *Physical Review* of April 1, 1930, there appears a paper by Prof. R. W. Wood on high frequency discharges in gases at low pressure in which he describes a type of discharge, naming it a plasmoid. This appears to be a new name for a phenomenon which has been described before. In particular, it appears to be the same as a type of discharge described briefly by me in NATURE of Mar. 10, 1928. Such a discharge was also shown by Messrs. Gill and Donaldson at an exhibition during the British Association meeting at Oxford in the summer of 1926.

It does not appear that Prof. Wood has verified his references carefully. I find that a paper which was published by him in the *Philosophical Magazine* in August 1929 is referred to in his recent paper as having appeared in October 1929.

Also in his paper in the *Philosophical Magazine* of August 1929, he refers to another paper published by him in NATURE of Oct. 8, 1927, as having been published in NATURE 1926.

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Electrical Laboratory,
Oxford, June 6.