With regard to the amount of oxygen in the swamp water, it was found both by Prof. Graham Kerr and by Dr. Carter[2] that eggs and larvæ lived satisfactorily and continued their development when kept in pots and in holes in the ground, both of which were filled with swamp water; no means of supplying oxygen to this water was found necessary, so it must be that the amount of oxygen in the swamp water is enough to supply the needs of the young Lepidosirens. In this connexion I am not disposed to regard as final the estimations of the oxygen present in the swamp waters of the Chaco as determined by Dr. Carter and Mr. Beadle, for Mr. Beadle[3] has since shown that these figures are subject to a correction which may be so great as 1 c.c. of oxygen per litre.

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[1] *Proc. Roy. Phil. Soc. Glasgow*, 1909.
[2] *Proc. Roy. Phil. Soc. Glasgow*, 1928.
[3] *J. Linn. Soc. Zool.*, **38**, 258; 1932.

Magnetic Quenching of Tellurium Fluorescence

THEORETICAL considerations on magnetic quenching of iodine fluorescence have been given by Van Vleck[1]. His theory explains the effect as the breaking down of a selection rule (which forbids the radiationless dissociation), in the vicinity of the state represented on the Franck-Condon diagram as the crossing of a stable and an unstable curve.

A similar effect was investigated in this work for visible resonance series of tellurium (Te_2). The

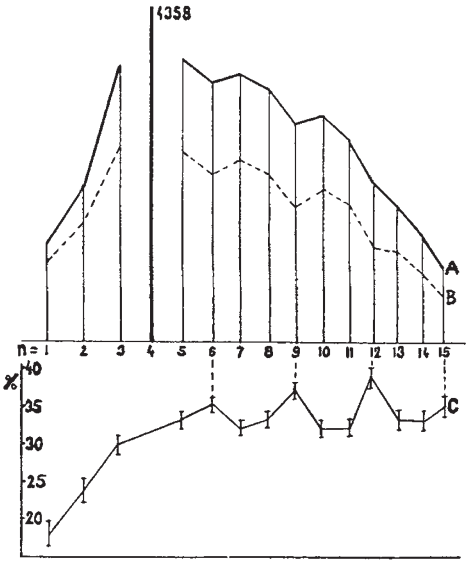

FIG. 1. Curves B and A represent the distribution of intensity in the series of λ4358 in a field of 26,000 gauss and in its absence respectively. Curve C indicates the percentage of quenching and the short vertical lines the probable error of its determination. For n see formula (1).

potential curves of Te_2 are not known very exactly but the works of Heil[2] and Hirschlaff[3] permitted the inference that there exist possibly conditions necessary for magnetic quenching. Moreover, the comparatively large atomic weight suggested that the spin-orbit interaction might appear sufficiently strongly to be the deciding factor between stable and unstable states. The resemblance of tellurium to other elements of the sixth column of the periodic classification suggested the possibility of ascribing the visible resonance series to $^3\Sigma - {}^3\Sigma$ transitions.

The electromagnet used in that work gave, in the volume occupied by the tube, a field up to 28,000 gauss. Special arrangements—a detailed description will appear later—made it possible to obtain various pressures and temperatures, the vapour being mostly superheated. The fluorescence was excited with the mercury lines λλ 4358 and 4046, and its intensity found with a Moll microphotometer.

The clearest results were obtained with vapour at saturation pressure for a temperature of 480°–520° C., and superheated to 620° C. The times of exposure were not longer than two hours, which assured a good stability of temperature. The differences of intensity for two exposures in identical conditions were found experimentally to be smaller than 1–2 per cent. The resonance series[4] of λ 4358:

$$\nu = 23{,}930 - 250{\cdot}4n + 0{\cdot}53n^2 \quad . \quad . \quad . \quad (1)$$

was measured for 11 Stokes and 3 anti-Stokes lines. The quenching in a field of 26,000 gauss amounted to about 35 per cent, and as is seen from Fig. 1, was smaller for anti-Stokes lines than for Stokes lines. The second, fifth, eighth and eleventh Stokes lines (n = 6, 9, 12, 15) which in an unperturbed series have weaker intensity than the mean intensity of their neighbouring lines, were more quenched (35–39 per cent) than the others (32–33 per cent). Neither result is in accord with the supposition that only the excited state is influenced by the field. The quenching of the resonance series of λ 4046 was measured only for the second and fourth lines and amounted to 15 per cent. Other lines were too weak to be investigated or were reabsorbed.

The magnetic quenching of fluorescence, hitherto known for iodine alone and now established for tellurium, indicates the existence of a more complicated mechanism of the effect than had been supposed.

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May 12.

[1] J. H. Van Vleck, *Phys. Rev.*, **40**, 544; 1932.
[2] O. Heil, *Z. Phys.*, **74**, 18; 1932.
[3] E. Hirschlaff, *Z. Phys.*, **75**, 315; 1932.
[4] B. Rosen, *Z. Phys.*, **43**, 69; 1927.

Number 60 in Time Measurements

WITH reference to the note in NATURE of March 4, p. 299, may I point out that the cycle of 60 years does not appear to date back before the Han dynasty (say 200 B.C.), and that the cycle of 60 before that date only occurs in the actual records as applied to days, probably back to about 2000 B.C. There are traces of a 10-day period in the ritual records and this may predate the 60-day period. T. Fergusson considered the 60-years period to have been borrowed from India and to be the cycle of conjunctions of Jupiter and Saturn in the same geocentric longitude, but beyond the fact that Szuma ch'ien used some queer foreign names for the years of the 60 cycle, there is no real evidence.

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