

carefully dried. Even when the gas was slightly wet, showing the water vapour band in the spectrum of the exciting spark, this band was still quite weak in the spectrum of the glow above the spark. This supports the view that the presence of water is not essential to the occurrence of the afterglow. The spectrum of the exciting spark consisted of the third positive and Ångström bands of carbon monoxide; the afterglow bands were also present on the spectrograms of the spark, but this does not necessarily imply that they were present in the exciting spark as the glow was also included in these spectrograms. No lines of atoms, other than those of aluminium from the electrodes, were observed in the region examined.

The effect of variation of the pressure of the gas has been studied. At a pressure of about half an atmosphere the glow was brighter, but the spectrum included a considerable amount of continuous background, resembling the carbon monoxide flame as usually obtained. At a pressure of about 100 mm. the glow was much fainter, and the spectrum more nearly resembled that of the afterglow in a vacuum tube, showing a well-marked band structure, and being comparatively free from continuum.

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<sup>1</sup> *Proc. Roy. Soc., A*, **142**, 362; 1933.

#### Absorption Spectrum of Mercuric Sulphide

WE experimented with the absorption spectrum of gaseous mercuric sulphide. The substance was introduced into a quartz absorption tube which could be heated to about 400° C. by electrical means, steps being taken to prevent condensation on the plane quartz ends. The copper and aluminium-under-water sparks were used as sources of continuous radiation. The sulphide seems to decompose very readily, and we obtained evidence only of the presence of Hg vapour by the resonance line 2536 Å. and of S<sub>2</sub> and, at high pressures, of S<sub>8</sub>, by the sulphur bands, which we identified without much difficulty. At higher pressures the overlying continuum becomes very prominent, and the banded structure disappears, as is usually the case with a gas under such conditions.

We would not have published these results were it not for the fact that recently Sen-Gupta<sup>1</sup> claims to have shown that mercuric sulphide dissociates in three regions of continuous absorption into Hg (<sup>1</sup>S<sub>0</sub>), and S (<sup>3</sup>P), S (<sup>1</sup>D<sub>2</sub>), S (<sup>1</sup>S<sub>0</sub>) respectively. We re-examined our plates in the hope of verifying this, and can only say that the separation of these distinct absorptions from the sulphur continuum must be one of very great difficulty. In fact, we cannot be sure if the first two regions are not entirely due to sulphur, which has two maxima, 4000 Å. in the S<sub>8</sub> region and 2670 Å. in the S<sub>2</sub> region. Our absorption spectra for HgS followed very closely the spectra published for sulphur at high pressures by Graham<sup>2</sup>.

The heat of dissociation of HgS has been calculated to be 60–70 kcal. This makes the reaction 2HgS = Hg + Hg + S<sub>2</sub> endothermic, so that the dissociation will be greater at the higher temperatures and pressures, and there will be a relatively larger concentration of S<sub>2</sub> compared with HgS. Consequently the interference effect due to S<sub>2</sub> will become more and more pronounced as the temperature

is raised, and it seems useless to try to increase the concentration of HgS in this way.

The whole question of the existence of an absorption spectrum of HgS would seem to centre round the electronic state of the molecule. If it is a <sup>1</sup>Σ ground state, it would not dissociate into Hg (<sup>1</sup>S<sub>0</sub>) and S (<sup>3</sup>P) as these atomic states do not combine to give a singlet state (Wigner and Witmer, Herzberg, etc.). Whether the first excited state dissociates in this way will depend on the probability of the inter-combination; so that the absorption spectrum of HgS in the necessary region may only be very slight and perhaps immeasurable.

It is noteworthy that V. and C. Meyer<sup>3</sup> found HgS to have a vapour density (compared with air) of 5.39. The vapour density of Hg + Hg + S<sub>2</sub> is not much different from this, namely, 5.35.

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<sup>1</sup> *Proc. Roy. Soc., A*, **143**, 438; 1934.

<sup>2</sup> *Proc. Roy. Soc., A*, **84**, 311; 1910.

<sup>3</sup> *Ber.*, **12**, 1262; 1879. See also Scott, *Proc. Roy. Soc. Edin.*, **14**, 410; 1887.

#### Intranuclear Spindle Formation and Mitosis in *Artemia salina*

CYTOLOGICAL studies on *Artemia* have brought out some new facts about the structure of the spindle and the morphology of the meiotic and mitotic division in this form, which agree only in part with previous hypotheses. (For a recent discussion of these, see Schrader<sup>1</sup>.) To what extent these data bear upon the general understanding of the problem of mitotic division will be considered elsewhere in more detail.

In *Artemia* the spindle, both in meiotic and cleavage divisions, is formed exclusively from nuclear material. It arises as two half-spindles from the poles of the nucleus inside the nuclear membrane, which remains intact up to early metaphase (Fig. 1 a). Its formation is accompanied by a steady loss of nuclear volume, indicating that the process involves a great reduction in the fluid content of the nucleus. During metaphase the nuclear membrane rapidly disappears.

There is a distinct structural difference between the polar fibres and the spindle fibres. The metaphase spindle is barrel-shaped and in early cleavage divisions stands out sharply against the polar fibres of the big centrospheres. It has a very similar form in the metaphase of the meiotic divisions, where there are no formed centrosomes or centrospheres, and in the late cleavage divisions, where these are only weakly developed (Fig. 1 b).

In the spindle two components can be distinguished: (1) relatively rigid fibres, immersed in (2) a less viscous matrix. During anaphase, the chromosomes move to the two poles leaving a much lighter central space (Fig. 1 b). The fibres found in this central space between the two sets of chromosomes would seem at first sight to correspond to Schrader's interzonal fibres; but in this case they appear to be identical with one component of the metaphase spindle, namely, the rigid fibres.

It may be suggested that during anaphase the chromosomes are moving as on tracks—or possibly within tubes, as suggested by Schrader—along these rigid fibres. The anaphase spindle is more cylindrical