the collecting ducts. Hargitt[7] has shown that in Diemyctylus, the lining of the ducts gives rise to the germinal epithelium from which fresh spermatogonia arise in the adult. He figures the terminal branches of the ducts

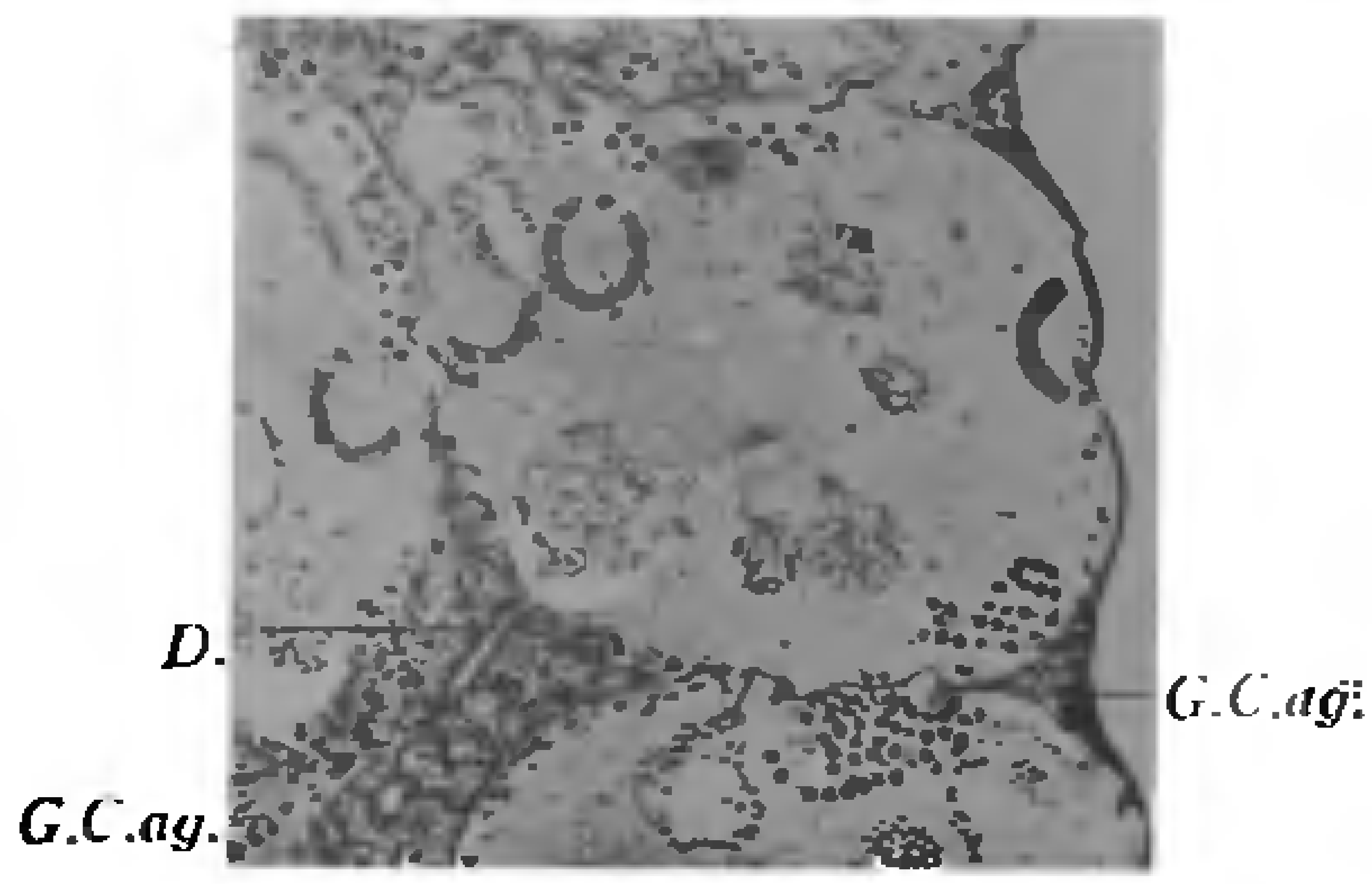

Fig. 2.

A part of the longitudinal section of a testis-lobe of Ichthyophis showing one of the locules emptying its contents into a duct. The darkly staining cell aggregations represent the source of the germ cells in the adult.

D —**Duct.** *G.C.ag.*—**Germ cell aggregations.**

ending blindly in masses of germ cells. In Amphiuma, MacGregor[8] finds the central duct of the testis capable of sending spermatogonia into the locules which are arranged in a radial manner around it. In Ichthyophis, it is not only the terminal branches of the ducts that give rise to the germ cells, but throughout its extent in the testis, the duct system is capable of developing germ cells from its lining. The similarity of the cells in the germinal epithelium on the surface of the testis and in these internal aggregations is very striking and there are reasons to believe that in both cases these cells first migrate into the locule and are later transformed into spermatogonia. Occasionally, however, mitoses may occur in these germinal cells.

A study of the spermatogenesis of this animal is in progress and the results will be published elsewhere.

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[7] Hargitt, G. T., 1924. *Journ. Morph.*, Vol. XXXIX, No. 1.

[8] MacGregor, H., 1899. *Journ. Morph.*, Vol. XV, Suppl.

Spectrum of Bi III.

The spectrum of Bi III has been analysed by Lang[1] and Mclennan[2], Mclay and Crawford. The classification of the higher transitions is identical in the two cases but of the fundamental transitions it is different. Mclennan, however, did not find $6p\ {}^2P_1$, the deepest term of the spectrum. Of the multiplet $6p\ {}^2P - 6d\ {}^2D$ of Lang the line 75924(30) belongs to Bi IV as shown by Arvidsson[3] and 74065(15) has not been obtained by Arvidsson nor is it present in the work of Lang.[4] Line 70257(10) of $6p\ {}^2P - 7s\ {}^2S$ fits well from considerations of intensity and position in the spectrum of Bi II[2] as $6p^2\ {}^1D_2 - 6p\ 6d\ {}^1F_3$, 87169(4) taken from Arvidsson's list, being $6p^2\ {}^2P_2 - 6p\ 6d\ {}^1F_3$. 101023(12) in $6p\ {}^2P - b\ {}^2S$ belongs to Bi IV[3]. The intensities of the pair $6p\ {}^2P_{1\cdot 2} - b\ {}^2D_2$ are unexpected and the pair may be fortuitous.

Extrapolating from the spectrum of Tl I and Pb II the separation of $6p\ {}^2P$ for Bi III should be about 20500. The following pairs with a frequency difference of 20790 have been obtained :—

95074(8)	96154(4)	108052(6)	108586(7)	130966(2)
74287(15)	75367(9)	87266(6)	87795(4)	110176(5)

In the first two pairs, the lines 74287 and 75367 have been already identified by the above authors as $6p\ {}^2P_2 - 7s\ {}^2S$ and $6p\ {}^2P_2 - 6d\ {}^2D_2$. 95074 and 96154 may be fixed as $6p_1\ {}^2P_1 - 7s\ {}^2S_1$ and $6p\ {}^2P_1 - 6d\ {}^1D_2$. The other pairs probably arise from $6p\ {}^2P - 6s\ 6p^2\ {}^{4,2}P.{}^2D.{}^2S$.

Due to some misprint the value of $6p\ {}^2P_2$ in Mclennan's paper is given 184390, 1000 less than the actual value. Making the correction $6p\ {}^2P_1$ is thus equal to 206180.

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Measurement of Viscosity by Oscillating Columns.

The method of oscillating columns was used for determining the viscosity co-efficients by Menneret[5] and Subrahmanyam[6], whose work both theoretical and experimental was

[1] Lang, *Phys. Rev.*, **32**, 737, 1928.

[2] Mclennan, Mclay and Crawford, *P.R.S.*, **129**, 579, 1930.

[3] Arvidsson, *Ann. Der. Physik*, **12**, 802, 1932.

[4] Lang, *Phil. Trans. Roy. Soc.*, **224**, 371, 1924.

[5] *J. Phys.*, **1**, 753, 1911.

[6] *Ind. Jour. Phys.*, **1**, 267, 1927.

found, on examination, incomplete and incapable of giving correct results. It can be shown mathematically that the logarithmic decrement for a liquid oscillating in a U tube to be $\frac{1}{2} \nu k^2 t$, where ν is the kinematic viscosity co-efficient and $k=1 \cdot 2197 \pi/a$ where a is the radius of the tube. The oscillations can be photographed and the log. dec. measured. By applying the above formula values were obtained for ν, and they agree very well with the standard values given in International Critical tables. Full details of the work will appear elsewhere.

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The Cathode Fall of Potential in Arcs.

LANGMUIR[1] has shown how it is possible to obtain a reliable estimate of the space potential and electron concentration by a study of the volt-ampere characteristics of a probe collector immersed in an ionised gas. This method has been employed by a number of experimenters to determine the cathode fall in arc discharges. Measurements have been made in the case of mercury by Lamar and Compton[2] and in the case of cadmium and thallium by Nottingham[3] and it was found by these observers that the cathode fall in each case was in the neighbourhood of the ionisation potential of the respective metals. Similar measurements have been made in a copper arc by Nottingham[4] and it is found that the cathode fall is 20·5 volts while the first ionisation potential of Cu is only 7·69 volts. It is interesting to note also that Anderson and Kretchman[5] who measured the cathode fall in a tungsten arc found it to be 16·2 volts, while the total potential across the arc itself was only 14 volts with a current strength of 12 amperes.

Measurements of a similar kind are comparatively difficult in the case of the sodium arc and the first attempt to determine the cathode fall in sodium was made by the present writer[6]. In the type of arc used by the author, the cathode was a pool of sodium with a device for restricting the movement of the cathode spot and the anode was an iron rod cooled by a stream of oil circulating through it. The cathode fall of potential was found to be 6·2 volts, the current strength in the experiments being 2 amperes. The cathode fall was found to rise up to 7·5 volts when a tungsten wire anode was used in place of the cooled iron anode. Recently F. H. Newman[7] describes a similar set of measurements he has carried out in a sodium arc carrying 5 amps. current and has found the cathode fall to lie close to 5 volts, the ionisation potential of sodium being 5·12 volts.

It is to be noted that the experimental results for the cathode fall in several metallic vapours as obtained by different observers do not show much agreement. For instance, in the case of mercury, Kömmnick and Lubcke[8] find the cathode fall lying between 9·0 and 11·3 volts in place of 10 volts as found by Lamar and Compton[9] and they point out that the cathode fall is influenced by pressure and density of the vapour. On the other hand, if the high field emission theory put forward by Langmuir[10] applies to the "cold cathode" discharge of the mercury arc type, the cathode fall for mercury shall have to exceed 13·4 volts as shown by R. C. Mason[11] from theoretical considerations based upon quantum mechanics. The discrepancy between the results obtained by the different observers and the discrepancy between the experimental and theoretical values in the case of mercury, indicate that the cathode fall is probably influenced to a marked extent by the conditions of the arc, such as current density and vapour pressure. Quite recently J. Kömmnick[12] finds that the cathode fall of potential in the mercury arc increases with decrease of the vapour pressure. This observation seems to account, therefore, for the difference in the value of 6·2 volts for the cathode fall in the sodium arc for a current strength of 2 amperes obtained by me and the value of 5 volts, corresponding to a current of 5 amperes

[1] *Gen. Elect. Rev.*, 440, 1924.
[2] *Phy. Rev.*, **37**, 1069, 1931.
[3] *Jour. Frank. Inst.*, **206**, 43, 1928.
[4] *Jour. Frank. Inst.*, **207**, 299, 1929.
[5] *Phy. Rev.*, **26**, 23, 1929.
[6] *Proc. Ind. Sci. Congress*, p. 106, 1932
[7] *Phil. Mag.*, **15**, 601, 1933.
[8] *Phy. Zeit.*, **33**, 215, 1932.
[9] *Loc. cit.*
[10] *G. E. Rev.*, **26**, 731, 1923.
[11] *Phy. Rev.*, **38**, 427, 1931.
[12] *Ann. der. Physik.*, **153**, 273, 1932.