The microspore nucleus divides giving rise to the tube and generative cells. After some time the nuclei lie free in the cytoplasm. The generative nucleus divides in the pollen grain to form two spherical nuclei, which later on become spindle-shaped. Sometimes, these male nuclei show a clear area around them, but I could not make out a definite cytoplasmic layer round them.

Usually there is a single hypodermal archesporial cell in the nucellus (Fig. 1), but sometimes there are two lying side by side or one above the other. In one case there
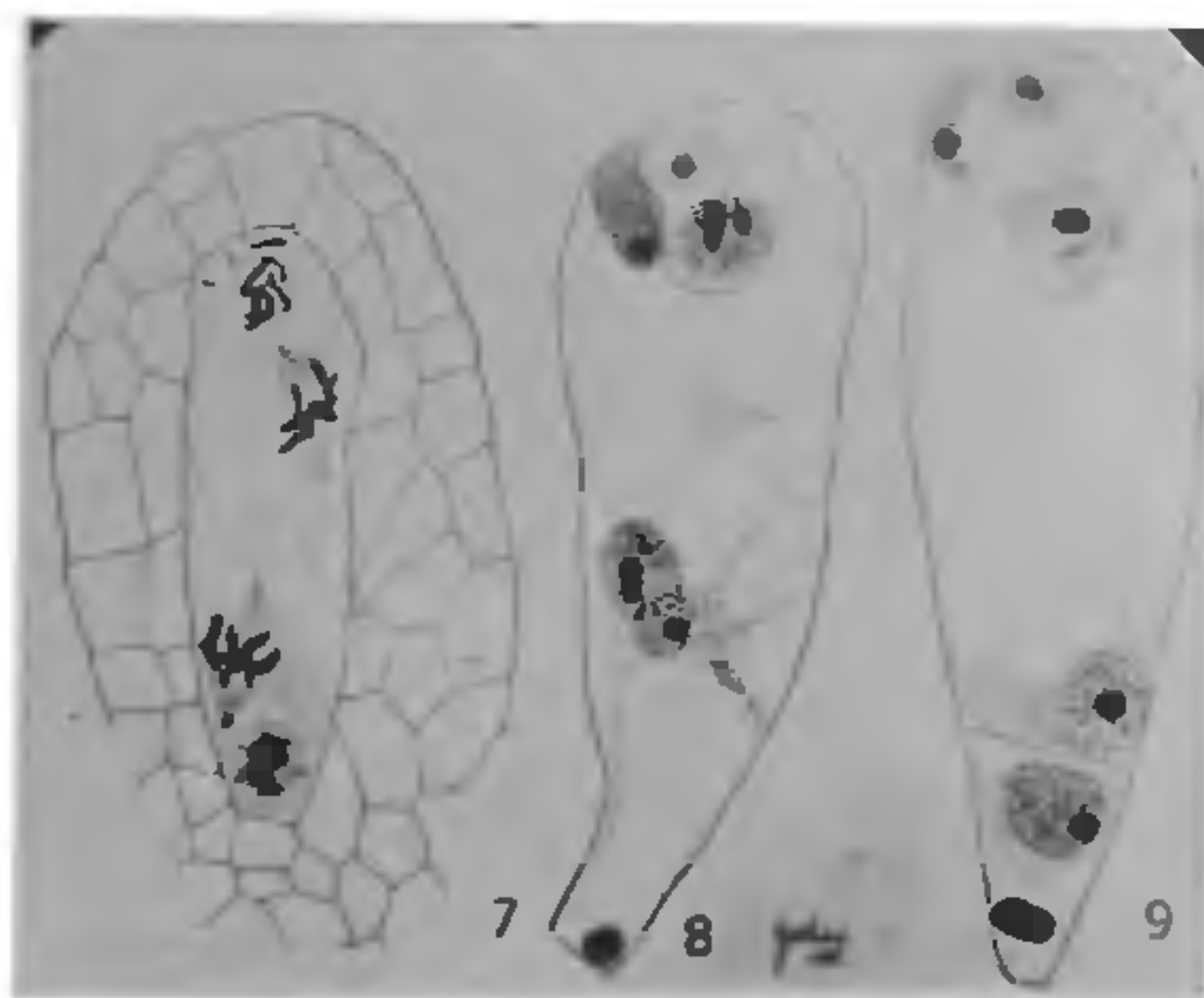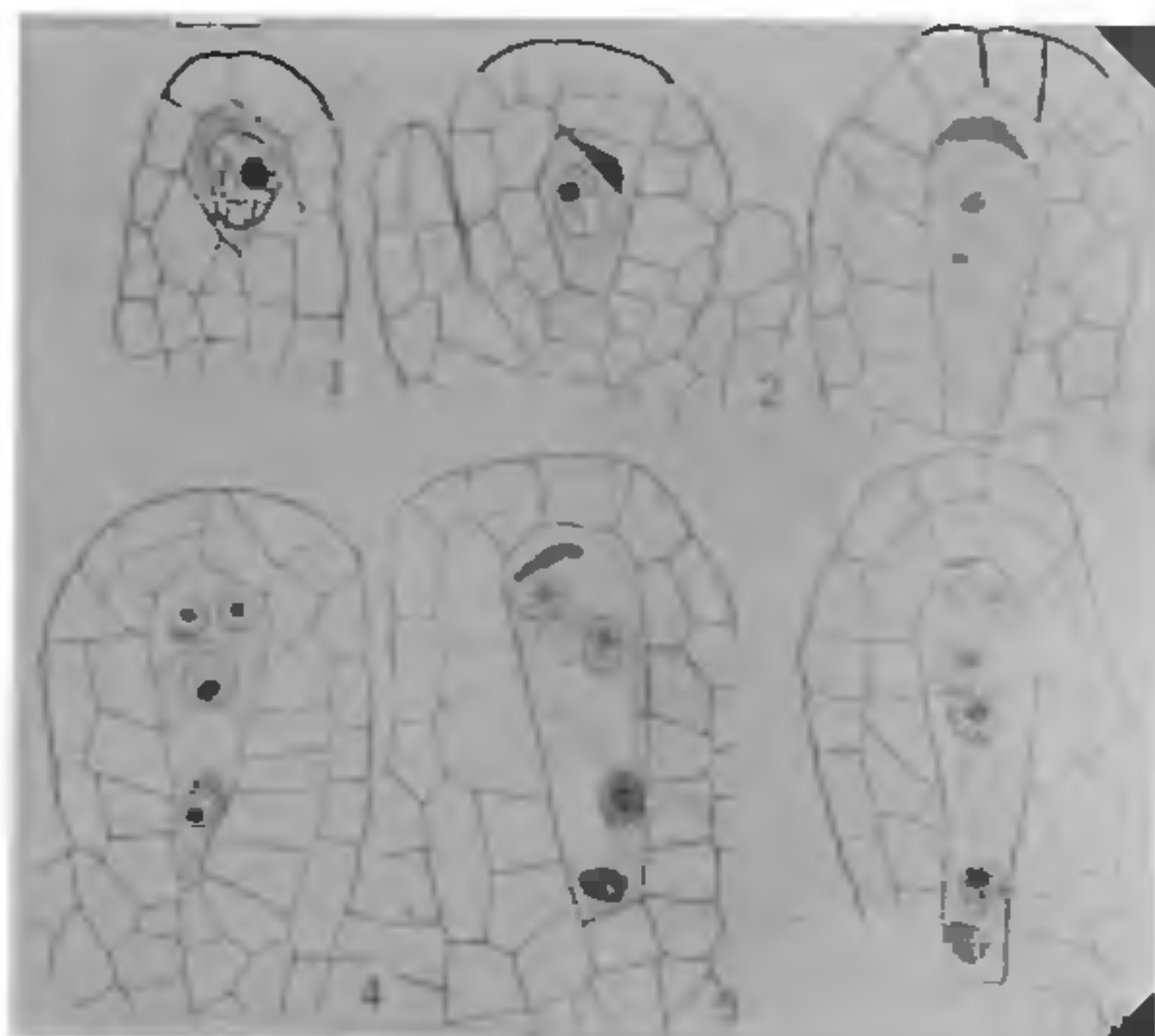
was an indication of the presence of three archesporial cells in the same nucellus.

The archesporial cell directly functions as the megaspore mother cell which divides into two cells of which the lower produces the embryo sac. The upper degenerates early (Fig. 2) but in rare cases its nucleus may divide into two before degeneration (Fig. 4).

The nucleus of the lower cell undergoes two divisions to produce a four-nucleate embryo sac (Figs. 3-5). After this stage, only the two micropylar nuclei divide in the

majority of cases and a six-nucleate embryo sac is organised as in *Limnophyton obtusifolium* and the other *Alismaceæ* investigated by Dahlgren[1] (Fig. 6). Less frequently one or both of the chalazal nuclei may also divide forming a 7- or 8-nucleate embryo sac respectively (Fig. 7). Such a variation in the number of nuclei has also been reported by Frisendahl[2] in *Elatine*. Evanescent cell plates may occasionally appear on the spindles of the embryo sac (Fig. 6).

All stages of double fertilisation have been seen. The pollen tube as it enters the embryo sac always disorganises one of the synergids. Generally the two polar nuclei and one male nucleus fuse simultaneously (Fig. 8). The fusion nucleus is situated in the middle of the embryo sac a little nearer the chalazal end.

The endosperm is of the Helobiales type. A definite wall is formed after the first division of the primary endosperm nucleus (Fig. 9), as reported by Schaffner[3] on *Sagittaria latifolia*.

The embryo is of the *Alisma-type*.

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The Band Systems of CdF.

THE spectrum of the molecule CdF as produced in the arc shows a number of band heads which are classified into two systems. One of these, the yellow-green, lies between 5300 and 5550 A.U. This system is degraded towards longer wavelengths. The other, the orange system, lies between 6025 and 6300 A.U. and is degraded towards the shorter wavelengths. The equations representing the two systems are:

[1] Dahlgren, K. V. O., " Die Embryologie Einiger Alismatazeen," *Svensk Bot. Tidskr.*, **22**, 1-17, 1928.

[2] Frisendahl, A., " Uber die Entwicklung chasmound kleistogamer Blüten bei der Gattung *Elatine.*" *Meddelanden fran Göteborgs bot. trädg.*, **3**, 99-142, 1927.

[3] Schaffner, J. H., " Contribution to the life history of *Sagittaria variabilis (latifolia)*," *Bot. Gaz.*, **23**, 252-273, 1897.

(1) Yellow-green R_2 heads :—

$\nu_{heads} =$
    $18871 \cdot 0 + [672 \cdot 38 \ (v' + \tfrac{1}{2}) - 5 \cdot 14 \ (v' + \tfrac{1}{2})^2]$
    $- [694 \cdot 29 \ (v'' + \tfrac{1}{2}) - 4 \cdot 96 \ (v'' + \tfrac{1}{2})^2].$

(2) Orange Q_2 heads :—

$\nu_{heads} =$
    $16558 \cdot 3 + [734 \cdot 36 \ (v' + \tfrac{1}{2}) - 5 \cdot 74 \ (v' + \tfrac{1}{2})^2]$
    $- [698 \cdot 34 \ (v'' + \tfrac{1}{2}) - 5 \cdot 36 \ (v'' + \tfrac{1}{2})^2].$

The yellow-green system is evidently due to the transition $^2\Sigma \rightarrow ^2\Sigma$ and the orange to $^2\pi \rightarrow ^2\Sigma$. The final level $^2\Sigma$ of both the systems appears to be the same though the frequencies of vibration and the anharmonic factors are slightly different. This discrepancy which has also been observed in the case of alkaline earth halides is probably due as Johnson[*] and Harvey[†] have pointed out, to the heads being formed at large J values and the distance $\nu_h - \nu_o$ being not constant throughout the system. The dissociation energies derived from these equations favour the following interpretation of the structure of the molecule :—

Cd $(5s \ 5p \ ^3P) + F \ (2p^5 \ ^2P) = CdF \ ^2\Sigma$ ground level.

Cd $(5s \ 6s \ ^3S) + F \ (2p^5 \ ^2P) = CdF \ ^2\pi$ and $^2\Sigma$ excited.

Details will be published elsewhere.

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On the Laws of Spreading of Liquid Drops on Filter Paper.

A LARGE number of experiments with various organic liquids such as alcohols, etc., and water has been recently made in this laboratory to discover the law or laws which govern the spreading of a single drop of the liquid on a filter paper. To prevent the effect of evaporation of the spreading drop, observations are made in a closed chamber kept saturated with the vapour of the liquid.

The liquids, so far studied, show that the velocity of spreading dies down according to two distinct exponential laws which may be put in the forms :—

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* *Proc. Roy. Soc.*, A **122**, p. 181 (1929).
† *Proc. Roy. Soc.*, A **133**, p. 336 (1931).

$$V_d = V_o \, e^{-\lambda_1 d} \qquad \qquad \qquad (1)$$
$$v_d = v_o \, e^{-\lambda_2 d} \qquad \qquad \qquad (2)$$

The second law becomes operative as soon as the influence of the first has disappeared.

A dimensional analysis of λ_1 and λ_2 leads to the following results, namely,

$$\lambda_1 = \frac{C_1}{A} \cdot \frac{(MT)^{1/2}}{\eta} \quad \text{and} \quad \lambda_2 = \frac{C_2}{v_c} \cdot \left(\frac{T}{M}\right)^{1/2}$$

where M is the mass of the drop; T the surface tension of the liquid: η the coefficient of viscosity; C_1 and C_2 are two pure numerics and A is the area of the filter paper wetted by the liquid until equation (1) holds and v_c is the critical velocity at the distance at which transition from law (1) to law (2) takes place. The critical velocity has been found to be a very definite constant for a given pure liquid, independent of the mass of the drop taken. The results observed completely verify the laws given above.

Further work on solutions of different electrolytes is in progress at present. Full details will be shortly published.

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The Condensation of 2-Chlorolepidine with Anthranilic Acid.

EPHRAIM (*Ber.*, 1892, **25**, 2710) condensed anthranilic acid with 2-chlorolepidine in absence of any solvent and suggested an anthranil structure (I) for the product, on the ground that the substance could be easily hydrolysed by alcoholic potash to an acid. Backeberg (*J. Chem. Soc.*, 1933, p. 390) supports this constitution without adducing fresh reasons, and finds moreover that the product is the same even when such solvents as nitrobenzene or acetic acid are employed (cf. E.P. 321738). Recently the present author in collaboration with Mr. D. C. Sen (*J. Chem. Soc.*, 1931, p. 2840) has studied the condensation of 2- and 4-chloroquinolines with anthranilic acid and has ascribed the general structure (II) to the products obtained