A Case of Ovoviviparousness in Adult Gall Midges (*Itonididæ*).

KHALE[1] first recorded the remarkable phenomenon of ovoviviparousness in gall midge larvæ. Later Felt[2] described this type of pædogenesis in the genera *Miastor* Mein, and *Oligarces* Mein. But the only reference in the literature to this habit in the adult gall midges is by Cotes[3], who records that Wood-Mason believed the "silver-shoot" gall midge of paddy *Pachydiplosis oryzæ* Wood-Mason, to be viviparous.

While recently working on the Indian forms of this family, I came across an undoubted case of this habit in the adults of a new species[4]. The abdomen of a female of this species was observed to be heavily loaded with numerous cylindrical, apodous larvæ, which were at first believed to be those of Hymenopterous parasites. Subsequent observations, however, proved to the contrary and it was found that they were true Itonid larvæ, hatched from eggs inside the abdomen of the mother.

After pairing of the midges, the eggs are fertilised but are not deposited by the female. The larvæ are hatched from them, retained and nourished in the abdominal cavity of the parent midge. Living maggots are then deposited after twelve days on decaying vegetable matter. When freshly extruded they are about 1 mm. long and yellowish-white in colour. Some of them are already in a far-advanced stage of development and immediately turn into pupæ. Others, however, feed on the decaying vegetable matter and pupate after a further period of development extending over a month. The adults emerge in about five days.

This habit seems to be of great advantage to the species in two ways. Not being so helpless as eggs, the larvæ have a chance of escaping parasitisation. When sufficient food is lacking, some at least of the larvæ, already well developed, can immediately pupate after being laid and turn into adults, thus providing against the entire extinction of the generation.

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September 1, 1934.

[1] Khale, W., "Die Paedogenesis der Cecidomyiden," *Zoologica*, 1908, **55**, 21, 1-80.

[2] Felt, E. P., "*Miastor americana* Felt, an account of Pedogenesis," *Bull. N. Y. St. Mus.*, 1911, No. 147, 82-104.

"Biology of *Miastor* and *Oligarces*," *Science*, 1912, **33**, 278-280.

[3] Cotes, E. C. "Notes on Indian Economic Insects," *Ind. Mus. Notes*, 1890, **1**, 103.

[4] This new species is described in a paper shortly to appear in the Records of the Indian Museum under the name *Thurauia chilkaensis*, sp. nov.

Exembryonate Seeds.

IN their interesting note recently published Joshi and Rao[1] record the formation, in *Tinospora cordifolia*, of fruits and seeds which are outwardly normal although devoid of all trace of an embryo. There is no evidence of fertilisation, indeed, even of pollination; the egg-apparatus and antipodal cells of the otherwise normal embryo-sac degenerate early, but a copious endosperm results from the fusion of the two polar nuclei; there is, of course, no triple fusion. The ovary ripens into a healthy, fleshy fruit, containing seeds which are normal except for the absence of an embryo.

The authors suggest a comparison with the case of *Cycas revoluta* recorded by Kashyap in 1921, where foreign pollen may possibly provide the necessary stimulus to the further development of the ovule[2]. But they do not refer to an important paper published earlier, in which le Goc[3] proved the influence of foreign pollen on the development of the ovule of *C. Rumphii*. In the *Tinospora*, however, there is no question even of foreign pollen. A palæbotanist is at once reminded of the fact that so many of the best preserved palæozoic gymnosperm "seeds" are totally devoid of an embryo. This fact has generally been explained on the analogy of the modern *Ginkgo*, where fertilisation is said to take place after the ovule has fallen to the ground. No such explanation will, however, apply in the present case.

But how does the *Tinospora* seed *germinate*, if at all? Whence does the *seedling* take its birth? These are obvious questions on which, it is a pity, the authors are silent. Does the endosperm itself function here as an embryo? It has been

[1] *Curr. Sci.*, 1934, **3**, 2, 62.

[2] Kashyap, *Journ. Ind. Bot. Soc.*, 1921, **2**, 120.

[3] le Goc, *Ann. Roy. Bot. Gard. Peradeniya*, 1917, **6**, 3, 187.

suggested, rather acutely, that the endosperm of the higher flowering plants is in its morphological nature a sort of embryo. No doubt the authors will pursue their enquiry, in due course, into these matters.

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On the Development of the Dorsal Arcualia in the Cervical Vertebra in Chelonia.

PREVIOUS workers[1-5] on the development of the vertebral column of Chelonia, have stated that the dorsal arcualia of the cervical vertebræ are formed from the cartilaginous basidorsals of either side to complete the neural arch. But our recent investigation disproves their findings. Mookerjee[6] has shown that in the vertebral column of Urodela the cartilaginous basidorsals of the corresponding vertebræ are situated at the middle region of the centrum. There is a third piece of cartilage, the supradorsal, which intervenes between the basidorsals of either side and leads to the completion of the cartilaginous arch. Besides this, at the anterior and posterior portions of this cartilaginous arch, there are two connective tissue arches which complete the dorsal arcualia of each vertebra. These connective tissue arches become osseous without going through the stage of chondrification, and they are thinner in cross-section than the cartilaginous basidorsals mentioned above. An identical condition, as detailed above, has been shown recently by Mookerjee in collaboration with Chatterjee[7] in the vertebral column of snakes. Now a similar condition has again been observed by us in the vertebral column of Chelonia (Figs. 1-5).

It may further be pointed out that in the intervertebral region of *Chrysemys* structures like the zygosphenes and zygantra or the fibrous tissue, characteristics respectively of snakes and newts[7] are not found; but the intervertebral region of *Chrysemys* comes closer to the anuran condition in as much as

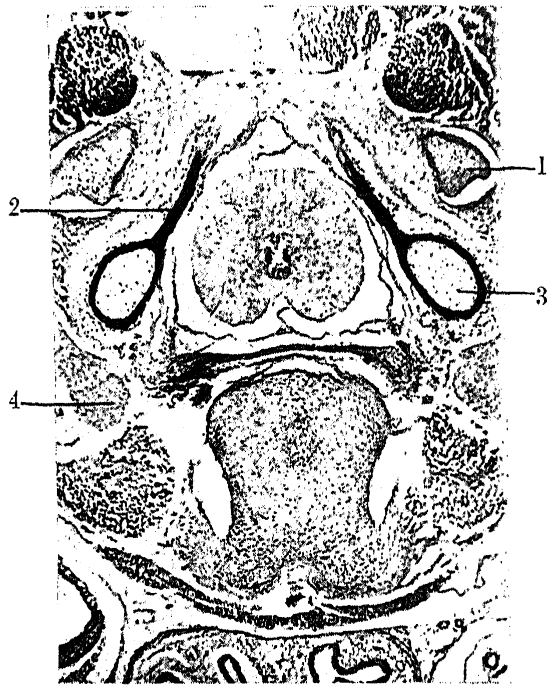

Fig. 1. ×40

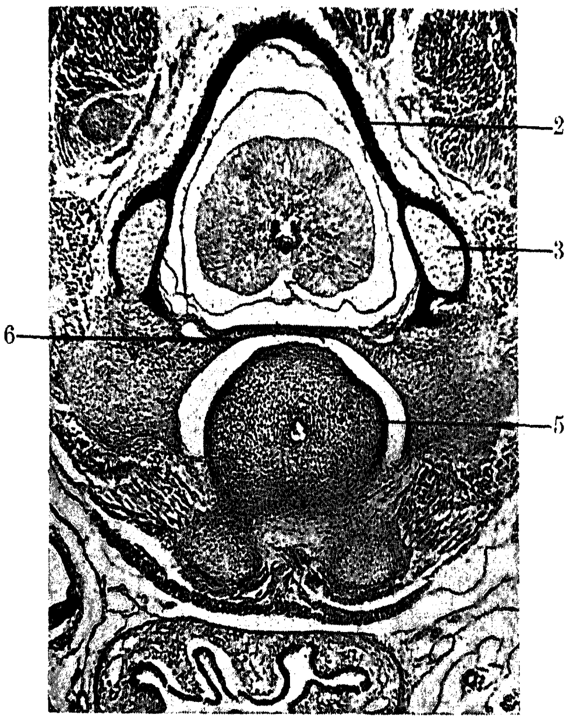

Fig. 2. ×42·5

a big gap exists between the two successive vertebræ.

Mention may also be made here of the fact that in the second vertebra of *Chrysemys*

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1 Gegenbaur, C., *Untersuchungen zur vergleichenden Anatomie der Wirbelsaule bei Amphibien und Reptilien*, Leipzig, 1862.

2 Hoffmann, C. K., *Bronn's Klassen unf Ordnungen des Tierreichs*, 1890, Bd. VI, Abt. 3.

3 Gadow, H., *Phil. Trans. Roy. Soc.*, 1896, **187 B.**

4 Gadow, H., *The Evolution of the Vertebral Column*, Cambridge, 1933.

5 Procter, J. B., *Proc. Zool. Soc. London*, 1922.

6 Mookerjee, H. K., *Phil. Trans. Roy. Soc.*, 1930, **218 B.**

7 Mookerjee, H. K., and Chatterjee, B. K., *Curr. Sci.*, 1934, **2,** 434-436.