

## Letters to the Editor.

**The Origin of the Archegonium in *Notothylas levieri* Schiff. MS.**

VARIOUS authors have proposed to separate the Anthocerotales from the liverworts and place them in a class co-ordinate with the Hepaticæ. One of the main arguments advanced in support of this view has been that while in all the other liverworts the archegonium arises from the endothecium, in the Anthocerotales it comes from the amphithecium.

My examination of *N. levieri*, a common Himalayan liverwort, shows that this distinction can no longer be maintained and favours the retention of the Anthocerotales within the Hepaticæ.

The early stages in the embryogeny of *N. levieri* conform to the usual anthocerotalean type (Figs. 1, 2), but a radical difference is seen in the origin of the archegonium. Unlike the condition observed in the other anthocerotales, the archegonium here originates from the entire endothecium (end.), while the amphithecium (amph.) forms only the wall (Fig. 3).



1 and 2.  $\times$  Ca 720.  
3.  $\times$  Ca 500.

My conclusion based on the observations of the early as well as the older stages of development of the sporogonium differs from that of Kashyap and Dutt<sup>1</sup> on the same species, which is based on the study of development from the meristematic zone at the base of the capsule and which is to the

effect that the archegonium arises from the endothecium as well as the inner layer of the amphithecium though they do not give any figures.

A very careful study has been made by me to decide this point and an examination of numerous preparations which contain embryos at practically all the critical stages of development leaves no doubt that in this species the endothecium (end.) alone is fertile (Fig. 3).

As Kashyap and Dutt have already stated there is no columella in *N. levieri*. In *N. flabellata*, a species which also lacks a columella, the late Prof. Goebel observed that the archegonium arises from the endothecium, but whether the inner cells of the amphithecium are fertile or not he could not definitely ascertain.<sup>2</sup> He remarks that these cells like the endothecial cells are rich in the protoplasmic contents.<sup>3</sup> In the young sporogonia of *N. levieri*, also, sometimes similar amphithecial cells are seen, but a comparison with the older embryos shows that these cells never produce the archegonium. This fact suggests that *N. levieri* has been derived by reduction from a species in which the amphithecium was fertile. The columellate species of *Notothylas* would thus seem to be primitive, while those without it are reduced.

Several authors (Lang<sup>4</sup>, Kashyap<sup>5</sup> and Bartlett<sup>6</sup>) have already emphasized that *Notothylas* shows signs of reduction in the species studied by them. In *N. indica* and *N. levieri*, too, as I have shown elsewhere<sup>7</sup> although the capsules usually remain enclosed within the involucre they generally open along one suture as in *Anthoceros Hallii*.<sup>6</sup>

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<sup>2</sup> In a recent paper (*Journ. Ind. Bot. Soc.*, 11, 170, 1932) I wrongly stated that according to Prof. Goebel the whole of the amphithecium gives rise to the wall.

<sup>3</sup> K. Goebel, *Organographie der Pflanzen*, Zweiter Teil, 1915-18.

<sup>4</sup> W. H. Lang, *Ann. Bot.*, 21, 201-10, 1907.

<sup>5</sup> S. R. Kashyap, *Liverworts of the Western Himalayas and the Punjab Plain*, Part I, 1929.

<sup>6</sup> E. M. Bartlett, *Ann. Bot.*, 42, 1928.

<sup>7</sup> Pande, *Journ. Ind. Bot. Soc.*, 11, 1932.

<sup>1</sup> S. R. Kashyap, and N. L. Dutt, "Two Indian Species of the Genus *Notothylas*," *Proc. Lahore Phil. Soc.*, Sec. IV, 1925.