

arrangement and development can be determined very satisfactorily.

In the vegetative portion of the hypha, the nuclei are of considerable size and lie in the inner part of the wall-lining of protoplasm. They are united by peculiar plasma threads, that run parallel or obliquely to the long axis of the hypha. The nuclei are ellipsoidal, elongated in the direction of the long axis of the hypha. One can determine the existence of a small nuclear body in each nucleus. In the hypha-ends the nuclei are nearer together. Here they are found somewhat closely connected in pairs, and lying entirely imbedded in the wall-lining of protoplasm. After the formation of the partition wall, they increase in numbers, by division, in the sporangial portion, and in the mature sporangium each zoospore contains a nucleus.

CONTRIBUTIONS TO THE LIFE-HISTORY OF NOTOTHYLAS. By D. M. MOTTIER.

[ABSTRACT.]

This paper embodies the results of a study of the development of the sporogonium and sex-organs of *Notothylas orbicularis* together with that of *Anthoceros*. These results may be summed up as follows:

The capsules of *Notothylas orbicularis* possess a columella varying in size with that of the capsule.

The columella is developed, as in *Anthoceros*, primarily in the young sporogonium with the archesporium and independent of it, and is not a secondary differentiation inside the spore chamber.

The archegonium of *Notothylas* resembles more closely that of the en-sporangiate ferns than does the archegonium of *Anthoceros*.

The antheridium arises from an hypodermal cell, thus differing in this respect from all other known *Bryophytes*.

THE ASH OF TREES. By MASON B. THOMAS.

The object for which this investigation was undertaken was to show by chemical analysis the amount of food a tree or shrub takes from the soil in its yearly growth. The method employed was to determine by a quantitative analysis of the ashes of trees and shrubs, the proportion of the mineral constituents of the soil that are found present in them. It seems