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root-cells, from which spring rhizoids terminating in multicellular disks. Others originate in the cell adjacent to the basal cell and in the cortications. In addition the first two possess a strengthening mass of intracuticular root-fibers, but Ceramium is quite destitute of them.

Thus, while of some value in showing relationships, it will be seen that the chief interest in a comparative study of the developing spores and holdfasts of the Florideæ would be in variations dependent upon differences in light, temperature, or the density of the surrounding medium, and in adaptations to vegetative reproduction.

In closing, I would acknowledge my indebtedness to Dr. Setchell, who, in 1895, suggested the holdfasts of the Rhodophyceæ as a subject that would repay investigation; to the late Dr. Humphrey, under whose helpful and suggestive direction the work described in this paper was practically begun; and to Professor Penhallow for kind advice.

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## LITERATURE REFERRED TO.

Chlorophyceen. Upsala, 1894.

2. BRANNON, M. A. — The structure and development of *Grinnellia* americana Harv. Annals of Botany 17:1. 1897.

3. BREBNER, G. — On the origin of the filamentous thallus of *Dumontia* filiformis. Jour. Linn. Soc. 30: 436. 1895.

4. DAVIS, B. M.—Development of the frond of *Champia parvula* Harv. from the carpospore. Annals of Botany 6: 339. 1892.

5. GIBSON, R. J. H.— Notes on the histology of *Polysiphonia fastigiata* (Roth.) Grev. Jour. of Bot. 29: 129. 1891.

6. OLTMANNS, FR. — Über die Cultur- und Lebensbedingungen der Meeresalgen. Jahrb. für wiss. Bot. 23 : 349. 1892.

7. OSTERHOUT, W. J. V.—On the life-history of *Rhabdonia tenera* J. Ag. Annals of Botany 10: 403. 1896.

8. STRÖMFELT, H. F. G.— Untersuchungen über die Haftorgane der Algen. Bot. Centralbl. 33: 381. 1888.