Stones of Iowa;* and lastly that of Mathews and Merrill on those of Maryland.†

The volume noted at the head of this article, bearing the date 1898 but seemingly not issued till the latter part of 1899, is the latest and most pretentious of them all, with the exception of that of the 10th Census, comprising some 566 pages with 49 full-page plates and four figures in the text. The plates include a colored geological map of the State and seven others in which the natural colors and textures of the stone are approximately reproduced by lithographic processes, the remainder being half-tone reproductions of quarry views and stone structures. The work is divided into three parts: (1) Demand, Uses and Properties of Building and Ornamental Stones; (2) Geological History of Wisconsin and Description of Areas and Quarries, and (3) Appendix, On The Composition and Kind of Stones.

The chief interest and value of the work center in part II. (pp. 75–357 inclusive), since the only information heretofore available on these points has been that given in the 10th Census report above referred to, and Merrill's Stones for Building and Decoration. The work has apparently been well and thoroughly done. By far the most interesting stones described, and the ones which on account of color may hope to find a market beyond the State limits, are the Montello, Waupaca, Waushara and Wausau granites, and the Berlin rhyolites. The brown sandstones of the Lake Superior region should, in the Middle and Western States, fill the place of the red brown Triassic stones in the Eastern. In nearly every instance samples of the stone described have been submitted to laboratory tests and their crushing strength, absorptive and general weathering properties ascertained, so far as is possible by these methods. It is a trifle discouraging to note that it was considered necessary to go to the expense and trouble of making over 100 tests of crushing strength on rocks which even a casual inspection would have shown to be sufficiently strong for all practical purposes. Concerning the value of such tests the present writer has expressed himself elsewhere.

* 8th Ann. Rep. Geol. Survey of Iowa, 1898.

† Vol. II., Rep. State Geol. Survey, 1899, pp. 241.

If one were disposed to be critical he might call attention to the carelessness manifested in some of the very few references given, and to the tendency to ignore the work of others, Professor A. D. Conover's paper of fifteen quarto pages in the report of the 10th Census, not even being mentioned. There is, further, a non-convincing air of freshness in the explanation put forward on p. 383, to account for the unfavorable action of freezing temperatures on newly quarried material.

Colored illustrations add to the attractiveness of the book, but are to some extent misleading, giving a perfection of surface and brightness of color, which the materials themselves do not possess. This is particularly the case with the red and pink granites. Plate 34 of the Lake Superior sandstone is also disappointing, as, indeed, is plate 45 of a similar subject in the 10th Census report, and plate 27 in that of the Maryland Survey. The attempt is instructive, as showing the relative merits of lithographic reproductions from colored drawings, as compared with the tricolor photographic process used in the Maryland report, the advantage however, being wholly with the latter.

Very poor taste has been shown in the arrangement of the views of quarries and structures in the half-tone plates, and particularly those numbered 4, 17, 24, 42 and 47. A picture which does not illustrate some definite feature is out of place in a work of this nature, and, if of value, it should be so oriented on the page as to be easy of reference. The fad for placing the several views on one page at varying angles with one another is not readily excusable, and in this particular case the effect is very inartistic as well.

There is much to be commended in the work, but it is not too much to say that it would be more useful if of half the size. The amount of paper involved is out of all proportion to the information contained therein.

GEORGE P. MERRILL.

Untersuchungen über die Vermehrung der Laubmoose durch Brutorgane und Stecklinge. By DR. CARL CORRENS, a. ö. Professor der Botanik in Tübingen. Jena, Gustav Fischer. 1899. Pp. xxiv + 472. 187 figs. Price, 15 M.

This extensive and very detailed work brings together a large number of observations on the vegetative reproduction of the true mosses by means of cuttings and of gemmæ, by which are meant those structures which serve, like the spores, to disseminate the plant over more or less extended distances. Interesting matters of biological interest are suggested to the mind by the analogies existing between these organs and seeds, but these will be referred to later on in the review.

The text is divided into two parts. A first or special part consists of a descriptive treatment of gemmæ and cuttings and of their behavior, arranged along taxonomic lines. The general part which follows treats of the morphological and anatomical structure of the organs under consideration, of their germination and of the conditions necessary for their occurrence and growth.

The large number of observations brought together in the special part prevent any adequate presentation in the limits of a review, so that it is possible only to point out that the great variety of asexual reproductive bodies which are found in the mosses may be reduced to a few types, viz.: the stem, leaf and protonema types. The stem type is found in those plants in which the stem is transversely breakable at intervals throughout its length, or merely at its base or apex. In this type the leaves may be reduced, resulting in bulbil formation, or the stem, to form brood-buds.

The leaf type occurs in forms in which the leaf is broken off as a whole and germinates, or is separable into fragments, each acting similarly.

True brood-bodies, so called by the author, arise only from the protonema in the wide sense, including that produced from the stem (rhizoids) and the chloronema.

The facts in this part which will interest especially, perhaps, the general botanist, are those relating to the methods by which these brood-organs are separated from the parent plant. This separation is accomplished either by the tearing of certains cells (rhexolytic) or by a splitting apart of cells by the behavior of the inner lamella (schizolytic). The rhexolytic process may be provided for by a special zone of cells or by a single cell, according to the complexity of the structure. The cell appointed for the sacrifice is called by Professor Correns a 'tmema' a term which constitutes a very picturesque addition to botanical terminology, the more so when one contemplates its compounds 'dolichotmema,' 'brachytmema' and the hybrid 'strecktmema.'

In the special part are first discussed the morphology and phylogeny of the brood-organs. Here the author advances the notion that the aërial part of the moss plant (*i. e.*, the stem and leaf) is phylogenetically older than the protonema and that it results from a reduction of the moss stem, though not, says the author, in the sense of Sachs and others, according to whom the oblique position of the transverse walls of the protonema is an indication that its terminal cell is the homologue of the apical cell of the moss stem, an explanation which, it will be conceded quite generally, is forced. According to the author's view, the forms such as *Ephemerum* and *Buxbaumia* are reduced and not primitive as to their shoot characters. This statement is probably correct in itself with regard to *Buxbaumia*, high authority to the contrary notwithstanding; though it is difficult to see why this fact may not very naturally and easily harmonize with the opinion of Goebel by supposing that a secondary reduction, correlated perhaps with the more pronounced development of the sporogonium, has taken place. This position is strengthened by the indubitable fact that analogous reduction has taken place in the sporophyte of some of the Spermatophyta.

Following is a discussion of the structure and development of brood-organs. A circle of interest centers in the paragraph in which it is pointed out that the nematogonal cells (the initial cells which give rise to protonemal structures) preserve their embryonic peculiarities, and regards this as an especially good example of the 'continuity of the germ plasm.'

The special adaptations for the abscission of brood-organs have already been referred to. It may be added that active loosening of the brood-bodies is of very restricted occurrence. In the vast majority of cases the breaking away is passive, depending on the impact of air, water and animals. The same end is held by some

observers to be attained through water absorption or drying out, and purely hygroscopic movements. Dissemination may occur by means of air and water currents, and a quite well established case is recorded in which Thysanura were responsible for carrying the brood-bodies of Aulocomnium and Androgynum. The projection of the parts bearing brood-organs above the general levels of the moss-turf is interpreted as an adaptation for dissemination through such animal forms. Hook-like organs occur (*Ephemeropsis* and *Bryum bulbilosum*), which are subject to similar teleological interpretation, though one with difficulty escapes the conviction that the point is somewhat far-fetched. Mucilaginous outer membranes, which insure adhesion to animal forms, are also present in some kinds.

Of the remaining matters perhaps the most important to mention here are the attempt to determine whether correlation occurs between the habit of producing gemmæ and the conditions under which the plants live, and to estimate the taxonomic value of the organs in question.

The typography and numerous illustrations are up to a high standard, but do no more than justice to the thorough work of the author. A full index of generic and specific names extends greatly the usefulness of the volume, which will be of very great value to those botanists who are interested in the biological matters relating to the mosses, but whose studies have not been directed to them in a taxonomic way. It will also serve a good purpose in enabling the student who may be contemplating research in these lines to orientate himself historically. This will be facilitated also by a very complete bibliography.

FRANCIS E. LLOYD.

FROM a systematic standpoint this work is of great value to American students, for of the 110 species described, 52 are known to occur in this country, and 108 out of the 187 figures refer to them. Systematic books have overlooked asexual methods of reproduction except in such cases as *Georgia pellucida*, *Aulacomnion palustre*, *Tortula papillosa*, and a few others where the means were so conspicuous as to defy ignorance; hence it will be a surprise to learn that *Dicranum sooparium*, *Funaria hygrometrica*, *Bryum argenteum* and *Dicranella heteromalla*, though commonly found fruiting, have also methods of propagation. Those species which are conspicuous for their brittle leaves are many of them rare in fruit, forming new plants from the fragments of the leaves, but an interesting addition to the list having this method is *Anomodon tristis*, which thus far is unknown in fruit. The 'Confervæ Orthotrichæ,' those brown septate bodies which occur on the leaves of various species of *Orthotrichum* and *Grimmia*, have long been familiar, but few students have realized why so many species of *Campylopus*, *Tortula*, *Bryum* and *Plagiothecium* were more often found sterile than fertile, nor how they reproduced in spite of this fact. Climates where sexual reproduction is difficult cause a greater development of other methods, and dioicous species are more apt to develop asexual methods than monoicous ones. An artificial key is given by which the asexually propagative species may be classified according to the modifications of the stem, leaves and protonema; it will be useful in encouraging the study and collection of such species as have been ignored or overlooked on account of lack of fruit. The work has paralleled that of F. De Forest Heald, published in the *Botanical Gazette* for 1898, but it is more extensive, and the author claims to have found that *Bryum annotinum*, *Pleuridium nitidum bulbillifera* and *Leptobryum pyriforme* are identical. There is a similar identity between *Pottia riparia* Austin, which antedates *Leptodontium Canadense* Kindb. and *Trichostomum Warnstorfii* Limpr., all of which propagate by clusters of septate propagulæ borne on the paraphyses, seemingly replacing the archegonia, hence all but *Pottia riparia* have thus far been only found sterile. Under whatever genus the species is recognized, that of Austin has priority, a fact to which I have already called attention.

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The Physical Nature of the Child and how to Study it. By STUART H. ROWE, PH.D., Supervising Principal of the Lovell District, New Haven, Conn.; formerly Professor of