multinucleate (forty have been observed) as they grow in numbers over the sporophyll from their place of deposition, sometimes 3 cm. from the micropyle. Some penetrate the integument instead of entering the micropyle. There is no differentiation of a tube nucleus and only a single generative cell is present. For these reasons the Araucarieæ are considered by the author as proto-siphonogamic. There are indications also of a non-specialized embryogeny, intermediate in character between that of the cycads and of *Ginkgo*.

The Flowering Period of a Hybrid Opuntia: F. E. Lloyd, Desert Botanical Laboratory.

A Study of the Leaf-tip Blight of Dracæna fragrans: John L. Sheldon, West Virginia Agricultural Experiment Station. (Read by request before the Botanical Society of America.)

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SCIENTIFIC BOOKS

Recherches expérimentales sur la Sexualité des spores chez les Mousses dioïques. Par El. et Em. Marchal. Mém. couronnés Cl. Sc. Ac. roy. Belgique, 2, I., 1906.

"A considerable number of plants are known in which a single egg gives rise by division to more than a single individual. Experimental investigations are demanded to determine if these individuals are always necessarily of the same sex." In response to this subject, thus recently proposed by the royal academy of Belgium, the Marchals have published the results of an interesting series of experiments on three dicœcious mosses, *Barbula unguiculata, Bryum argenteum* and *Ceratodon purpureus.* Sowings were made from individual sporangia of these three species and, in the mixed growth resulting, both male and female plants were obtained. The conclusion thus reached that the capsule in these species contains both male and female spores was confirmed by sowings from single spores. Of five spores from a single capsule of *Bryum argenteum,* three gave rise to protonemata producing male and two to those producing female plants. Similarly, of seven single-spore sowings from a capsule of *Barbula unguiculata,* three spores produced male and four produced female plants exclusively.

Secondary protonemata, obtained by regeneration from stem, leaf or pieces of protonemata, as well as by germination of gemmæ, were of the same sex as the plants from which they were derived.

Attempts to influence the sex of protonemata by subjecting them to different external conditions were entirely unsuccessful. The effects of the following factors were tested: (1) Illumination. Cultures in strong and in weak, diffuse daylight and under red and under orange-colored glass. (2) Temperature. Three grades of temperature from 10 to 27° C. (3) Humidity. Cultures in saturated atmosphere and in an atmosphere as dry as consistent with growth. (4) Nutrition. A clayey sandy soil watered with solutions of different chemical composition. The nutrition experiments would have been more satisfactory if a substratum had been used which alone was not capable of producing an abundant moss vegetation as was the sandy clay employed. The experiments are sufficient, however, to show that the gametophytes of the mosses tested are strictly dicœcious. Writers on the mosses have claimed that in dicœcious species both sexes arise from the same protonema, but heretofore no careful study of the sexual differentiation in the mosses has been undertaken. Marchal's important experiments illustrate the value and necessity of the cultural method of investigation.

These three species of mosses studied by Marchal and the liverwort *Marchantia polymorpha* investigated by the reviewer (*Bot. Gaz.,* XLII., 171, Sept., 1906) are the only dicœcious bryophytes for which the sexual character of the sporophyte is known. That these forms which are dicœcious in the gametophyte are all hermaphroditic in sporophyte (heterothallic and homophytic according to a more precise terminology [*Bot. Gaz., l. c.*]) does not prove that this is the universal type

for dicœcious Bryophytes. There is no *a priori* reason why in certain forms the sex of the whole sporophyte may not be determined in the zygote as is the case in the dicœcious flowering plants and in *Mucor Mucedo*. The determination of the sex of the spores in a capsule apparently takes place at or but slightly before their formation. An attempt to suppress the formation of spores of one sex in the capsule would appear, therefore, more promising than attempts to change the sex of a spore or of a protonema already formed.

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Le Mallatie Crittogamiche delle Piante Coltivate. DOTT. VITTORIO PEGLION, Professore die Biologia agraria nella R. Università di Bologna. 2a edizione, 1906. Casale Monferrato. 12mo., pp. viii + 323.

It is difficult for Americans to realize the great progress that is being made in Italy in the applied sciences. In botany, at least, few investigators take pains to acquire a working knowledge of the Italian language, and in consequence Italian work is best known to us through German and French reviews. The above work is a case in point: although issued over a year ago, no mention of it appears to have been made in any publication in the English language.

The book is one of a series now numbering somewhat over fifty—the Biblioteca Agraria Ottavi—all of which deal with some phase of technical agriculture, and in general represent the best Italian thought along their particular lines. No attempt has been made in this book to exhaust the subject of plant pathology, but the information contained is condensed and up to date: in many cases forming the best summary of knowledge on the given subject that the reviewer has seen in any language. But little attention is paid to mycology; the taxonomic position of the parasite does not determine the order of discussion; in other words, the book is written from the standpoint of the disease itself—making it almost unique among works on plant pathology. There is no index, but a very full table of contents; there are practically no illustrations. The book is printed in large, clear type, generally free from errors. In one place a curious transposition of paragraphs has occurred, which the author, *in litteris*, corrects as follows: the matter from and including the title 'La Peronospora del Frumento' on p. 96, to the beginning of the last paragraph on p. 97, should be interpolated between the second and third paragraphs of p. 93 following the words '* * * come suol farsi.' Also the matter beginning at the bottom of p. 97 with the words 'Quando si approssima * * * ' and ending on p. 99 with '* * * contestata da diversi studiosi.' should be interpolated on p. 102 before the words 'Quando una uredospora, od una * * * .'

The book opens with a chapter of generalities, after which two chapters are devoted to fungicides and the methods of applying them. A much greater number and variety of fungicides appear to be in common use than have been found practicable in America. It is interesting to note how, owing to field conditions, the knapsack type of sprayer is almost exclusively used. With cheap and efficient labor the results of such spraying should be, and apparently are, much better than those obtained here by the wholesale use of power and other large sprayers.

The remaining chapters are devoted to specific diseases of the following plants: wheat, oats, barley, corn, rye, rice, alfalfa, beans, peas, potatoes, beet, cabbage, turnip and other cruciferæ, hemp, flax, tobacco, watermelon, strawberry, onion, tomato, grape, pear, apple, peach, plum, olive, citrous fruits, mulberry. Three chapters are devoted to diseases attacking plants in the seed-bed, to the treatment of wounds, and to the various forms of root-rot of trees. It is unfortunate that the author has not seen fit to include some bibliographical matter under these various heads; or at least to bring Voglino's bibliography (1895) down to date.

This book is of especial interest to American plant pathologists at this time on account of its discussion of the diseases of the semi-tropical plants, largely untreated in other