DO FERNS HYBRIDIZE?

In a paper entitled "Physiological Aspects of Fertilization and Hybridization in Ferns,"[1] Dr. W. D. Hoyt gives considerable space to the evidence heretofore brought forward to prove hybridity among ferns. After considering the evidence under three headings, viz., (*a*) characters of the mature sporophyte, (*b*) experiments in which prothallia of different species have been grown together and some of the resulting plants have been considered intermediate, (*c*) experiments in which sperms of one species have been presented to eggs of another species, and their behavior watched, he concludes that the affirmative evidence is entirely insufficient, and that the only evidence which is worthy of consideration is negative. He also adduces what he considers additional negative evidence based on his study of the behavior of the gametes of certain ferns with which he worked.

Dr. Hoyt's paper deserves consideration for its physiological features. His experiments and observations as to the behavior of the sperms and the fusion of the gametes are extremely interesting. Unfortunately, however, the paper does not deserve serious consideration with respect to his conclusions regarding the evidence as classified under the first two headings. His conclusions on these points carry no weight whatever, because they are not based on a first-hand knowledge of the facts concerned.

For example, in order to be sure of the identity of the common ferns with which he worked, such as *Dryopteris Thelypteris,* he felt obliged to send his material to Mr. W. R. Maxon for identification. What weight then can his opinion carry with regard to what forms constitute reasonable variations of these common species and what forms are so different as to deserve a specific if not a hybrid rank? Dr. Hoyt's work with fern hybrids suggests the story which is told of a certain (or rather uncertain) investigator of the embryology of a species of *Pinus* who did not know the tree in life. Moreover, when Dr. Hoyt was beginning his study of this particular problem at the New York Botanical Garden, he did not even care to examine ample material of nearly all the reputed hybrids of *Dryopteris,* although he was offered every opportunity to do this. Apparently his mind was already made up on this point. He wished only to see the experimental plants which Miss Slosson produced by planting in pairs unisexual portions of the prothallia of *Dryopteris cristata* (L.) Gray and *D. marginalis* (L.) Gray, and *Asplenium platyneuron* (L.) Oakes and *Camptosorus rhizophyllus* (L.) Link, respectively. The fact that these experimentally produced plants are identical with the wild plants described as the hybrids of these pairs of species, Dr. Hoyt explains easily by suggesting that all may be mere variations. If he had known well the parent species and the reputed hybrids, he could not have made such a suggestion. Either there are hybrids in *Dryopteris,* et al., or else there are a considerable number of undescribed new species.

The third class of evidence is the only kind of which Dr. Hoyt has any adequate knowledge, and even here his unfamiliarity with the wild plants has reduced to a vanishing point the negative value of that which he presents. Thus he cites as the main evidence which he offers to disprove hybridity among ferns, the fact that he was unable to cause fusion between the gametes of two species which no one has ever suspected from field study to be in the habit of crossing, *i. e., Dryopteris Thelypteris* (L.) Gray and *Dryopteris noveboracensis* (L.) Gray. Sixty-seven attempts he records as having been made to secure the fusion of an egg of one of these with the sperm of the other, but, as he observes, most of the eggs "looked bad," that is, incapable of fertilization, so that his main conclusion rests on a few attempts to cross two species which a knowledge of the wild plants would have warned him not to use. It is to be regretted that he did not try to cross *Dryopteris cristata* with *Dryopteris marginalis.*

He reports four negative attempts to cross *Asplenium platyneuron* (L.) Oakes with *Camptosorus rhizophyllus* (L.) Link, between

[1] *Bot. Gaz.,* 49: 340–370, 1910.

which a natural suspected hybrid is known, a duplicate of which Miss Slosson produced culturally. Most of his experiments at crossing were made with species in unrelated genera, *e. g., Pteris* and *Athyrium,* two genera belonging in entirely different tribes. Also, he cites as the best evidence previous to his paper the work of C. Voegler, who was unable to obtain fusion between the sperms and eggs of several pairs of unrelated fern genera, some of them genera from very distinct families, *e. g., Ceratopteris* and *Dicksonia, Dicksonia* and *Nephrolepis,* et al.

The case, then, for fern hybrids, stands just where it did and is based on facts which require reasonable explanation. The evidence favoring hybrids has been fully presented, and does not need recapitulation. It is quite true that experimental proof of the kind attempted by Hoyt and Voegler is lacking. No one has ever observed the development of a suspected hybrid from before the period of fusion of the gametes. But such evidence is not usually required in cases of reputed hybridity. The arguments advanced by Mr. Hoyt against fern hybridity apply with practically equal force to most cases of accepted hybridity among flowering plants and in animals.

In conclusion, then, these reputed fern hybrids possess in all respects the characters generally recognized as characteristic of hybrids. The existence of these plants demands some explanation, and their identification as hybrids furnishes the simplest and most reasonable one yet offered.

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THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE AND AFFILIATED SOCIETIES
SECTION B—PHYSICS

THE annual meeting of the American Association for the Advancement of Science, Section B, Physics, was held in the physical laboratory of the University of Minnesota, at Minneapolis, December 28–30, 1910. It was a joint meeting with the American Physical Society. Three forenoon and three afternoon sessions were held. Of these, two were "general interest" sessions, in charge of the officers of Section B and four were occupied with the reading of research papers, in charge of the American Physical Society.

The presiding officers were Dr. E. B. Rosa, vice-president of Section B, and Professor Henry Crew, president of the Physical Society. At a short business session of Section B Professor O. M. Stewart was elected a member of the council, Professors A. Zeleny and K. E. Guthe members of the sectional committee and Professor G. W. Stewart a member of the general committee.

All sessions were held in the lecture room of the Physics Building of the University of Minnesota. The dinner on Thursday evening with the mathematicians and engineers at the Commercial Club was a very pleasant and enjoyable occasion.

The officers for the next annual meeting, to be held in Washington during the convocation week of 1911–12, are as follows:

Vice-president and Chairman of Section B—Professor R. A. Millikan, University of Chicago.

Retiring Vice-president—Dr. Edward B. Rosa, Bureau of Standards, Washington.

Secretary—Professor Alfred D. Cole, Ohio State University, Columbus.

Members of the Sectional Committee—E. B. Rosa, R. A. Millikan, A. D. Cole, K. E. Guthe, A. P. Carman, G. F. Hull, E. L. Nichols, A. Zeleny.

The address of the retiring chairman of Section B, Dr. L. A. Bauer, was given Thursday afternoon on the subject "The Broader Aspects of Research in Terrestrial Magnetism." This was a joint session with Section D, whose vice-presidential address was delivered at the same time by Professor J. F. Hayford, on "The Relation of Isostasy to Geodesy, Geology and Geophysics." The former of these addresses is presented in full in SCIENCE, January 13, 1911, and the other will be published soon.

At the other general interest session the following program was presented:

"Recent Advances in Phosphorescence and Fluorescence," Professor Edw. L. Nichols, Cornell University.

"The Isolation of Ions," Professor R. A. Millikan, University of Chicago.

"The International Electric Units" (report on changes to go into effect January, 1911), Dr. E. B. Rosa, Bureau of Standards, Washington.

"Osborne-Reynolds's Theory of Gravitation," John Mackenzie, M.E., Minneapolis.

Abstracts of three of these papers follow. (That of Professor E. L. Nichols will probably appear in the next issue.)