

the issue, namely, M. has a cousin defective in the same sense. This cousin is the daughter of a paternal aunt whose husband, from quite another family, is "smell-blind."

"After making inquiries," M. writes, "among people I know to be from my former place of residence, I came to the conclusion that that locality inbreeds this defect so that quite a number are afflicted with it."

This, in case the trait is sex-linked, is exactly the condition necessary to explain the relatively large number of duplex females herein recorded.

Whatever may or may not be true, the trait has reappeared in one collateral and two direct generations. This is sufficiently frequent to warrant the assumption that "smell-blindness" is heritable, and, from its behavior in this pedigree, it should not be very surprising if further evidence were to place it in the list of sex-linked characters.

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BIOLOGICAL PRINCIPLES IN THE ZOOLOGY COURSE

IN an article entitled "Botany after the War," Professor Bradley M. Davis¹ discusses the changes which a period of war adjustment is likely to bring to the teaching of botany in introductory courses. It is not necessary to read between the lines to detect that Professor Davis will welcome the changes that he anticipates. His interest is chiefly directed to the relegation of morphology—especially the morphology of types—to a less commanding position than it now enjoys. His general thesis is well embodied in his closing interrogation whether the first course will not "come more and more strongly to stand out as one that attempts nothing more than the grounding of fundamental principles and a selection of information with rather definite reference to its general and practical interests, or its broad philosophical bearing."

The writer has not followed the discussion

¹ SCIENCE, N. S., Vol. 48, November 22, 1918, pp. 514-515.

in the *New Phytologist*, but the reference to it made in the cited article leads him to infer that the ideal course in botany has been realized in few, perhaps none, of our institutions. Such an inference with regard to botany seems not at all unnatural to one who is acquainted with the situation in the teaching of its sister science zoology. In the latter subject the type course has long been the dominant one, almost the exclusive one, an inheritance from the time when zoology was a purely morphological science. Several books, it is true, have been in recent years described by their authors as the product of a revolt against the type course; but they mostly contain internal evidence that the laboratory courses which they accompany in the authors' own laboratories still consist largely of the dissection of types. While these teachers recognize that fundamental principles, rather than a knowledge of animal types, is the desirable acquisition of the beginning student, they have not had the courage to make that acquisition possible in the laboratory as well as in the recitation and lecture.

There is no fundamental reason why the work of the laboratory may not be grouped exclusively around general principles instead of around phyla and classes. Why allow demonstration of the tenets of the cell doctrine to be picked up piece-meal in several courses when a brief exercise on a number of unrelated organisms accomplishes the same purpose more completely at the outset? The simpler activities of protoplasm may be studied even by beginners, by introducing at one time organisms from widely different groups. The first-hand study of the principles of ecology does not require a knowledge of large animal associations, but can be satisfactorily based upon two or three forms taken from different phyla; and it is seldom necessary to know regarding any one of these animals more than a small fraction of the anatomical facts which a type course would include, to explain for the beginner the relation of that animal to its habitat. In the type course homology must be taught very incidentally in almost arbitrary connection with some one form, or must wait until

a number of closely related types have been dissected; and in the meantime the student is endeavoring to assimilate a classification without a knowledge of the chief practical means of establishing a system of taxonomy. Nor is taxonomy itself necessarily excluded when types are abandoned. An exercise in which the principles of taxonomy are made clear by illustrative material from the whole animal kingdom gives the student a better conception both of classification and of the groups of animals than anything less than a very long type course could be expected to do. And finally, the argument that a type course exhibits a splendid evolutionary series loses its force when types may be supplanted by much better evidence from vertebrate and invertebrate fossils, from geographical distribution, and other sources. Moreover, certain phyla, as the echinoderms, never did have much evolutionary significance, when taken in connection with other phyla, yet the usual type course includes at least one echinoderm.

The objection is sometimes raised that a course based on principles instead of types gives a full knowledge of not a single animal. This objection, however, comes only from those to whom zoology has a special interest, and who will go on for advanced work in the same field; and in their second course they will get that complete information about some one animal which they desire. An elementary course based on principles should therefore be the best foundation for students of all grades of interest. To him who will never pursue another course in biology it gives the very things that will be of interest or value. To him who will specialize in the subject, it affords the best possible framework into which the details subsequently acquired can be fitted.

Unlike courses in elementary botany, if Professor Davis's paper is correctly interpreted, the course in zoology based on principles does not await the future for its realization. In at least one institution such a course is now in operation. In the University of Michigan the first course in zoology is of the kind described. Dissection of types is no longer practised, the entire laboratory work being collected around

principles. It is a truly general course; first hand knowledge of the elementary facts from each of the main divisions of zoology is gained in the laboratory and from these facts fundamental principles are derived. It has been in operation for several years, and has more than justified its introduction. Such a course makes new demands on the text-book and on the mode of teaching, but these difficulties can be removed. It is likely to be a little more expensive to install than the type course, but its current expenses may well be less.

The sponsors of this course regard it as the best kind of course, whether after the war, during the war, or any other time. Whatever of practical or applied biology it contains is there, not for any benefit that may accrue to the nation in times of stress, but because of its general interest and importance. For it is clear that the amount of applied biology that could be included in a beginning course would not enable any one save his country, unless increased by practical courses to follow.

In pedagogical method the course on principles need not differ from the type course. The inductive method may be as consistently employed. Accuracy in observation is just as necessary. Correctness of interpretation is quite as essential. But this difference exists: the thing observed is itself of interest, or the interpretation is important. Features of an animal which are not of interest or are not important are omitted.

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INTERNATIONAL ORGANIZATION OF SCIENCE

TO THE EDITOR OF SCIENCE: The statement adopted by the Inter-Allied Conference held in London under the auspices of the Royal Society, *SCIENCE*, November 22, page 509, as a preamble to certain resolutions which are to be made public later, directs attention to the serious difficulties which the recent war has imposed on the international scientific projects already inaugurated and on those under consideration. As these projects are of common interest it can scarcely be expected that a