of leaving established genera intact, except in those instances where they are composed of unnatural assemblages of species. Such procedure has been especially advocated by Dr. Robinson.[1] What a saving of energy this would mean—energy that could then be applied to the fundamental problems of plant classification! It may here be noted that this shuttling back and forth of botanical names is not science and that time spent upon it might well be given to the real problem of the taxonomist, namely, the determination of relationships, or, in other words, the construction of a natural classification based upon phylogeny and supported by evidence from every possible source, including experiment, statistics and the paleontologic record.

In putting out a flora of this sort, the author often encounters forms which are not of sufficient value to be ranked as species but which are, nevertheless, too important to be entirely ignored or to be relegated to synonymy. Professor Abrams has wisely adopted the expedient of assembling some of these under those species of which they are evolutionary derivatives and of printing the name and the brief description in small type. By this method the user of the book is permitted a choice between the segregate name and the one given for the inclusive species. It is quite probable that for some purposes the one will be the more useful, while in other connections the alternate name will be chosen. In the reviewer's opinion, the book would find a far wider field of usefulness if the accepted species were made much more inclusive and more advantage taken of the subordinate category. By this means the number of full species would be considerably reduced, an outcome much desired by the non-specialist, and the segregate names would still be available for those who might find use for them. If, in addition, the more important of these latter were to be treated as subspecies or varieties their relationships to the parent stock would be immediately evident in the trinomial used for their designation. Under this procedure only the limits of the collective species would need to be agreed upon while the minor categories could be modified to meet special needs without disturbing the binomial. It is evident that some such plastic arrangement must be worked out if botanical nomenclature is to attain its fullest value.

The first volume of this important flora, which is to be completed through the issuance of two more, begins with the *Ophioglossaceae* and ends with the *Aristolochiaceae*. It thus includes all the ferns and fern allies, the gymnosperms, the monocotyledons and most of the apetalous families of the dicotyledons. Portions of the text were supplied by specialists, as follows: *Pteridophyta* (except *Isoetaceae*) by William R. Maxson, *Isoetaceae* by Dr. Norma Pfeiffer, *Poaceae* by Professor A. S. Hitchcock, *Cyperaceae* (except *Carex*) by Dr. N. L. Britton, *Carex* by Mr. K. K. Mackenzie, and *Salix* by Dr. C. R. Ball. Dr. F. V. Coville assisted in preparing the text of the *Juncaceae*. In matters of typography, illustration, index, etc., the book is all that can be asked for. It is hoped that the succeeding volumes will appear as rapidly as the painstaking methods of the author will permit.

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[1] Robinson, B. L., 1906, Science, N.S., Vol. 23, pp. 81–92.

LABORATORY APPARATUS AND METHODS

A MODIFICATION OF RECONSTRUCTION METHODS

After reconstructing several chondrocrania models of beeswax, which proved to be a laborious task, the writer has succeeded in perfecting a method that eliminates the unpleasant but necessary details of making the plates which are required in the older methods where wax is used, and at the same time shortened the process of construction without sacrificing accuracy.

This method differs from that described by Sussana P. Gage ('07), in the *Anatomical Record*, Vol. I, page 166; in that strawboard is used instead of blotting paper, and beeswax in the place of pins and nails, as the principal substance for fastening the sections together. Wire is necessary as an additional support only in the larger models where special stress occurs.

Strawboard is considered preferable to blotting paper where the sections are cut fifteen micra or more, as it may be obtained in practically any desired thickness at almost any print shop, thus avoiding the necessity of two or more thicknesses to represent each section, as may occur where blotting paper is used. Strawboard is more firm than blotting paper and is considered by the writer to be less easily distorted. Standard grade number 40, which is approximately two millimeters in thickness, has been used with satisfactory results in the construction of several models, which vary from four to seventeen inches in length. Camera lucida outline drawings of the parts to be modeled are made on the strawboard and a sewing machine is employed to make a perforated pattern of the drawn parts with the needle of the machine piercing the holes close enough together that separation along the lines may be practically complete. The pieces cut out, however, usually retain their position, until intentionally removed. Before each piece is placed in the model, the part on which it is to rest is given a thin uniform coating of melted beeswax, then the new part is added, pressed down and held in position for a short time until the wax hardens. After the model is thus built up the exposed surfaces are covered with a thin coating of wax, which on hardening smooths the surface and tends to prevent injury from excess moisture.

One objection to reconstructions made entirely of wax is that they are very apt to become distorted when exposed to the variable temperature of an ordinary room. Models constructed as described above are not so easily affected, since the beeswax between the strawboard sections is protected. Such models are also lighter, easier to handle, and not so liable to injury when packed and shipped as are the wax ones. In this respect they differ little from those made of blotting paper. The greatest advantage over both the wax and blotting paper methods is the rapidity with which a reconstruction can be made, without the sacrifice of accuracy. The fact that the blanks are easily preserved makes possible their use at a later time in checking over the details of the model, which often is of great assistance.

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INEXPENSIVE LANTERN SLIDES FOR TEXT OR TABULAR DATA

IT is often desirable to project text, mathematical formula or tabular data upon a screen for purposes of class instruction or during the presentation of a paper at a scientific meeting. Use of a lantern saves the time of the instructor which would be necessary to inscribe the data on a blackboard and also makes for greater accuracy and legibility. The obvious drawback to the use of the lantern lies in the cost of photographed lantern slides.

I have found that very satisfactory slides may be prepared by making use of the ordinary "Dermatype" stencil sheets such as are used for mimeograph work. The data are cut on this stencil by the bare type of a typewriter so as to occupy an area on the stencil measuring approximately 7 x 8.5 cm. By the use of elite type, rather extensive tables can be printed within this space. A portion of the sheet, with the data in the center, measuring 8.5 x 10 cm, is then cut from the stencil by a sharp knife or a safety razor blade and mounted between two thin sheets of glass of the same dimension. Black paper tape is later used to bind the edges of the glass.

Such a lantern slide projects light figures or letters on a light blue background, the data being plainly visible even in a fairly well-lighted room. Such lantern slides are permanent and can be prepared at a cost for materials of approximately five cents each.

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SPECIAL ARTICLES

SPECIFICITY IN FERTILIZATION

THE results of experiments that I completed while working as a research associate of the Carnegie Institution of Washington, at the Misaki Marine Biological Station of Tokyo Imperial University, add to our knowledge of the factors controlling specificity in fertilization.

The methods devised made it possible to eliminate cortical block to activation in every cross-activation attempted, and to obtain better than 90 per cent. early development in all cross-activated material. This percentage of cross-activation is unusually high, but the especial significance of the results lies in the fact that of thirteen cross-activations made, eight were from four pairs of reciprocal crosses. It is well known that the facility with which a cross-activation is made in one direction is no indication of the degree of success which may be anticipated with the reciprocal cross.

All the work was done with echinoids. The preliminary studies of species fertilization revealed the fact that the eggs of *Heliocidaris tuberculata* did not form a separated fertilization membrane, and that the eggs of *Temnopleurus toreumaticus,* shortly after insemination, contracted strongly within the fertilization membrane, not to resume their normal rounded form until just prior to the first division.

We think of developmental reactions in terms of eggs. Ordinarily, we endeavor to give the egg such treatment that it will follow its own normal course of development. These experiments followed a different plan. I decided to inseminate the *Heliocidaris* egg with *Temnopleurus* sperm and then attempt to make this egg show the reactions that are normally shown by the *Temnopleurus* egg following species activation, namely, to form a separated fertilization membrane and to contract strongly a few minutes after activation.

To state the matter in another way: After some comparative study I took as a working hypothesis the idea that sperms differ in degree, at least, in their effect on the egg. The effect produced by a spermatozoön on the egg of its own species may be called, for convenience, its natural effect. The work done by a spermatozoön in producing the natural effect is an indication of the natural potency of the spermatozoön.