found. He left his heirs some 15,000 or more stone, bone, shell, clay and copper artifacts of aboriginal workmanship. These include many interesting engraved shells, decorated copper plates, effigy pipes, etc. It is doubtful whether Myer's collection could be duplicated in the state of Tennessee, since most of the monuments and graves have been explored.

The heirs wish to have Mr. Myer's collection preserved intact in some museum. It has been highly recommended by Dr. Neil M. Judd, of the Smithsonian, Dr. Fewkes and others. Mr. Myer's son, Mr. W. H. Myer, care of Frazer & Co., 30 Church Street, New York, N. Y., has the matter in charge and will be glad to correspond with any museum officials who are interested.

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SCIENTIFIC BOOKS

Illustrated Flora of the Pacific States, Washington, Oregon and California. By LEROY ABRAMS. Vol. 1. Stanford University, California, Stanford University Press, 1923. xii + 557 pp. $9.00, prepaid.

A DESCRIPTIVE flora is primarily for the purpose of enabling one to identify the plants of the region covered. But some go farther than this and aim to give also new information regarding the plants themselves. Professor Abrams' flora is distinctly a work of this latter sort and is to be classed as a valuable contribution to knowledge of the morphology, relationships and geographic distribution of the species growing spontaneously in the three Pacific Coast states. The flora of this region has been so little studied, as compared with that of other parts of the United States, that numerous readjustments in the classification are necessary if an author is to present anything more than a compilation of previously recorded facts, and in the present instance his intimate field acquaintance with the flora and his access to types in eastern and European herbaria have enabled him to prepare what is essentially a critical revision of each of the genera treated.

But this assembling of new material has not been permitted to interfere with the more immediately practical values of the book. The style and general make-up are frankly patterned after the well-known illustrated Flora of the Northern United States and Canada, by Britton and Brown. Consequently, each species is illustrated by a text figure as well as keyed and described and the distribution and principal synonyms are clearly given. It is confidently predicted that, as in the case of its prototype, the figures will greatly add to the popularity of the work and that many users who would otherwise prefer a more conservative treatment of genera and species will be led to adopt the accompanying names.

In the matter of generic and specific concepts, the author has not gone to the extreme in either direction, although there is a decided tendency towards the acceptance of generic segregates and "small species." The nomenclature follows the rules now under consideration by the American Botanical Society and recommended by its nomenclature committee (of which Professor Abrams is a member). There is here a splendid opportunity for comparing the results with those obtained when the International Code and a more conservative treatment of genera and species are followed, for Professor W. L. Jepson, who in the main follows the latter code and who is moderately conservative, has recently covered most of the same area and the same families in his "Flora of California." Since much of this first volume of the Abrams flora has been contributed by collaborators, some of whom also contributed to the Jepson flora, it is necessary to select for comparison some portion of each book prepared by the author himself. Consequently the Liliales and Orchidales have been chosen as furnishing a fair comparison, and all non-Californian forms have been excluded, since these are not covered by Professor Jepson's work. In the two orders named, Abrams gives 8 families, 57 genera and 255 species, whereas Jepson has 5 families, 45 genera and 225 species. Furthermore, there are 55 additional cases where the plant names differ, although the authors are in agreement as to specific limits. The final result is that if one were to use Abrams's flora and then turn to Jepson's, he would find that of the 255 plant names accepted in these orders by the former, only 170, or about 67 per cent., are given full recognition by the latter. The remaining 85 names, or 33 per cent., would need to be sought among the synonyms and a considerable number could not be found even there.

In attempting to discover the reasons for these differences, it develops that 29 per cent. of the cases of non-agreement are traceable to differences in the rules of nomenclature followed by the respective authors, while 71 per cent. are due to differences of opinion as to what constitutes genera and species. It seems, therefore, that an agreement among taxonomists as to rules of nomenclature, although much to be desired, is perhaps only secondary in importance as compared with the need of an agreement on generic and specific limits.

On analyzing the situation farther, it is found that, at least as between these two authorities, the shifting of generic lines is responsible for as many name changes as is the difference in species concept. What an enormous amount of confusion would be avoided if all systematists were to apply the principle

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.

HARVEY M. HALL

[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,