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THE NEED OF MONOGRAPHIC ACTIVITY IN AMERICAN BOTANICAL TAXONOMY[1]

IT recently fell to my lot to oversee the reclassification of a large botanical library during its reshelving at the Gray Herbarium. Many questions arose during the process, most of them relating to clearness and expediency from the standpoints of library methods and experience. With these I will not trouble you. But incidentally I was impressed by certain quantitative aspects of botanical literature, particularly of taxonomic publication. These proved interesting to me and I hope I can make them so to you.

Nearly all publications on systematic botany fall pretty readily into one or the other of two chief categories: they are either floras, dealing with the vegetation of some particular region, or they are monographs treating a special group of plants. Our fundamental division was, therefore, into floras, arranged geographically, and monographs, classified systematically.

In this grouping the first thing that struck me was the overwhelming predominance, both in bulk and numbers, of the floristic works over the monographic. The second was that of the monographs, that is to say of those works treating not a region but a particular group of plants; the output in America has at all times been exceedingly small compared with that in Europe. Finally it was evident that most of the monographic work thus far accomplished in America has been restricted to purely American groups, exceedingly little of it taking on a cosmopolitan character.

The historic reasons for this state of affairs are tolerably obvious and there is no need to go into them at any length. American botany is relatively recent and its workers, at no time very numerous, have been confronted by the overwhelming task of reducing to systematic

[1] A communication read before the Systematic Section of the Botanical Society of America, December 29, 1922.

record the immensely diversified flora of a continent. Until lately the United States has not been a colony-holding power. Its scientific collections have not had that influx of material from remote quarters of the globe which has for many decades, indeed for two or three centuries, been pouring into the great herbaria and stimulating research in several of the Old World nations long holding remote colonial possessions.

Whatever may have been the causes the fact is one which we must face. Certainly more than ninety per cent., probably ninety-five or even ninety-eight per cent. of the cosmopolitan treatments of plant groups have been elaborated and published in Europe. In this form of botanical activity America has shown striking lack of ability or want of interest. She has never even tried to do her part. It is worth while to examine this particular form of aloofness. The pertinent questions are these: In how far is monographic activity really important? If it is of fundamental significance in our science, why are we so backward in regard to it? Is our nation active in proportion to its ability? Is it subject to some handicap precluding efficiency in this field? Is it unconsciously shirking an obligation? Is it missing an opportunity? Finally, what is the relation of such close and detailed study of plant groups to our national power, to our preparedness both in war and peace?

To answer such questions it is of the first importance to grasp the relations existing between floristic and monographic research. It must be understood that they are coordinate modes of investigation, of like dignity, difficulty, scope and importance. Each, however, has its peculiar advantages, each its specialized methods, each its allure, its psychological bias, each its practical importance in the ultimate scientific record of the world's vegetation. From a theoretical standpoint their material is of like extent as in qualitative and quantitative analysis. The task of the systematist will not be completed until each region has its flora and each natural group its monograph.

The materials for floristic work are everywhere ready to hand. Each region has its vegetation. Its plants attract by their diversity. The study of a local flora has great fascination. It appeals alike to amateur and professional. It is replete with opportunities for field work, personal collecting, exploration. It is in large measure an out-of-door job. Usually it is also a companionable enterprise involving cooperation, since few floras can be prepared by the single-handed exertion of any one investigator.

The monographer, on the other hand, must have access to large collections and libraries. Even then he must patiently assemble much of his material by correspondence. The plants of his group are likely to be scattered in remote quarters of the globe. He is rarely able to see them—at least most of them—in nature. He has to work with other people's specimens and make the most of collectors' notes. His task is chiefly an indoor one. It is apt to be a lonely one.

The published flora is a matter of popular interest. It has a sale. There are even calls for successive editions. It is true its author is rarely enriched by the proceeds, but he has the gratification of knowing his work useful. He sees that it meets with a measure of appreciation.

The monographer finds his wares much less in demand. He almost always has difficulty in securing a publisher. The sale is slight and very slow. In other features of his task, however, the monographer has advantages over the floristic writer. Floras usually have many hundreds, often thousands of species. If their treatment is to be completed in a lifetime there must be haste. If the result is to be brought within the limits of publication there must be compression. Elimination becomes necessary. Exceptions must be suppressed. Doubtful cases may not be discussed. Synonymy must be trimmed to its most important elements. Bibliography has to be cut to a minimum. Even descriptions must be brought down to telegraphic brevity. The final product becomes dogmatic.

The floristic writer, thus overwhelmed by the number of elements to be treated, is forced to relegate extra-limital species to temporary oblivion and neglect, except in so far as their hurried examination is necessary to establish the identity of plants within his range. Furthermore, the elements included commonly form only small and disjointed fragments of the natural groups they represent. This frequently lends them a specious distinctness which they

are far from possessing in nature. There is an almost unavoidable temptation to distort categorical values. Thus a variety in nature may in a given region appear to be a species. Still more frequently a subgenus or section tends to assume undue clarity and seems to merit the rank of a full-fledged genus.

It is in the monograph that nearly related plants are brought together no matter what their geographic remoteness may be. It is to the monographer that we must turn for well-judged estimates of the distinctness of groups and of their appropriate rank in classification.

In general the monographer is less closely tied down by the limits of time and space. His group usually contains fewer species. They can receive greater individual attention. Transitions and exceptions can be discussed. Descriptions can be drawn in far greater detail. Complete synonymy, copious bibliography, and the citation of exsiccatæ become features of importance. The monograph is rarely undertaken in the course of professional routine and surely never for personal gain. It is the kind of thing which must be done *con amore* and in a leisurely way—a charming puzzle which must often be laid aside only to be taken up again as opportunity permits. There is nothing that the monographer loathes so much as compilation. He must acquire not merely a bowing acquaintance but a real friendly familiarity with each element in his group. Many of his most important decisions come toward the end of his work, being doubtless brought about by cumulative observations and slowly trained judgment.

Let no one understand me to imply that work of this nature is not done in our country. There have been notable examples of it. Where may the world look at present for special knowledge of groups like the Laboulbeniaceæ, certain portions of the Orchidaceæ, and of genera like Yucca, Phoradendron, Nymphaea, Cuscuta, Lonicera, or certain parts of that exceedingly difficult family, the Cactaceæ? Many other groups also are now being studied in truly monographic spirit. The rusts, the hepatics, the mosses, the ferns, the grasses, Carex, Passiflora, the Scrophulariaceæ, the Lentibulariaceæ, certain portions of the Compositæ, for example. The work of most of the investigators here alluded to has undoubtedly begun from interest in the local North American elements in their respective groups. It is, however, apparently taking a broader turn as time goes on and we may hope for a finished monographic result.

Nevertheless, any such list of monographic undertakings in the United States is impressive not by reason of its length, but quite to the contrary. Its wide gaps are its striking feature. While one can well-nigh count upon his fingers the groups which are now being followed up in our country with any prospect that their treatment will take on a cosmopolitan scope, there are scores and hundreds of groups for which no North American specialist is yet in sight or even remotely in training.

Floristic and monographic work are reciprocal and interdependent. Both are essential to satisfactory progress in our subject. Floristic endeavor is certainly the pioneering enterprise. It is to secure knowledge of the general vegetation not of particular groups that practically all botanical exploration is initiated and collections are brought together. Thus until floristic work has made some headway monographic activity is impossible, but on the other hand floras can attain excellence only in proportion as they gradually assimilate the results of monographic investigation.

It is to the monographer that we must go for detailed elaboration and for highly trained judgment as to categorical values. To the floristic writer we look for things no less important, namely careful elimination, terse presentation, clear keys, and for the works that popularize our subject. Were there no other grounds than these it should be clear that our country ought to be doing its fair share of monographic as well as floristic work. But there is another point that I would emphasize. A good monograph can not be produced without creating *ipso facto* a specialist, a person of trained familiarity with a group, an authority to whom we may turn for precise and prompt information concerning it. Such specialists are national assets.

The practical importance of plant classification is little understood. Very few people realize the great number of plants which have come to have economic and industrial significance. Vegetable products are so important to humanity and their use for foods, fibers, medicines, timbers, dyes, condiments, flavors,

oils, waxes, gums, resins, and what not, has become so much a matter of course that it is apt to be taken for granted. I am told that in horticulture alone more than twenty-five thousand kinds of plants have been brought into use and thus acquired commercial value. Hundreds of others have gained significance in pharmacy and the industrial arts. But the most pertinent fact of all is that there are still thousands of plants which have never been investigated as to their possible utility—species either not yet collected at all or so imperfectly known that they could not at present be precisely identified by any systematist in our country.

Do we not clearly need specialists? Can we get them in any other way than by encouraging monographic attention to particular limited groups? We have long been dependent upon our European colleagues for nearly all monographic works of reference. Recent years have greatly altered conditions. The European output of this type of finished work of reference has already been diminished. It is clearly up to us to do our part, indeed for the next two or three decades if possible rather more than our normal share in this highly significant activity.

How is this work to be fostered? Gradually, of course. No abrupt change would be either feasible or desirable. Much may be accomplished if the need is clearly grasped. Let each botanical establishment, each botanical society, club and journal stress the importance of this type of published output and facilitate the initial efforts of all students, whether professional or amateur, who are found to possess appropriate talents or a bent toward work of such concrete and scholarly nature.

There is no way to acquire an art but by practising it. The art here suggested has from theoretical importance and practical utility much to recommend it. It has, furthermore, no small charm in itself. As a hobby for the cultivated layman it is hard to imagine a more fascinating pursuit than the gradual assembling of materials and data for such an enterprise. Unhappily members of our small leisure class —using the term even in its most favorable sense—rarely have the requisite intellectual ambition or the needful concentration. Monographic results are much more likely to come from the spare hours of the physician, the lawyer, the banker, the business man. Such persons in gratifyingly large numbers are taking an interest in systematic botany. Around botanical centers there are scores of them, consulting professional herbaria and libraries and building up their private collections. They are active, energetic, gifted with fine enthusiasm, and often decidedly helpful, but as yet they show little ambition beyond the minor problems of their own local floras or the vegetation of the places visited during summer outings. Certainly it should be possible to stimulate such promising material to monographic activity.

As to the professional botanist, I am so optimistic as to have hope even there. After due allowance for those who in quest of microscopic detail or physiological reaction have drifted far from taxonomic interest, after eliminating the overworked whose professional routine in classroom or laboratory depletes every enthusiasm for botanical activity, after admitting that many hours of the academic year and no small portion of the vacation periods must be devoted to text-book writing, popular lectures, summer school instruction, or other remunerative employment to piece out inadequate salaries, still there must be a residuum.

Nearly all botanists in the course of their training or professional work have been consciously attracted by some group of plants. It is well-nigh impossible to occupy oneself seriously with any phase of plant-life without developing such an interest, without coming to have a sort of pet group. Many have had incipient ambitions to make something of such interests. It is reasonable to hope that with increasing facilities from the growth of neighboring collections and libraries more such beginnings may develop to monographic fruition.

Where such an interest can be initiated or revived it could often be pursued with growing enthusiasm. Appropriate groups of plants are of all sizes and degrees of difficulty. Manifestly it would be preposterous for any but the best equipped and already experienced workers to undertake the willows, sedges, asters or œnotheras, not to mention the aroids or palms, but there are hundreds of genera of moderate size still very imperfectly classified—groups where the patient and conscientious attention even of the amateur would bring results

highly interesting to himself and decidedly useful to our science.

Let us do our best to stimulate this intensive examination of particular groups. We *must* do so if we are not to be chiefly dependent upon foreign works of reference. Much as we owe to these foreign treatments—and I am most humble in my respect for many of them—I am convinced that were similar activity to be fostered in America it would have certain merits of its own. There are some prevailing defects in monographs. Many of them lack clarity. Many reach a tedious degree of detail and in their ultimate subdivisions border on the artificial. One reason why I greatly hope that more of my compatriots will engage in monographic work lies just in the fact that there will be limits to their patience, that they will seek the practical, and will in general stop subdivision at the point where distinction becomes inadequate or where further classification would pass the bounds of probable utility.

B. L. ROBINSON

UNIVERSITY CAREERS IN MEDICINE AND SURGERY[1]

A SHORT time ago when the opportunity arose to talk informally with some of you and your classmates, I presented as a general subject, "The selection of a career in medicine." This is an almost impossible topic for anyone to give you final advice upon, since, in order to justly appreciate a given student's abilities and possibilities would necessitate a far wider acquaintance of the individual student's upbringing, environment, and character than is possible for any of your present instructors. However, it does seem as if the possibilities of choice might well be laid before you from time to time in order that you yourselves should fully understand what fields of endeavor are open to you, and that you yourselves may begin to sift out of the many walks in life that particular career to which you find yourselves attracted and by nature better fitted to fulfill. In view of the present dilemma the graduating class finds itself in, it seemed possible that a further discussion of this topic might not be amiss. And since my own life has given me most experience in but a single direction, I have chosen as a title for this occasion, "University careers in medicine and surgery."

As I pointed out on the former occasion, the student may choose broadly between practice and a university career. In the field of practice, he may be physician, surgeon, take up a surgical specialty, restrict his field to internal medicine, X-ray, metabolism, or do everything in that most honorable rôle, the country practitioner. Likewise, if he chooses a university career, he has an equally wide choice varying from any one of the multitudinous laboratory posts to a career in the clinical branches of medicine and surgery.

You will see that I have made the art and science of teaching the dividing line. That is really the great dividing line. Do you want to, are you able to, and will you spend the time necessary to equip yourself for the task of teaching? It is by no means a simple task. In fact, in addition to the difficulties attendant on obtaining a good training and developing one's inborn characteristics, there are many pitfalls for the teacher. The same dangers confront all teachers. The worst of these is self-satisfaction. Many a teacher has, to put it brutally, heard himself deliver hypotheses so often that finally he actually comes to believe ideas that are not entirely supported by facts; he then becomes narrow, dictatorial, and pompous. Such an attitude is less common among instructors in the preclinical sciences and those untrained in laboratory methods. Such men are not real teachers; they are but go-betweens. The real teachers often talk but little and teach to a great part by precept and example coupled with a spoken idea, a suggestion, and a little encouragement. Their methods are to develop the student, not to propound their own views; to lead rather than to drive.

I make some diversion here, since, unless you are endowed with certain qualities and realize what teaching is, you can easily go astray in your choice. But I have especially emphasized teaching as the dividing line because in the last score of years the words research and laboratory have become coupled in medicine with the words success and training. And the impression has been given that the great dividing line in medicine is whether or no one is a researcher or has had a laboratory

[1] Presidential address, Boylston Medical Society, Harvard Medical School, December 15, 1922.