

THE NEED OF A MORE GENERAL KNOWLEDGE OF AND TRAINING IN BOTANY

J. H. WHITTEN, CHICAGO NORMAL COLLEGE

Recent developments in the field of botany have been so remarkable that botanists may justly feel proud of the knowledge, the great material prosperity, and the improved living conditions made available, by the contributions of their particular science.

The subdivisions of the mother science have become so vigorous and have penetrated so far into their respective fields that it is impossible for the members of any one group to be thoroughly cognizant of the achievements of the others. There is, however, a common ground on which all botanists may meet. There is likewise a stock of knowledge which must be not only the possession of botanists, but which must become the inheritance of the average citizen if botany is to fulfill the important mission allotted to it by nature. It is chiefly in the interest of botanical education that I wish to speak.

Genetics as we know it at present in its application to plants youngest member of the botanical family. Since its rebirth less than two decades ago, it has held the spotlight of the scientific stage, and the workers have done much to deserve the attention they have received. Definite methods of procedure have been formulated by which cultivated plants may be modified almost to suit the fancy of the producer. By an intelligent manipulation of the normal reproductive processes of plants, new varieties may be produced, desirable characters accentuated and objectionable qualities removed. Yet genetics, mendelian inheritance, and eugenics are terms which have but little vital significance to the vast majority of college graduates, while to the great rank and file of citizens educated in the public school they are meaningless symbols.

All botanists know that phytopathology has passed from the pioneer stage. Its importance to all phases of plant production is now so well established that colleges and universities every-

where have departments wholly devoted to this branch of botany. Conclusive evidence to justify the formation and maintenance of these new departments at public expense is to be found in the results obtained by the corps of active practitioners associated with every experiment station. But to what extent has the great body of knowledge accumulated by the experts become effective in the practices of the average man engaged in growing plants? My observations in this particular field have been somewhat extensive, ranging from the large commercial nurseries to the back woods farmer. It has been found that the producer who treats his seed wheat for smut or his potatoes for scab, or who in any way modifies his practice to prevent the infection of his crops or to control the spread of contagious diseases is the very rare exception. The resultant losses are measured in hundreds of millions of dollars.

In bacteriology the contrast between the valuable knowledge extant and the portion functioning among the people is greater than in any other field of botany. And since many of the edicts of the bacteriologists are laws of health nonconformance to them through ignorance is all the more disastrous. City ordinances calculated to protect public health are for the most part dead letter laws. No law can be enforced against an indifferent or antagonistic public opinion. Ignorance when not antagonistic is usually characterized by indifference. Instead of our public schools being places where specific and effective instruction is given on the nature and control of contagious diseases, they are more often places where contagious diseases are disseminated. It is truly pathetic to hear well meaning parents rejoice because Willie got the whooping-cough or Johnie the mumps, measles, chicken pox, scarlet fever or what not, while he is young. Their theory is, and to our disgrace it is the prevailing theory among the masses, that people must have these diseases and therefore the sooner it is over with the better for all concerned.

It would be ludicrous if it were not so serious to witness the attempts to prevent infection when the information goes out from the health officials that the city water supply is contaminated. City folks are not the only nor even the worst offenders against the laws of sanitation so well known to the botanists.

Down on the farm where everything is supposed to be so pure, fresh and healthful, we more often find filth resulting from garbage undisposed of, open privies, and other sources, so that one is continuously exposed to typhoid, hookworm, and diarrhea through the well known channels of infection.

These conditions it seems to me are directly chargeable to the lack of an educational policy intended specifically to overcome them.

The agriculturists are doing more and succeeding better in disseminating the facts which we hope are destined to transform farming from an empirical practice to a scientific procedure.

As the result of state and national aid the agricultural experts have gone directly to the adult population and with much tact and persistency have demanded a hearing. No such inclusive campaign has ever before been attempted in American education. The results, in so far as the results of an educational campaign can be judged, have justified the effort and the expenditure of public money. There is, however, much remaining to be done. There are legions of farmers living contentedly in their sins. They plant their crops by the moon, operate on their stock according to the signs of the zodiac, and carry buck-eyes to ward off disease. Many of these individuals have been in contact with the truth, but they have passed the formative period of their lives and their habits have become fixed. They may even assent intellectually to the teachings of the experts, but they have not the power to adjust themselves to the new methods. They go calmly on doing as their fathers did while the average yield of crops thruout the country is only from one-third to one-half what it would be if the average farmer knew and applied the available knowledge on plant production. As propaganda the course which has been pursued by the agriculturists has produced wonderful results, but as a fixed educational policy it has many elements of weakness. The greatest good has come, not from the regeneration of the adult population, but from the number of young people who have been influenced to enter the schools and take up a systematic and thorough study of agricultural science.

I have included this statement on the conditions in agriculture because as Dr. Gager recently said, "Most botanists have never been able to shake off the superstition that somehow or other the successful growing of crops is in part at least a botanical problem."

Suppose we turn our attention from applied botany very briefly to the pure science side of the subject without which there could be no applied science worthy of the name. Suppose we were to select some of the big and vital things which have been done recently in plant physiology or morphology, in taxonomy or in ecology, in cytology or evolution, and go before the public to find out what is known in these fields of plant science. We should learn not only that the so-called educated public knows nothing of the facts, but also that the individuals are extremely scarce who know that the field of botanical endeavor has become so large as to include any such subdivision of subject matter.

The facts which I am endeavoring to emphasize are: (1) that there is a large stock of extremely valuable knowledge in the botanical storehouse. Knowledge which has as many points of contact with the lives and practices of the people who compose the average community as can be established by any of the fundamental sciences. It is knowledge which applies directly to sanitation and maintenance of health, to the production and preservation of foods, and to increased efficiency wherever there is involved an intelligent control over plant life or plant products. (2) Just as obvious as the preceding and to those of us interested in public education equal to it in importance is the fact that there is but a very small portion of this knowledge that is being used by the people to whom it is most applicable and by whom the funds have been contributed which has made it available. Through the lack of judicious advertising and efficient salesmanship there is but little public demand for our goods and our most valuable stock is lying stored in the libraries unused.

Live contact has not been made between the research laboratory and the public mind. As a result the current which should transport the new knowledge to all the people and which

should ever carry a fresh and vigorous supply of new workers back to the laboratories is not functioning effectively in either direction. The public is not receiving just returns on its investment and it is only natural that the condition should be met by indifference and the withdrawal of support.

The U. S. Commissioner of Education tells us that the number of high school students taking botany decreased 45% between 1910 and 1915, and that less than 8% of the *total* enrollment studied the subject.

Botanists must decide if it is desirable for the present movement to continue. It means that in the near future botany will be studied only in the colleges and the universities, and that knowledge of plant life from the scientific point of view will gradually disappear from the people who receive their entire education in the elementary and the secondary schools. If this is considered desirable then the present course which is a sort of intellectual isolation is the correct one to pursue.

Any one who knows the subject matter of botany and who is interested in public education will look upon such a result as a calamity both to the science and to education.

The attempted solutions which have been presented recently under the names of Civic Biology—Elementary Agriculture, General Science, and other popular names have for the most part been unsatisfactory to the botanists. We feel as if we were trying under a camouflage of popular phrases, to teach our students a little botany without them knowing it. A rose by any other name may be as sweet, but the botany which has been offered under these assumed names has in most cases been so dilute that it is well nigh valueless. It perpetuates none of the valuable history of our science, meets the present needs only in the most superficial way, neither does it have any elements of promise in it for the future.

There is, after all, a good deal in a name and it is very unfortunate that botany has become a synonym of uselessness in the public mind. The name seems to stimulate about the same round of emotions in the average individual that the term Nature Study creates among the scientists, except, perhaps,

that the latter are a little more violent. I believe that the good name of botany can and will be cleared of the unjust indictment of being useless. I also believe that science will soon form a part of the elementary school course, but I doubt if it can go in under the name of Nature Study.

The work done by the advocates of general science has, I believe, been done in good faith and it has served at least one excellent purpose. It has put the case squarely before us in a way that demands immediate attention.

It is not a simple problem. Many factors have contributed to the condition so tersely expressed in the report of the Commissioner of Education. It seems to me that the discussions of Dr. Gager and Prof. Jordan before the sections of Botany and of Agriculture respectively of the American Association for the Advancement of Science point us in the right direction. What these men have said I believe is in perfect harmony with what Prof. John M. Coulter has been preaching in season and out of season for the past five years or more. The apparent harmony of thought and purpose coming from what in the recent past have been considered rival camps is evidence that progress is being made. I believe that the time should come and I have faith that it will come, and that soon, when the agricultural courses both in the secondary schools and in the colleges will require a preliminary knowledge of botany. The agriculturalists need it and the botanists can do the job. *When agreement can be reached on what the content of such a course should be a big step will have been made toward the solution of our problem.*

I do not believe, however, that botanical courses in the secondary school should exist entirely or even primarily, as a preliminary to agriculture or horticulture. There are too many students who by the very nature of the case cannot continue in that direction and botany can be made to serve them in a more effective way.

I would like to see the courses in botany prepared for the high schools and for beginning work in college so that the points of application to the lives and interests of every one would be so numerous and so evident that there would be no

question as to why they should be required of all, no matter what occupation might be chosen in the future.

In the administration of these elementary courses I would remove the handicap of extra hours which has been arbitrarily imposed on high school science and which is one of the chief causes of its unpopularity with students. I believe that five hours a week under a good science teacher will contribute as much to the education of a high school boy or girl or of a college freshman as an equal number of hours spent in any other subject even though two or four of these hours are spent in the laboratory. The extra hour requirements in the elective sciences have caused the courses to be shunted into almost inaccessible places on the schedule and to be handicapped in numerous other ways. Botany as well as the other sciences would be greatly benefited if more men educated in science would sacrifice their personal interests and seek administrative position.

The best time for the training of a botanist to begin is while he is still at his mother's knee, and the more agencies which can be made to contribute to the desired end the better. Much effort may well be spent in general appeal and instruction by the press and from the stage and platform, but in the last analysis the regularly organized educational institutions will have to be held responsible for the job. Surely there is no place in the public school system where in this so-called scientific age the teaching of science should be neglected.

There is a rich fund of material related to the knowledge of, and control over, plant life which is admirably suited for the needs of all the children in the elementary school. The big reason why Nature Study has been a failure up to the present time is that the scientists have not given it the attention it deserves. Adverse criticisms have been and are abundant, but constructive cooperation has been almost lacking.

There should be a direct and definite course of science teaching which should proceed in regular sequence through the elementary school, and the high school into the university. I would direct no one into such a course simply because it led into the university, but because the lives of those who traveled in that direction would be enriched and enlightened every step

of the way. It should make no difference whether an individual went but a short distance along the route or whether the entire journey was completed. He should be given direct and immediate values for the time and effort spent.

Other sciences have established the connection between the fundamentals of their subject matter and the daily lives of the people without material loss in scientific value, and I believe that botany will not longer lag behind in the process.
