

## BIOLOGIC SCIENCES IN OUR HIGH SCHOOLS.

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The high schools of the United States, and more recently of Indiana, have been effecting important changes in their courses in the biologic sciences. These changes concern not only the secondary schools, but the higher institutions which draw their students from these schools, and which in turn train the teachers for the high schools. The present situation is therefore of wide enough interest to warrant the following summary account.

Four biologic sciences, physiology, botany, zoology, and general biology, are being offered in our schools. The agricultural sciences, while fundamentally biologic, present such special problems that they may be eliminated from this discussion.

Of the four sciences named, physiology has figured least prominently. In its elementary presentation it has dealt chiefly with human hygiene, a subject so often presented in the grades that physiology is gradually being dropped as a high school subject.

Botany once held the chief place as a high school science, 65 per cent of the Indiana schools presenting it as recently as 1922. But it is rapidly being replaced by general biology, less than 40 per cent of the high schools teaching it today.<sup>1</sup>

Zoology as a secondary school science began to decline at an even earlier date. It now survives in hardly 1 per cent of our schools.

Against the above, general biology, which appeared in Indiana three or four years ago, offers a striking contrast. In 1922 it was taught in some 3 per cent of our schools; today it is offered in something over 40 per cent of them.

These are the conditions, whether they suit us or not. The older sciences have failed to hold their places in secondary education while general biology has found a widespread acceptance.

In attempting to appreciate the reasons for this situation we must understand that the high school student may fairly be concerned with the science that proves of most profit to him when he becomes an average adult with an average but incidental interest in biologic affairs. For every future biologist we may train in our high schools, we must train several hundred future citizens who need such a bird's-eye view of the world in which they live, and such a grasp of broad principles that they may understand what biologic problems are concerned in the specific phenomena with which they will meet. The general biology course has won its acceptance chiefly because it presents a bird's-eye view of the sciences of taxonomy, morphology, heredity, evolution, ecology, distribution, and behavior.

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<sup>1</sup> Data based on information from the Indiana State Board of Education.

General biology utilizes both plant and animal material but it is not botany added to zoology. It is concerned with those principles applicable to all organisms, and usually leaves for advanced courses in botany such data as apply only to plants, or to advanced courses in zoology the material that concerns only animal species. In every field of our science there are fundamental problems common to all living creatures. The principles of heredity are neither botany nor zoology; the principles of evolution are broadly biologic, whether illustrated by plants or animals, and in elementary teaching can best be presented from both plant and animal data; the problems of ecologic relations, balanced conditions, epidemics, and economic control embrace in every instance plants and animals. These are the general problems in which the average man wants instruction.

Whether such a course in the principles of general biology can succeed in our high schools can hardly be predicted from the short three years of our Indiana experience. But our judgments are by no means dependent upon this information. We are trying no new experiment, we are neither pioneers nor radicals, but belated followers of a program tried and proved in other states of the Union. As long ago as 1916 three-quarters of the courses in the biologic sciences in New York State were general biology.

That their experience was satisfactory is evident from the subsequent increase of the subject in that state. Today 95 per cent of the biologic sciences taught in New York are in general biology.<sup>1</sup>

Similar records might be cited for Massachusetts, Pennsylvania, Virginia, Ohio, Minnesota, Missouri, Montana, Utah, Colorado and California, to name but a few of the states that have tried the experiment for us.<sup>2</sup>

General biology will succeed in Indiana if our normal schools, colleges, and universities will support it by training teachers to adequately synthesize botany and zoology. We have not met the situation when we train our students to teach botany, and train them to teach zoology. We cannot expect them to make the synthesis which we as professional biologists have failed to make. Somewhere in our program our botany and zoology majors should find a unit course that may serve to guide their own more specialized studies; and whatever his state license may say, no biology teacher is adequately trained until he has had a course in methods and practice teaching in general biology.

Some of our high school instructors, trained in botany and zoology are making excellent biology teachers. Many of them are badly handicapped by their specialized training. Indiana now needs something like 200 teachers ready to present a unit biology, after which the yearly demand will far exceed the supply we are furnishing today.

Recent exhibitions of the public ignorance of fundamental biologic principles emphasize just how much the country needs elementary training. If we find defects in the present biology program, let us apply

<sup>1</sup> Data from 19th Report, N. Y. State Board Education, pp. 594-596, 670-672.

<sup>2</sup> This based on information secured within the year by correspondence with the Boards of Education of each of the states, and from confidential figures supplied by publishing companies.

ourselves to the task of remedying them; but let us realize that this general course is providing such an opportunity as no other biologic science has ever given us. Then let us in our higher institutions assume the training of the teachers who will put across this general biology in the high schools.

