

# A Third of a Century in Biology Teacher Education

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At the beginning of the present century there arose in the United States a group of men eminent in their respective fields who turned their attention to the teaching of biology in the elementary schools and the high schools. Huxley in England had devoted many of his writings and public addresses to the place of biology in education. His essays and lectures should be made the Bible of all young biology teachers. They give inspiration and purpose to science teaching. David Starr Jordan, biologist, biological philosopher, university president, and international diplomat, was spreading the gospel of biology teaching in this country. His little book, *Reality and the Conduct of Life* should be familiar to all who wish to gain a vision of the purposes, aims, and methods of biology teaching. John M. Coulter and Bradley Moore Davis at the University of Chicago, and Besse at the University of Nebraska were concerning themselves with botany at the high school level and with nature study in the grades. Liberty Hyde Bailey and the Comstocks at Cornell University, and C. F. Hodge at Clark University were promoting nature study in the grades.

At this time I was a student, first at the University of Chicago, then at Indiana University, and later at Clark University. During the summers, as an instructor at the University of Indiana Biological Station at Winona Lake, I was associated with Eigenmann, Caldwell, Needham, Hodge, and a number of young biologists. It was from my associations

with these men that I got my ideas as to the materials and methods of biological education. I was taught that the *materials* should be plants and animals, and that the *method* should be that of the laboratory and the field. Textbooks and teachers were to be only helps and guides. I have never strayed far from this early teaching.

The aim and purpose of biology teaching was not always so clear. Whether it was to teach a useful body of knowledge or to create a habit of mind was an open question. Huxley and Jordan had taught that it should serve both purposes, but a great many biologists of that period were little concerned with any application of the knowledge taught. Hodge was an exception. He defined nature study as "learning those things about nature most worth knowing to the end of doing those things that make life most worth living." He believed that the plants and animals studied should be those that had some intimate relationship to the well-being of mankind, that in the selection of such plants and animals interest could be added to the other desirable attitudes of mind developed.

Since this period there has been developed a vast mass of biological knowledge directly related to human welfare and well-being. Most of our knowledge of genetics, endocrinology, phytopathology, bacteriology, economic entomology, limnology, and nutrition with their important individual and social significance has been developed in the past thirty years. During the same period

agriculture, home economics, physical and health education, and psychology have gained a large place in the curricula of our schools. Because of the individual and social significance of these subjects, and because they took over much of the biology that pertained to human welfare, these subjects found a large place in the education of our youth and fundamental biology was in many places almost crowded out of our elementary and secondary schools. The indifference of many of those engaged in the field of biology and the education of teachers of biology toward any application of biological knowledge to the problems of mankind had made it easy for these subjects to supplant biology in the high school curricula. However there were some biologists who were not indifferent, but were disturbed at what was going on.

I remember the attempts of the Kansas biologists to reinstate biology in the schools. The biology roundtable of the State Teachers Association brought Coulter, Besse, Needham, and Bigelow in successive years to Kansas to tell us what to teach in biology in order to attract a larger number of students into the biology classes. We were advised by some to go ahead teaching botany and zoology. Needham and Bigelow especially advised us to teach a biology that had some special application to the problems of agriculture, home economics, health education, and other phases of man's well-being. They pointed out that the physical science classes in the high school were filled because the students in these classes found an immediate application for their knowledge.

In colleges and universities throughout the country courses in agricultural zoology, agricultural botany, agricultural bacteriology, household biology, household bacteriology, etc., began to appear in an attempt to teach some biol-

ogy with an individual and social significance. The titles of high school texts were changed from general biology, botany, or zoology to such titles as "Civic Biology," "Human Biology," "Applied Biology," "Biology of the Home and the Farm" in order to make them more attractive. One publisher simply tore the backs off a series of botany and zoology texts and brought them out under a designated title without a word of change in the text with the hope that they would find a wider sale.

Probably there was another reason for the lack of popularity of biology in the high school curricula. Too often the laboratories were unsightly and ill smelling, and the teachers were untactful in presenting many of the vital processes and therefore offended not only the students but their parents. Then there were those young enthusiastic teachers who offended many in their tactless presentation of the laws of evolution, heredity, and reproduction. The physical sciences taught in our high schools had no such intimate relations to life and were acceptable, while much of the biology was related directly to the intimate processes of living and if not tactfully presented gave offense. The curricula of the high school being also largely classical, the educational authorities in charge often had something of the same attitude toward biology that they have today toward industrial and vocational education. The English and Latin teachers were not convinced that the biology teacher was a cultivated and refined individual.

In many places through the country there have always been disciples of Huxley and Jordan, biologists who believed that the fundamentals of botany and zoology should form the basis of biological education. These biologists also believed that in teaching these fundamen-

tals of botany and zoology a body of knowledge directly applicable to the welfare of the human race could be presented, that the laws of evolution and heredity and reproduction could be made a part of the courses in biology without in any way offending the students, and that the attempt to attract students to biology by giving such courses as agricultural botany, zoology, and bacteriology, or household biology, or any other designated course was futile. They also believed that the tendency to highly departmentalize work for the student who was going to teach biology was a mistake, that those highly specialized in botany, zoology, physiology, or bacteriology, in the nature of things, could not be the best teacher of the fundamentals of all the biological sciences. They also realized that if the high school biology teacher was to present the biological knowledge most intimately related to man's well-being, he must fill his courses

with the essentials of the developing sciences of bacteriology, endocrinology, genetics, entomology, and plant pathology.

Today it is encouraging to this group of men that The Union of Biological Societies of the American Association for the Advancement of Science has turned its attention to promoting a wider and better biology teaching in our elementary and high schools. It is also of interest that at the graduate level several universities are offering graduate work with a major in biology as preparation for secondary biology teaching. Probably the most significant move looking to better and more universal teaching of biology is the organization of the National Association of Biology Teachers. It should enlist the support of all secondary, college, and university teachers of any biological subject who are interested in having the knowledge in their fields find wider application in the lives of men and women.

## Opaque Projection in Biology

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Opaque projection is ordinarily still projection, and still projection remains one of our most effective means of instruction. Moreover, as will be noted later, a considerable amount of motion can be shown with an opaque projection instrument. Such a machine directs the attention of all observers to the same thing at the same time and for as long an interval as is necessary for careful study and discussion. Material can be repeated as needed. The whole process is very flexible. In the paragraphs which follow the writer hopes to point out some

of the wide variety of uses to which this instrument can be put.

### OPAQUE OBJECTS

The amount of opaque material which can be projected advantageously in the biology classroom is almost unlimited, and the cost is negligible. Illustrations from books, magazines, and catalogues are easily screened. Charts, hand-drawn sketches, and maps can often be used effectively. Typewritten or handwritten assignments and announcements can be made by the use of this machine. Postcards and photographs—photographs