# Biology Out-of-Doors in the Elementary School

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**A proponent of Agassiz's dictum to "study nature, not books" illustrates the importance of using the outdoor laboratory with elementary school students.**



An organism is the product of its heredity and its environment. This is the basic concept of living things. This is the basic concept of life. It should be the basic concept of biology curricula and biology courses. It is not. And, as a result, this basic concept is not known or understood by the products of America's schools—the American public.

I should have said the products of America's biology teachers, for they are the ones who have been given the responsibility for developing courses and curricula designed to give their students an understanding of the science of life. In this they have failed. Perhaps it would be more accurate to say that they have half-failed. For, certainly, there has been no neglect in the teaching of heredity. I hear fifth and sixth graders day after day talk of DNA—even the gene is not sophisticated enough for them. Whether they understand DNA or the gene I leave to you. At least we can say the textbook and the teachers are covering the subject matter.

When we get to the other half of our basic concept—environment—however, we find neither understanding nor coverage, despite the fact that the future of man as an organism depends on an understanding not just of the organism but of the organism in relation to an environment.

We are going through a period of biological evolution unmatched in the history of the earth. Whole environments are being wiped out, species which have evolved over billions of years are being brought to the threshold of extinction, populations of living things are going through unprecedented alterations. Even man does not escape. Perhaps man is affected more than the other organisms of the earth.

Within a relatively few years (in terms of life on earth) man the animal has been forced to live in a new environment—the urban environment. During most of his time on earth, man has been a rural being—a farmer or hunter, an animal with close ties to the land and its environments. He has only begun his new existence in his urban environment—his artificial environment. We know that animals react to sounds, changes in light intensity, smells, and changes in temperature. Caged animals deprived of these stimuli develop ulcers and suffer nervous breakdowns. And what of man in his new artificial environment—his "ideal" environment, conditioned air, uniform intensity light, soundproof rooms, closed windows? Is man the animal adapted for living in this new environment? Will he react as the other animals deprived of natural stimuli, with nervous breakdowns, ulcers, inability to live in a crowd? A glance at the daily newspapers or a review of the statistics on the quantity of sedative, antacid, and sleeping pills sold

would lead one to wonder if man is indeed adapted for city life.

And what does all of this have to do with biology out-of-doors in the elementary school program? Just this. If man is the only organism which can consciously control, transform, wisely use, preserve, or destroy his environment, then a knowledge of how man controls, transforms, wisely uses, preserves, or destroys his environment, should be an essential element of human understanding. It is not! Because biologists and biology teachers neglected to give their students an opportunity to gain this knowledge, these understandings. As a result, we in America are rapidly destroying the environment on which our future as a species depends. We have polluted our waters, and the air we breathe. We have introduced biocides into our environment without any consideration of their effect on plants, animals, or ourselves. We have produced new species of disease organisms resistant to all known controls. We reproduce beyond the capacity of the earth to support our life. In short, because of our ignorance of elementary biology, we now face the problem of survival.

To gain an understanding of environments, scientists go to the environments. Children must also go there. Although the classroom is an environment (and a very useful one to study as it changes minute by minute), the environments of most living things are out of doors. We must go there to learn about them.

We must develop curricula and textbooks which recognize the place of environments in biology. Obviously, knowledge of environments is a complex thing. Environmental changes are being made on the basis of economic feasibility, social desirability, or political expediency more often than on the basis of scientific knowledge. We as biologists and biology teachers must accept the responsibility for this. We must give our future economists, sociologists, politicians, and writers the scientific knowledge for informed public action in matters dealing with environment and life on this earth.

In order to develop biology—or education—for a total environment, we must develop a total environment for biology— or education. This involves teachers and facilities as well as courses and curricula. In our schools, we use the text, the curriculum guide, the manual or workbook, the classroom, the film room, the *indoor* biology laboratory, but never the *outdoor* biology laboratory. And you all have one just outside your classroom or indoor laboratory, whether it be a paved parking lot, a forest, or a lawn. It is an environment, and it is *the* environment which you should start with in helping your students to understand our basic concept of the interaction of heredity and environment in the development of a species. Every other environment they will ever study will be similar. Every organism will be similar. In each case there will be a set of inherited characteristics which allow a species to maintain its population in that environment. In each case, there will be a set of environmental conditions which interact.

For example, in the study of populations, every organism inherits certain traits which govern its reproductive capacity; such as number of eggs produced, care of eggs, care of young, age of maturing, frequency of egg production, length of life. Interacting with these are the environmental factors, usually limiting factors, such as food, water, cover (a place to hide or from which to hunt), weather and climate, disease, enemies, or natural disasters like fire, flood, or quake. This can be worked out by children for any animal or plant in any environment, including themselves in their environment. It is that simple, whether the species is an ant or a man.

Why can't you do this in the classroom? You can. I have on many occasions, quite satisfactorily. But it is easier, and much more effective to do it out-of-doors, in the actual laboratory situation, the natural situation. If we believe in the laboratory as an efficient place to learn science, then the outdoor laboratory must be the most efficient place to learn the science of the out-of-doors —of the world in which we live.

The outdoor lab is always there. It is always set up, stocked, and ready to use. And, most important, its lessons change, its conditions change every minute. There are real measurements to be taken, real questions to be answered, real situations to be studied.

Why, then, is the outdoor laboratory not used? There are several reasons, I think.

Many feel it is more difficult, although those who use it say it is easier to teach there. Many feel unprepared, like fish out of water, and this is probably true. For biologists and biology teachers have traditionally been trained with dried, salted, pickled, embalmed, in fact with anything but living things, which is what biology is supposed to be all about. In addition, there has never been an opportunity until recently for a biology student to take a course which dealt with the relationships of living things to one another and their environment—to study ecology.

Even in this enlightened era of concern for sanative environments when ecology courses can be found in college catalogs, they are more apt to be courses in animal ecology, or plant ecology, with no relationship between the two. In fact, in more cases than I would care to believe, these courses are taught by different individuals, in different college departments, usually in different buildings.

The job of integrating the knowledge of plants and animals and the world in which they live together, which the professors have been unable to accomplish, is left to the student.

So, too, the high school student is often left with the job of integrating the plant and animal sections of his biology course, which his teacher and textbook may have been unable to do.

The situation seems to be getting worse, rather than better. With new techniques and new equipment, biology seems to be becoming more and more concerned with the microscopic and the molecular, less and less concerned with life as a whole. We may lose the pickle jar, but we will gain the oscilloscope. The laboratory of life will remain unused at most levels of education.

This leaves the job of giving our young people a knowledge of the world in which they live, their relationship to it, and its relationship to them, to the elementary school and the elementary school teacher. Perhaps this is fortunate. At the elementary level, we can allow children to see the forest before they are forced to identify species of trees, shrubs, and vines. They can see the pond with all of its inhabitants living together before they worry about drawing the standard laboratory picture of the fish (from a dead specimen). They can then decide which of the world's inhabitants, or environments, they would like to know a little better. It is a little like the boys at the beach, looking over the total environment before they zero in on a particular species which catches the eye and sparks interest. I believe that if we can develop a science curriculum for the elementary school which will give our children the basic background for understanding the role of heredity and environment in the development of species, we will eliminate the ignorance and apathy which have washed America's use of her environment. Our efforts at The Pinchot Institute are directed to that purpose. We are interested in more than understanding. We are concerned with attitudes, and with abilities to search, and question, and experiment. We want our future citizens to make decisions on the basis of careful consideration of alternatives for action.

We must provide them with opportunities for finding answers to their questions, for doing research if you will. Some of my former biology professor colleagues would laugh if I talked of fourth graders doing research. It should be the other way. Seldom does a high school or college student get to do any research unless he is one of the select few doing honors work.

But elementary students in the outdoor laboratory can do research. There are questions there, the answers to which cannot be looked up in the book, or sought from an expert. Only the living specimen, if they are sought out, can supply the answers. For example, when doing leaf study in the early spring as the buds are opening, how are the new leaves folded? Are they all the same? How long does it take for a bud and its leaves to open? How many leaves in a bud? Are all trees the same? All oak trees? I call this research. Do you? Even if your students find an answer in a text, or library book, or from an expert, it should be checked with their own data. They will develop a scientific attitude toward finding answers to their questions, toward the words of the specialist, and toward the information in their books.

The elementary teachers want to do this. Children come to school with an insatiable thirst for knowledge about the world in which they live. In the past, this interest has

been killed off in a year or two. Let's help the elementary teacher accomplish this job of giving our children a knowledge of the world in which we live. Your future high school and college biology students will be better for the background they will have had. One word of warning. Be prepared to upgrade your courses. The future biology students will not be satisfied with your rehash of old materials and your theory that you have to start all over because it was done so poorly at the lower levels. Good biology education is now taking place in the elementary schools.

## Rabies V: What to Do If Bitten

It should be emphasized that everyone bitten by domestic or wild animals need not undergo antirabic treatment. If the bite or scratch has been inflicted by an animal obviously not rabid or demonstrating any sign of rabies, the treatment is not necessary.

At the same time, there are several situations in which the antirabic treatment is imperative. Obviously, if the bite has come from an animal known to be suffering from rabies or has certain suggestive symptoms, the treatment should be commenced at once. Also, treatment is mandatory if the animal causing the injury has been killed or is otherwise unavailable for observation and diagnosis.

Ideally, the animal, be it a dog or whatever, should be apprehended, confined, and placed under the care and supervision of a veterinarian. For about two weeks, it will be treated normally, and if no rabies symptoms manifest themselves and it remains well otherwise, it can be released and the matter forgotten.

If, however, rabies symptoms appear, the veterinarian will have the animal destroyed in such a manner as not to damage the brain. The head is then dispatched to a laboratory to be examined for the presence of "Negri bodies" in the brain tissue as they are considered certain evidence of rabies. When to begin the antirabic treatment depends on the individual situation and the advice of the supervising veterinarian and attending physician.

## Rabies VI: Control and Elimination

Though horrible in its ramifications and impervious to cure, rabies can not only be controlled, it can be eliminated. Many persons each year are inconvenienced, to say the least, by having to take antirabic vaccinations. Sometimes farm animals have to be destroyed and many pets needlessly die. Yet all of this could be prevented.

Control in domestic animals is not very complicated and once established not very difficult to maintain, but it takes determination and cooperation especially on the part of pet owners.

Many localities not only require that dogs be licensed, but be vaccinated against rabies as well. The American Veterinary Medical Association (AVMA) unequivocally supports the vaccination program and urges all pet owners to have their pets vaccinated whether or not required to do so by local ordinances. Veterinary medical scientists have developed vaccines which are safe and effective and offer maximum protection against rabies. Every dog three months of age or older should be vaccinated. Three-month old puppies should be revaccinated in six months. Generally, all dogs should be vaccinated once a year. A veterinarian is the best source of information on the necessary frequency of vaccination for a pet. Vaccination is in no way harmful to the animal.

## State Biologists Association

Maine biologists, high school and collegiate, have organized a state association under the leadership of Alton Gustafson, Bowdoin College, and Joseph Vaughan, Brunswick High School. The first meeting of the group was held May 7, 1966, and featured Dr. Richard Cowan of the Smithsonian Institution and the OBTA presentation.