

PRESIDENTIAL ADDRESS

CLASSICAL BIOLOGY — THE BASIC SCIENCE

Morton Green

Department of Biology, S. Dak. School of Mines and Technology

The remarks made here do not necessarily apply to any individual or to any particular group of individuals in this audience. Nevertheless, because of the nature of the subject I am taking advantage of the opportunity which presents itself and will express my opinions.

For a while, in searching for both a topic and a title, a paraphrase of "Yankee Go Home," incessantly entered my mind. These, and similar titles were rejected, not because they were impolite expressions of an emotional state but because of their negativeness. Further, remarks such as these are mere name calling and I felt would reduce me to the level of some of those of whom I shall speak.

In the past several years there has been a hue and cry that Biology, referred to as Classical Biology here, is out of date: That students of Biology should first study the basic sciences of mathematics, chemistry, and physics (Bonner, 1960; Lenhoff, 1963) and that, furthermore, classical biology need not be studied at all since it is no more productive than mere stamp collecting (deSolla Price, D. J., 1960). These statements and others like them have led to what has been called "The Schism in Biology." It is maintained, here, that this schism is a myth. In order for a schism to take place, there first must be unity; in this case, a unity between Biochemists, Biophysicists and other Mechano-Biologists with Biologists. There never was such a unity, *ipso facto*, there is no schism.

What, then, do we have? An enormous amount of information regarding the chemistry (and physics) of living organisms has been gathered in a relatively short period of time. This is a result of a phenomenon now called "a Breakthrough." There is, on the part of some research workers in these fields, a deliberate insistence that their contributions to science, especially to biological science, are the most important. Their attitudes, it seems to me, reflect a gross egotism, and the smell of empire building is in the air.

I do not disagree that their findings are important. I do not disagree that they have just opened a new door. But I would caution them that while an occasional unexpected and perhaps startling discovery will be made, most of these workers will be

doing routine research, making their small but needed contributions to the general body of knowledge just as do the rest of us.

It is maintained, here, that no schism exists but a deplorable lack of knowledge of and, consequently, understanding of what classical biology is. A recent example is that of Bonner (1963) whose concept of taxonomy is shockingly beyond belief for a scientist who calls himself a biologist. Bonner thinks that taxonomy consists only of collecting and identifying specimens, and that the most important contribution of a taxonomist is that of describing new genera and species. And further, that when all the species have been described there will be nothing left for a taxonomist to do. Therefore, he reasons, if a student is interested in biology he should avoid natural history. Indeed, he should be directed away from it. It would seem that Dr. Bonner is not acquainted with either the modern concept of taxonomy or with the species problem. Can it be that he is ignorant of the published works of such contributors as Ernst Mayr, Theodosius Dobzhansky, and G. G. Simpson? It may be added, parenthetically that Simpson (1962-1963) has probably done more to explain the problems of and close the nonexistent rift than any other scientist.

It may, perhaps, be asked why Bonner is singled out (and he is) and the answer is that, in my opinion, Bonner uses the Bulletin of the American Institute of Biological Science as his propaganda medium. Biologists with interests outside of the "New Biology" do not seem to find the same favor in the AIBS bulletin as do others. At least, it seems so to me. Now I have just mentioned the "New Biology." This unfortunate term is in prominent use by that group of biologists (self-called) favoring the biochemical approach to living organisms. The derogatory euphemism "Traditional Biology" (of biochemists) I reject in favor of "Classical Biology." But let us return to the "New Biology." This term has been called unfortunate. Why? First of all, to call biochemistry "New" is an outright deception. There is nothing new about it, only new information and a great amount of it. The only thing that might be called new is its appearance in more detail in textbooks intended for introductory courses. Secondly, how long do the users of the term "New Biology" think that they can use it? The use of the word "new" is overworked.

Let us return to the proposition that a prospective student of biology study the physical sciences before studying any courses in biology. The underlying theme and purpose of scientific investigation in biology is organic evolution. I believe that there is no quarrel with this statement, even from non-biological scientists. It surely is evident by now that the attitudes and modes of thought of an evolutionary biologist are different from those of physical scientists. Any evolutionary biologist who has discussed organic

evolution with his colleagues from the physical sciences is aware of this and surely the physical scientists should be able to discern the differences also. Even when the physical scientist endorses organic evolution he does so in such a back handed manner as to leave no doubt in the mind of the evolutionist that the endorsement is in reality a rejection and disapproval of organic evolution by an anti-evolutionist who does not know that he is one. For example G. A. Kerkut (1960) imagines that the evolutionist is not aware of some extremely difficult problems. He is of the opinion that our students are not told these problems but that they are kept secret until we have convinced them, falsely, that the principle of organic evolution is correct. Once convinced, then it is safe to tell them. Surely, this is no more than naivety and not a form of anti-intellectualism. But is it? Let us examine a section of Kerkut's work dealing with a subject of which I have some familiarity, the evolution of the horse as seen through research in vertebrate paleontology. Kerkut thinks it is amazing that since the first phyletic scheme was drawn up in the 1870's that it could have been modified so often. He is troubled that different workers are able to propose slight variations in the interpretations of the available material. He would lead one to think that similar situations do not exist in other branches of science. It is recommended that Kerkut and others, read the AIBS Biological Science Curriculum Study Pamphlet by Auffenberg (1963) in which some of the problems of horse evolution are detailed. This work is intended for high school students.

There is more. But we can excuse a non-specialist for not being aware of the literature and for not having an understanding of a field of science outside his own. But can we excuse him? It is left to you to decide this.

Let us go to another example. In recent years, there has appeared in the popular press multitudes of statements regarding the possibility of life on other planets. Take notice to who makes the positive statements that life does or must exist elsewhere. Seldom, if at all, is it a biologist, but some biochemist, astronomer, or perhaps an astro-physicist. I neither deny nor affirm the possibility but it would be well for those who make such positive statements if they were to read a textbook of ecology, even an elementary one, before making further pronouncements.

The mention of ecology brings to mind certain problems about chemical pesticides so ably revealed by Rachel Carson (1962) and also by Lewis Herber (1962). No scientist, especially those who plan to make changes with the natural ecologic state, should proceed before reading these works as well as a short article by Pyke (1963). In connection with this I should like to mention a

commercial letter received by me. This letter, probably sent to thousands of biologists, is accompanied by reprints of unfavorable reviews of "Silent Spring." To sum up, the letter and the reviews decry Miss Carson's book because it is one sided. I can only smile at this and say, "Isn't it time, isn't it time the other side were told?" These viewpoints are not new. Biologists have long held them but time and time again the views and opinions of the biologist brought up in the classical tradition are ignored. The case of ecologic disruption is but one.

In all of this, it is not intended to mean that there is no place in classical biology for modern techniques or for information derived from new sources. What is intended here, is the viewpoint that a student planning to study biology, whether in the classical vein or in the molecular approach should first study classical biology in order to develop, and be inculcated with, the evolutionary doctrine. The biochemist or biophysicist, if he wishes to be called a biologist, should be a biologist first, a chemist or physicist second. One is the viewpoint, the other, the technique. The technique should not precede the viewpoint.

In spite of superficial appearances to the contrary, I maintain that natural history is the most basic and most difficult of the sciences. It has, indeed, been studied the longest and is yet the poorest known. In natural history we are constantly confronted with man's anthropomorphism. It seems that people, particularly those who are not biologists, are most susceptible to this. Because of this the biologist has a great deal of difficulty in trying to get a truth across. Man is a living organism is the attitude, *ergo*, he knows all about himself and all other living things. He cannot be told otherwise. The biologist is ever battling this. Remarks pertaining to living organisms made by scientists not in biological fields do not help us in our relations with the general public or our students. Time and again students have said to me, "Did you see in last night's paper that Dr. so and so said such and such?" The usual reply is, "Obviously, he is an ignoramus who should know better and would be wiser to say nothing about a subject in which his knowledge is superficial."

I refute the contention that classical biology is either dead or dying and that it has no future. Rather, it is needed now more than ever. I plead with the physical scientists who have been so vociferous to be quiet. I also plead with the biologist to speak out and be heard. Admittedly, this is not easy to do for so often the view of the evolutionary biologist is an unpopular one, (as protest against atomic fallout, protest against sending earth contaminated vehicles into space, protest against destruction of forests and other natural areas, as well as publicly voicing the prin-

ciple of organic evolution.) But speak out anyway. Write that letter and mail it. Don't just show it to your colleagues for approval and then file it.

In conclusion, what constructive criticism can be made in the face of the onslaught that conceives of biologists as physical scientists? We must admit that the future biology major should have a sufficient knowledge of techniques and methods from other fields available and applicable to his field for an understanding of the meaning of contributions from specialties other than his.

These suggestions regarding the curriculum for the biology major are offered. One year of physics, mathematics through calculus, and chemistry through organic chemistry are essential. These courses plus a normal complement of biological subject matter make a formidable curriculum. We would expect that the humanities and languages would not be neglected. Obviously, this cannot be covered within the four year scope for a Bachelor's degree. The student should know what is expected of him. While he may not be able to cover all the recommended hours in a four year program, he should adjust his scheduling of courses so that he will not be graduated with glaring gaps in his background. A sequence not completed can then be done in the first year of graduate work. For example, statistical methods or physical chemistry if needed for a particular major. The responsibility belongs to department heads and advisors. Competent guidance by these faculty members must be at work.

A suggestion regarding physical science majors is made, too, that no undergraduate physics or chemistry major be eligible for a Bachelor's degree without one year of biology. For such a student to go beyond one year of graduate work without a year of biology should be unthinkable. Despite all the criticism leveled at biology curricula my personal experience has been that far more biology majors have had courses in physical sciences (exclusive of geology) than physical science majors have had courses in biology.

It is time for a re-examination. Since we are living organisms it would be well to consider biology the basic science, basic to our understanding of life, and basic to mankind's future needs and existence. I challenge departments in the physical sciences to accept this as a fundamental premise and to meet its needs.

Questions concerning biological problems, particularly those involving a community of living organisms, should be referred to biologists for study and reply and not to those (physicists and chemists) whose knowledge pertaining to these questions is insufficient or who have a political or pecuniary interest at stake.

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