A Naturalist at Large: Skin-in, Skin-out

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Each semester I arrange a seminar of a dozen or so students who meet one evening a week in the living room of the house. I try to select students with different interests, from different departments of the university, with the idea of getting to know a small but varied sample of the student body. We decide on some topic for discussion during the semester, but whatever the official topic, two subjects—education and sex—always come up, and always generate heated arguments.

I suppose there is nothing new about the interest in sex, although the talk does seem to me more open and general than it was in my own student days. But the preoccupation with education on the part of the students— with subject matter and methods of teaching—does strike me as new. Sure, we used to grouse about the requirements and talk about professors we didn’t like, but I don’t remember any vocal rebellion about the system or any serious discussion of alternatives. Now students, faculty, administration, and the public in general all seem to be deeply concerned. This is partly a consequence of sheer numbers, resulting in the complex and impersonal “multiversity,” and partly the consequence of the post-Sputnik pressures for intensified training, especially in the sciences.

But my purpose here is to look not at the general problems that have developed in our educational system—for which I have no solutions—but at the special case of the role of natural history in high school and college. I’ll not try to define natural history—its nature is reflected by the contents of this magazine, which include aspects of anthropology, geology, geography, and astronomy, as well as biology. My specific concern is with biology—with the approach to the study of living things. My impression from discussions with non-science students confirms my own belief that the present emphasis in the teaching of biology is misplaced—giving far too little attention to activities of living animals and plants.

Biology has generally become a required subject in high school, usually at the sophomore level. Most colleges have adopted the principle of “distribution,” meaning that every student should be exposed to a number of courses in the natural sciences, social sciences, and humanities, and must at least have a certain level of skill in mathematics and some foreign language. The idea is to develop broadly educated citizens by acquainting them with a variety of different kinds of knowledge. This mostly involves taking introductory courses. It seems to me that introductory courses are designed for the purpose of discouraging interest in the particular subject—and
that they are generally successful. The trouble, of course, is that the instructors are apt to be most interested in the minority of students who will possibly be future specialists in the fields in question. The others presumably acquire understanding through some obscure process of contagion; however, I suspect the rate of infection is not very high.

The situation in biology seems particularly dismal—an opinion that I share with a large number of my colleagues, though we are far from agreement on what should be done about it. One difficulty is a basic split among biologists themselves on the matter of where emphasis should be placed in teaching. The eminent paleontologist George Gaylord Simpson has discussed this in an article in the summer issue of The American Scholar, under the title “The Crisis in Biology.” Simpson distinguishes between “molecular” and “organismal” biology: between the scientists interested in the physics and chemistry of living processes and those interested in the workings of the organisms themselves.

This distinction is probably more logical than the one I have long made between the “skin-in” and “skin-out” aspects of biology. I meant to separate the study of the way the parts of an organism work from the study of the whole animal or plant—it’s behavior, its place in the biological community and in the evolutionary scheme. The anatomist or physiologist may still be interested in seeing how the parts go together to make the whole organism, but the molecular biologists often seem to lose sight of the whole organism in their pursuit of chemical details.

The physico-chemical point of view toward life has a long history, but it is currently particularly fashionable because of a series of undeniably important discoveries. The most notable and talked-about of these concern the determination of the structures of the nucleic acids DNA and RNA, which seem to lie at the basis of heredity. But there is still much to learn. Simpson quotes “one of the stormy petrels of biology” as saying that to consider “that DNA is the ‘secret of life’ is less true . . . than that life is the secret of DNA.”

Teachers and textbook writers understandably want to reflect the most recent developments in their subject, and this means, as Simpson remarks, that “biology students may be taught recent and esoteric bits of biochemistry but not the systematics, physiology and ecology of organisms.” Plants and animals are still with us, however; and it seems to me that the most important thing that the ordinary student should get from biology is some understanding of the forms of life with which we share the planet, and their relationships among themselves and with our species. I don’t worry about the future specialist, because in the long run he will have to educate himself—the teacher’s problem in this case is to encourage him and to be available and helpful in whatever way he can.

I like to distinguish between education, which I take to be concerned with ideas and understanding, and training in particular skills and techniques. Education in this sense should help us to cope with our own problems and with the problems of our society and of mankind as a whole. The great problems that face mankind, as
I see them, are the population explosion; the threat—and reality—of war; the conservation or wise management of resources; and the maintenance of a healthy environment. None of these can be considered purely biological: since the concern is with people, the whole range of the social sciences is involved. But the human species is a part of the earth’s biosphere, so that biological concepts and facts are also relevant and important. Yet the pertinent parts of biology, of natural history—ecology, behavior, systematics, even evolutionary theory—get little attention in our textbooks and lectures.

At the University of Michigan I try to meet this problem with a course called “Zoology in Human Affairs” (the title was not my idea, but it leaves me free to talk about almost anything). Enrollment is limited to juniors and seniors who are not science majors. I can thus presume some previous experience with such subjects as psychology, anthropology, sociology, economics, and the like. To preserve my own sanity, I try to make the course somewhat different each year. But I also try always to cover to some extent such topics as the organization and interrelatedness of biological communities (including the man-altered landscape); the dynamics of animal populations, emphasizing the peculiarities of the present human situation; the history of ideas about evolution and man’s place in nature; the epidemiology (natural history) of disease, chiefly because it has been my own special research interest; and animal behavior with emphasis on aspects that may be relevant to our own evolution and development.

After a couple of experiments, I have abandoned the idea of using a textbook. I want the students to find that reading about biology can be interesting as well as instructive, so I have them get four or five paperback trade books. I have made one exception to the use of paperbacks. I want some book to give a background of the ideas of ecology, and after trying a number of the available paperbacks, I have, for the last three years, settled on Peter Farb’s Ecology in the Life Nature Library. Like all of the Life books it is beautifully illustrated, and something I hope students want to keep.

Whether or not to use one of my own books remains an open question. At one time or another I have tried The Nature of Natural History, The Forest and the Sea, and Man in Nature, but I always have a guilty conscience because I feel that the students get enough of me in listening to the lectures—and besides, it stops me from making cracks about professors who use their own books.

King Solomon’s Ring, by Konrad Lorenz, is a perennial favorite. It is, as they say, “anecdotal,” but I can explain the psychological theories about animal behavior in lecture. George Schaller’s The Year of the Gorilla gives them a special case of a field study of one of the great apes, and I try to sketch the other recent studies of wild primates in lecture. This year I am trying Darwin’s Voyage of the Beagle. It should give them a glimpse of geographical diversity, some insight into the Darwin personality, and a feeling for a natural history not yet permeated by evolutionary thought.

Each year I try one or two books I have not used before. If the majority
of the students find a book dull, I do not use it again, regardless of my personal opinion. I want the material to be accurate, but I also want the reader to enjoy the experience. I am trying to give the students an appreciation of the scientific enterprise through exposure to a few aspects of "organismal" biology. I do not see how they can get this by memorizing the names for the appendages of the crayfish, or even by trying to master the chemical complexities of intracellular metabolism.

I like the remark made by Joseph Wood Krutch in his book *The Great Chain of Life*: "To proceed from the dissection of earthworms to the dissection of cats . . . is not necessarily to learn reverence for life or to develop any of the various kinds of 'feeling for nature' which many of the old naturalists believed was the essential thing. To expect such courses to do anything of the sort is as sensible as it would be to expect an apprenticed embalmer to emerge with a greater love and respect for his fellow man."

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A Membership Fairy Tale

Once upon a time . . . there was a small group of science educators who thought it would be mutually beneficial to band together and form a national association for all teachers of science. A long time ago, this idea was nourished with effort until it grew . . . and grew . . . into an organization with its own bylaws, committees, and publications.

In the year 1960, there were all of 13,022 members, and then there were 13,224, and then 14,904, and then more! The new year of 1968 found them with 22,000 members and many more subscribers to their two national professional journals and with plans for the celebration of their twenty-fifth anniversary of existence!

And they lived happily ever after, or did they—these 22,000 members? Under the dynamic leadership of their elected officials, this association felt the full surge of its youthful exuberance and began to grow and grow again! Each member vowed to obtain another member, and then there were 44,000 members. These members then again doubled their number and then there were 88,000 members. And, before the IBM machines could record new membership figures, all of the more than 100,000 science educators in these United States were now members of their professional association!

Now, their voice was not only heard but felt in educational circles. Now, they could accomplish the many long-needed improvements in their chosen profession, for truly, they were all professionals! Now, they could transform their dreams into reality, their projections of the future into the mainstream of their everyday practices.

From fairy tale to fact? It can be done! You, the NSTA member, can make the fiction of today turn into the practice of tomorrow through your eagerness to spread the advantages of