

Letters to the Editor

About the "Extended Discretion" Laboratory Approach

This approach (*ABT* 42:7) has to replace the recipe-like biology laboratory exercises. The recipe-like exercises are not only boring to the students. Also, they're boring to the teacher. If the teacher is bored, it's a difficult matter for a teacher to motivate the students. The students desire and need the challenges offered by the ED approach. I certainly believe that we've underestimated their potential, and I base this statement on a review of many exercises in various general biology laboratory manuals over the last six years of teaching. Very few manuals on the market today offer to the student an educational and stimulating afternoon in the laboratory.

There's no doubt that laboratory time can provide for students a better understanding of difficult biological concepts, and they should be geared to be as important as the lecture component of the course.

I get very annoyed whenever I reflect on the type of laboratory exercises that I had as an undergraduate and as a graduate student. They were definitely lacking and boring—recipe-like activities, to a great extent.

Finally, I'd like to commend Dr. William H. Leonard for his well-done study and article in *ABT*. Hopefully, the outcome of his work will account for a large number of biology laboratory manuals based on the ED approach.

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Leonard Responds

First of all, let me thank Dr. Panik for sharing my enthusiasm for labo-

ratory activities which promote student involvement in discretion, science processes, and creativity. I, too, am simply disgusted by the state of the art of commercial lab programs for high school biology; and I, too, agree that nearly all available are far too cookbook.

I have been both surprised and pleased at receiving over 75 comments and requests for more information from biology teachers as a result of my article on the Extended Discretion Laboratory Approach. All of this demonstrates the real purpose of educational research: to identify variables contributing to meaningful learning and to communicate these to teachers for improved learning conditions.

Incidentally, I am working on laboratory "manuals" (I don't like that word because it implies rote or mechanical) for both high school biology and university-level non-major biology. Perhaps, as Dr. Panik suggests, others will follow.

Two Helpful Hints for the Laboratory Instructor

Hint 1: An Easier Way To Administer Lab Practical Exams. A laboratory practical exam is one of the best ways to ascertain whether or not a student has learned the material. In anatomy courses this type of exam is essential, yet it takes a tremendous amount of time to prepare. Rather than setting up slides on microscopes, I have cut out pictures from old biology catalogs and mounted them on index cards. To give a practical exam, I sort out the pictures I need and stick a colored pin through the index card with a temporary cardboard backing. The advantage of this method over project-

ing Kodachrome slides is that if students are absent (they always are nowadays), I can store the exam in a drawer and set it up in minutes. By not using microscopes, I do not have problems with students moving pointers or lifting tape to peak at labels.

An excellent permanent collection can easily be made and stored for future use.

Hint 2: An Easier Technique of Chromatographic Separation of Plant Pigments. I found the article "The Advantages of Chlorophyll Extraction with Alcohol" (Storey 1980) very informative, but I would like to add an easier technique of applying plant pigments. The pigments may be applied *directly* to chromatography paper by rolling the edge of a coin on a leaf which is on top of the paper. Two or three rolls of the coin transfers more pigment than the old fashioned technique of applying a solvent. Problems with broken capillary tubes or other applicators are eliminated. This procedure is easier and safer because no extraction is necessary.

The chromatograms prepared in this fashion were the best I have ever seen with distinct bands of color.

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Reference

STOREY, R. 1980. The advantages of chlorophyll extraction with alcohol. *American Biology Teacher* 42(3):180

More on Animals in the Classroom

The response of Wayne Moyer to Arthur D. Meyer's letter [*ABT* 42(5):315] about "Animals in the Class-

room” raises an important point about biology education that Dr. Moyer avoids, but that needs emphasis. Students are upset by pithing and similar physiological procedures because they *do not understand the basic principles involved*. Since these concepts are central to understanding animal physiology and among the most interesting we teach, we should devote more time to helping students understand them, not less. Students need to be carefully introduced to the materials of life, but the introduction should be thorough enough to make them comfortable with blood and reflex responses. We should be looking for teachers who can demonstrate that they have found successful ways of teaching these concepts and asking them to give workshops to teach these skills to others, not abandoning these concepts as unteachable—after all, we learned them. When the critics realize that they object because they do not understand, and not because we are cruel, we will be teaching biology.

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Moyer Responds

I agree with Don Igelsrud’s main point that laboratory procedures are not ends in themselves, and that teachers who fail to impart the principle underlying a procedure have failed to teach. However, we still have an obligation to examine the side effects of what we ask students to do in the name of science. Awareness is all I advocate.

“Evolution and Creationist Arguments”: Other Views

I have just read “Evolution and Creation (*sic*) Arguments” by Catherine A. Callaghan in *The American Biology Teacher* (42:7). Quite frankly, I am a little puzzled as to why

it was even printed. What is the object in having an evolutionist write an article on the superior evidences of evolution to believing evolutionists? As a science teacher and a creationist, I found the twenty points of her argument shallow and unconvincing.

Creationists are sometimes labeled unscientific. I for one maintain an open mind and will listen and consider opposing points of view. But I find most of my evolutionary friends are quite dogmatic in their *one* view of origins and unwilling to consider the evidences of creation. I would not ask one to make a blind leap of faith but to consider the evidence in a rational manner and then make an objective evaluation.

Would it not be more intellectually honest, to have a creationist write an article on the scientific evidence of creation? Why not allow your readers to hear both sides of the argument, from people on opposite sides in the argument? Your readers are intelligent people, though most have been educated in *only one* view concerning the origin of life and its development. And if educated in only one view, how many options do they have from which to make an intelligent choice? Any argument is convincing when you have only heard half of it. Or if you have heard both sides of the story from the same person.

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Catherine A. Callaghan’s article, “Evolution and Creation (*sic*) Arguments,” in *ABT* (42:7) precisely illustrates the dilemma confronting public school teachers regarding the evolution-creation controversy—how to present both sides of an argument when one has been trained to present only one side. It was refreshing to read both sides of the argument presented in a mainstream science journal—Callaghan and the *ABT* staff must be commended.

Darwin considered *The Origin of Species* “one long argument from

the beginning to the end.” In that respect, one of William Hopkins’s criticisms of *The Origin* reads as follows:

Indeed, our author makes at any time but little use of the verb “to prove,” in any of its inflections. His formula is “I am convinced,” “I believe,” and not “I have proved.” We are not finding fault with these more modest forms of expressions; but we may be allowed, perhaps, to remark, that they are the formulae of a creed, and not of a scientific theory.

Hopkins’s criticism could apply to Callaghan’s article; the only difference is in the expressions that she used such as, “presumably,” “probably,” “it may have,” “evolutionists, who believe,” etc.

I hope Callaghan does not condescendingly presume that because she has endeavored to respond to a criticism that the criticism is neutralized. To illustrate the point, it is doubtful that to simply say that the yucca moth and the yucca plant “obviously” coevolved is any more credible than to say “that they had evolved separately and just happened to get their act together” or that they were created with a symbiotic relationship.

The purpose of this letter is not to respond in detail to Callaghan’s article, rather to point out the overall danger confronting public educators—that we jeopardize our professional integrity by persisting in presenting one-sided arguments in the classroom.

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DARWIN, F. (ed.) 1896. *Life and letters I*. New York: D. Appleton and Company.

HULL, D. L. (ed.) 1973. *Darwin and his critics*. Cambridge: Harvard University Press.

Callaghan Responds

My purpose in the article, “Evolution and Creationist Arguments,” was to provide biology teachers with

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