table) indicated that the number of bacteria at point A was significantly higher than at point B ($P > 0.01$). Subsequent study revealed that the stream, above point A, drains a neighborhood that uses septic tanks. This drainage probably accounts for the high levels of bacteria observed at point A. The reduction in viable bacteria, as observed at point B, may have been due to the chlorine content (0.35 to 2 ppm) of the effluent.

Teaching models of this kind easily demonstrate that the appearance of water is a poor indicator of fecal pollution.

Howard C. Leslie, Donald M. McKinstry
Biology Dept.
Pennsylvania State University
Behrend Campus, Erie, Pa. 16510

"Why Don't Biologists Say What They Mean?"

We high school biology teachers have for years been defending the work of science and of scientists, which, in the strict sense, we are not. One of our staunchest defense mechanisms must be called on for this frequently asked question: "Why don't biology teachers say what they mean? Why do they have to invent those long, hard-to-pronounce, difficult-to-spell words just to say (such and such)? Why don't they say it in plain English?"

Why do biologists do this? Some high school biology students, unfortunately, never develop past the point of having to learn "all these terms" just to be able to understand the questions on the test. If this is so, can't we biology teachers present our ideas without what we know is going to be a mental block for these students? We know, of course, that we can't. The problem, then, is not one of trying to teach biology without using terms but one of trying to make the students see why it can't be done. This problem can be solved.

For the past several years I have intentionally precipitated the above question by selecting a short article from a scientific journal—one selected for its large number of scientific terms—and distributing it to my students to read in class. The article never takes more than three or four minutes of the average student's reading time. It is given to the students without any explanation as to the purpose of the reading. When they are finished, they are asked if they understood it, and invariably the "hard words" question is raised.

Without making any attempt at an immediate answer to that question, I ask the students to recall from their English courses what the purpose of language is—whether the language be verbal or visual. They all know, of course, that language is really nothing more than a convenient way to convey an idea, from speaker to listener or from writer to reader. Good! With a little prodding, a few specific examples are brought out. Consider, for instance, the word "brave," which we all use frequently enough. Suppose a speaker or a writer wanted to engender in the mind of a listener or a reader the abstract ideas associated with the word "brave." Is there a simpler or more convenient way of doing this than by using the word? No, the students admit.

We then talk for a few minutes about the work of scientists, and we recall a point that is usually made quite early in a high school science course. The point is that a great deal of a scientist's time is consumed in reading reports of the work of other scientists and writing about his own work. The total number of words written and read by scientists throughout the world in any given period must be enormous. The students see that this must be so. "Is it not rather important, then, that the writing be done in as concise a manner as possible? If not, how would a scientist ever be physically able to keep abreast of his field?" Most high school students have never been inside a typical scientist's office to notice the stack of back-logged journals on his desk, all earmarked "to be read tomorrow." Most, however, do remember seeing a somewhat similar situation: medical journals stacked on their family physician's desk.

At this point it is tempting, though I have never done so yet, to give them a dictionary of scientific terms and ask them to rewrite the article they have just read—this time leaving out all of the terms they consider to be scientific jargon and using only equivalent expressions as contained in the dictionary. In other words, I might ask them to rewrite the article "in plain English." Having them actually do this really isn't necessary, because they readily recognize that the length of the article would have to be dramatically increased.

Okay, then: the biologist has to use terms to eliminate a lot of unnecessary words. But can't he use terms that are already familiar to most people? Usually this question doesn't have to be answered by a teacher, because the obvious answer will be volunteered by a preceptive student; namely, that new ideas call for new terms. Most people are not familiar with biologic terms because they are not familiar with the ideas the terms express. It is just that simple. As an example at this point, the word "heterotroph" can be introduced. After explaining to them what is special about an organism that is heterotrophic, I ask the students how many words would be wasted, or how much time, if when we wanted to refer to an organism that is heterotrophic we had to describe it, instead of using the word heterotroph.

By this time, most students are quite willing to admit the necessity of biologic terminology. This doesn't make their task of learning the terminology any easier, but at least they understand the purpose of it all.

This way of explaining terminology to beginning students is certainly not novel. I remember Don Herbert—TV's "Mr. Wizard"—using a similar technique in one of the programs of his popular series. Also, I am aware of the success of many of the new secondary-science textbooks in reducing much of the *unnecessary* terminology, and my suggestions should not be construed as a defense of those teachers who continue to burden their students with an excessive dependency on terminology.

Students can be shown that biologists really do say what they mean. In fact, they say *exactly* what they mean, and no more.

Felix A. Gaudin
Chairman, Science Dept.
De La Salle High School
5300 St. Charles Ave.
New Orleans, La. 70115

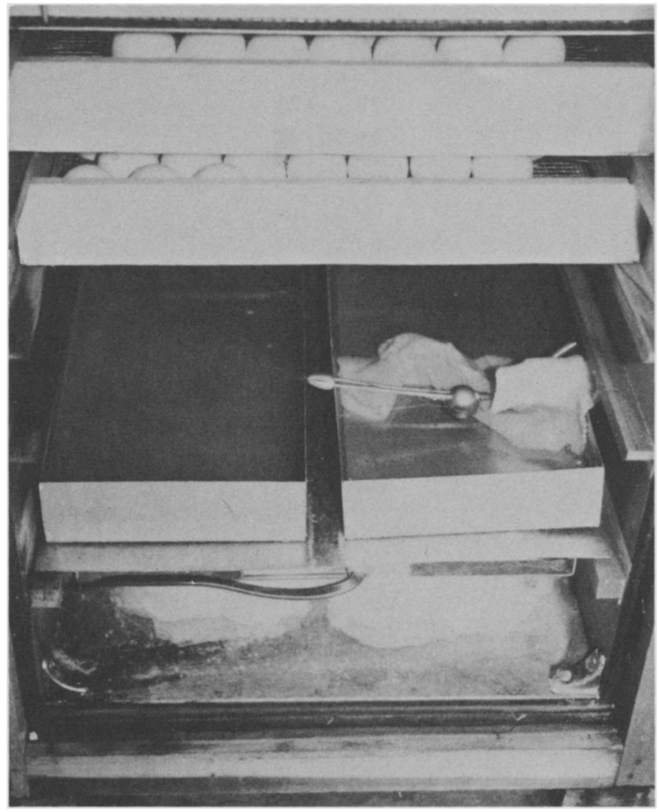
Device for Controlled Humidification

It is frequently necessary to hold relatively small spaces, such as incubators, at high and fairly constant levels of humidity. In a dry climate it may even be difficult to produce the moderate levels of humidity required for the successful incubation of chicken eggs when only stationary water trays are used. Commercial controlled-humidification devices are available but expensive. For several years now, I have been using a simple arrangement that yields fairly accurately controlled relative humidities in incubators over a wide range of values.

The system has five principal components: (i) a rag; (ii) a shallow but rather capacious water reservoir; (iii) an air pump such as is used to bubble air through an aquarium; (iv) an enclosed thermoswitch that opens its contacts on rising temperature (Fenwall #17302-0 or a similar one); and (v) a perfume atomizer without its bowl or rubber bulb.

One wire going from the plug to the air pump is cut, and the two leads from the thermoswitch are connected to the cut wires so that the switch is in series with the pump. The switch is placed in the incubator immediately over the water reservoir and the rag is suspended from the body of the switch into the reservoir. The switch, consequently, acts as a wet-bulb thermostat. The pump, which is kept outside the incubator, is connected to the atomizer in place of the rubber bulb by a length of convenient plastic or rubber tubing. The stem of the atomizer—the part that originally sat in the bowl—is placed in the water reservoir in the incubator, and the atomizer is then oriented to spray across the incubator. That completes the construction of the unit.

If the incubator is not already so equipped, a wet-bulb–dry-bulb thermometer combination or other type of hygrometer is placed in it. The thermoswitch is adjusted until the pump starts. At this time, a spray of water should issue from the atomizer's nozzle. If it does not, most likely a particle of dirt has entered the ducts of the atomizer; the particle often can be removed by momentarily placing a finger over the nozzle so as to cause the air to flow out the stem and blow bubbles in the reservoir. When the relative humidity, as judged by the hygrometer reading or the difference between the wet-bulb and dry-bulb temperatures, has reached the desired point, the thermoswitch is readjusted until the pump just stops. Further adjustment is rarely needed unless a different humidity level is desired.



Device in small humidified chamber containing eggs. Atomizer lies in front of rag, which is wrapped around thermostat and dipped in water. Connection to pump is seen in space below.

Maintenance consists in keeping the reservoir filled with clean tap water or, preferably, distilled water; reverse-flushing the atomizer by occluding the nozzle, as described above; replacing the rag when the old one has become rotten; and keeping the pump oiled according to the manufacturer's instructions.

Werner G. Heim
Biology Dept.
Colorado College
Colorado Springs, Colo. 80903

Correction

The authors of "Anyone Can Start an AT Biology Program" (*ABT* 33 [8]: 480-483*f*.) inform us that their statement that Bob Prior and Don Oberacker were Mount Wachusett Community College teachers is incorrect. Prior, at Quinsigamond Community College, Oberacker, at Greenfield Community College, and Ted Filteau, at Mount Wachusett, shared a federal grant and formed a consortium to develop the curriculum called Man in the Biosphere.