An Overture

The Prospect of a "Nuclear Winter": New Responsibilities for Biology Teachers

A large-scale nuclear war would inevitably produce long-term effects on our atmosphere. To consider the latest scientific predictions regarding this very conceivable disaster, more than 600 scientists and government officials gathered in Washington, D.C. last October at the Conference on Long-Term Worldwide Biological Consequences of Nuclear War. The consensus among scientists was that nuclear war would produce a protracted period of below-freezing temperatures, extended darkness, and even greater levels of radioactivity than previously had been expected. Conferees began to label the nuclear-exchange aftermath "nuclear winter."

Major studies conducted both in the United States and in Russia were presented. They indicate that the projected nuclear winter would also greatly affect the Southern Hemisphere, where previously it was thought effects would be substantially less devastating.

Predictions presented at the conference were based on computer simulations of a spectrum of nuclear war scenarios, ranging up to combined explosions of the 10,000 megaton magnitude. Variables considered included the amount of smoke and dust blasted into the atmosphere by explosions of different sizes, how much sunlight would be screened or absorbed at each dust concentration, and how atmospheric temperatures would change accordingly. For a mid-range (5,000 megaton) nuclear exchange, the following effects were predicted:

- Smoke and dust would block sunlight creating a dark "night" lasting several weeks. After this, light filtering through the dense cloud and dust layer would be insufficient to sustain photosynthesis, perhaps for months.
- Due to lack of sunlight, worldwide temperatures would drop to subfreezing levels. Most crops and domesticated animals would be lost.
- Radioactive fallout would be at greater levels and last longer than had previously been predicted.
- Extinction of a large portion of the Earth's microorganisms, plants, and animals would be virtually inevitable.

Dismal predictions such as these, based on the careful work of some of our best scientists, cannot be ignored—especially by biology teachers. The time when biology teaching meant simply "marching through the phyla" is as archaic as finger-operated telegraphs and cylinder phonographs. Biology teachers today clearly have some responsibility for developing in their students some awareness of science-related worldwide problems, skills for decisionmaking regarding these problems, and some commitment to application of science to improvement of the human condition, rather than to its destruction. Some implications for biology teachers are:

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appears. The eye sees the human shapes that have been painted on stone. It is easy to fool the human eye.

What are the creationists doing? Godfrey (1981b) described the thrust of the creationist activities in "The Flood of Anti-evolutionism—Where is the Science in 'Scientific Creationism'?":

> Field or laboratory research represents a very minor charge of scientific creationists. Most efforts are directed toward rewriting the discoveries and interpretations of evolutionists. In this endeavor, numerous evolutionists are portrayed as scientists who have all the evidence to disprove evolution (and support creation) at their fingertips, but who are either too stubborn or too deeply indoctrinated in evolutionary dogma to appreciate it. Arguments of anthropologists, biologists, chemists, geologists, astronomers, physicists, and engineers are reinterpreted or taken out of context. (p. 13)

On the issue of human and dinosaur tracks, she states:

> The fact is, the genus *Homo* does not occur in the Mesozoic alongside brontosaurus, [sic.] as the creationists claim; if it did, we would indeed have to question our evolutionary assumptions.

In conclusion, Godfrey summarizes:

> Yet the scientific creationists, by misrepresenting the ongoing work of evolutionists, have helped the antievolutionary cause to gain more momentum than ever before in the twentieth century. Scientific creationists are widely viewed as learned scholars with impressive credentials, and more and more people are being persuaded that staggering evidence is on their side. Many scientists are baffled that such poor science can be so easily swallowed, and that creation is being taught as science in some schools around the country. Scientific creationism may be poor science, but it is powerful politics. And politically, it may succeed.

As teachers of biology, we must maintain that the rules for establishing knowledge in science are different from those of other fields, such as religion. Scientific theory is a logical explanatory system. It must be able to explain all the observed evidence, and it must allow scientists to predict where to look for new evidence. As long as a theory performs both of these roles satisfactorily, it is accepted as useful. The theory of evolution has met these tests successfully for over a century, and is not likely to be overthrown by a single new fact. The theory of evolution is the unifying theme that makes sense of the millions of separate facts in biology. If creationists use false "facts," biology teachers need to recognize them and know what the scientific evidence really is. Biology teachers must keep aware of the tactics being used against them as creationists try to prevent the teaching of evolution.

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- Simply "covering" classical biology content is not enough. Students need to be alerted to possible social and biological effects of the application of scientific discoveries.
- Students should learn decisionmaking skills useful in confronting scientific political issues. Case studies, debates, role-playing of international court trials and congressional committees, and inventing scenarios for the future are just a few examples of classroom activities oriented toward decisionmaking.
- Students should be encouraged to be active rather than passive. Once a decision has been reached through data-collection and reason, something should be done about it. Encourage writing of letters to congressmen, asking tough questions of political candidates and scientists, attending events that focus on important scientific political issues, and, of course, voting (when eligible).

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