

# Perspectives

---

## Arguments for Maintaining the Integrity of Science Education

Wayne A. Moyer  
Executive Director  
National Association of Biology Teachers

The first duty of the State in fostering science teaching within the schools under its control is to develop scientific literacy among its future citizens. It should, therefore, be the policy of the State to include as science only that material which has passed the test of being science, having been published in scholarly journals, subjected to critical analysis, and accepted by the scientific community. The Foreword of the 1978 *Biology Syllabus for New York* expresses this view: "It is the intent of this course to provide students with an awareness of the natural world, basic scientific concepts, stimulation of inductive reasoning, and a basic understanding of biological processes and generalizations."

In carrying out this function, certain groups and individuals may perceive conflict between scientific knowledge and their personal beliefs. Christian Scientists, for example, might be offended by teaching of the germ theory of disease; Catholics might be offended by teaching reproductive physiology as it relates to birth control; and religious groups which hold that the Bible is inerrant might be offended by teaching of evolutionary theory. This places the State in a dilemma: should it yield to vocal, even strident, appeals from such groups and remove the offending material, or at least modify

its science guidelines; or should it remain firm in its policy of teaching that which has been defined as science by the scientific community?

The National Association of Biology Teachers believes that the interests of a technological, science-oriented society are best served when scientific knowledge is made freely available and its citizens understand the methods and limitations of science. This position is expressed in a policy statement adopted by the Executive Committee on 30 October 1980. The integrity of science and of science education must be preserved if the scientific enterprise is to continue serving humanity. Pseudosciences, such as astrology and alchemy, which have failed as valid explanations of empirical observations in the free market of ideas, or have bypassed the market altogether, should be excluded from science curricula, as they are from science practice.

It might be argued that scientific knowledge has grown beyond the ability of the school system to encompass all that is known, therefore making selection necessary. What harm, then, if certain offending concepts are merely omitted? Our opinion is that such selection is the prerogative of the professional staff or of the school system. Biology teachers bear the same relationship

to the body of biological knowledge as do medical practitioners: both must select those ideas and findings which, in their professional opinion, will most benefit their respective clients. Referring to the example of evolutionary theory, biology educators and practicing biologists have found this theory to be fundamental to understanding biology, having the same heuristic value as the periodic table of elements does in chemistry. Science educators are convinced that a course in modern biology, at the secondary level and beyond, cannot be taught without repeated reference to evolutionary theory as a unifying idea.

The point might then be made that a given set of empirical observations might be explained by reference to truth derived from outside the realm of science. It is held by some that the Bible, as the inerrant word of God, is literally true. Therefore, observations such as the occurrence of fossils of extinct creatures in sedimentary rock forming mountains, the similarity of DNA throughout all living things, and the enormous distances between stars, might be "explained" as the result of sudden, recent creation of a fully functioning universe and life, followed by a worldwide, cataclysmic flood. This is the creationist explanation and has been defined by law as science in Arkansas and Louisiana.

There is no question in the minds of teachers that children who are taught by their parents and church that the Bible is literally true face a real and serious conflict when they receive school instruction in evolution theory: either their parents are wrong or their teachers are wrong. But is so-called balanced instruction in both the scientifically derived theory (evolution) and the theologically derived theory (creationism) an appropriate remedy for this conflict? I think not.

Such a remedy in its oversimplification distorts understanding and destroys the integrity of both science and religion. Epistemology traditionally recognizes three realms of knowledge:

1. Revelation (as in acceptance of scripture as the inerrant word of God and elaborated by theology)
2. Reason (as in mathematics and logic)
3. Empirical (as in all of science and history).

It is also accepted that knowledge claims derived in one realm cannot be known or proven in another realm. To do so creates an apparent paradox which can be resolved only by abstraction to a higher level of understanding. Such is the case when claims of revealed knowledge are mistakenly used to explain empirical observations; as when the creation story contained in the first 11 chapters of the Book of Genesis is used to explain the origin of humans and the universe. The paradox posed is that either scripture or science is correct, but not both. The resolution is to recognize that both are correct, *each within its own realm*; they offer supplemental views of the universe.

Most organized religions in America accept the position that religion and science are not in conflict, but offer parallel paths to knowledge. Therefore, to assert that other “theories” can explain origins without recognizing their source, distorts understanding, confuses students, and leads the public to believe that a vote against balanced treatment legisla-

tion is a vote against God.

A second problem with the balanced treatment remedy involves the difference between lay and professional use of the term, *theory*. President Reagan reflected common understanding when he said in a press conference in 1980 that evolution is “only a theory” which has not yet been proven, thereby implying that theory is mere speculation. To the scientist, however, a theory relates a body of empirical observations in a meaningful way, predicts new observations, and successfully incorporates them as they are made. A given theory may have to compete with alternative explanations, which it does by doing a better or worse job of incorporating new data. A theory in science can thus rise or fall on the basis of a single observation, as the Ptolemaic theory of planetary motion did when Galileo observed the phases of Venus with his telescope. Thus, a *scientific* theory is never considered proved, but is continually scrutinized against new data.

By contrast a *revealed* explanation never needs to be tested by scrutiny against data from the real world; it is simply accepted as already and irrevocably proved. Creationism as an explanation of origins is thus not a theory, but a conclusion based on prior religious belief. There is no procedure, as in a scientific theory, for modifying creationism as new evidence accumulates. Creationism has remained unchanged since the documents from which the Genesis story was compiled were first written down, sometime between 700 and 600 B.C. Creationism was the same when Lyell published his *Principles of Geology* in 1830, the same when Darwin published *Origin of Species* in 1859, the same in 1980, the year Johanson and Edey published *Lucy: The Beginnings of Mankind*, and will be the same when science unravels the mysteries of chromosomes and human development.

A far better remedy than balanced treatment has already been fashioned by practicing biology teachers. John Horn, appearing as a state

witness in *Segraves v. California Board of Education* in early March 1981, testified that he never requires *belief* in evolution by his biology students, only *understanding*. Students are free to propose the creationist explanation of origins, some even quoting from their Bibles in class. Discussion over the differences between scientific and religious explanations follow, but only evolution theory appears on examinations, because it is a science class. Mr. Horn’s sensitivity to the concerns of children who perceive a conflict between science instruction and their religious beliefs won a commendation from presiding Judge Perluss.

In his summation Judge Perluss quoted from the testimony of Dr. William V. Mayer. When asked if there shouldn’t be a statement (at the beginning of a science textbook) saying: This does not deal with theology, Mayer responded, “Absolutely... I would say there should be a clear explanation, that perhaps should run through the entire textbook, reinforcing within the student’s mind what he’s dealing with. He’s dealing with science, and we are not making a pretense of teaching art, poetry, theology, or any other discipline. Science says these things, and outside of that realm science is not only moot but might even be inappropriate... Moreover science is not dogmatic in that it is open-ended and that it has an absence of pre-set conclusions...”

This distinction between what is science and what is religion might be introduced into the social studies curriculum as is suggested in the California Social Studies Guidelines. In this manner, the State’s obligation to educate scientifically literate citizens is met while remaining sensitive to the religious beliefs of children who have chosen to attend public schools.

But children should never be forced by the State to choose between science and God on the incorrect presumption that evolution and creation are alternatives.