This document includes two separate articles. One argues that creation should be taught as an alternative to evolution in science classes. The other article argues against teaching alternative ideas.

Article 1: Creationism Should Be Excluded from Science Courses

"NSTA Position Statement: The Teaching of Evolution," http://www.nsta.org/position. This position statement reprinted courtesy of the National Science Teachers Association, Arlington, VA.

In the viewpoint that follows, the National Science Teachers Association (NSTA) contends that creationism—a nonscientific and religious view of biological origins—should not be included in science curricula. Evolutionary theory, which asserts that life developed through a process of mutation and natural selection, is based on scientific observation and evidence, the authors point out. It is the unifying concept of science that all students should learn. Administrators and teachers should not give in to pressure from sectarian groups to downplay the significance of evolutionary theory or to include nonscientific ideas in biology courses, the NSTA maintains. The NSTA is an educational advocacy organization located in Arlington, Virginia.
As you read, consider the following questions:

1. What does the term "theory" mean in the world of science, according to the NSTA?
2. What are the main weaknesses of creation science, according to the authors?
3. According to the NSTA, which religious denominations opposed a bill to include creation science in public schools?

The National Science Teachers Association (NSTA) strongly supports the position that evolution is a major unifying concept in science and should be included in the K-12 science education frameworks and curricula. Furthermore, if evolution is not taught, students will not achieve the level of scientific literacy they need. This position is consistent with that of the National Academies, the American Association for the Advancement of Science (AAAS), and many other scientific and educational organizations.

NSTA also recognizes that evolution has not been emphasized in science curricula in a manner commensurate to its importance because of official policies, intimidation of science teachers, the general public's misunderstanding of evolutionary theory, and a century of controversy. In addition, teachers are being pressured to introduce creationism, "creation science," and other nonscientific views, which are intended to weaken or eliminate the teaching of evolution.

Declarations

Within this context, NSTA recommends that

- Science curricula, state science standards, and teachers should emphasize evolution in a manner commensurate with its importance as a unifying concept in science and its overall explanatory power.
- Science teachers should not advocate any religious interpretations of nature and should be nonjudgmental about the personal beliefs of students.
- Policy makers and administrators should not mandate policies requiring the teaching of "creation science" or related concepts, such as so-called "intelligent design," "abrupt appearance," and "arguments against evolution." Administrators also should support teachers against pressure to promote nonscientific views or to diminish or eliminate the study of evolution.
- Administrators and school boards should provide support to teachers as they review, adopt, and implement curricula that emphasize evolution. This should include professional development to assist teachers in teaching evolution in a comprehensive and professional manner.
- Parental and community involvement in establishing the goals of science education and the curriculum development process should be encouraged and nurtured in our democratic society. However, the professional responsibility of science teachers and curriculum specialists to provide students with quality science education should not be compromised by censorship, pseudoscience, inconsistencies, faulty scholarship, or unconstitutional mandates.
- Science textbooks shall emphasize evolution as a unifying concept. Publishers should not be required or volunteer to include disclaimers in textbooks that distort or misrepresent the methodology of science and the current body of knowledge concerning the nature and study of evolution.

—Adopted by the NSTA Board of Directors July 2003

The Nature of Science and Scientific Theories

Science is a method of explaining the natural world. It assumes that anything that can be observed or measured is amenable to scientific investigation. Science also assumes that the universe operates according to regularities that can be discovered and understood through scientific investigations. The testing of various explanations of natural phenomena for their consistency with empirical data is an essential part of the methodology of science. Explanations that are not consistent with empirical evidence or cannot be tested empirically are not a part of science. As a result, explanations of natural phenomena that are not based on evidence but on myths, personal beliefs, religious values, and superstitions are not scientific. Furthermore, because science is limited to

explaining natural phenomena through the use of empirical evidence, it cannot provide religious or ultimate explanations.

The most important scientific explanations are called "theories." In ordinary speech, "theory" is often used to mean "guess" or "hunch," whereas in scientific terminology, a theory is a set of universal statements that explain some aspect of the natural world. Theories are powerful tools. Scientists seek to develop theories that

- are firmly grounded in and based upon evidence;
- are logically consistent with other well-established principles;
- explain more than rival theories; and
- have the potential to lead to new knowledge.

The body of scientific knowledge changes as new observations and discoveries are made. Theories and other explanations change. New theories emerge, and other theories are modified or discarded. Throughout this process, theories are formulated and tested on the basis of evidence, internal consistency, and their explanatory power.

Evolution as a Unifying Concept

Evolution in the broadest sense can be defined as the idea that the universe has a history: that change through time has taken place. If we look today at the galaxies, stars, the planet Earth, and the life on planet Earth, we see that things today are different from what they were in the past: galaxies, stars, planets, and life forms have evolved. Biological evolution refers to the scientific theory that living things share ancestors from which they have diverged; it is called "descent with modification." There is abundant and consistent evidence from astronomy, physics, biochemistry, geochronology, geology, biology, anthropology, and other sciences that evolution has taken place.

As such, evolution is a unifying concept for science. The *National Science Education Standards* recognizes that conceptual schemes such as evolution "unify science disciplines and provide students with powerful ideas to help them understand the natural world," and recommends evolution as one such scheme. In addition, *Benchmarks for Science Literacy* from AAAS's Project 2061, as well as other national calls for science reform, all name evolution as a unifying concept because of its importance across the disciplines of science. Scientific disciplines with a historical component, such as astronomy, geology, biology, and anthropology, cannot be taught with integrity if evolution is not emphasized.

There is no longer a debate among scientists about whether evolution has taken place. There is considerable debate about how evolution has taken place: What are the processes and mechanisms producing change, and what has happened specifically during the history of the universe? Scientists often disagree about their explanations. In any science, disagreements are subject to rules of evaluation. Scientific conclusions are tested by experiment and observation, and evolution, as with any aspect of theoretical science, is continually open to and subject to experimental and observational testing.

The importance of evolution is summarized as follows in the National Academy of Sciences publication *Teaching about Evolution and the Nature of Science*: "Few other ideas in science have had such a far-reaching impact on our thinking about ourselves and how we relate to the world."

Creationism and Other Nonscientific Views

The *National Science Education Standards* note that, "[e]xplanations of how the natural world changes based on myths, personal beliefs, religious values, mystical inspiration, superstition, or authority may be personally useful and socially relevant, but they are not scientific." Because science limits itself to natural explanations and not religious or ultimate ones, science teachers should neither advocate any religious interpretation of nature nor assert that religious interpretations of nature are not possible.

The word "creationism" has many meanings. In its broadest meaning, creationism is the idea that the universe is the consequence of something transcendent. Thus to Christians, Jews, and Muslims, God created; to the Navajo, the Hero Twins created; for Hindu Shaivites, the universe comes to exist as Shiva dances. In a narrower sense, "creationism" has come to mean "special creation": the doctrine that the universe and all that is in it was created by God in essentially its present form, at one time. The most common variety of special creationism asserts that

- the Earth is very young;
- life was created by God;
- life appeared suddenly;
- kinds of organisms have not changed since the creation; and
- different life forms were designed to function in particular settings.

This version of special creation is derived from a literal interpretation of Biblical Genesis. It is a specific, sectarian religious belief that is not held by all religious people. Many Christians and Jews believe that God created through the process of evolution. Pope John Paul II, for example, issued a statement in 1996 that reiterated the Catholic position that God created and affirmed that the evidence for evolution from many scientific fields is very strong.

"Creation science" is a religious effort to support special creationism through methods of science. Teachers are often pressured to include it or other related nonscientific views such as "abrupt appearance theory," "initial complexity theory," "arguments against evolution," or "intelligent design theory" when they teach evolution. Scientific creationist claims have been discredited by the available scientific evidence. They have no empirical power to explain the natural world and its diverse phenomena. Instead, creationists seek out supposed anomalies among many existing theories and accepted facts. Furthermore, "creation science" claims do not lead to new discoveries of scientific knowledge.

Legal Issues

Several judicial decisions have ruled on issues associated with the teaching of evolution and the imposition of mandates that "creation science" be taught when evolution is taught. The First Amendment of the Constitution requires that public institutions such as schools be religiously neutral; because "creation science" asserts a specific, sectarian religious view, it cannot be advocated in the public schools.

When Arkansas passed a law requiring "equal time" for "creation science" and evolution, the law was challenged in Federal District Court. Opponents of the bill included the religious leaders of the United Methodist, Episcopalian, Roman Catholic, African Methodist Episcopal, Presbyterian, and Southern Baptist churches, along with several educational organizations. After a full trial, the judge ruled that "creation science" did not qualify as a scientific theory (*McLean v. Arkansas Board of Education*, 529 F. Supp. 1255 [ED Ark. 1982]).

Louisiana's equal time law was challenged in court, and eventually reached the Supreme Court. In *Edwards v. Aguillard*, [482 U.S. 578 (1987)] the court determined that "creation science" was inherently a religious idea and to mandate or advocate it in the public schools would be unconstitutional. Other court decisions have upheld the right of a district to require that a teacher teach evolution and not teach "creation science" (*Webster v. New Lennox School District, #122*, 917 F.2d 1003 [7th Cir. 1990]; *Peloza v. Capistrano Unified School District*, 37 F.3d 517 [9th Cir. 1994]).

Some legislators and policy makers continue attempts to distort the teaching of evolution through mandates that would require teachers to teach evolution as "only a theory" or that require a textbook or lesson on evolution to be preceded by a disclaimer. Regardless of the legal status of these mandates, they are bad educational policy. Such policies have the effect of intimidating teachers, which may result in the de-emphasis or omission of evolution. As a consequence, the public will only be further confused about the nature of scientific theories. Furthermore, if students learn less about evolution, science literacy itself will suffer.

Article 2: "Scientific Creationism" Should Be Taught in Science Classrooms

Duane T. Gish received a B.S. degree in chemistry from the University of California at Los Angeles, and a Ph.D. in biochemistry from the University of California at Berkeley. He is the author of numerous articles and several books and a worldwide lecturer on the subject of the scientific evidence for creation. Dr. Gish is one of the founders and a board member of the Creation Research Society, St. Joseph, Missouri.

Within the domain of empirical science, creation scientists and evolutionary scientists operate in a similar way. Both assume that events in the physical world today mirror the past and foreshadow the future. But neither creation nor evolution may be referred to as scientific theory since neither can offer eyewitness evidence of what happened in the past. Both are ultimately based upon inferences derived from circumstantial evidence. As such, they remain on an equal footing and should receive equal time in public classrooms in the United States.

Science is our attempt to observe, understand and explain the operation of the universe and of the living things found here on planet Earth. Since a scientific theory, by definition, must be testable by repeatable observations and must be capable of being falsified if indeed it were false, a scientific theory can only attempt to explain processes and events that are presently occurring repeatedly within our observations. Theories about history, although interesting and often fruitful, are not scientific theories, even though they may be related to other theories which do fulfill the criteria of a scientific theory. While operating within the domain of empirical science, creation scientists function in exactly the same manner as evolution scientists, assuming that what they see happening today happened in the past and will happen in the same way in the future. Science is empirical, and thus this is the only way a scientist can operate.

The nature of theories on origins

On the other hand, the theory of creation and the theory of evolution are attempts to explain the origin of the universe and of its inhabitants. There were no human observers to the origin of the universe, the origin of life, or as a matter of fact, to the origin of a single living species. These events were unique historical events which have occurred only once. Thus, no one has ever seen anything created, nor has anyone ever seen a fish evolve into an amphibian nor an ape evolve into man. Furthermore, it is impossible to go into the laboratory and test any theory on how a fish may have changed into an amphibian or how an ape-like creature may have evolved into man. The changes we see occurring today are mere fluctuations in populations which result neither in an increase in

complexity nor significant change. Therefore, neither creation nor evolution is a scientific theory. Creation and evolution are inferences based on circumstantial evidence.

Thus the notion, repeated incessantly by evolutionists, that evolution is a scientific theory while creation is nothing more than religious mysticism is blatantly false. This is being recognized more and more today, even by evolutionists themselves. Karl Popper, one of the world's leading philosophers of science, has stated that evolution is not a scientific theory but is a metaphysical research program.[1] Birch and Ehrlich state that:

Our theory of evolution has become ... one which cannot be refuted by any possible observation. Every conceivable observation can be fitted into it. It is thus "outside of empirical science" but not necessarily false. No one can think of ways in which to test it. Ideas, either without basis or based on a few laboratory experiments carried out in extremely simplified systems have attained currency far beyond their validity. They have become part of an evolutionary dogma accepted by most of us as part of our training.[2]

Green and Goldberger, with reference to theories on the origin of life, have said that:

... the macromolecule-to-cell transition is a jump of fantastic dimensions, which lies beyond the range of testable hypothesis. In this area all is conjecture.[3]

It seems obvious that a theory that is outside of empirical science because no one can think of ways to test it, or a theory that lies beyond the range of testable hypothesis, cannot qualify as a scientific theory. Any suggestion that these challenges to the status of evolution as a scientific theory are exceptions lifted out of the evolutionary literature by creation scientists can be refuted by a thorough search of that literature. Even Futuyma, one of those who has recently written a book attempting to refute creation, states in that book that:

Two major kinds of arguments about evolutionary theory occur within scientific circles. There are philosophical arguments about whether or not evolutionary theory qualifies as a scientific theory, and substantive arguments about the details of the theory and their adequacy to explain observed phenomena.... A secondary issue then arises: Is the hypothesis of natural selection falsifiable or is it a tautology? ... The claim that natural selection is a tautology is periodically made in the scientific literature itself...."[4]

It is evident that the major challenge to the status of evolution as a scientific theory comes from within the evolutionary establishment itself, not from creation scientists.

Creation and evolution are thus theoretical inferences about history. Even though neither qualifies, strictly speaking, as a scientific theory, each possesses scientific character, since each attempts to correlate and explain scientific data. Creation and evolution are best characterized as explanatory scientific models which are employed to correlate and explain data related to origins. The terms "creation theory," "evolution theory," "creation science" and "evolution science" are appropriate as long as it is clear that the use of such terms denote certain inferences about the history of origins which employ scientific data rather than referring to testable and potentially falsifiable scientific theories. Since neither

is a scientific theory and each seeks to explain the same scientific data related to origins, it is not only incorrect but arrogant and self-serving to declare that evolution is science while creation is mere religion. Creation is in every sense as scientific as evolution.

The relationship of theories on origins to philosophy and religion

No theory on origins can be devoid of philosophical and religious implications. Creation implies the existence of a Creator (a person or persons, a force, an intelligence, or whatever one may wish to impute). The creation scientist assumes that the natural universe is the product of the design, purpose and direct volitional acts of a Creator. Science can tell us nothing about who the Creator is, why the universe was created, or anything about the relationship of the things created to the Creator. Creation scientists have no intention of introducing religious literature into science classes or science textbooks in the public schools of the United States. It is thus absolutely untrue to say that creation scientists are seeking to introduce Biblical creation into the public schools. Their desire is that the subject of origins be taught in a philosophically and religiously neutral manner, as required by the U.S. Constitution.

On the other hand, evolution is a non-theistic theory of origins which by definition excludes the intervention of an outside agency of any kind. Evolutionists believe that by employing natural laws and processes *plus nothing* it is possible to explain the origin of the universe and of all that it contains. This involves the acceptance of a particular philosophical or metaphysical world view and is thus basically religious in nature. The fact that creation and evolution involve fundamentally different world views has been frankly admitted by some evolutionists. For example, Lewontin has said:

Yet, whatever our understanding of the social struggle that gives rise to creationism, whatever the desire to reconcile science and religion may be, there is no escape from the fundamental contradiction between evolution and creationism. They are irreconcilable world views.[5]

Thus, Lewontin characterizes creation and evolution as *irreconcilable world views,* and as such each involves commitment to irreconcilable philosophical and religious positions. This does not imply that all evolutionists are atheists or agnostics, nor does it imply that all creationists are Bible-believing fundamentalists.

While it is true that teaching creation science exclusively would encourage belief in a theistic world-view, it is equally true that teaching evolution science exclusively (as is essentially the case in the U.S. today) encourages belief in a non-theistic, and in fact, an essentially atheistic, world view. Indoctrinating our young people in evolutionism tends to convince them that they are hardly more than a mechanistic product of a mindless universe, that there is no God, that there is no one to whom they are responsible. Thus, Julian Huxley asserted that:

Darwinism removed the whole idea of God as the creator of organisms from the sphere of rational discussion ... we can dismiss entirely all ideas of a supernatural overriding mind being responsible for the evolutionary process.[6]

In their literature, humanists have proclaimed that humanism is a "non-theistic religion." They quote Sir Julian Huxley as stating:

I use the word "Humanist" to mean someone who believes that man is just as much a natural phenomenon as an animal or plant; that his body, mind and soul were not supernaturally created but are products of evolution....[7]

In his review of George Gaylord Simpson's book *Life of the Past*,[8] Huxley says:

And he concludes the book with a splendid assertion of the evolutionists' view of man. Man, he writes, "stands alone in the universe, a unique product of a long, unconscious, impersonal, material process.... He can and must decide and manage his own destiny."[9]

In his eulogy to Theodosius Dobzhansky, one of the world's leading evolutionists until his death, Ayala wrote that:

... Dobzhansky believed and propounded that the implications of biological evolution reach much beyond biology into philosophy, sociology, and even socio-political issues. The place of biological evolution in human thought was, according to Dobzhansky, best expressed in a passage he often quoted from Pierre Teilhard de Chardin: "(Evolution) is a general postulate to which all theories, all hypotheses, all systems must henceforward bow and which they must satisfy in order to be thinkable and true. Evolution is a light which illuminates all facts, a trajectory which all lines of thought must follow—this is what evolution is."[10]

The above statement is as heavily saturated with religion as any assertion could be, and yet it is quoted approvingly by Ayala and Dobzhansky, two of the main architects of the neo-Darwinian theory of evolution.

It is no wonder that Marjorie Grene, a leading philosopher and historian of science, has stated that:

It is as a *religion of science* that Darwinism chiefly held, and holds men's minds. The derivation of life, of man, of man's deepest hopes and highest achievements, from the external and indirect determination of small chance errors, appears as the very keystone of the naturalistic universe.... Today the tables are turned. The modified, but still characteristically Darwinian theory has itself become an orthodoxy preached by its adherents with religious fervor, and doubted, they feel, only by a few muddlers imperfect in scientific faith.[11]

Birch and Ehrlich have used the term "evolutionary dogma," Grene has referred to Darwinism as a "religion of science," an "orthodoxy preached by its adherents with religious fervor," and Dobzhansky and Teilhard de Chardin proclaim that all theories, hypotheses, and systems must bow before evolution in order to be thinkable and true. One could easily search the evolutionary literature to find many other examples that reveal the religious nature of the evolutionary world view. *It can thus be stated*

unequivocally that evolution is as religious as creation, and conversely, that creation is as scientific as evolution.

Creation and evolution are the only valid alternative theories of origins

Evolutionists often assert that creationists have constructed a false dichotomy between creation and evolution, that there are actually many theories of origins. While it is true that there are several sub-models within the general creation model, just as there are several sub-models within the general evolution model, all theories of origins can be fitted within these two general theories Thus, Futuyma, an evolutionist as we have noted earlier, states:

Creation and Evolution, between them, exhaust the possible explanations for the origin of living things. Organisms either appeared on the earth fully developed or they did not. If they did not, they must have developed from preexisting species by some process of modification. If they did appear in a fully developed state, they must indeed have been created by some omnipotent intelligence.[12]

No professionally trained teacher should thus hesitate to teach the scientific evidence that supports creation as an alternative to evolution. This is recognized by Alexander, who stated that:

No teacher should be dismayed at efforts to present creation as an alternative to evolution in biology courses; indeed at this moment creation is the only alternative to evolution. Not only is this worth mentioning, but a comparison of the two alternatives can be an excellent exercise in logic and reason. Our primary goal as educators should be to teach students to think. ... Creation and evolution in some respects imply backgrounds about as different as one can imagine. In the sense that creation is an alternative to evolution for any specific question, a case against creation is a case for evolution, and *vice versa*.[13]

In a sense, both creation and evolution are based on axioms, assertions that are assumed to be true and which have predictable consequences. In his conclusion to a paper in which he gives an axiomatic interpretation of the neo-Darwinian theory of evolution, C. Leon Harris states:

First, the axiomatic nature of the neo-Darwinian theory places the debate between evolutionists and creationists in a new perspective. Evolutionists have often challenged creationists to provide experimental proof that species have been fashioned *de novo*. Creationists have often demanded that evolutionists show how chance mutations can lead to adaptability, or to explain why natural selection has favored some species but not others with special adaptations, or why natural selection allows apparently detrimental organs to persist. We may now recognize that neither challenge is fair. If the neo-Darwinian theory is axiomatic, it is not valid for creationists to demand proof of the axioms, and it is not valid for evolutionists to dismiss special creation as unproved so long as it is stated as an axiom.[14]

That belief in creation and evolution is *exactly parallel* was frankly stated by the prominent British biologist and evolutionist, L. Harrison Matthews. Matthews thus states:

... The fact of evolution is the backbone of biology, and biology is thus in the peculiar position of being a science founded on an unproved theory—is it then a science or a faith? Belief in the theory of evolution is thus exactly parallel to belief in special creation—both are concepts which believers know to be true but neither, up to the present, has been capable of proof.[15]

Teaching both theories of origins is an educational imperative

Thus, since creation is as scientific as evolution, and evolution is as religious as creation; since creation and evolution between them exhaust the possible explanations for origins; a comparison of the two alternatives can be excellent exercises in logic and reason; no theory in science should be allowed to freeze into dogma, immune from the challenge of alternative theories; academic and religious freedoms are guaranteed by the United States Constitution; public schools are supported by the taxes derived from all citizens; therefore, in the public schools in the United States, the scientific evidences which support creation should be taught along with the scientific evidences which support evolution in a philosophically neutral manner devoid of references to any religious literature.

Footnotes

1. Karl Popper, in *The Philosophy of Karl Popper*, ed. P.A. Schilpp, Vol. 1 (La Salle, IL: Open Court), pp. 133-43.
2. L.C. Birch and P.R. Ehrlich, *Nature* 214 (1967): 369.
3. D.E. Green and R.F. Goldberger, *Molecular Insights into the Living Process* (New York: Academic Press, 1967), p. 407.
4. D.J. Futuyma, *Science on Trial* (New York: Pantheon Books, 1983), p. 171.
5. R. Lewontin, in the Introduction to *Scientists Confront Creationism*, ed. L.R. Godfrey (New York: W.W. Norton and Co., 1983), p. xxvi.
6. J. Huxley, in *Issues in Evolution*, ed. S. Tax (Chicago: University of Chicago Press, 1960), p. 45.
7. "What is Humanism?" Humanist Community of San Jose (San Jose, CA 95106).
8. G.G. Simpson, *Life of the Past* (New Haven, Conn.: Yale University Press, 1953), p. 157.
9. J. Huxley, *Scientific American*, 189 (1953): 90.
10. F.J. Ayala, J. Heredity 63 (1977): 3.
11. M. Grene, *Encounter* (Nov. 1959), pp. 48-50.
12. D.J. Futuyma, *Science on Trial*, p. 197.
13. R.D. Alexander, in *Evolution versus Creationism: The Public Education Controversy* (Phoenix: Oryx Press, 1983), p. 91.
14. C.L. Harris, *Perspectives in Biology and Medicine* (Winter 1975), p. 179.
15. L.H. Matthews, Introduction to *The Origin of Species*, C. Darwin (Reprint. London: J.M. Dent and Sons, Ltd., 1971), p. x.