

Why Teach Evolution?

From the early 20th century onward, teaching biological evolution in the public schools has been a contentious issue. Although a series of federal court decisions has upheld the proper place of biological evolution in the curriculum, the struggle over evolution in the curriculum continues. Recent conflicts over the content of science education standards in many states have arisen precisely because evolution was awarded its proper status as the fundamental theoretical construct underpinning modern biology. Why does teaching evolution remain so socially and politically controversial? Is it "fair" to teach only evolution in public schools? Does this policy help or does it harm the students in these schools?

What is biological evolution?

In the biological sciences, evolution is a theory of change that accounts for the pattern of similarities and differences among living things on earth throughout the earth's history and across all the habitats and biomes that exist or have existed in that history. Evolution is a theory of emergence of new varieties of life forms, not a "theory of origins" that accounts for how life began. There are currently a number of proposed models and hypotheses for the beginning of life as we know it, but evolution begins after life is established on earth.

What about macroevolution?

Scientists use the terms macroevolution and microevolution to describe different perspectives on life's history, not fundamentally different processes. Macroevolution describes the result of evolutionary changes we can observe over time in response to mass extinctions, global climate changes, and other large-scale events that affect the abundance and distribution of species. Macroevolution is what we see in the fossil record as forms of life change from one geological time to another, and we see organisms that share features both with organisms that appeared earlier in time and also with organisms that emerge later. These transitional states show the continuity between groups of organisms even while they demonstrate that changes that occur among them. So, in macroevolution, we focus on patterns of evolutionary changes that occur between species, while in microevolution, we focus on patterns of evolutionary changes that occur within species and evolving lineages. These two terms refer to different perspectives on the process of evolutionary change, but not to fundamentally different processes.

Why is evolution mandated in science education standards?

There are two main reasons that biological evolution is mandated in science education standards. First, it is the fundamental, unifying theory that underlies all the life sciences. It has formed the basis of productive and active research for over 140 years and continues to do so. This is why evolution is universally accepted among professional biology researchers.

The second reason is that science education standards emphasize learning the process of science and especially scientific inquiry. The first step in this process is to develop testable questions that can be answered by scientific investigation. These questions are guided by scientific theories and their answers continue to show the value of biological evolution as a theory for forming useful, answerable questions in biology.

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*Text provided by Andrew J. Petto and the
National Center for Science Education*

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Why are no other theories required in the science education standards?

Many scientific theories are required in science education standards. For example, students learn atomic theory, which is the foundational theory for understanding the basics of chemistry and physics — including the periodic table of the elements. Other, advanced theories, such as quantum theory, or unsettled ones, such as super-string theory, are less likely to be included. To be included in standards, theories generally must satisfy all three of these criteria: (a) are recognized by the scientific community as settled because of their consistent performance in supporting research for some time; (b) are fundamental to a field of study because they form a unifying framework to help us understand important issues in that field; and (c) can be presented to and understood by students in public schools at various ages because they have the necessary content background and analytical skills to understand them. Not every scientific theory meets all three of these criteria, and those that do not meet all three will not usually appear in the curriculum at this level of study.

What about other scientific “theories of origins?”

A main goal of the science education standards is to teach students how to form questions for successful scientific inquiry. This question is an example of how a misunderstanding of the process of science can undermine this goal. There is no competing scientific theory for the pattern of diversity of life on earth. The terms "theories of origins" and "origins science" are religious ideas that reflect an interventionist theology held by some Christian denominations.

Isn't evolution controversial?

Biological evolution is a scientifically settled theory. Among scientists, this means that its fundamental principle — the shared ancestry of living organisms — has overcome all scientific challenges. However, the general public is uncomfortable with evolution because of what some people perceive as the moral, or cultural implications of evolution. In most cases, this discomfort results from a poor understanding of evolutionary theory and how it is applied in the sciences. Scientific controversies are resolved by careful scientific inquiry, but moral and political dilemmas can never be resolved only by scientific inquiry. These dilemmas can also never be resolved by ignorance, so it is especially important for students to have a complete and accurate understanding of the contemporary theory of biological evolution.

What about dissenting scientists?

In the past few years, a statement has circulated supposedly expressing new skepticism about evolution: "We are skeptical of claims for the ability of random mutation and natural selection to account for the complexity of life. Careful examination of the evidence for Darwinian theory should be encouraged." [There is a publically available list online of scientists.] This statement is misleading; it implies that evolutionary theory is based merely on random mutation and natural selection. In the past 140 years, many sources of biological change have been identified and incorporated into evolutionary theory. First, the statement describes evolutionary theory incorrectly. Then it implies that being skeptical of the incorrect definition is the same as being skeptical about biological evolution. This is a classic "straw-man" argument.

What about critical thinking?

Critical thinking is an important component of a good education. Critical thinking about evolution must start with a solid understanding of what evolution is and how contemporary scientists understand it. "Critical thinking" materials recently offered to school boards consist of misinterpretations of scientific research about biological evolution. They confuse an active discussion among scientists over the details of evolution with a disagreement about whether evolution has occurred. This is not critical thinking, but hucksterism.

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