

*under the security state*, Westport, CT: Praeger [describes the high-stakes testing and teacher accountability schemes that are central to contemporary school reform as part of an effort to delegitimize the public control of schooling; these reforms are a trap, programmed to ensure the failure of public schools in order to transfer their control over to private corporations; once this control is established, the public will lose any voice in shaping the agenda of compulsory schooling]; Illich, I., 1971, *Deschooling society*, New York: Harper & Row [one of the first books to challenge the school's self-proclaimed ability to deliver the individual and/or society into a condition of secular salvation]; Illich, I., 1992, *In the mirror of the past: Lectures and addresses 1978–1990*, New York: M. Boyars [a seminal collection of Illich's ideas for recognizing the radical otherness of our twentieth-century mental topology and to become aware of its generative axioms that usually remain below the horizon of contemporary attention].

*David Gabbard*

## CREATIONISM, INTELLIGENT DESIGN, AND EVOLUTION

### THE CREATIONIST CRUSADE

Evolution is clearly the most controversial topic in the public school science curriculum in the United States. Among scientists, there is no significant controversy about the basic scientific issues: The earth is ancient (about 4.5 billion years old); living things have descended, with modification, from common ancestors; and natural selection, by adapting living things to their environments, is a major driving force in the history of life. As the National Academy of Sciences observes, “The scientific consensus around evolution is overwhelming.” Recognizing the centrality of evolution to biology, the National Association of Biology Teachers and the National Science Teachers Association have taken a firm stand on the pedagogical necessity of teaching evolution. Teaching evolution is a matter of social controversy, however, owing to the prevalence of creationism—the rejection of a scientific explanation of the history of life in favor of a supernatural account—among the public. Not all antievolutionists are creationists, and not all creationists are fundamentalist Christians—there are creationists who identify themselves with Jewish, Islamic, Hindu, New Age, and Native American religious traditions—but the juggernaut of antievolutionist activity in the United States is propelled by Christian fundamentalism.

Creationists are not unanimous in their attitudes toward the antiquity of the earth, common ancestry, and the efficacy of natural selection. Those who reject all three are called young-earth or recent creationists; young-earth creationism is currently the dominant form of creationism in the United States. Those who reject only the latter two are usually called old-earth creationists; different forms of old-earth creationism, corresponding to different interpretations of the book of Genesis to accommodate the antiquity of the earth, include Day/Age and Gap creationism. There is not a standard term for creationists who reject only the efficacy of natural selection, perhaps reflecting their relative unimportance in the debate. The latest incarnation of creationism—intelligent design—is strategically vague in its attitudes toward the age of the earth and common ancestry, in the hope of maintaining a big tent under which creationists of all varieties are

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## CREATIONISM, INTELLIGENT DESIGN, AND EVOLUTION WEB SITES

Following is a sampling of organizations (and their Web sites) active in controversies over creationism, evolution, and their places in public science education. Where applicable, a relevant subsection of the Web sites is identified. All Web site addresses were operational as of January 2007.

### Creationist Web Sites

#### *Young-earth Creationist Organizations*

Answers in Genesis: <http://www.answersingenesis.org>

Creation Research Society: <http://www.creationresearch.org>

Institute for Creation Research: <http://www.icr.org>

#### *Old-earth Creationist Organizations*

Reasons to Believe: <http://www.reasons.org>

#### *Intelligent Design Organizations*

The Discovery Institute's Center for Science and Culture: <http://www.discovery.org/csc>

Intelligent Design Network: <http://www.intelligentdesignnetwork.org>

### Evolution Web Sites

#### *Scientific Organizations*

American Association for the Advancement of Science: [http://www.aaas.org/news/press\\_room/evolution](http://www.aaas.org/news/press_room/evolution)

The National Academies: <http://www.nationalacademies.org/evolution/>

#### *Science Education Organizations*

National Association of Biology Teachers: <http://www.nabt.org/>

National Science Teachers Association: <http://www.nsta.org/220/>

#### *Anticreationist Organizations*

National Center for Science Education: <http://www.ncseweb.org>

TalkOrigins Foundation: <http://www.talkorigins.org>

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welcome to shelter; its representatives run the gamut from antiselectionist creationists to young-earth creationists, while the bulk of its public support seems to be provided by young-earth creationists.

In its traditional forms, creationism is typically based on biblical inerrantism—the belief that the Bible, as God's Word, is necessarily accurate and authoritative in matters of science and history as well as in matters of morals and doctrine. Inerrantism allows for the nonliteral interpretation of metaphorical

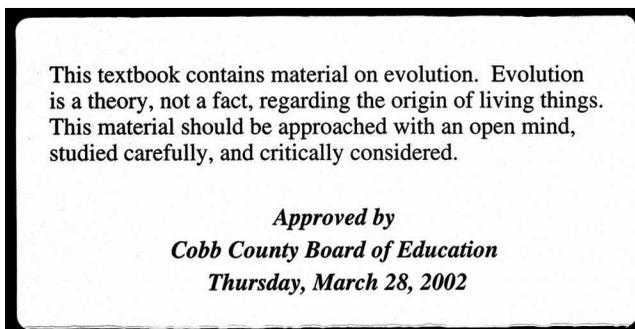
or figurative language, and thus young-earth and old-earth creationists are able to agree on the principle of inerrantism while disagreeing on its application. Mindful of the legal failures of attempts to include creationism in the public school classroom, proponents of intelligent design sedulously disavow any commitment to the Bible, but such a commitment tends to surface nevertheless—for example, in their frequent invocation of the Gospel of John’s opening verse, “In the beginning was the Word . . .” Whether avowing inerrantism or not, creationists typically express a passionate concern for the supposed moral consequences of the acceptance of evolution; the “tree of evil”—with evolution at its root and various evils, real and imagined, as its branches—is a common image in creationist literature. Creationism is primarily a moral crusade.

It is a crusade that is waged against any public exposition of evolution—in recent years, national parks, science museums, public television stations, and municipal zoos have faced challenges to their presentations of evolution—but the primary battleground is the public school system. Attempts to remove, balance, or compromise the teaching of evolution occur at every level of governance: from the individual classroom (where teachers may themselves be creationists, or may mistakenly think it fair to present creationism along with evolution, or may decide to omit evolution to avoid controversy), to the local school district, to the state government’s executive or legislative branch or even—rarely, and then usually as a mere token of support—to the federal government. Such attempts are a recurring feature of American science education from the 1920s onward, in a basically sinusoidal trajectory. Whenever there is a significant improvement in the extent or quality of evolution education, a creationist backlash quickly ensues, only to meet with resistance and ultimately defeat in the courts.

### **FROM SCOPES TO EDWARDS**

The first phase of the antievolutionist movement in the United States, beginning after the close of World War I, involved attempts to constrain or even to ban the teaching of evolution, in response to its appearance in high school textbooks around the turn of the century. Due in part to the rise of organized fundamentalism, antievolution legislation was widely proposed (in 20 states between 1921 and 1929) and sometimes enacted (in Arkansas, Florida, Mississippi, Oklahoma, and Tennessee). It was Tennessee’s Butler Act, which forbade teachers in the public schools “to teach any theory that denies the story of the Divine Creation of man as taught in the Bible, and to teach instead that man has descended from a lower order of animals,” under which John Thomas Scopes was prosecuted in 1925. Although Scopes’s conviction was overturned on appeal, on a technicality, the trial exerted a chilling influence on science education. Under the pressure of legislation, administrative decree, and public opinion, evolution swiftly disappeared from textbooks and curricula across the country.

It was not until after the launching of Sputnik in 1957 that evolution returned to the public school science classroom. Fearing a loss of scientific superiority to the Soviet Union, the federal government funded a massive effort to improve science education, which included a strong emphasis on evolution. Particularly



**Figure C.5** The Cobb County, Georgia, evolution warning sticker (2002–2005).

important were the biology textbooks produced by the Biological Science Curriculum Study, established in 1959 by a grant from the National Science Foundation to the education committee of the American Institute of Biological Sciences. The popular BSCS textbooks, written with the aid of biologists such as Hermann J. Muller (who complained of the inadequate treatment of evolution in biology textbooks in a famous address entitled “One Hundred Years Without Darwin Are Enough”), treated evolution as a central theme, and commercial publishers began to follow suit. Meanwhile, the Tennessee legislature repealed the Butler Act in 1967, anticipating the Supreme Court’s decision in *Epperson v. Arkansas* (1968) that laws prohibiting the teaching of evolution in the public schools violate the Establishment Clause of the First Amendment.

After it was no longer possible to ban the teaching of evolution, creationists increasingly began to argue that creationism was a viable scientific alternative that deserved to be taught alongside evolution. Poised to take the lead was young-earth creationism, in the form of the creation science movement, which contended that there is scientific evidence that the earth (and the universe) are relatively young (on the order of 10,000 years), that the earth was inundated by a global flood responsible for a mass extinction and for major geological features such as the Grand Canyon, and that evolution is impossible except within undefined but narrow limits (since living things were created to reproduce “after their own kind”). Organizations such as the Creation Research Society (1963) and the Institute for Creation Research (1972) were founded, ostensibly to promote scientific research supporting creationism. Creation science remained absent from the scientific literature—but was increasingly prominent in controversies over science education.

During the second phase of the antievolution movement, science teachers, school administrators, and textbook publishers found themselves pressured to provide equal time to creation science. Creationists started to prepare their own textbooks, such as the CRS’s *Biology: A Search for Order in Complexity* (1970) and the ICR’s *Scientific Creationism* (1974), for use in the public schools. The movement received a boost in 1980 from Republican presidential nominee Ronald Reagan, who endorsed teaching creationism whenever evolution was taught. And legislation calling for equal time for creationism was introduced in no fewer than 27 states, successfully in both Arkansas and Louisiana in 1981. But both

## A MESSAGE FROM THE ALABAMA STATE BOARD OF EDUCATION

This textbook discusses evolution, a controversial theory some scientists present as a scientific explanation for the origin of living things, such as plants, animals and humans.

No one was present when life first appeared on earth. Therefore, any statement about life's origins should be considered as theory, not fact.

The word "evolution" may refer to many types of change. Evolution describes changes that occur within a species. (White moths, for example, may "evolve" into gray moths.) This process is microevolution, which can be observed and described as fact. Evolution may also refer to the change of one living thing to another, such as reptiles into birds. This process, called macroevolution, has never been observed and should be considered a theory. Evolution also refers to the unproven belief that random, undirected forces produced a world of living things.

There are many unanswered questions about the origin of life which are not mentioned in your textbook, including:

- Why did the major groups of animals suddenly appear in the fossil record (known as the "Cambrian Explosion")?
- Why have no new major groups of living things appeared in the fossil record for a long time?
- Why do major groups of plants and animals have no transitional forms in the fossil record?
- How did you and all living things come to possess such a complete and complex set of "Instructions" for building a living body?

Study hard and keep an open mind. Someday, you may contribute to the theories of how living things appeared on earth.

**Figure C.6** The Alabama evolution warning sticker (1996–2001).

laws were ruled unconstitutional, the Arkansas law by a federal district court (*McLean v. Arkansas*, 1982) and the Louisiana law ultimately by the Supreme Court (*Edwards v. Aguillard*, 1987), on the grounds that teaching creationism in the public schools violates the Establishment Clause.

## INTELLIGENT DESIGN

In the wake of the decision in *Edwards*, which held that the Louisiana law impermissibly endorsed religion “by advancing the religious belief that a supernatural being created humankind,” a group of creationists sought to devise a form of creationism able to survive constitutional scrutiny. A scant two years after *Edwards*, intelligent design was introduced to a wide audience in *Of Pandas and People* (1989; second edition 1993), produced by a fundamentalist organization called the Foundation for Thought and Ethics and intended for use as a supplementary biology textbook. Like its creation science predecessors, *Of Pandas and People* contended that evolution was a theory in crisis, on the common creationist assumption that (supposed) evidence against evolution is perforce evidence for creationism. Unlike them, however, it attempted to maintain a studied neutrality on the identity and nature of the designer, as well as on issues, such as the age of the earth, on which creationists differ.

During the 1990s, the intelligent design movement coalesced, with its de facto headquarters shifting from FTE to the Center for the Renewal of Science and Culture (later renamed the Center for Science and Culture), founded in 1996 as a division of the Discovery Institute, a think tank based in Seattle. At the same time, as states began to introduce state science standards, which provide guidelines for local school districts to follow in their individual science curricula, the treatment of evolution was improving, penetrating even to districts and schools where creationism was taught—the Supreme Court’s decision in *Edwards* notwithstanding—or where evolution was downplayed or omitted altogether. (The importance of state science standards was cemented by the federal No Child Left Behind Act, enacted in 2002, which requires states to develop and periodically revise standards.) The stage was set for the third phase of the antievolution movement, which is going on today.

Like the creation science movement before it, the intelligent design movement claimed to favor a top-down approach, in which the scientific establishment would be convinced first, with educational reform following in due course. But like creation science before it, intelligent design was in fact aimed at the public schools. Supporters of intelligent design have attempted to have *Of Pandas and People* approved for use in Alabama and Idaho, proposed laws to require or allow the teaching of intelligent design in at least eight states, and attempted to rewrite state science standards in at least four states, including Kansas, where in 2005 the state board of education rewrote the standards to disparage the scientific status of evolution. As with a similar episode in 1999, the antievolution faction on the board lost its majority in the next election, and the rewritten standards were abandoned in 2007. Such activity at the state level was mirrored at

the local level, where attempts to require or allow the teaching of intelligent design caused uproar sporadically across the country.

In the small Pennsylvania town of Dover, the result was the first legal challenge to the constitutionality of teaching intelligent design in the public schools, *Kitzmiller v. Dover*. After a summer of wrangling over evolution in biology textbooks, the Dover Area school board adopted a policy in October 2004 providing that “[s]tudents will be made aware of gaps/problems in Darwin’s Theory and of other theories of evolution including, but not limited to, intelligent design.” The board subsequently required a disclaimer to be read aloud in the classroom, according to which evolution is a “Theory...not a fact,” “Gaps in the Theory exist for which there is no evidence,” and “intelligent design” as presented in *Of Pandas and People* is a credible scientific alternative to evolution. Eleven local parents filed suit in federal district court, arguing that the policy violated the Establishment Clause. The court agreed, writing that it was “abundantly clear that the Board’s ID Policy violates the Establishment Clause,” adding, “In making this determination, we have addressed the seminal question of whether ID is science. We have concluded that it is not, and moreover that ID cannot uncouple itself from its creationist, and thus religious, antecedents.”

### THE FALLBACK STRATEGY

Like *McLean*, *Kitzmiller* was tried in a federal district court, and the decision is directly precedential only in the district. (The Dover school board chose not to appeal the decision, in part because the supporters of the policy on the school board were defeated at the polls.) Thus there is no decisive ruling at the highest judicial level that explicitly addresses the constitutionality of teaching intelligent design in the public schools so far, and it is possible that a future case will ultimately produce a decision by the Supreme Court. Even before the *Kitzmiller* verdict, however, the Center for Science and Culture was already retreating from its previous goal of requiring the teaching of intelligent design in favor of what it called “teaching the controversy”—in effect, a fallback strategy of attacking evolution without mentioning any creationist alternative. To its creationist supporters, such a strategy offers the promise of accomplishing the goal of encouraging students to acquire or retain a belief in creationism while not running afoul of the Establishment Clause. Unless there is a significant change in church/state jurisprudence, forms of the fallback strategy are likely to become increasingly prominent in the antievolution movement.

A perennially popular form of the fallback strategy involves disclaimers, whether oral or written. Between 1974 and 1984, for example, the state of Texas required textbooks to carry a disclaimer that any material on evolution included in the book is to be regarded as “theoretical rather than factually verifiable”; in 1984, the state attorney general declared that the disclaimer was unconstitutional. The state of Alabama began to require evolution disclaimers in textbooks in 1996; the original disclaimer (since revised twice) described evolution as “a controversial theory some scientists present as a scientific explanation for the origin of living things, such as plants, animals and humans.” Disclaimers have been challenged

in court twice. In *Freiler v. Tangipahoa* (1997), a policy requiring teachers to read a disclaimer that conveyed the message that evolution is a religious viewpoint at odds with accepting the Bible was ruled to be unconstitutional. In *Selman v. Cobb County* (2005), a textbook disclaimer describing evolution as “a theory, not a fact” was ruled to be unconstitutional, but the decision was vacated on appeal and remanded to the trial court, where a settlement was reached.

Attacking the content of textbooks is also a perennially popular form of the fallback strategy, especially in so-called adoption states, where textbooks are selected by a state agency for use throughout the state, and the publishers consequently have a strong incentive to accommodate the demands of the agency. In Texas, Educational Research Associates, founded by the husband-and-wife team of Mel and Norma Gabler, lobbied the state board of education against evolution in textbooks, succeeding in having the BSCS textbooks removed from the list of state-approved textbooks in 1969. Owing both to changes in the Texan political landscape and opposition from groups concerned with civil liberties and science education, ERA’s influence waned in the 1980s. But the tradition is alive and well: while evaluating biology textbooks for adoption in 2003, the Texas board of education was inundated with testimony from creationists, complaining of supposedly mistaken and even fraudulent information in the textbooks. All 11 textbooks under consideration were adopted nevertheless.

Calling for “critical analysis” of evolution—and, significantly, *only* of evolution, or of evolution and a handful of issues that are similarly controversial, such as global warming or stem-cell research—is the latest form of the fallback strategy. Its most conspicuous venture so far was in Ohio, where in 2002, after a dispute over whether to include intelligent design in the state science standards was apparently resolved, the state board of education voted to include in the standards a requirement that students be able to “describe how scientists continue to investigate and critically analyze aspects of evolutionary theory.” The requirement served as a pretext for the adoption in 2004 of a corresponding model lesson plan that, relying on a number of creationist publications, appeared to be intended to instill scientifically unwarranted doubts about evolution. Following the decision in *Kitzmiller* and the revelation that the board ignored criticisms of the lesson plan from experts at the Ohio Department of Education, the board reversed itself in 2006, voting to rescind the lesson plan and to remove the “critical analysis” requirement from the standards.

## WHAT NEXT?

The United States is not the only country with controversies about evolution in the public schools: In recent years, there have been reports of such controversies from Brazil, Canada, Germany, Italy, Malaysia, the Netherlands, Poland, Russia, Serbia, Turkey, and the United Kingdom, for example. But the United States is clearly exceptional in the amount and influence of creationist activity—and of creationist belief. Comparing the levels of acceptance of evolution in the United States with those in 32 European countries and Japan, a recent report noted, “Only Turkish adults were less likely to accept the concept of evolution

than American adults” (Miller et al., 2006), and plausibly attributed resistance to evolution among the American public to three factors: the acceptance of fundamentalist religious beliefs, the politicization of science, and the widespread ignorance of biology. Longitudinally, the report adds, “After 20 years of public debate, the percentage of U.S. adults accepting the idea of evolution has declined from 45% to 40% and the percentage of adults overtly rejecting evolution declined from 48% to 39%. The percentage of adults who were not sure about evolution increased from 7% in 1985 to 21% in 2005.”

These attitudes appear to be reflected in the public’s attitude toward the teaching of evolution in the public schools. According to a pair of recent national polls (CBS News, November 2004; *Newsweek*, December 2004), a majority—60–65 percent—favors teaching creationism along with evolution, while a large minority—37–40 percent—favors teaching creationism instead of evolution. The situation is perhaps not quite so dire as these data suggest, however; in a poll that offered respondents a wider array of choices, only 13 percent favored teaching creationism as a “scientific theory” along with evolution, and only 16 percent favored teaching creationism instead of evolution (DYG, on behalf of the People for the American Way Foundation, November 1999). Still, it seems clear that in the public there is a reservoir of creationist sentiment, which frequently splashes toward the classroom. In a recent informal survey among members of the National Science Teachers Association (March 2005), 30 percent of respondents indicated that they experienced pressure to omit or downplay evolution and related topics from their science curriculum, while 31 percent indicated that they felt pressure to include nonscientific alternatives to evolution in their science classroom.

In addition to whatever creationist sympathies there are in the public at large, reinforced by the efforts of a creationist counterestablishment, there are also systemic factors that combine to sustain creationism and inhibit evolution education. Perhaps the most important among these is the decentralized nature of the public school system in the United States. There are over 15,000 local school districts, each with a degree of autonomy over curriculum and instruction, typically governed by a school board comprised of elected members of the community usually without any special training in either science or education. Each district thus offers a chance for creationist activists—who may, of course, be elected to school boards themselves—to pressure the school board to remove, balance, or compromise the teaching of evolution. Also important is the comparative lack of attention to preparing educators to understand evolution and to teach it effectively. Especially in communities with a tradition of ignorance of, skepticism about, and hostility toward evolution, it is not surprising that teachers who are neither knowledgeable about evolution nor prepared to teach it effectively often quietly decide to avoid any possible controversy.

There are signs of hope for supporters of the teaching of evolution, however, in addition to the consistency with which courts have ruled against the constitutionality of efforts to remove, balance, or compromise the teaching of evolution. Rallied by the spate of intelligent design activity, the scientific community is increasing its public engagement and advocacy, including outreach efforts

to science educators in the public schools. Academic work in the burgeoning field of science and religion is producing a renewed interest in exploring ways to reconcile faith with science, while over 10,000 members of the Christian clergy have endorsed a statement affirming the compatibility of evolution with their faith. And the increasing economic importance of the applied biological sciences, of which evolution is a central principle, is likely to be increasingly cited in defense of the teaching of evolution. Still, controversies over the teaching of evolution are clearly going to continue for the foreseeable future.

**Further Readings:** Alters, B. J., & Alters S. M., 2001, *Defending evolution: A guide to the evolution/creation controversy*, Sudbury, MA: Jones and Bartlett; Larson, E. J., 2003, *Trial and error: The American controversy over creation and evolution*, 3rd ed., New York: Oxford University Press; Miller, J. D., Scott, E. C., & Okamoto, S., 2006, Public acceptance of evolution, *Science* 313: 765–766; National Academy of Sciences, 1999, *Science and creationism*, 2nd ed., Washington DC: National Academies Press; Scott, E. C., 2005, *Evolution vs. creationism: An introduction*, Berkeley: University of California Press.

Glenn Branch

## CRITICAL PEDAGOGY

### WHAT IS CRITICAL PEDAGOGY?

Perhaps the most distinguishing element of critical pedagogy is its aim to empower people to transform their world. There is no uniform definition of critical pedagogy, as educators and theorists have transformed the concept over the years as they deployed new approaches to understanding the world and changing it.

Critical pedagogy usually refers to educational theory, teaching, and learning practices that aim to raise learners' critical consciousness regarding oppressive social conditions. Critical pedagogy focuses on the development of critical consciousness for both "personal liberation" and collective political action aimed at overcoming oppressive social conditions and to create a more egalitarian, socially just world. Pedagogy that is critical encourages students and teachers to understand the interconnected relationships among knowledge, culture, authority, ideology, and power. Understanding these relationships in turn facilitates the recognition, critique, and transformation of existing undemocratic social practices and institutional structures that produce and sustain inequalities and oppressive social relations.

Critical pedagogy is particularly concerned with reconfiguring the traditional student/teacher relationship, where the teacher is the active agent, the one who knows, and the students are the passive recipients of the teacher's knowledge. The critical classroom is envisioned as a site where new knowledge, grounded in the experiences of students and teachers alike, is produced through meaningful dialogue. In short, critical pedagogy aims to empower to students by (1) engaging them in the creation of personally meaningful understandings of the world; and (2) providing opportunities for students to learn that they have agency, that is their actions can enable social change.