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## The Challenge of Creationism and Intelligent Design: An Introduction

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Readers of the *Astronomy Education Review* probably don't need to be told that the scientific world view is under attack in many places around the world. Here in the United States, ideas from both modern biology and astronomy are being challenged by religious fundamentalists in several states. In Kansas and elsewhere, organized movements have as their aim to deny the scientific evidence about both the evolution of species and the age of the universe.

A new doctrine called "intelligent design" is being touted as a scientific alternative to evolution, although there is no evidence for it from any reputable peer-reviewed source. Even the president of the United States has weighed in on the issue, suggesting that such alternative views should be given a forum in our science classes. While we believe that evolution as studied and understood by mainstream scientists is in no way incompatible with religious faith, we also believe that science classes should teach science—by definition, "the observation, identification, description, experimental investigation, and theoretical explanation of phenomena."

Recent surveys continue to document that the public understanding of science in the United States is depressingly low. In 2000, the National Assessment of Educational Progress indicated that only 29% of fourth graders, 32% of eighth graders, and a depressing 18% of twelfth graders performed at or above the level termed proficient in science for their grade. Nor are their parents doing much better. The *NSF Science & Engineering Indicators* of 2004 reports that fewer than 1/5 of adult Americans can be considered minimally science literate in the sense required for participation in civic society.

Seen in this context, the public confusion about evolution makes more sense. National polling data bear out that many people really don't understand what scientists mean by a theory, or what the evidence is in favor of evolution or the age of the universe. In November 2004, the Gallup Poll asked Americans about evolution as a theory:

- only 35% of adults said that it was a theory supported by evidence
- 35% said that it was one of many theories
- 29% didn't know

The Gallup organization has been tracking public ideas of human development since 1982, and they have changed little over the years. In 2004,

- 13% said that humans developed over millions of years with no role played by God
- 38% said that humans developed over millions of years but that God guided the process
- 45% said that God created humans pretty much in their present form at some time in the last 10,000 years

A December 2004 *Newsweek* poll asked if respondents favored teaching creation science in addition to evolution:

- 60% favored it
- 12% were undecided
- only 28% were opposed

The Dover, Pennsylvania, school district has now mandated the teaching of intelligent design, and a trial to determine whether this is legal is just about to begin as we write this. In a widely criticized move, the Smithsonian Institution agreed to cosponsor the showing of a film endorsing the ideas of intelligent design. Florida has a creationist theme park called "Dinosaur Adventure Land," where families come to see dinosaur bones that were "made by God on the 6th day of creation 6,000 years ago."

On March 19, 2005, *The New York Times* reported that some IMAX (giant screen) theaters at science centers are refusing to show educational films that feature the geology of an ancient Earth, the Big Bang, or any hint of evolution. These include films such as *Cosmic Voyage*, *Volcanoes*, and *Galapagos*. Some test audiences in the South termed these films blasphemous and scared the science center marketing people. For such nonprofit films, a few theaters can make a major difference in breaking even, so this will discourage filmmakers from putting in such so-called controversial ideas in the future.

Clearly, those of us devoted to science education have our work cut out for us. The *Astronomy Education Review* would like to do its part. In this issue, we present several resources for those who want to help students or the public understand more about science, evolution, and the age of the universe:

1. A bibliography of useful readings, below
2. A statement recently issued by the American Astronomical Society about intelligent design (<http://aer.noao.edu/AERArticle.php?>)
3. An article by Matthew Bobrowsky, with a clear analysis and questions and answers to aid those who are asked about the astronomical implications of creationist ideas (<http://aer.noao.edu/AERArticle.php?issue=7&ion=4&article=2>)

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## Selected Resources for Responding to Challenges to Evolution and the Age of the Universe

### *Books*

Berra, T. *Evolution and the Myth of Creationism: A Basic Guide to the Facts in the Evolution Debate*. 1990, Stanford U. Press.

Futuyma, Douglas. *Science on Trial: The Case for Evolution*. 1983, Pantheon. A leading evolutionary biologist explains the case for evolution that the creationists seek to deny.

Godfrey, L., ed. *Scientists Confront Creationism*. 1982, Norton. A useful collection of articles.

Kitcher, Philip. *Abusing Science: The Case Against Creationism*. 1982, MIT Press. A philosopher takes a critical look at the claims against evolution and illuminates the issues involved.

McGowan, Chris. *In the Beginning: A Scientist Shows Why the Creationists Are Wrong*. 1984, Prometheus Books. A Canadian zoologist examines and refutes creationist arguments.

Pigliucci, Massimo. *Denying Evolution: Creationism, Scientism, and the Nature of Science*. 2002, Sinauer Associates. A biologist gives the history of, explains, and refutes the various "brands" of creationism.

Ruse, Michael, ed. *But Is It Science?* 1996, Prometheus. A collection of articles about the creationism/evolution controversy, by scientists, philosophers, and so on.

Ruse, Michael. *The Evolution Wars*. 2000, Rutgers U. Press. A history of the creationist-evolution controversy.

Scott, E. & N. Eldredge. *Evolution vs. Creationism: An Introduction*. 2005, U. of California Press. A detailed analysis with good answers by the scientist who heads the national effort to maintain science in the classroom when it comes to evolution.

Strahler, Arthur. *Science and Earth History: The Evolution / Creation Controversy*. 1987, Prometheus Books. A discussion from the geologist's point of view, with lots of information about dating the Earth's rocks.

Tuomey, C. *God's Own Scientists: Creationists in a Secular World*. 1994, Rutgers U. Press. An anthropologist examines the culture of creationism as if he were looking at a far-away tribe.

Wilson, David, ed. *Did the Devil Make Darwin Do It? Modern Perspectives on the Creation-Evolution Controversy*. 1983, Iowa State U. Press. Interesting collection of essays by historians, scientists, and educators, laying out the history of the controversy and the perspectives of the sciences.

## **Articles**

Abell, G. "The Ages of the Earth and the Universe" in Laurie Godfrey (ed.), *Scientists Confront Creationism*. 1983, Norton.

Bobrowsky, M. "Teaching Evolutionary Processes to Skeptical Students" in *Physics Teacher*, December 2000, p. 565. Includes a list of creationist arguments and science teacher responses. Nice summary of issues.

Bobrowsky, M. "Dealing with Disbelieving Students on Issues of Evolutionary Processes and Long Time Scales" in *Astronomy Education Review*, vol. 4, issue 1.

<http://aer.nao.edu/AERArticle.php?issue=7&ion=4&article=2>

Brush, S. "Finding the Age of the Earth by Physics or by Faith?" in the *Journal of Geological Education*, 1982, vol. 30, pp. 34-58.

Coyne, J. "The Faith That Dare Not Speak Its Name: The Case Against Intelligent Design" in *The New Republic*, August 22/29, 2005 issue (vol. 233, issue 4727/8, p. 21). Superb layperson's introduction to the history and politics of intelligent design and a refutation of its arguments. By a biologist.

Dutch, S. "A Critique of Creationist Cosmology" in the *Journal of Geological Education*, 1982, vol. 30, p. 27.

Edis, T. "Darwin in Mind: Intelligent Design Meets Artificial Intelligence" in *Skeptical Inquirer*, March/April 2001, p. 35. An analysis of the latest "guise" of creationism, "Intelligent Design Theory." (On the Web at <http://www.csicop.org/si/2001-03/intelligent-design.html>)

Scott, E. "Antievolution and Creationism in the U.S." *Annual Reviews of Anthropology*, 1997, vol. 26, p. 263. A leading proevolution educator summarizes the issues.

Wilson, M. "Geology Confronts Creationism: An Undergraduate Science Curriculum" in *Skeptical Inquirer*, January/February 2002, p. 52. A course for geology majors to help them understand the controversy.

## **Web Sites**

*An Ancient Universe: How Astronomers Know the Vast Scale of Cosmic Time:*

<http://www.aas.org/education/ancientuniverse.html>. A booklet for teachers, school board members, and the public refuting creationist claims of a young universe and explaining how we know that the cosmos is 10 to 14 billion years old. Produced by the Astronomy Education Board of the American Astronomical Society.

*National Center for Science Education:* <http://www.ncseweb.org/>. NCSE is the key organization working to oppose the efforts of creationists and to assist educators who want to present the evolutionary perspective. Their site is full of excellent information and links, with particular attention to current events and the political struggles to prevent creationism from taking root.

*Science and Creationism* is a short booklet from the National Academy of Sciences, with a fine summary of the scientific perspective on evolution: <http://bob.nap.edu/html/creationism/>

*Creation Watch*: A special Web site from the Committee for the Scientific Investigation of Claims of the Paranormal, with great resources for those who want to respond to intelligent design and other forms of creationism: <http://www.csicop.org/creationwatch/>

*Talk.Origins Archive*: <http://www.talkorigins.org> contains articles, essays, and discussion about all aspects of the creation/evolution controversy. For an interesting example of how creationists tried to use some recent astronomical results to argue for a young universe, see <http://www.talkorigins.org/faqs/supernova/snrfab.html>

*The Age of the Earth*: <http://www.talkorigins.org/faqs/faq-age-of-earth.html> This useful page from the Talk.Origins site describes how we measure the age of our planet and then dissects some of the common creationist arguments for a younger Earth.

*Questions and Answers about Creationism/Evolution*: <http://www.vuletic.com/hume/cefec/>. A nicely organized summary of creationist arguments and scientific responses.

*Supernovae, Supernova Remnants, and Young Earth Creationism* by Dave Moore: <http://www.talkorigins.org/faqs/supernova/>. Discusses how some creationists misuse arguments about exploding stars.

*No Answers in Genesis*: <http://home.austarnet.com.au/stear/default.htm> is a site run by Australian skeptics that takes on creationist claims aggressively.

*Changing Speed of Light Analysis*: <http://www.talkorigins.org/faqs/c-decay.html>. Addresses the creationist idea that the age of the universe could be a lot less than astronomers think if the speed of light has been getting a lot slower with time, so that light from distant objects wouldn't have had to leave them so long ago. A more technical site is <http://homepage.mac.com/cygnusx1/cdecay/>

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