

To the Editors:

Lyle H. Jensen writing on the topic of Intelligent Design/Creationism (*RefleXions*, fall 2007), says of Michael Denton's 1985 non-peer-reviewed book "Evolution: A Theory in Crisis" that it "provides a good summary of the evidence challenging Darwinian evolution which had arisen from within various scientific fields prior to 1985 when it was first published." I have read Denton's book and my impression of it is much different.

The blurb on the back cover of my copy reads, "What will be most embarrassing to the neo-Darwinians... will be Denton's revelation that the evidence from his specialty, molecular biology, lends them no support. - *The Spectator*." As it happens, I have a degree in molecular biology, which has been quite useful to me in my practice of protein crystallography. I invite Jensen to open his copy of Denton's book to chapter 12, "A Biochemical Echo of Typology." One would think that a molecular biologist would be able to interpret a sequence comparison, and yet Denton flubs one after another. In the first example (page 278 in my edition) Denton tabulates sequence differences of cytochrome C from various species, and notes that various eukaryotes (horse, pigeon, tuna, silkworm, wheat, yeast) all have an approximately equal number of differences in comparison to bacteria (*R. rubrum* C2). Denton is disturbed by the "dramatic absence of intermediates" (p. 280). This is puzzling until an informed reader realizes that Denton apparently imagined the evolutionary interpretation of life as a ladder, rather than a tree! With a proper understanding of evolution, it is clear that all of the eukaryotes listed share a common ancestor with each other more recently than they do with bacteria. The intermediates are those common ancestors, which are buried deep in the past. Thus the sequence results agree very well with Darwinian predictions, but not with Denton's erroneous interpretation.

Every other sequence comparison listed by Denton, when properly interpreted, likewise fits readily into a Darwinian framework. If Denton had graphed these comparison as branching trees rather than his favored Venn diagrams, it would be readily apparent that phylogenetic trees drawn up on the basis of protein or nucleic acid sequence comparisons agree very well with those drawn from fossil and anatomic comparisons, although based on entirely different methods. This constitutes independent verification.

This interpretation of sequence comparisons as ladders instead of trees is a stunning error which was apparently picked up and repeated by the authors of *Of Pandas and People* (Davis & Kenyon, 1989), the supplementary textbook which was at issue in the Dover, Pennsylvania trial in 2005.

I will restrict myself to this one example which lies inside my area of competence, but I suggest to Jensen that he discuss any other material in Denton's book or other Intelligent Design/Creationism sources, which he finds to be convincing with competent experts in the relevant field of science.

David J. Schuller

To the Editors:

Lyle H. Jensen's letter (fall 2007, *RefleXions*) is of great interest. However, it is worth pointing out that both the original works of Darwin and the works of Jun-Yuan Chen (the most eminent palaeontologist in China as described by Prof. Jensen) are macroscopic studies, in contrast to the studies we crystallographers, hopefully, arrive at, which are on the molecular scale. Our molecular scale enables casting a very distinct and unique understanding of the concept of "evolution" as applied to all forms of life, much to the credit of Linus Pauling whose pioneering work has been so admirably extended by none other than Lyle H. Jensen himself.

The second letter (from Fanwick and Krause) following after that of Prof. Jensen, brings to mind the ACA Annual Meeting in Seattle, on the campus of the University of Washington. Here is an example where one did relish the resort like experiences in the evenings and where the seriousness and focus of science was enhanced by the campus setting.

Brahama D. Sharma

You Say You Want an Evolution? A Role for Scientists in Science Education

Abstract: The Coalition of Scientific Societies recently conducted a national survey of likely U.S. voters to examine acceptance of evolution, attitudes toward science and scientists, and opportunities for promoting science education. Most respondents accepted that life evolved, many accepted that it evolved through natural processes, and more favored teaching evolution than creationism or intelligent design in science classes. The majority ranked developing medicines and curing diseases as the most important contributions of science to society, and they found promoting understanding of evolutionary science's contribution to medicine to be a convincing reason to teach evolution. Respondents viewed scientists, teachers, and medical professionals favorably, and most were interested in hearing from these groups about science, including evolution. These data suggest that the scientific community has an important role to play in encouraging public support for science education.

Editors Note: A full paper has been published on the results of the survey¹. What follows here are some selected extracts from that paper.

Although evolution is firmly established as one of the most important, integrative, and robust concepts in science, teaching evolutionary science and related subjects (e.g., the origins of the universe, the age of the earth, plate tectonics) has been challenged in school districts across the United States. These challenges—whether introducing religious beliefs as "alternatives" to science, labeling evolution or the big bang as "theory, not fact," or singling out scientific subjects for "critical analysis"—jeopardize science education. Recognizing the harm such actions pose to science education and, ultimately, to the foundation on which scientific advancement is based, 17 scientific societies, representing the

physical, chemical, biological, and social sciences and science teachers communities, established an unprecedented coalition to explore opportunities for collective understanding and action. As part of this effort, they engaged a professional research firm to conduct a national survey of approximately 1,000 likely U.S. voters¹ that examined attitudes toward science and scientists, views on evolutionary science in the context of education, and means through which the scientific community can effectively bolster support for teaching evolution and related subjects.

Recent studies show that Americans' views on evolutionary science have been relatively stable over the past several decades, being almost equally split between those accepting human evolution^{2,3}, and those favoring a Biblical creationist account of the origins of life³. For example, when people were asked to choose whether humans developed over millions of years either with or without guidance from God, more selected evolution with guidance. In another form of the question, however, respondents were asked if they thought humans evolved or were created in their present form. Those who accepted evolution were then asked if they thought it occurred through natural processes or with guidance. When asked this way, fewer reported that evolution occurred with guidance than through natural selection³.

We anticipated that acceptance of evolutionary science would also be influenced by the distinction between human and non-human species. We asked half of the respondents about their views on the evolution of "all living things" and found that 61% accepted that "all living things have evolved over time." Of those, 36% thought all living things "evolved due to natural processes such as natural selection" and 25% thought "a supreme being guided the evolution of living things for the purpose of creating life in the form it exists today." We asked the remaining respondents to consider human evolution and found that 53% accepted that "humans and other living things" evolved. This majority included 32% who accepted that humans and other living things evolved through natural processes and 21% who thought they had evolved with guidance. Compared to other surveys³, we found weaker overall support for creationism: 28% and 31% agreed with statements that "all living things" or "humans and other living things," respectively, were created in their present form.

There is considerable uncertainty about what to teach in public school science classes, particularly with regard to including certain religious perspectives: 32% of respondents in our study were unsure about teaching creationism and 41% were uncertain about teaching intelligent design. By comparison, 22% expressed uncertainty about teaching evolution. Consistent with other studies⁵, however, more respondents favored teaching evolution (53%) than creationism (36%) or intelligent design (27%) in public school science classes. These data show that a majority of people favor—and even more may be open to—teaching evolution in science classes.

Why don't more Americans accept evolutionary science? Like other studies³, this survey shows a connection between respondents' views on evolution education and their answers to three scientific questions. Although 69% had some college

education, only 23% gave correct responses to all three of the following statements: the continents or land masses on which we live have been moving for millions of years and will continue to move in the future (79% correctly agreed); antibiotics kill viruses as well as bacteria (43% correctly disagreed); the earliest humans lived at the same time as the dinosaurs (53% correctly disagreed). Respondents who answered all three questions correctly were much more likely to respond that humans and other living things evolved (78%) than that they were created in their present form (11%), and more favored teaching evolution (78%) than creationism (27%) or intelligent design (24%). In contrast, respondents who answered fewer than two questions correctly were less likely to accept that life evolved (36%) than to believe it was created in its present form (47%), and they were about as likely to favor teaching evolution (36%) as creationism (38%) and intelligent design (29%).

Americans value the contribution that scientific research makes to eliminating diseases⁴, and they value the relationship between evolutionary science and medicine. We found that 63% of respondents ranked developing medicines and curing diseases as the most important contributions of science to society and 61% thought that understanding the contribution of evolution makes to modern medical science, including to understanding and treating diseases such as avian influenza, was a convincing reason to teach evolution in science classes. This finding, together with Americans' consistently strong support of medical research⁴, suggests that making the connection between evolutionary biology and advancing other areas of medical research (e.g., understanding human gene function or the mechanisms by which antibiotic resistance develops) might be equally compelling. People may also appreciate the contributions that evolutionary science makes to other fields, including agriculture, forensics, and even software engineering, although these were not examined in this study.

Teaching evolutionary science may also enhance science pedagogy, as it "offers educators a superb opportunity to illuminate the nature of science and to differentiate science from other forms of human endeavor and understanding"⁶. The tools and techniques that scientists employ to study evolution—gathering evidence from various sources, making logical inferences, establishing and testing competing hypotheses—are the hallmarks of science and necessary for everyday decision-making. Data from this survey suggest that the public values these learning opportunities: a majority of respondents rated thinking critically, learning to draw conclusions from evidence and learning how science is conducted as very important purposes of public school science education. Communicating the value of learning science, including evolution, for developing analytical skills that are widely applicable beyond the classroom may strengthen public support for all types of science.

The scientific community plays a key role in communicating the importance of science education to the public. Sixty nine percent of respondents had favorable feelings toward scientists and even more viewed medical researchers (72%) and doctors (76%) favorably. While fewer people (59%) rated public school science teachers highly, public school teachers in general were the most widely favored group (79%).

When it comes to scientific issues, the scientific community commands the attention of the public. Among respondents presented with a list of people who might explain science to the public, 88% expressed interest in hearing from a scientist, and almost as many were interested in hearing from a science teacher (85%) or a doctor or nurse (84%). On the topics of evolution, creationism, or intelligent design, most respondents expressed interest in hearing from scientists (77%), science teachers (76%), and clergy (62%). Fewer people were interested in hearing from Supreme Court Justices on evolution (37%), or from school board members and celebrities either on science (34% and 16%, respectively) and evolution (30% and 11%, respectively). These data indicate that Americans respect the expertise of science and education professionals and also look to clergy for guidance on scientific issues of potential relevance to religion. The value of encouraging each of these groups—including scientists who hold religious beliefs—to become involved in promoting quality science education cannot be overstated.

In communicating the value of science, scientists must emphasize the outcomes that matter to people—advancing medicine, improving health, fostering critical thinking—and they must do so clearly and understandably. Technical expositions on scientific topics will not get the attention of the public or policy makers who lack relevant expertise. If researchers can not communicate their findings in ways that are comprehensible, meaningful, and relevant to non-scientists, their message to the public—and their effectiveness as spokespeople for science—is lost⁷. There are ample opportunities for scientists to develop and exercise their communication skills and, whether writing letters to local newspapers, speaking with school boards or community groups, or partnering with educators to design curricula, many scientific and professional societies have trained staff or other resources to help.

There is a clear need for scientists to become involved in promoting science education. Challenges to teaching science undermine students' understanding of the scientific method, how scientific consensus develops, and the distinction between scientific and non-scientific explanations of natural phenomena. If we are to continue to develop the talent necessary to advance scientific and medical research, we must ensure that high standards in science education are maintained and that efforts to introduce non-science into science classes do not succeed. Failure to reach out effectively to a public that is supportive of science and open to information from the scientific community is not just a missed opportunity; it is a disservice to the scientific enterprise.

References

- [1] The complete article and the list of "Coalition of Scientific Societies" members are available online at evolution.faseb.org/sciencecoalition
- [2] J.D. Miller, E.C. Scott, S. Okamoto, *Science* (2006) **313**, 765-766.
- [3] "Reading the Polls on Evolution and Creationism" (The Pew Research Center for the People and the Press, Washington, DC, 2005; peoplepress.org/commentary/display.php3?AnalysisID=118).

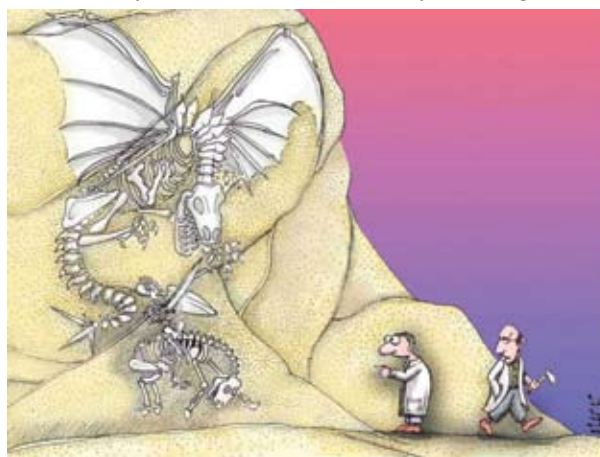
- [4] *America Speaks* (Research!America, Alexandria, VA, 2007; www.researchamerica.org/publications/AmericaSpeaks/AmericaSpeaksV8.pdf).
- [5] *Evolution, Creationism, Intelligent Design* (The Gallup Poll; www.galluppoll.com/content/default.aspx?ci=21814).
- [6] National Academy of Sciences, *Teaching About Evolution and the Nature of Science* (National Academies Press, Washington, DC, 1998).
- [7] M.C. Nisbet, C. Mooney, *Science* (2007) **316**, 56.

Web Resources

- American Association for the Advancement of Science
www.aaas.org/news/press_room/evolution/
- American Institute of Biological Sciences
www.actionbioscience.org/evolution/index.html
- American Physiological Society
www.the-aps.org/pa/policy/bioissues/evolutionTeach.htm
- American Society of Human Genetics
www.genednet.org/pages/k12_evolution.shtml
- Federation of American Soc for Experimental Biology
www.evolution.faseb.org
- Howard Hughes Medical Institute
www.hhmi.org/biointeractive/evolution/index.html
- National Academies
nationalacademies.org/evolution/
- National Center for Science Education
www.natcensci.ed.org
- PBS Evolution Website
www.pbs.org/wgbh/evolution
- Understanding Evolution (UC Museum of Paleontology)
evolution.berkeley.edu/

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For more information contact
Jennifer A. Hobin - Jhobin@faseb.org



Ignore it Henderson, It's Unscientific - by Nick. D. Kim, U. Waikato, New Zealand. See nearingzero.net/res.html