REPORTS OF THE NATIONAL CENTER FOR SCIENCE EDUCATION

DEFENDING THE TEACHING OF EVOLUTION IN THE PUBLIC SCHOOLS

Volume 28, Number 3 MAY-JUN, 2008

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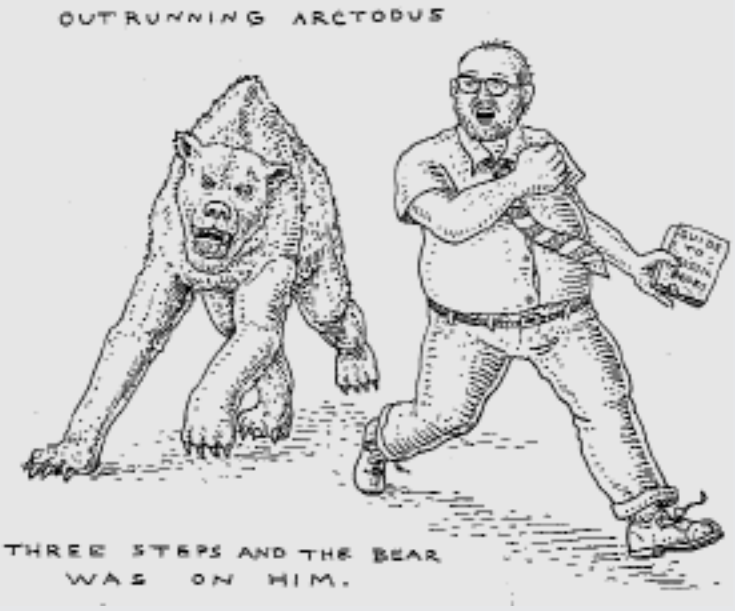

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NATIONAL CENTER FOR SCIENCE EDUCATION
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CONTINUES *NCSE REPORTS* & *CREATION/EVOLUTION*

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Cover: Human evolution exhibit at Penn Museum; photo by Lauren Hansen-Flaschen

Other artwork ©Ray Troll, 1997
For more information on Ray's work explore his website at <www.trollart.com>.

FROM THE EDITOR

One of the main unrealized goals of the "wedge strategy" is for "intelligent design" to develop a viable program of scientific research that would appear in mainstream scientific journals. Even though many of the political and public-relations goals of the strategy have been largely met, it is the research (that is, *scientific*) goals that remain unfulfilled. The only two works that have even come near achieving a presence in the scientific research literature are review articles in which existing research results are *reinterpreted* in light of "intelligent design". The most recent of these attempts is the subject of Steven Salzberg's lead article in this issue. Ultimately, the review was withdrawn because extensive passages were plagiarized, but Salzberg points out that there were other red flags that should have alerted the journal's editor and reviewers that this was not a standard review article.

Our centerfold front page shines a light on one of the arenas in which "intelligent design" has had intermittent success — electoral politics. Cheryl Shepherd-Adams graciously allows us to excerpt a blog posting written as a tongue-in-cheek "field guide" to indigenous North American political wildlife — *Anti-evolutionistii stealthus*. Cheryl points out the distinctive vocalizations, cryptic coloration, and elusive behaviors of this too-common species.

IN THE NEWS

As this issue went to press, Louisiana passed, and Governor Bobby Jindal signed, the landmark "academic freedom" legislation allowing teachers to introduce "alternative" theories and ideas in "controversial" areas — despite protests from scientific, legal, and educational organizations. Once again, Louisiana may take the lead in helping us root out thinly veiled attempts to insert creationism into the science curriculum — but unfortunately not until a lot of children are harmed. Details in a future issue of *RNCSE*.

We also see anti-evolutionist activity across the country, again — most notably a teacher in Mount Vernon, Ohio, has been dismissed after defying school board instructions on curricular content and classroom conduct. Mount Vernon has been a community with a troubled past with creationism/evolution issues, and we have reported on it several times in the past.

Textbook and standards issues are popping up in Texas. As one of the largest of the "textbook adoption" states, everyone interested in science education has a lot riding on the outcome. Across the pond, there is more anti-evolutionism in Germany and in Turkey. Taner Edis writes about the legal setbacks of Harun Yahya and his colleagues — though this may be little more than a temporary setback for their brand of Islamic creationism.

ON THE BOOKSHELF

As always, our book reviewers have been busy. Kim Bilica reviews *Teaching About Scientific Origins: Taking Account of Creationism*, which she described as a "polyvocal" text, in which the editors have tried to allow the voices of the authors — and their divergent positions — come through so that readers see their positions as the proponents intend them. This is a different sort of edited text than many are used to reading, but Bilica tells us that it is worth reading.

Daryl Domning reviews the volume that emerged from the Papal conference at Castel Gandolfo on issues related to creation and evolution. Domning reports not only that the book may signal a move toward "intelligent design" but also that it seems to ignore a significant amount of contemporary Roman Catholic theology that is quite compatible with modern scientific accounts of the history of life and the universe.

Two books aim at showing the importance of evolution to modern scientific thinking. Massimo Pigliucci and Jonathan Kaplan's *Making Sense of Evolution* and David P Mindell's *The Evolving World* both show that evolution is fundamental to events and experiences that we all experience every day. Pigliucci and Kaplan aim their books at a scholarly reader — perhaps someone in scientific research or in advanced graduate study — while Mindell is trying to reach a broader audience. Reviewers have separately come to similar conclusions — these two books may be overreaching a bit, but both have excellent qualities and advance long-awaited and sorely needed syntheses.

Read on!

RNCSE 28 (3) was printed in September 2008.

NEWS

Penn Kicks Off Year of Evolution

On April 19, 2008, the University of Pennsylvania Museum of Archaeology and Anthropology opened a new exhibit to celebrate the central role of evolutionary science in modern biology. The exhibit, entitled *Surviving: The Body of Evidence*, runs through May 2009 and is the museum's contribution to the Year of Evolution of public programs and events that coincide with the bicentennial of the birth of Charles Darwin and the sesquicentennial of the publication of *On the Origin of Species*.

YEAR of EVOLUTION

The University of Pennsylvania and the Penn Museum are joined by major Philadelphia cultural organizations in launching an ambitious Year of Evolution of public programs and events. These events will draw on the contributions of many outstanding educational and research institutions in Philadelphia, including the Academy of Natural Sciences, The Franklin Institute, the Philadelphia Zoo, the Mütter Museum and College of Physicians, the American Philosophical Society Museum, and the Wagner Free Institute of Science. In addition to highlighting Darwin's contribution to modern biology, the partner institutions will offer special programs on the work of Gregor Mendel, evolutionary medicine, and primate ecology and evolution, as well as featured lectures and presentation from prominent internationally known experts in evolutionary science (including NCSE Supporters Donald Johanson and Kenneth R Miller).

According to the Year of Evolution website, the exhibit and related programs provide an opportunity to reflect on the importance of Darwin's contribution to biology and the impact it has had on our understanding of the history and diversity of life:

> As we approach the 200th anniversary of the birth of Charles Darwin, the originator of the modern theory of evolution, it is a rich time to take stock of how much we've learned since *On the Origin of Species* was published in 1859.

To round out the celebration, there will be additional lectures, Penn Museum programs for children and families, scholarly symposia, and an evolution-focused freshman class book-reading selection at the University of Pennsylvania.

For more information, visit the exhibit's web site <http://www.museum.upenn.edu/surviving>.

[*Thanks to Pam Kosty at the Penn Museum for the information used in this note.*]

Harun Yahya's Legal Troubles

Taner Edis

The most commonly available form of Islamic creationism appears under the "Harun Yahya" brand. For the last ten years, books, articles, websites, and videos by Harun Yahya have been promoting an intellectually negligible but very postmodern and media-savvy form of creationism to a wide audience. The Harun Yahya operation is based in Turkey, but it has an international reach. Indeed, Yahya's influence goes beyond other Muslim countries and Muslim immigrant populations. Even my students, in a Midwestern university, will often stumble upon Harun Yahya web sites when researching creationism, and sometimes they do not realize that it is an Islamic rather than Christian form of creationism they have encountered.

Harun Yahya is a pseudonym, and Adnan Oktar, a Turkish sect leader and art school dropout, is said to be the person who writes all the Yahya material. Given the immense quantity of output under the Yahya label, this claim is implausible. I think of Harun Yahya as a brand, and Oktar as the public face of the brand. The details and funding sources of the organization that supports Oktar are not clear. The Science Research Foundation, BAV (Bilim Araştırma Vakfı in Turkish), is a group that supports creationism and boasts Oktar as its honorary president, but not much about BAV is known aside from its public activities in support of creationism and a moderate religious nationalism.

The Yahya form of creationism has been enjoying a degree of success that Protestant creationists based in the United States can only envy. But Oktar has also been embroiled in legal battles in Turkey, from long before he reinvented himself as a creationist guru. In May 2008, Adnan Oktar's legal troubles reached a new peak with the announcement that Oktar and some associates have been sentenced to three years in prison. He and a number of other defendants associated with BAV have been convicted of extortion and of forming an organization for the purpose of committing criminal acts.

Taner Edis is Associate Professor of Physics at Truman State University and RNCSE's associate editor for physics. His latest book is An Illusion of Harmony: Science and Religion in Islam *(Amherst [NY]: Prometheus, 2007), which discusses creationism in Islam.*

The Oktar and BAV saga is far from over. There is an appeals process to look forward to, and Oktar and supporters are already calling foul and alleging that the Turkish courts have acted under political pressure. Given that Oktar has some wealthy and powerful friends — and likely some powerful enemies as well — there may be all sorts of goings-on unknown to the public. The mainstream Turkish press did not report many details on Oktar's conviction beyond the basic legal facts.

On May 10, 2008, Oktar appeared in a news conference to present his view of events. While expressing respect for the judicial outcome, he and his spokespeople described the conviction as a legal scandal and a violation of due process. In particular, Oktar and his associates attributed their legal troubles to a conspiracy, speaking at length of a Masonic plot against BAV and Oktar. Apparently the conspiracy is international, with European Freemasons behind the 2007 Council of Europe report against the teaching of creationism (see *RNCSE* 2007 Sep–Dec; 27 [5–6]: 20–5), which cited Harun Yahya as an example. As part of the worldwide conspiracy, Oktar's group said, Turkish Masons also oppose BAV and its work in favor of creationism and other religious, conservative, and nationalist causes. Oktar also said that he will soon have another book out, which will expose Masonic activities.

In the press conference, Oktar and his supporters emphasized the theme that the persecution they are facing right now was similar to that undergone by prophets, such as related in the story of Joseph in the Qur'an. Strong defenders of the faith should expect persecution by worldly powers, and possible jail time will be faced by true believers as a badge of honor. Oktar already interprets past episodes in this fashion, such as the time before he became a creationist figurehead when he was forced to spend time in a mental institution. This, too, was a conspiracy that only strengthened Oktar's resolve.

It is still unclear what the recent convictions mean for Oktar and the Yahya brand of creationism. Even if Oktar's appeals fail and he does time in jail, his movement may be able to turn this into a tale of martyrdom in the hands of secular powers. The prodigious output in the name of Yahya might slow down, which might give defenders of evolution in Muslim lands a respite.

But even if the Yahya brand were to vanish as a result of all these legal troubles, this would only be a minor setback for Islamic creationism. The Harun Yahya phenomenon has made it clear that the Muslim world resists evolutionary science, and that more evolution-friendly interpretations of Islam remain weak. The Yahya operation has established that there is a considerable market for an Islamic-colored version of creationism. If Harun Yahya were to fall silent, this could just be an incentive for other brands to compete for that market.

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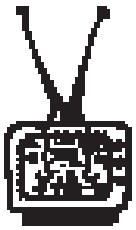
UPDATES

Florida, Pinellas County: A Darwin Day event was cancelled by a county official who "flinched" at the prospect of a lecture on evolution, according to Daniel Ruth, writing in his column in the *Tampa Tribune* (2008 May 8). Lorena Madrigal, a professor of anthropology at the University of South Florida, was invited to give a Darwin Day talk by the Friends of Brooker Creek Preserve, a group that provides public support for the preserve, a wilderness area located in the northeastern corner of Pinellas County. However, Ruth reported, she "was given the bum's rush by Pinellas County officials, who canceled her appearance. 'They told me very clearly they felt their budget was in danger if the lecture took place,' Madrigal said." William Davis, the director of the Pinellas County Department of Environmental Management, which manages the reserve, explained, "Her topic was about evolution ... I flinched on that. ... We are not the platform for debate on creationism versus evolution." Unimpressed, Ruth asked rhetorically, "If an acknowledged academic expert on evolution is deemed an inappropriate speaker to deliver a speech, especially on the very day honoring the man who created the scientific theory of evolution, then just when would it be acceptable for Professor Madrigal to offer up her views?"

Maine, Madison: A member of the board of directors of School Administrative District 59 — headquartered in Madison, about forty miles north of Augusta — thinks that evolution and the Big Bang ought to be deleted from the curriculum, according to the Waterville *Morning Sentinel* (2008 May 6). At the board's April 28, 2008, meeting, Matthew Linkletter argued that neither creationism nor evolution belong in a science classroom, saying, "You can't show, observe or prove it ... It's something you have to believe by faith. It doesn't meet the criteria of science. ... If it's not scientifically verifiable, then maybe we should leave it out of the science classes. When you make a statement that's not backed by facts and just represents a world view, then it has no place." High school teacher Jessica Ward disagreed, noting, "My personal, as well as the National Science Teachers[,] position, is that you can't teach genetics or ecology without evolution. The basis for it is the theory of evolution." She also noted that the Maine state science standards mandate instruction in evolution. The board's chair Norman Luce, however, commented, "I don't care if everybody else in the country uses it. Science is about proving things. [Linkletter] has a good point," and



suggested that evolution might be more appropriately discussed in a philosophy class. A later report in the *Kennebec Journal* (2008 May 11) quoted a state Department of Education official as responding, "For our students to be prepared for college work and life in the 21st century, it's necessary [for them to study evolution] ... Evolution is not just a belief, or based on faith, it's based on scientific evaluation ... The worldwide science community supports it." Action on the science curriculum was tabled; the board was reportedly to address the issue at its next meeting on May 19, 2008, but the district superintendent told the Waterville *Morning Sentinel* (2008 May 13) that the board would not do so then, adding that there was no specific timeline for a discussion and vote.

Massachusetts: Nathaniel Abraham's lawsuit against Woods Hole Oceanographic Institution lingers on. Contending that his civil rights were violated in his firing from his job at Woods Hole for not accepting evolution, Abraham filed suit against the research center on November 30, 2007, seeking compensatory and punitive damages under Title VII of the Civil Rights Act of 1964 (see *RNCSE* 2008 Jan/Feb; 28 [1]: 20–2 for background). The case was dismissed on April 22, 2008, because Abraham failed to file suit in a timely manner after the Massachusetts Commission Against Discrimination rejected his complaint (see *RNCSE* 2008 Mar/Apr; 28 [2]: 16–8). On May 19, 2008, however, his lawyer, David C Gibbs III, filed a notice of appeal. The case is on its way to the US Court of Appeals for the First Circuit.

Michigan: Senate Bill 1361, introduced in the Michigan Senate on June 3, 2008, and referred to the Senate Committee on Education, is yet another "academic freedom" bill. Identical to House Bill 6027 (see *RNCSE* 2008 Mar/Apr; 28 [2]: 16–8), which is still in committee, SB 1361 would require state and local administrators "to create an environment within public elementary and secondary schools that encourages pupils to explore scientific questions, learn about scientific evidence, develop critical thinking skills, and respond appropriately and respectfully to differences of opinion about controversial issues" and "to assist teachers to find more effective ways to present the science curriculum in instances where that curriculum addresses scientific controversies" by helping them "to help pupils understand, analyze, critique, and review in an objective manner the scientific strengths and scientific weaknesses of existing scientific theories pertinent to the course being taught."

In a press release dated May 20, 2008 (available on-line at <http://michigancitizensforscience.org/main/nfblog/2008/05/20/mcfs-press-release-on-hb-6027/>), Michigan Citizens for Science blasted HB 6027, writing:

> it does a disservice to teachers, school administrators and local school boards by urging them to incorporate material into science classes that is at odds with well-established science. The bill itself notes that "some teachers may be unsure of the expectations concerning how they should present information on such subjects," yet it does nothing to clear up that uncertainty. It does not spell out what ... "the scientific strengths and scientific weaknesses of existing scientific theories" are that teachers are supposed to discuss and that lack of definition is intentional. This is a recipe for disaster, ushering teachers and school boards into a Dover trap, by inviting them to include material that not only has no scientific basis, but has already been declared in Federal court to be unconstitutional to teach.

Missouri: When the Missouri legislative session ended on May 16, 2008, House Bill 2554 died, although it was passed by the House Committee on Elementary and Secondary Education on April 30, 2008. The bill would have called on education administrators to "endeavor to create an environment within public elementary and secondary schools that encourages students to explore scientific questions, learn about scientific evidence, develop critical thinking skills, and respond appropriately and respectfully to differences of opinion about controversial issues, including such subjects as the teaching of biological and chemical evolution," and to "endeavor to assist teachers to find more effective ways to present the science curriculum where it addresses scientific controversies." "Toward this end," it continued, "teachers shall be permitted to help students understand, analyze, critique, and review in an objective manner the scientific strengths and scientific weaknesses of theories of biological and chemical evolution."

The intent and likely effect of HB 2554 was not lost on the editorialist for the *St Louis Post-Dispatch* (2008 Apr 27):

> Once again this year, a bill has been introduced in the Legislature that would encourage students to question evolution. House Bill 2554, sponsored by Rep Robert Wayne Cooper, R–Camdenton, claims to support academic freedom for teachers, and to help students "develop critical thinking skills." Those are the latest fig leaves used by creationists in their long war against science and evolution.

In previous legislative sessions, Cooper sponsored a total of three anti-evolution bills: HB 911 and HB 1722, calling for equal time for "intelligent design" in Missouri's public schools, in 2004, and HB 1266, calling for "critical analysis" of any "theory or hypothesis of biological origins," in 2006. All three of these bills died, although HB 1266, like HB 2554, was passed by the House Committee on Elementary and Secondary Education.

Ohio, Mount Vernon: A complaint filed in federal court on June 13, 2008, accused John Freshwater, a Mount Vernon, Ohio, middle school science teacher, of inappropriately bringing his religion to

school — including by displaying posters with the Ten Commandments and Bible verses in his classroom, branding crosses into the arms of his students with a high-voltage electrical device, and teaching creationism. The complaint also alleged that the principal of the school, the superintendent of the school district, and the board of education allowed Freshwater to continue teaching and failed to discipline him, even after the branding incident (which occurred in December 2007) was brought to their attention. The attorney representing the complainants (who are identified only as "John Doe and Jane Doe") told the *Columbus Dispatch* (2008 Jun 20), "These concerns had been going on for at least 11 years, and the school had not done anything."

According to the conclusions of a report on Freshwater commissioned by the district and dated June 19, 2008, "Freshwater engaged in teaching of a religious nature, teaching creationism and related theories and calling evolution into question. He had other materials in his classroom that could be used for that purpose." Investigators found various creationist literature in his classroom, including Jonathan Sarfati's *Refuting Evolution* and Jonathan Wells's *Icons of Evolution*. Additionally, high school teachers in the same district complained that they had to "re-teach" concepts related to evolution that Freshwater misrepresented: one commented, "At the ninth grade level when we bring up evolution there is challenge and argumentation from students who have had Mr Freshwater, bordering on hostility." And the principal of the high school specifically asked for her daughter not to be assigned to Freshwater's class.

A lawyer for the Mount Vernon City School District told the *Dispatch* (2008 Jun 19) that the administration directed Freshwater not to discuss his religious beliefs in class: "They told him he was to teach — not preach." He added that Freshwater could not have been disciplined before the completion of the investigation. The *Dispatch* (2008 Jun 20) subsequently reported, "Neither Freshwater nor his attorney, Roger Weaver, could be reached for comment last night. Freshwater's friend Dave Daubenmire defended him. 'With the exception of the cross-burning episode. ... I believe John Freshwater is teaching the values of the parents in the Mount Vernon school district,' he said." Daubenmire previously acknowledged to the *Dispatch* (2008 Apr 17) that Freshwater taught "intelligent design" in his classroom.

At its June 20, 2008, meeting, the Mount Vernon City School District Board of Education unanimously voted to begin proceedings to terminate Freshwater's employment with the district. "Freshwater preached his Christian beliefs about how the world began, discredited evolution and didn't teach the required science curriculum, the board says. He was told to stop teaching creationism and intelligent design, but he continued to do so, an investigation found," the *Columbus Dispatch* (2008 Jun 21) reported. According to the *Dispatch*, "After learning of the board's decision, Freshwater called the consultants' report half-truths and said he never veered from the state standards for teaching science"; his lawyer described the complaints as "fabrications," adding that Freshwater intends to appeal the board's decision. (For a previous report on the situation, see *RNCSE* 2008 Mar/Apr; 28 [2]: 16–8.)

Pennsylvania, Everett: A lawsuit that would have required a disclaimer about evolution to be included in the biology textbooks used in the Everett Area School District's high school, having failed, is now being revived. In 2007, Thomas Harclerode, a 78-year-old resident of Everett, a town of about 2000 in south central Pennsylvania, about 95 miles east of Harrisburg, asked the school board to adopt a textbook disclaimer, which read, in part:

> This text book is an excellent teaching aid: however there is one aspect of it which has been challenged by an ever increasing number of Scientists.
>
> Over a century ago, Darwin proposed a THEORY that basically said, life began from some primordial soup through random chance and time. ...
>
> The number of excellent and brilliant Scientists is continuing to grow in Their belief that life did not begin by random chance and time. Scientist such as: DR Francis Collins ... Professor Michael J. Behe ... Jerry Bergman Phd ... David Menton Phd. ... Prof AE Wilder-Smith ... etc. ...
>
> Despite the millions of Fossil record availables, there has not been found the multitude of intermediate fossils, which Darwin thought should exist, to show one specie evolving into another, known as "Macro Evolution". To date the few intermediates that have been reported have turned out to be fakes, such as The Piltdown Man, The Java Man, The Peking Man etc. ...
>
> In light of the above, you are encouraged to do your own research and make your own decision on this very important controversy. [*Printed as it originally appeared.*]

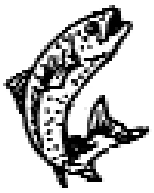
Then superintendent of the school district Rodney L Green recommended to the board that it not comply with Harclerode's request, citing the district solicitor's view that the disclaimer resembled the disclaimer at issue in *Kitzmiller v Dover* and the possibility that it would constitute a disregard of established constitutional law.

Harclerode disagreed, telling the *Bedford Tribune* (2007 Jul 28), "The Dover case down there was based on intelligent design and the court ruled they couldn't teach intelligent design," and filed suit in the Court of Common Pleas of Bedford County, Pennsylvania, requesting that the court "Decree the Defendants to place an Addendum in their Biology books showing the evidence against the theory that Life began by Time and Chance." Subsequently, he urged the board to overrule the superintendent: the *Bedford Tribune* (2008 Feb 15) reported, "He said he hoped a school board that

includes four new members would reconsider. They are in charge of what the curriculum includes, he said, not the superintendent."

Ultimately, the court dismissed the suit. According to the *Bedford Tribune* (2008 Apr 18), "Bedford County President Judge Daniel Howsare dismissed the lawsuit, writing that Harclerode 'lacks standing,' because he failed to demonstrate he would suffer 'direct and immediate harm' because of the district's 'actions or omissions.'" Harclerode reportedly acknowledged his lack of standing and announced that he would not appeal the decision, although he continues to think that the disclaimer would be constitutional and appropriate. The current superintendent of the school district Royce Ann Boyd commented, "We already teach students to question and we'll continue to do that."

In May 2008, however, spurred by a letter to the editor and a column in the local paper applauding his actions, Harclerode rethought his decision not to appeal. The *Bedford Tribune* (2008 May 24) reported, "he decided to take his case to Commonwealth Court. He's not sure about his legal case, but Harclerode said, 'Morally, I'm headed in the right direction.' ... Harclerode is hoping a 'Christian lawyer' will step forward to take his case on a *pro bono* basis. 'So far, it hasn't happened,' he said earlier this week." NCSE's David Almandsmith told the newspaper that Harclerode's disclaimer was not only unconstitutional but also misleading about the scientific standing of evolution: "To point out there have been frauds and there have been mistakes ... it makes it sound like it is fairly common," he said. "There are millions of fossils that support evolution and many thousands of research projects to support evolution."



South Carolina: Senate Bill 1386, introduced in the South Carolina Senate on May 15, 2008, and referred to the Senate Committee on Education, was a further instance of the "academic freedom" bill aimed at undermining the teaching of evolution; it died on June 5, 2008, when the legislature adjourned. The bill contended that "[t]he teaching of biological and chemical evolution can cause controversy, and some teachers may be uncertain of administrative expectations concerning the presentation of material on these scientific topics" and that "public school educators must be supported in finding effective ways to present controversial science curriculum and must be permitted to help students understand, analyze, critique, and review the scientific strengths and weaknesses of theories of biological and chemical evolution in an objective manner."

Accordingly, S 1386 would have, if enacted, amended the state's education code to provide:

> The State Board of Education, superintendents of public school districts, and public school administrators may not prohibit a teacher in a public school of this State from helping his students understand, analyze, critique, and review the scientific strengths and weaknesses of biological and chemical evolution in an objective manner. This act does not condone the promotion of religious or nonreligious doctrine, the promotion of discrimination for or against a particular set of religious beliefs or nonreligious beliefs, or the promotion of discrimination for or against religion or nonreligion. By no later than September 1, 2008, the State Department of Education shall notify district superintendents of the provisions of this act, and each superintendent shall then disseminate to all employees within his district a copy of the provisions of this act.

The lead sponsor of S 1386, Senator Michael Fair (R–District 6), spearheaded a number of previous anti-evolution efforts in the legislature. In 2003, he tried to amend a bill dealing with instructional materials and textbooks to require a disclaimer about the origin of life as "not scientifically verifiable"; withdrawing the amendment, he then successfully amended the bill to establish a 19-member South Carolina Standards Committee to "(1) study science standards regarding the teaching of the origin of species; (2) determine whether there is a consensus on the definition of science; (3) determine whether alternatives to evolution as the origin of species should be offered in schools." The *Greenville News* (2003 May 1), reported that Fair "said his intention is to show that Intelligent Design is a viable scientific alternative that should be taught in the public schools." The bill died, however, when the legislature adjourned.

Fair introduced a bill in the next legislative session that would have established the South Carolina Standards Committee. The language about "alternatives to evolution" was removed from the bill in committee, however. Regrouping, Fair then introduced S 909, a bill modeled on the so-called Santorum language stripped from the federal No Child Left Behind Act of 2001. If enacted, S 909 would have required, "Where topics are taught that may generate controversy, such as biological evolution, the curriculum should help students to understand the full range of scientific views that exist, why such topics may generate controversy, and how scientific discoveries can profoundly affect society." The bill failed, but Fair won himself a description as "the dominant voice advocating for SC schools to teach more than Charles Darwin's theories of evolution," according to *The State* (2005 Jun 17).

In 2005, Fair also launched a campaign against evolution in the state's science standards. A member of the South Carolina Education Oversight Committee, he pressed for the expansion of "critical analysis" language already present in the standards dealing with evolution, despite the criticism of then State Superintendent of Education Inez Tenenbaum, who told *The State* (2006 Feb 13), "'Critically analyze' is not just wordsmithing ... It carries with it a whole campaign against evolution." After a seven-month delay during which Fair and his confederates unsuccessfully lobbied for insertion of "critical analysis" lan-

guage into all of the evolution indicators, the EOC approved the standard as submitted. But even here Fair claimed victory, telling AgapePress (2006 Jun 15) that it was a precursor to allowing the teaching of "intelligent design" in South Carolina's public schools.

Texas: "A battle looms in Texas over science textbooks that teach evolution," Laura Beil reported in the June 4, 2008, issue of *The New York Times*, "and the wrestle for control seizes on three words. None of them are 'creationism' or 'intelligent design' or even 'creator.' The words are 'strengths and weaknesses.' Starting this summer, the state education board will determine the curriculum for the next decade and decide whether the 'strengths and weaknesses' of evolution should be taught. The benign-sounding phrase, some argue, is a reasonable effort at balance. But critics say it is a new strategy taking shape across the nation to undermine the teaching of evolution, a way for students to hear religious objections under the heading of scientific discourse."

The story mentioned the recent spate of anti-evolution bills invoking "academic freedom" but, unlike in other states, "[i]n Texas, evolution foes do not have to win over the entire Legislature, only a majority of the education board; they are one vote away." The chair of the Texas state board of education, Don McLeroy, described the debate as between "two systems of science" — "You've got a creationist system and a naturalist system," he told the *Times* — but avowed, "My personal religious beliefs are going to make no difference in how well our students are going to learn science."

In 2003, "strengths and weaknesses" language in the Texas state science standards was selectively applied by members of the board attempting to dilute the treatment of evolution in the biology textbooks then under consideration. In the end, however, all of the textbooks were adopted without substantial change. Now the committee charged with the task of revising the standards plans to recommend the removal of the "strengths and weaknesses" language, Kevin Fisher, a member of the committee, told the *Times*, commenting that the "weaknesses" listed on a Texas creationist website were "decades old" and have "all been thoroughly refuted." But the board is free to reject or amend the committee's recommendations.

The *Times* article also quoted NCSE's deputy director Glenn Branch, who commented on the trend of "anti-evolution policies in sheep's clothing"; Kathy Miller of the Texas Freedom Network, who explained, "'Strengths and weaknesses' are regular words that have now been drafted into the rhetorical arsenal of creationists"; and Dan Foster, former chairman of the department of medicine at the University of Texas Southwestern Medical Center at Dallas and past president of the Academy of Medicine, Engineering, and Science of Texas, who worried, "Serious students will not come to study in our universities if Texas is labeled scientifically backward."

The *Times* story followed on the heels of a story in the *San Antonio Express-News* (2008 May 31), which similarly predicted, "After feuding for months over how to teach school children to read, the State Board of Education soon will shift to a topic that could become much more controversial — the science curriculum. Science, after all, involves biology. And biology is built on the theory of evolution, raising fears among some observers that social conservatives on the 15-member panel will try to shade textbooks with religion." One of those social conservatives, the board's vice chair David Bradley, explained, "Evolution is not fact. Evolution is a theory and, as such, cannot be proven. Students need to be able to jump to their own conclusions."

In a commentary posted at Texas Citizens for Science's website (available on-line at <http://www.texscience.org/reviews/weaknesses.htm>), Steven Schafersman commented, "What Bradley and his colleagues actually plan to do is damage evolution instruction by trying to get the new science standards to include alleged but false 'weaknesses' of evolution, in order to weaken evolution content, confuse students and make them think science is less accurate and reliable about biological origins than it really is, and intimidate teachers to avoid or minimize the subject (as many of them do now in Texas)." With respect to Bradley's description of evolution as theory not fact, he added, "This banal canard is indulged in by every creationist who thinks he can get away with it. ... Evolution is a fact, if fact is defined as something for which so much reliable evidence exists that it would be irrational to deny it."

Likewise, David Hillis, a distinguished biology professor at the University of Texas at Austin, told the *Express-News* that the main purpose of the "strengths and weaknesses" language "is to introduce religious ideas and anti-science ideas into the science classroom," adding, "Evolution is an easily observable phenomenon, and has been documented beyond any reasonable doubt. The 'theory' part of evolutionary theory concerns the experiments, observations, and models that explain how populations evolve. At this level of introductory instruction, it is ludicrous to think about teaching what some people disingenuously call 'weaknesses.' ... We teach what is known and has been supported by a huge body of scientific research."

In the wake of the report in *The New York Times*, the newspaper addressed the issue editorially, writing (2008 June 7), "The Texas State Board of Education is again considering a science curriculum that teaches the 'strengths and weaknesses' of evolution, setting an example that several other states are likely to follow. This is code for teaching creationism." Observing that "[e]very student who hopes to understand the scientific reality of life will sooner or later need to accept the elegant truth of evolution as it has itself evolved," the editorial concluded, "If the creationist view prevails in Texas, students interested in learning how science really works and what scientists really understand about life will first have to overcome the handicap of their own education."

Closer to the scene, the *Houston Chronicle* (2008 Jun 7) explained that "strengths and weaknesses" language is "a 'teach

the controversy' approach, whereby religion is propounded under the guise of scientific inquiry," adding, "Given the recent comments of both the chairman and the vice chairman of the board, there is ample reason for alarm." Rebuking Don McLeroy, who described the debate to the *Times* as between "two systems of science" — "You've got a creationist system and a naturalist system" — the editorial commented, "What students really need is to be able to study science from materials that have not been hijacked by creationists whose personal agenda includes muddying the science curriculum. Creationism is not a 'system of science,'" and ended by asking, "What chance do Texas students have of competing in the 21st century if their learning of science is warped and stunted by such benighted leadership?"

Germany: Plans for a Bible-based theme park outside Heidelberg are raising eyebrows in Germany, according to *The Independent* (2008 Jun 6), which reported, "Brunch in the Tower of Babel, a stroll round Noah's Ark or a big-dipper splashdown in The Flood are experiences that will shortly be available to millions of Germans if a controversial biblical-themed park near the ancient university town of Heidelberg is given the go-ahead." Behind the proposed development is the Swiss young-earth creationist group Pro Genesis, one of the most influential creationist groups in the German-speaking world. A minister of parliament for the Heidelberg area expressed concern that the presence of the park would damage the region's reputation for academic excellence.

Turkey: Adnan Oktar, the Islamic creationist who writes under the pseudonym "Harun Yahya," was sentenced by a Turkish court to three years in prison for "creating an illegal organization for personal gain," according to a report from Reuters (2008 May 9; and see p 4 for Taner Edis's report). Oktar is the head of the Foundation for Scientific Research (Bilim Araştırma Vakfi, or BAV) in Ankara, Turkey.

The charges reportedly stemmed from a previous trial in which Oktar was "charged with using threats for personal benefit and creating an organization with the intent to commit a crime." A BAV source confirmed the fact of Oktar's sentencing, but claimed that the judge was influenced by pressure groups and stated that Oktar would appeal the verdict.

BAV originally adopted its arguments from young-earth creationist organizations in the United States, but discarded claims about a young earth and a global flood flood not vouched for by the Qur'an or Islamic tradition. Subsequently, BAV evinced a degree of sympathy for "intelligent design" creationism instead, employing catchphrases like "irreducible complexity" and using the phrase "intelligent design" as equivalent with "creation." Later, however, Harun Yahya denounced "intelligent design" as insufficiently Islamic.

According to the historian of creationism Ronald L Numbers in *The Creationists* (Cambridge [MA]: Harvard University Press, 2006, p 425), "Initially BAV focused its missionary activities on Muslims in the Turkic Republics and in the Balkans, but it quickly expanded to reach Muslims throughout the world," with speakers dispatched to Asia, Europe, Singapore, South Africa, and, as Pat Shipman reported (*RNCSE* 2006 Jul/Aug; 26 [4]: 11–4), the United States. And its efforts have lately not been limited to Muslims: in 2007, unsolicited copies of a lavishly produced tome entitled *The Atlas of Creation* were distributed to bemused teachers and scientists in France, the Netherlands, and the United States (see *RNCSE* 2007 May–Aug; 27 [3–4]: 6–9).

[*NCSE thanks Elizabeth Coyle of the* Bedford Tribune *for information used in this article.*]

NCSE NEWS

News from the Membership

Glenn Branch, NCSE Deputy Director

From time to time we like to report on what our members are doing. As the following list shows, they — and we — have a lot to be proud about!

Lawrence S Lerner gave a talk on June 11, 2008, entitled "Where do textbooks come from? I'll tell you when you're older" as part of the Distinguished Speaker Series of the Bay Area Alumni of the University of Chicago. A description of his talk read, "'Surreal' is one way to describe the world of K–12 textbooks. Those of us in the real world may find it hard to believe that: Typically, not one word was written by any of the authors on the title page ... The books are riddled with errors and distortions ... The expert reviewers who detect these errors and distortions are paid for their trouble and then ignored ... Subject-matter content is a minor one of many criteria used in determining adoptions ... The adoption process is commonly a farce." Professor Emeritus of Physics and Astronomy at California State University, Long Beach, Lerner is a recognized expert on state science standards, and was the recipient of a Friend of Darwin award from NCSE in 2003.

Former NCSE staffer **Nick Matzke** and NCSE Supporter **Kenneth R Miller** are featured in a section of **Carl Zimmer**'s new book *Microcosm: E coli and the*

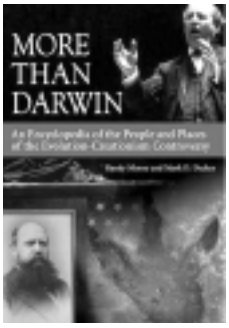
Nick Matzke

New Science of Life (New York: Pantheon, 2008) dealing with the role of microbiology in the *Kitzmiller* trial. "Miller, a biologist at Brown University, pointed out that Behe's claims about irreducible complexity could be tested. ... 'We do break it apart, and lo and behold, we find — actually we find a variety of useful functions, one of which I have just pointed out, which is type III secretion,' Miller testified. 'What that means is that the argument that Dr Behe has made is falsified, it's wrong, it's time to go back to the drawing board,'" Zimmer wrote. Later, Matzke's paper about the evolution of the bacterial flagellum (coauthored with Mark Pallen: *Nature Reviews Microbiology* 2006; 4 [10]: 784–90) was mentioned: Zimmer commented, "A better hypothesis may emerge ... But it is a far superior hypothesis to one built on nothing but appearances and a personal sense of disbelief."

Responding to previous letters in the *Baraboo News Republic*, **Karen Mesmer** explained why scientists are dismissive of "intelligent design" creationism, writing in part, "scientists aren't intolerant of new ideas as much as they are skeptical. They demand empirical (measurable) evidence, do further testing and subject the idea to peer review. If the idea isn't backed by proper evidence, it is discarded. This happens to many new ideas in science and makes science self-correcting, searching for the best models possible to explain natural phenomena. Intelligent design (ID) has been examined by the scientific community and found to be deficient as a scientific idea." Her letter appeared in the May 2, 2008, issue of the newspaper.

David P Mindell will become the new Dean of Science and Research Collections at the California Academy of Sciences in San Francisco, *Science* reported in its April 11, 2008, issue (320: 161). "Our hope is to become one of the pre-eminent research museums in the world," he told the journal. Mindell is a professor of ecology and evolutionary biology at the University of Michigan and a curator at its Museum of Zoology; he is also the author of *The Evolving World* (Cambridge [MA]: Harvard University Press, 2006; reviewed on p 27), in which, as **David R Lindberg** wrote in *BioScience*, "he applies his expertise to relate the role of evolution to everyday life, an ostensibly difficult task that he skillfully accomplishes by linking evolutionary mechanisms to familiar objects and activities."

Randy Moore was interviewed about his new book *More than Darwin: An Encyclopedia of the People and Places of the Evolution–Creationism Controversy* (Westport [CT]: Greenwood Press, 2008), coauthored with **Mark Decker**, for the University of Minnesota's College of Biological Sciences podcast series; audio and a transcript is available on-line at <http://www.cbs.umn.edu/main/multimedia/morethandarwin.shtml>. Alluding in passing to NCSE's archives, Moore told his interviewer, "We went all over just trying to track this stuff down. We went out to Oakland and looked at some original first editions of books and when you see those kinds of things, you get a much clearer picture and you understand not only evolution better, but certainly the controversy much better — where it started. You know, it didn't start with Darwin, far from it. These new words, 'intelligent design', that's a very, very old idea." Moore, a recipient of NCSE's Friend of Darwin award in 2004, is Professor of Biology at the University of Minnesota, Twin Cities.



NCSE Supporter **Michael Ruse**'s essay "The struggle between evolution and creation: An American problem" appeared on On Line Australia ("Australia's e-journal of social and political debate") on May 13, 2008 (available on-line at <http://www.onlineopinion.com.au/view.asp?article=7353>); it also appeared in the print journal *Issues* (2008 Mar; 28). "I believe the big mistake is to think that the real motivation of American literalists is ultimately scientific," Ruse wrote. "It is not. It is much more a concern with moral issues." After discussing the content and history of the creationism/evolution controversy, he concluded, "Evolution is a focal point for both modern secularists and traditional evangelical Christians as they hurl different moral prescriptions past each other. Although as one who is English born and who finds this whole thing almost quaint and incredible, as one who now lives and works in America, I would be surprised if there were not this controversy." Two weeks later, Ruse published a further op-ed, "Darwin passes his testings," in the Fredericksburg, Virginia, *Free Lance-Star* (2008 Jun 1), discussing the converging lines of evidence for evolution. "These were Darwin's clues — fossils, island inhabitants, forelimbs of vertebrates, similar embryos — and jointly they pointed to one and only one culprit. Evolution. And this is the reason why Charles Darwin and his theory are worth celebrating today," he wrote. Ruse is Lucyle T Werkmeister Professor of Philosophy at Florida State University; among his recent books is *Charles Darwin* in the Blackwell Great Minds series (Oxford: Blackwell, 2007).

NCSE's executive director **Eugenie C Scott** and NCSE Supporter **Michael Ruse** reviewed each other's books for the *American Journal of Psychology* (2008; 121 [2]). Of Scott's *Evolution vs Creationism: An Introduction* (Westport [CT]: Greenwood Press, 2004), Ruse wrote, "As with everything that Eugenie Scott does, what we get is plain, straightforward, useful, honest. There is no fancy writing here, no clever metaphors. She sets out to tell us about the creationist movement, its history, and its main claims, and this she does."

Creationism Slips Into a Peer-Reviewed Journal

Steven L Salzberg

A strange thing happened in the scientific literature recently. A pair of creationists, who have seemingly legitimate scientific credentials, attempted to publish some creationist assertions in a peer-reviewed journal. Their effort was nearly successful, mostly because they hid their pseudoscience in the middle of the article, surrounded by legitimate scientific discussion of unrelated topics. Luckily, they were caught just in time, and it turned out that they were pretty clumsy. In fact, if they had been just a bit more clever, they might have gotten away with it.

Steven L Salzberg is the Director of the Center for Bioinformatics and Computational Biology and the Horvitz Professor of Computer Science at the University of Maryland, College Park. Before switching to bioinformatics and genomics, his research focused on machine learning and its research applications. Salzberg and his research team develop computational gene finders and systems for large-scale genome sequence alignment and assembly, including the open-source genome assembler AMOS. In addition to his software systems, Salzberg has contributed analyses to many genome sequencing projects, using computational methods to analyze genome duplications, rearrangements, and other evolutionary phenomena in a wide range of organisms, including the first large-scale genomics study of the human and avian influenza A viruses. Salzberg has authored or co-authored two books and over 150 publications in leading scientific journals. He is a Fellow of the American Association for the Advancement of Science (AAAS) and a member of the Board of Scientific Counselors of the National Center for Biotechnology Information at the National Institutes of Health.

First, let us examine the facts: the two authors, Mohamad Warda and Jin Han, submitted a review paper to the mainstream journal *Proteomics*. This is a well-regarded journal, with a distinguished editorial board, which focuses on novel technologies for studying the protein content (the "proteome") of a cell or a tissue sample. Virtually all scientists reading this journal are familiar with evolutionary theory, but the journal itself is not a forum for discussion of evolution. No one would expect a paper on creationism to appear here.

The paper submitted by Warda and Han was a review paper about mitochondria. The mitochondrion is an organelle contained within the cells of most multicellular life, including plants and animals. Mitochondria are often referred to as the "energy factories" of the cell, because they produce adenosine triphosphate, ATP, which is the source of much of the chemical energy that a cell uses. Of course, mitochondria do not "make" energy — they merely help to convert energy from food into another form of energy that the body can use.

Review papers are different from other scientific papers: rather than describing novel experiments and results, they review and summarize the work of others on a particular topic. Reviews do not normally contain new conclusions, but once in a while a review paper might distill many related findings into a broader result than any of the individual papers discussed in the review. The Warda and Han paper professed to be a summary of how proteins in the cell interact with the mitochondrial genome. Fair enough. It turned out, though, that Warda and Han are creationists, and their "review" was a stealth attempt to get their creationist

Lamenting that the book "downplays the extent to which American creationism is not really about gaps in the fossil record and that sort of thing" as opposed to "a moral drive against what evangelical Christians think are the great social evils in modern society," he nevertheless concluded, "All who live in America are in her debt — even those, especially those, who deplore what she does. I congratulate her on her efforts, and I thank her for her book." Of Ruse's *The Evolution–Creation Struggle* (Cambridge [MA]: Harvard University Press, 2005), Scott wrote, "Ruse persuasively — and I believe insightfully — tells the story of evolution's zig-zag path toward its gradual acceptance by scientists and a parallel zig-zag path as the meaning of the term changed in the popular imagination."

NCSE's executive director **Eugenie C Scott** reviewed William F Loomis's *Life As It Is* (Berkeley [CA]: University of California Press, 2008) for *Nature*, describing the book as providing "a tour of the brave new biology relevant to such social issues as abortion, euthanasia, the use of embryonic stem cells, cloning, overpopulation and global warming" as well as a discussion of how scientific considerations inform, and ought to inform, policy decisions. She concluded, "The idea that a realistic understanding of biology will usher in a paradise of ethical correctness is naive: the panoply of extra-scientific considerations that influence ethical decision-makings cannot be ignored or minimized. A weakness of Loomis's book is his comparative neglect of such considerations. But if his intention is less ambitious, namely that a realistic appreciation

claims into the peer-reviewed literature. This report describes what they did and how they got caught.

The paper and the "mighty creator"

Like many journals, *Proteomics* releases papers online before the official publication appears. In early February 2008, I was alerted by Andrew MacArthur, an evolutionary biologist, that there was a new paper in *Proteomics* that gave a "mighty creator" credit for designing the mitochondrion. The paper was titled "Mitochondria, the missing link between body and soul: Proteomic prospective evidence." Much of the paper reads like any review paper, with considerable technical detail and 239 references to the literature. However, the paper had four major red flags that the journal's reviewers and editors should have caught before accepting it for publication:

The title
The abstract
The creationist claim
The conclusions

The title. Scientific papers do not talk about the "soul", and although this could be just a clever metaphorical usage of that word, the title should raise suspicions that the paper contains something other than science.

The abstract. The very first paragraph of most papers is the abstract, a short summary of the main results. Warda and Han write that their review includes "novel proteomics evidence to disprove the endosymbiotic hypothesis of mitochondrial evolution that is replaced in this work by a more realistic alternative."

First of all, novel evidence does not belong in a review, so the reviewers should have been on the alert when they saw that. But more important, this claim should be quite startling to any evolutionary biologist. The endosymbiotic hypothesis proposes that the mitochondria found in many organisms today are the remnants of an ancient bacterium that was engulfed by an early, single-celled ancestor of eukaryotes about two billion years ago. This hypothesis dates back many decades (see <http://en.wikipedia.org/wiki/Endosymbiotic_theory>) and has been gaining support since the 1960s; for example, see the papers by Kurland and Andersson (2000) and Gray and others (2001). The sequencing of the mitochondrial genomes of many animals and plants has greatly strengthened the endosymbiotic hypothesis. So what do Warda and Han have to offer as an alternative? The abstract does not say.

The creationist claim. The paper reviews the literature in a rather dry fashion until page 8, in a section titled "Mitochondrial integrated function disproves endosymbiotic hypothesis of mitochondrial evolution." In this section, Warda and Han do some funny things. First, they cite a number of references that have nothing to do with the findings in this section. Then they offer up the statement that attracted the most attention from the blogosphere:

> Alternatively, instead of sinking into a swamp of endless debates about the evolution of mitochondria, it is better to come up with a unified assumption. ... More logically, the points that show proteomics overlapping between different forms of life are more likely to be interpreted as a reflection of a single common fingerprint initiated by a mighty creator than relying on a single cell that is, in a doubtful way, surprisingly originating all other kinds of life.

Aside from the fact that this sentence is so badly written as to be nearly incomprehensible, the phrase "mighty creator" sticks out like a sore thumb. Boiled down to its essence, Warda and Han are saying "God did it."

The conclusion. Does the article contain any more creationist assertions? After the "mighty creator" section, it just jumps back into review mode and continues like that almost until the end — until the very last paragraph. There, Warda and Han had one more surprise. They concluded that "many controversial questions still need to be answered, e.g., how signaling molecules … precisely translocate from or to mitochondria in a matter of milliseconds while crossing a huge ocean of soluble and insoluble barriers." Perhaps this is a legitimate question, but then they wrote: "we still need to know the secret behind this disciplined organized wisdom. We realize so far that mitochondria could be the link between the body and this preserved wisdom of the soul devoted to guaranteeing life." This is simply nonsense — the mitochondria are

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of biology ought to inform ethical decision-making, then that is incontrovertible." Her review appeared in the April 10, 2008, issue of the journal (452: 690–1); copies are available from the NCSE office.

Jason Wiles, along with Arthur Allen, James Robert Brown, Sheril R Kirshenbaum, and Lawrence Solomon, was a guest on the Canadian television show *The Agenda with Steve Paikin* on May 13, 2008, to discuss "The assault on science: Rational inquiry, the scientific method, or sheer ignorance: Is science itself to blame for the backlash against scientific inquiry?" During the show, Wiles discussed the diversity of the public's attitudes toward science and the looming environmental crisis, as well as his specialty of evolution education, rehearsing the legal history of the creationism/evolution controversy. He also commented on the controversy surrounding the rejection of **Brian Alters**'s funding proposal to study the influence of antievolutionism in Canada — the proposal was rejected in terms that suggested, on the part of the evaluators, skepticism about evolution and sympathy for "intelligent design" creationism (see the collection of articles from *Humanist Perspectives* available online via <http://www.humanistperspectives.org/collected_articles/contact_SSHRC.html/>). Full video and audio of the show is available on-line at <http://www.tvo.org/cfmx/tvoorg/theagenda/index.cfm?page_id=7&bpn=779196&ts=2008-05-13%2020:00:45.0>. Wiles runs the Evolution Education Research Centre at McGill University and recently began teaching in the Department of Biology at Syracuse University.

linked to the "wisdom of the soul"? It is gibberish, and nothing in the article supported it, but somehow it slipped past the reviewers.

The plagiarism is uncovered

Thanks to the rapid action of the blogosphere, and four blogs in particular, this paper came to the attention of many scientists before the print version appeared. I first blogged on the paper on February 7, 2008 (<http://genefinding.blogspot.com/2008/02/stealth-attempt-to-sneak-creationism.html>). Attila Cordas (<http://pimm.wordpress.com/2008/01/29/can-you-tell-a-good-article-from-a-bad-article-based-on-the-abstract-and-title>) and Lars Juhl Jensen (<http://larsjuhljensen.wordpress.com/2008/02/10/commentary-neither-buried-nor-treasure>) also blogged about it. PZ Myers mentioned it a day before I did on his widely-read Pharyngula blog (<http://scienceblogs.com/pharyngula/2008/02/a_baffling_failure_of_peer_rev.php>), and within a matter of hours a commenter named Sili asked, "has anyone yet checked to see whether this might be plagiarized?" The disjointed style was the first clue — much of the article appears technically competent, although the writing style varies, and the creationist claims are written very poorly. Within a few more hours, the first evidence of plagiarism was uncovered: an entire paragraph copied verbatim from another article.

From there, the evidence quickly snowballed. Within a few days there were dozens of examples, and it appeared that the majority of the text was simply copied wholesale from other sources. John MacDonald, a professor at the University of Delaware, compiled many of these into a document (<http://udel.edu/~mcdonald/wardahan.pdf>) showing that Warda and Han stole much of their article from six different articles plus a scientific website. The examples fill eight pages. In all cases, Warda and Han copied text word-for-word without attribution.

Plagiarism is a gross violation of scientific ethics. From the journal's point of view, it represents another problem: copyright violation. Because the text was taken without attribution and without permission, the authors were violating the copyright of the original authors. Ironically, the discovery of plagiarism by the bloggers gave *Proteomics* an easy out: because of the plagiarism, editor-in-chief Michael Dunn insisted that Warda and Han retract the paper.

The article was removed from the journal website, which now says only that the retraction is "due [to] a substantial overlap of the content of this article with previously published articles in other journals." Further adding to the irony, the article remains the fourth most highly-accessed article for the journal in the past year, no doubt because of the controversy.

The authors

Mohamad Warda and Jin Han submitted the article from Inje University in Korea, a relatively new university that as yet has little international stature for scientific research. Han has published multiple scientific articles in respectable journals; Warda was apparently working as Han's student or postdoc, and now lists his address as Cairo University in Egypt. Warda and Han had published together previously, including at least one paper in the journal *Proteomics*. The authors were contacted directly by James Randerson of *The Guardian*, who reported the incident on his blog (<http://www.guardian.co.uk/science/blog/2008/feb/13/thankstocjv5040forputting>). Only Warda responded, and his response makes it clear that (a) he is a creationist, and (b) he cannot write English well. In an e-mail quoted by Randerson, Warda wrote:

> The problem is that we described in very clear and definite way the disciplined nature that takes part inside our cells. We supported our meaning with define proteomics evidences that cry in front of scientists that the mitochondria is not evolved from other prokaryotes. They want to destroy us because we say the truth; only the truth.

And in response to a question about plagiarism, he wrote "I not burrow [*sic*] any sentences from others," despite the obvious evidence that he borrowed voluminously.

PZ Myers was able to get a response (see <http://scienceblogs.com/pharyngula/2008/02/one_author_responds.php>) from Jin Han, who explained that:

> I found the serious mistakes in the paper during the process of edits, which I confused between the early drafts and the latest versions: I did not check the use of the sentences in the references (more than 200 references). Finally I made serious error to make the final version. In order to rectify an error, I requested to retract the paper to the editorial office of Proteomics.

Myers pointed out, correctly, that this response does not really explain anything: not the creationist claims, nor the bizarre title, and certainly not the extensive plagiarism.

Clearly, based on their efforts to sneak false creationist claims past reviewers, Warda and Han are dishonest scientists whose work should be viewed with great skepticism in the future. Their extensive plagiarism is a second offense, and that alone would disqualify them from work in most legitimate scientific laboratories. In the United States, plagiarism is one of the few activities that can (and has, in some cases) lead to the firing of a tenured professor. Warda and Han should at a minimum be censured by their universities, but thus far there is no evidence that any action was taken.

The editor's response

I contacted the editor-in-chief of *Proteomics*, Michael Dunn, to find out more about what happened. Many scientists have speculated publicly that the peer review process went seriously wrong for this paper. Dunn assured me that the paper was reviewed by two "well-respected and highly competent reviewers" both of whom recommended minor revisions. For some reason, though, "neither picked up the references to creationism, nor did they recognize that sections of the text were plagiarized," according to Dunn. It is not too surprising that the reviewers missed the plagiarism, but the title and abstract should have raised huge red flags warning the reviewers that this

continued on page 19

A North American Field Guide: Identifying *Anti-evolutionistii stealthus*

Cheryl Shepherd-Adams

Anti-evolutionists who campaign for office have learned to camouflage their distaste for Darwin during the last few election cycles. Although their plumage has evolved and their calls can vary, anti-evolutionist scat shows that their basic physiological processes remain unchanged. This scat tends to blend easily into the background, often becoming odiferous only after the candidate has been elected to office.

Briefly, here are some identifying characteristics of *Anti-evolutionistii stealthus*:

1. Distinctive vocalizations: These include calls ...

a. For local control

These candidates will often not specify exactly what items need to be placed under local control, nor do they demonstrate that local boards don't already have this control. At the same time, they call to enforce "accountability" measures, such as standardized exams prepared at the state or national (*not* local) level.

b. To augment or modify the state curriculum allowing for critical analysis or development of critical thinking skills

Many of these folks state that they only want to teach more about evolution, but they haven't shown why they're limiting so-called "critical analysis" to science classes and to evolution in particular. Lately, global warming, stem cell research, and human cloning have joined evolution as the only topics worthy of critical analysis within the entire high school curriculum.

c. For Academic Freedom/Academic Bill of Rights for K–12 students/teachers

This most recent ploy from the Discovery Institute will enable teachers to "augment" science instruction by teaching "intelligent design" and using creationist teaching materials. The DI has provided a template for legislation, advice from their staff and propaganda in the form of giving legislators free passes to *Expelled.* DI spokesman Casey Luskin opined: "The Academic Freedom Act empowers teachers to teach more about evolution, not less" (see item 1.b). The bills explicitly deny that religion is to be taught, though many sponsors and supporters of these bills are quite clear about their religious motivations.

d. To treat so-called "origins science" differently than other science topics

Anti-evolutionists adhere to an artificial separation of "operations science" from "origins science". They believe that if a human didn't witness an event, it didn't happen. "Were you theeeere?" is a favorite tagline of creationist leader Ken Ham (and not incidentally what Yahweh asked poor Job [Job 38:4]). If this were true, of course, our courts would never convict many criminals. Furthermore, the "intelligent design" crowd argues *for* the ability of science to analyze past events with no eyewitnesses, using forensic science examples to make their case.

2. Social behavior: They will not give an opinion as to the age of the earth

Sometimes accompanied by, "... but it doesn't matter because I don't want my beliefs taught in the science classroom." Most of the folks who gave testimonials in favor of teaching the "controversy" or "criticisms of evolution" at the May 2005 Topeka "intelligent design" hearings either stated their belief in a 10 000–year-old earth or refused to give an answer.

3. Camouflage: They try to hide or downplay their associations with anti-evolution groups

During the 1999 Kansas creationism debacle, state board of education members Steve Abrams, Scott Hill, and Harold Voth presented a set of standards they claimed to have authored. However, Jack Krebs of Kansas Citizens for Science provided solid evidence that the document was primarily written by Tom Willis, head of the Creation Science Association of Mid-America.

In July 2006 (former) Kansas State Board of Education member Connie Morris personally delivered thousands of expensive, glossy inserts to newspaper offices in her district a couple of weeks before her defeat in the primary. The inserts were blatant advertisements for the "intelligent design"-friendly 2005 Kansas science standards. Publishers of the Hays and Liberal newspapers confirmed that the ads were paid for by the Intelligent Design Network of Kansas, Inc., but the inserts didn't refer to that fact in any way.

4. Avoidance behavior: Some will avoid public forums or press interviews

Iris Van Meter used this strategy effectively during the 2002 Kansas state school board elections. Van Meter turned down invitations to candidate forums, wouldn't give interviews, and pretty much stayed in hiding during the entire campaign. Two weeks before the election, a glossy, nicely-produced brochure went out to her district maligning her opponent, pro-science Val DeFever, as a supporter of atheism.

The *Lawrence Journal-World* (2006 Jul 6) noted similar antics in the 2006 stealth attempt by Jesse Hall to defeat pro-science incumbent Janet Waugh: "'Hall hasn't appeared at any candidate forums and is backed by individuals associated with the religious right,' Waugh said." However, an e-mail sent out across the state just before the 2006 primary — even forwarded by some ministers to their congregations — left little doubt that Hall was the anti-evolutionist's chosen candidate.

Similarly, Barney Maddox is a creationist dentist who ran for the Texas state school board. Although he was comfortable calling Darwin's work a bunch of "pre-Civil War fairy tales" for the Institute for Creation Research, he also declined all media interviews as a candidate.

Of course, no one of these indicators infallibly labels a candidate as a member of the *Anti-evolutionistii stealthus* species. But keep your eyes open, and ask your candidate these questions:

> Do you support the current state science standards?
> Would you support an academic freedom bill such as the one recently enacted in Louisiana?
> How old is the earth, and what leads you to that conclusion?
> How should "local control" influence science curriculum issues?

... and don't let them get away with lulling the voters into a false sense of security.

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[*Adapted with permission from a July 2, 2008, blog posting. For the original, visit <http://www.anevolvingcreation.net/standup/2008/07/north-american-field-guide-identifying.html>.*]

Cheryl Shepherd-Adams has taught students in high school science classes across the Midwest for more than 20 years. She's a 7th-generation Kansan who gets feisty when her state board of education pretends to know more about science than the scientists themselves. She is a member of the board of directors of Kansas Citizens for Science, and has received several awards for excellence in science teaching.

Mass extinction is forever

At least five mass extinctions — at the end of the Ordovician, late in the Devonian, at the end of the Permian (sometimes called the "Great Dying"), at the end of the Triassic, and, most famously, at the end of the Cretaceous (ending the reign of the dinosaurs) — have shaped the evolution of life on earth. Over the last thirty years or so, mass extinctions have assumed a new importance in paleontology, following the publication in 1980 of the hypothesis that a meteorite or comet was responsible for the end-Cretaceous extinction, and the subsequent identification of the Chicxulub Crater on the Yucatan coast of Mexico as a likely impact site. With such literally world-shaking discoveries, it is anything but surprising that there are a plethora of excellent books on mass extinctions now available. The following books are now available through the NCSE website: <http://www.ncseweb.org/store.asp> — look in the "In the latest *RNCSE*" section. And remember, every purchase benefits NCSE!

Illustration by Dave Smith, used with permission of the University of California Museum of Paleontology.

For the Masses

Evolutionary Catastrophes: The Science of Mass Extinction
by Vincent Courtillot
Originally published in French in 1995, *Evolutionary Catastrophes* seeks to explain the competing theories on the causes of mass extinctions to a general audience, including, *en passant*, a discussion of the personalities involved and of the nature of science. Presenting the evidence for and against the rival accounts — asteroid impacts and volcanic eruptions — Courtillot argues that the driving force of the mass extinctions of the last 300 million years was volcanic activity. Reviewing the book for *Nature*, Douglas Palmer wrote, "Courtillot gives a well-argued taste of the debate for the general reader and has been very well served by his translator, Joe McClinton."

Catastrophes and Lesser Calamities: The Causes of Mass Extinctions
by Tony Hallam
In *Catastrophes and Lesser Calamities*, the renowned geologist Tony Hallam reviews the cataclysmic events that have affected the career of life over the past half-billion years. Not concerned to promote a single hypothesis, he reviews a range of possible causes for mass extinctions, both individually and acting in concert. David J Bottjer urged, "If you have been aware of the importance of mass extinctions in the evolution of life but need to know more about what caused them, then this is the book for you." Hallam is also the coauthor of the definitive treatise *Mass Extinctions and Their Aftermath*.

Rivers in Time: The Search for Clues to Earth's Mass Extinctions
by Peter D Ward
From the publisher: "The book presents the gripping tale of the author's investigations into the history of life and death on Earth through a series of expeditions that have brought him ever closer to the truth about mass extinctions, past and future. First describing the three previous mass extinctions — those marking the transition from the Permian to the Triassic periods 245 million years ago, the Triassic to the Jurassic 200 million years ago, and the Cretaceous to the Tertiary 65 million years ago — Ward assesses the present devastation in which countless species are coming to the end of their evolution at the hand of that wandering, potentially destructive force called *Homo sapiens*."

For the Student

The Mass-Extinction Debates: How Science Works in a Crisis
edited by William Glen
When the impact hypothesis of the end-Cretaceous extinction was advanced in 1980, it sparked a massive debate among scientists. The articles included in *The Mass-Extinction Debates* attempt, in the words of its editor, to "take up the philosophy of those ideas, the logic and mode of their argumentation, and the behavior of the scientists involved." Contributors include William Glen, Elisabeth S Clemens, Digby J McLaren, J John Sepkoski Jr, David M Raup, SVM Clube, Herbert R Shaw, Leigh M Van Valen, Kenneth J Hsü, and John C Briggs; interviews with William A Clemens and Stephen Jay Gould are also included.

Mass Extinctions and Their Aftermath
by Anthony Hallam and Paul B Wignall
Mass Extinctions and Their Aftermath, published in 1997, was intended as the first systematic review of all the mass extinctions that have occurred in the history of life. "Having been largely ignored throughout most of the history of palaeontological and geological research," the authors

<http://www.ncseweb.org/store.asp>

write, "the subject of mass extinction has emerged within the last couple of decades as one of the most lively and contentious issues in the whole of science." The reviewer for the *Times Higher Education Supplement* described the book as "the only comprehensive, 'single-author' treatment of the major features of the entire palaeontological extinction record."

Extinctions in the History of Life
edited by Paul D Taylor
Extinctions in the History of Life is a collection of concise and clear essays intended to introduce students of biology and geology to the central issues of extinction. Contributors include Paul D Taylor on extinction and the fossil record, J William Schopf on extinctions in life's earliest history, Scott L Wing on mass extinctions in plant evolution, David J Bottjer on the beginning of the Mesozoic, Paul B Wignall on causes of mass extinctions, and David Jablonski on the evolutionary role of mass extinctions. The reviewer for the *Journal of Paleolimnology* praised it as "a valuable summary and a benchmark for future reading."

The Great Dying

When Life Nearly Died: The Greatest Mass Extinction of All Time
by Michael Benton
About 250 million years ago, life underwent its greatest extinction event, with up to 96% of marine species and 70% of terrestrial vertebrate species becoming extinct. In *When Life Nearly Died*, Michael Benton presents the latest scientific research on the end-Permian extinction with accuracy and verve. Matt Ridley writes, "Unlike many palaeontologists, who are content to describe individual fossils, Benton also likes to think about big questions. He knows how to communicate with a general audience. … *When Life Nearly Died* is now the book of choice for non-specialist readers who want to find out about the biggest catastrophe in the history of life."

Extinction: How Life on Earth Nearly Ended 250 Million Years Ago
by Douglas H Erwin
Extinction, the publisher writes, "is a palaeontological mystery story. Here, the world's foremost authority on the subject provides a fascinating overview of the evidence for and against a whole host of hypothesis concerning this cataclysmic event that unfolded at the end of the Permian." The reviewer for *The Quarterly Review of Biology* comments, "Although this book may frustrate readers expecting to learn how life nearly ended 250 million years ago, it will reward them with a fascinating case study in scientific inference, a case that remains very much open." Erwin is Senior Scientist and Curator in the Department of Paleobiology at the Smithsonian's National Museum of Natural History.

Gorgon: Paleontology, Obsession, and the Greatest Catastrophe in Earth's History
by Peter D Ward
In *Gorgon* — its title a nod toward the gorgonopsids, cousins of the cynodonts from which mammals are descended, and casualties of the end-Permian extinction — Peter D Ward combines paleontology with travelogue and memoir, exploring the history of life as he recounts his fieldwork in the back country of South Africa. Pat Shipman described *Gorgon* as "a compelling and thoroughly readable account of science and scientists as they travel through space, time, ideas, and cultures … A terrific book." A prolific author whose latest book is *Under a Green Sky*, Ward is professor of geological sciences at the University of Washington in Seattle.

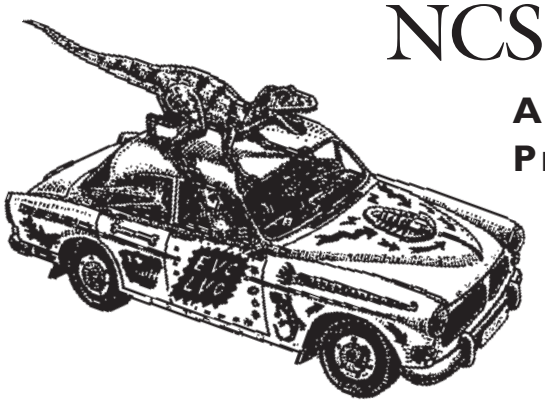
The Extinction of the Dinosaurs

T rex *and the Crater of Doom*
by Walter Alvarez
A popular exposition of the hypothesis that a meteor or comet impact caused the extinction of the dinosaurs, from one of the scientists who devised it — a not-to-be-missed classic. The reviewer for *Scientific American* praised it as "Engaging and witty. Read Alvarez for an excellent account of how scientists pose questions and seek to solve them," and Timothy Ferris described it as "a clear and efficient exposition that conveys plenty of cogent detail while keeping an eye on the subtle interplay of thought, action and personality that makes scientific research such arresting human behavior."

The End of the Dinosaurs: Chicxulub Crater and Mass Extinctions
by Charles Frankel
From the publisher: "*The End of the Dinosaurs* gives a detailed account of the great massive extinction that rocked the Earth 65 million years ago, and focuses on the discovery of the culprit: the Chicxulub impact crater in Mexico. It recounts the birth of the cosmic hypothesis, the controversy that preceded its acceptance, the search for the crater, its discovery and ongoing exploration, and the effect of the giant impact on biosphere. …The account of the impact and its aftermath is suitable for general readers."

Night Comes to the Cretaceous
by James Lawrence Powell
Engagingly telling the story of how the impact hypothesis revolutionized how scientists think about the end-Cretaceous extinction, *Night Comes to the Cretaceous* was praised by David Fastovsky as "clearly the best" of "the welter of whodunits explaining the extinctions (including the dinosaurs) at the Cretaceous/Tertiary (K/T) boundary 65 million years ago ... The prose is spare, yet lucid, and the book is beautifully written." Former director and president of the Los Angeles County Museum of Natural History, Powell is also the author of *Grand Canyon: Solving Earth's Grandest Puzzle* and *The Mysteries of Terra Firma: The Age and Evolution of the Earth*.

NCSE on the Road



A Calendar of Special Events, Presentations, and Lectures

Date September 11, 2008
City Oxford OH
Presenter Eugenie C Scott
Title Science and Religion as Ways of Knowing
Event Public lecture
Time 4:30 PM
Location Hall Auditorium, Miami University of Ohio
Contact Mary Jane Berman, Falkeda@muohio.edu

Date September 16, 2008
City Boone NC
Presenter Eugenie C Scott
Title Why Darwin Matters
Event Public lecture in Darwin series
Time 7:00 PM
Location Appalachian State University
Contact Howie Neufeld, neufeldhs@appstate.edu

Date October 16, 2008
City Memphis TN
Presenter Eugenie C Scott, Steve Case, Vic Hutchinson
Title Avoiding *Kitzmiller v Dover*: Keeping Your District Out of Court
Event Panel discussion at National Association of Biology Teachers Annual Convention
Time 2:30 PM
Location Cook Convention Center
Contact Eugenie C Scott, scott@ncseweb.org

Date October 16, 2008
City Greenville NC
Presenter Eugenie C Scott
Title Darwin's Legacy in Science
Event Voyages of Discovery lecture series
Time 7:00 PM
Location East Carolina State University
Contact John A Tucker, Tuckerjo@ecu.edu

Check the NCSE web site for updates and details — <http://www.ncseweb.org/meeting.asp>.

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continued from page 14

article had questionable science. I have to conclude that the reviewers were very sloppy, incompetent, or both; at the very least they were inattentive in this case, despite the editor's claims to the contrary. And Dunn himself is not without responsibility in this case: he must have seen the reference to "the soul" in the article's title, and he should have been more pro-active. His failure to make any public statement about the creationist claims in the article also raises questions about the leadership at the journal.

Conclusion

This entire episode points out a weakness in scientific peer review that creationists and other pseudoscience proponents may try to exploit again. We only caught this attempted fraud thanks to the diligence of bloggers: the journal itself had already missed it. What is perhaps more troubling is the fact that the journal relied solely on the plagiarism to force the retraction: if not for that, the article might have been published despite its unsubstantiated creationist claims. I asked Dunn specifically about this issue, but he declined to comment. The Warda and Han paper demonstrates a new strategy that proponents of creationism might attempt again, and perhaps next time they will not be so foolish as to plagiarize their text. We can only hope that the publicity surrounding this incident will alert both reviewers and editors of scientific journals to be on the lookout for "stealth" creationist claims in the future.

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Good, Bad, and Lots of Indifferent: The State of State K–12 Science Education Standards

Lawrence S Lerner

Curriculum standards have many important applications. They are used as guidelines by curriculum developers, by textbook publishers, and by examination writers, among other things. I was first asked by the Thomas B Fordham Foundation to evaluate the science education standards of every state that had them in 1997. I surveyed 36 documents — a pretty dull but (I hope) useful task (Lerner 1998).

When I did a second review in 2000 (published as part of Finn and Petrilli 2000), the number of documents had increased to 46. As in 1997, far too many were mediocre to bad. There were several general reasons for this poor quality. More often than not, a poor standards document stumbled on more than one count. But one common failing of poor standards was a poor treatment of biological evolution. Such a treatment could be badly written; or it could be confused; or error-filled, or timid, or hypocritical. It could suffer from some combination of these, or biological evolution could simply be absent. Quite often, the evolution of the earth and the universe suffered as well. With this in mind, the Fordham Foundation commissioned me to do a study focused on the treatment of evolution in K–12 science education standards, and this was published later in 2000 (Lerner 2000).

Lawrence S Lerner is Professor Emeritus of Physics and Astronomy at California State University, Long Beach, and a nationally recognized authority on state science education standards.

Since then, there has been a surge of public interest in accountability and evaluation in public education. And it will not be long before the No Child Left Behind Act mandates statewide testing of all students.

In response to all this activity, the Fordham Foundation commissioned a new review in 2005. By this time, the District of Columbia and every state but Iowa had published standards, and the tendency was toward longer documents. The task had become so large that it was undertaken by a six-member team of scientists, science teachers, and a philosopher of science. Each team member surveyed all the standards but concentrated on his or her specialty. Our report was published in December. Although the evaluations were based on the overall quality of the standards documents, experience dictated that we devote special attention to the treatment of evolution.

As I had done in the earlier reports, we used a set of criteria such as clarity, organization, sound content, rigor, and steady development of subject matter consistent with the maturation of the student. We assigned numerical scores for each criterion and used the total scores to assign letter grades A through F (Figure 1). There is a tendency for good standards to concentrate in the Southwest and Northeast. But that oversimplifies the fact that there are good and bad standards to be found in all regions. For example, South Carolina's and Virginia's standards were excellent, while New Hampshire's, Wisconsin's, were Oregon's were very poor.

Figure 2 shows the distribution of grades. The good news is that 19 states, where more than half of American students go to school, have excellent or good science education standards (A or B). Not so happily, 16 states scored mediocre to bad (C or D) and 15 states flunked (F). Kansas is a notorious special case to which I will turn shortly.

Curiously, there was a lot of churning between 2000 and 2005. Some states improved and some declined. Figure 3 shows the changes. Standards quality did not change in the states shown in white. Quality improved in the gray states, and declined in the black ones. Overall there was little change, but of the 45 states (plus the District of Columbia) that were evaluated in 2000, 12 improved, 19 declined, and 15 did not change.

I do not think we can take comfort in the overall steady state, given the broad attention paid to standards in recent years. Rather, it is bad news. We might expect that the availability of good state standards written in a wide variety of styles would make it easy for those states with poor standards to make improvements. Here is a situation in which the most punctilious critic will condone cribbing!

Evolution in the standards

Turning specifically to the treatment of evolution, Figure 4 shows the results of our 2005 study. In this map, lighter colors represent better treatment of evolution. We lumped the As and Bs together as "sound," shown in the lightest gray (for example, California). The next darker shade of gray (for example, Arizona) stands for "passing" or C. The next darker shade (for example, Texas) represents "marginal" or D, and the blacks represent "failed" or F. Again, Kansas was a special case, rating a shameful F-minus.

There is a strong — but far from complete — correlation between good quality overall and good quality in treatment of evolution. There are a few exceptions. Maine's standards, for instance, rated B in overall quality but F in its treatment of evolution. For North Carolina, we found B overall but D for evolution. In most cases, however, the difference was at most one letter grade.

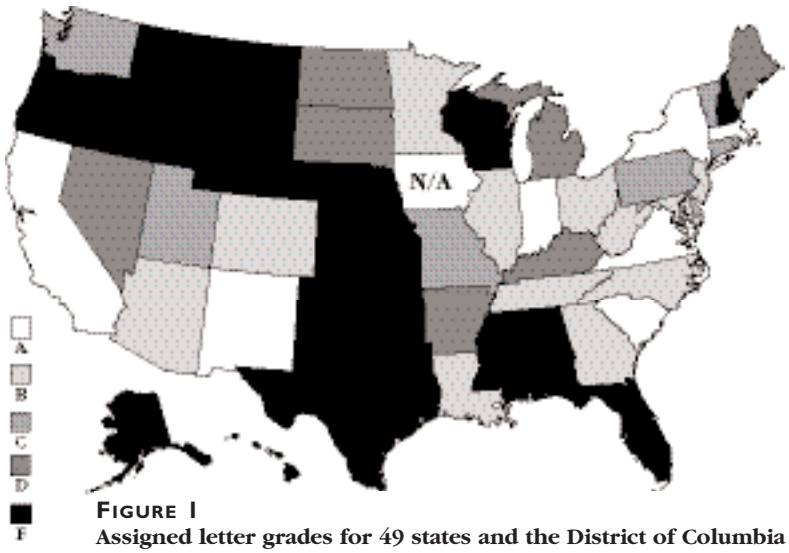

Figure 1
Assigned letter grades for 49 states and the District of Columbia

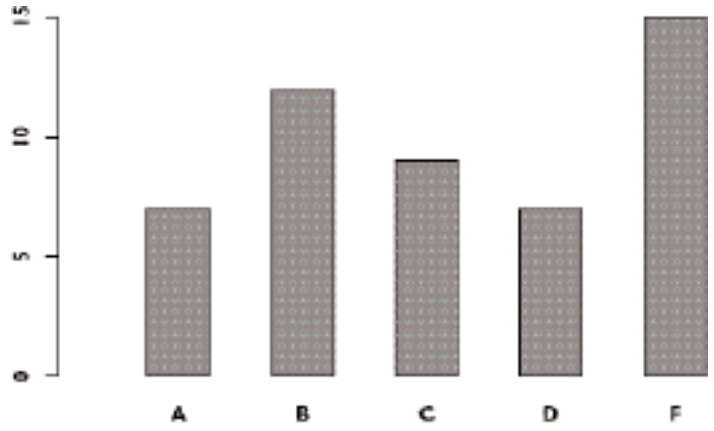

Figure 2
Distribution of grades

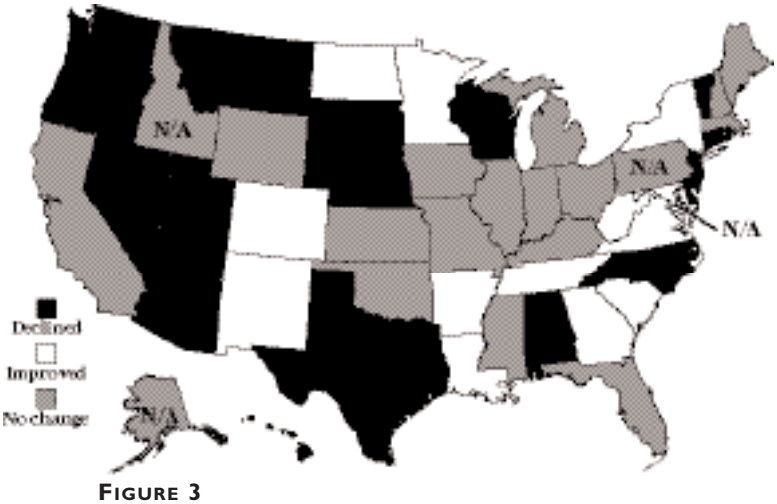

Figure 3
Trends in grades between 2000 and 2005 for 49 states and the District of Columbia

Figure 5 shows the overall results for treatment of evolution in 2000 and 2005, summed over all the states. Overall, we see pretty much the same thing as for the standards as a whole. The number of states earning A or B declined from 24 to 20; C grades held steady at 7, D grades rose from 6 to 10, and F grades remained at 12. Kansas, having fluctuated wildly in the interim between reports, retained the dubious distinction of "not even failed" — F-minus.

It is interesting to note that, although there is a disproportionate concentration of ill-treatment of evolution in the Bible Belt, geography is neither a necessary nor a sufficient condition for such treatment. Georgia and South Carolina, for instance, treated evolution very well while New Hampshire and Wisconsin did not.

Just as in the general standards for science education, poor treatment of evolution in the standards can have several causes. In some cases, the issue is simply one of competence: the writers either did not or could not present evolution (or the life sciences in general) in a cogent, accurate manner. But more often, we see design at work (in more than one sense of the word!). The deliberate effort to ignore, minimize, or distort the central organizing principle of the life sciences has a long and varied history.

The standards exhibit a variety of strategies for finessing evolution: Mississippi, for example, follows a "what they don't know won't hurt them" or "ignorance is bliss" strategy. The Mississippi standards simply avoid the use of the dreaded "e-word" and present only bits and pieces of the underlying evidence. (One may draw a parallel between this approach and the ubiquitous "abstinence-only" sex education programs adopted by Mississippi, among many other states.)

Alabama, more aggressively, begins its science education standards document with the notorious "Alabama disclaimer," which singles out evolution as somehow less reliable than any other science:

> The theory of evolution by natural selection, a theory included in this document, states that natural selection provides the basis for the modern scientific explanation for the diversity of living things. Since natural selection has been observed to play a role in influencing small changes in a population, it is assumed, based on the study of artifacts, that it produces large changes, even though this has not been directly observed. Because of its importance and implications, students should understand the nature of evolutionary theories. They should learn to make distinctions among the multiple meanings of evolution, to distinguish between observations and assumptions used to draw conclusions, and to wrestle with the unanswered questions and unresolved problems still faced by evolutionary theory.

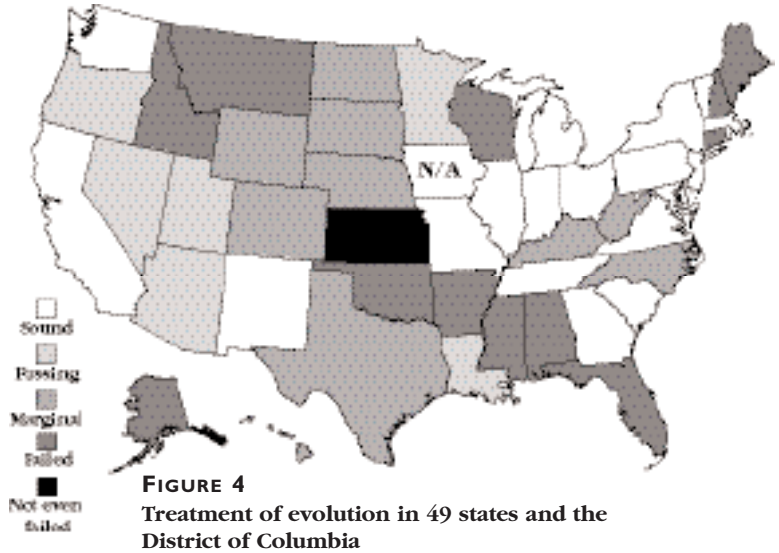

FIGURE 4
Treatment of evolution in 49 states and the District of Columbia

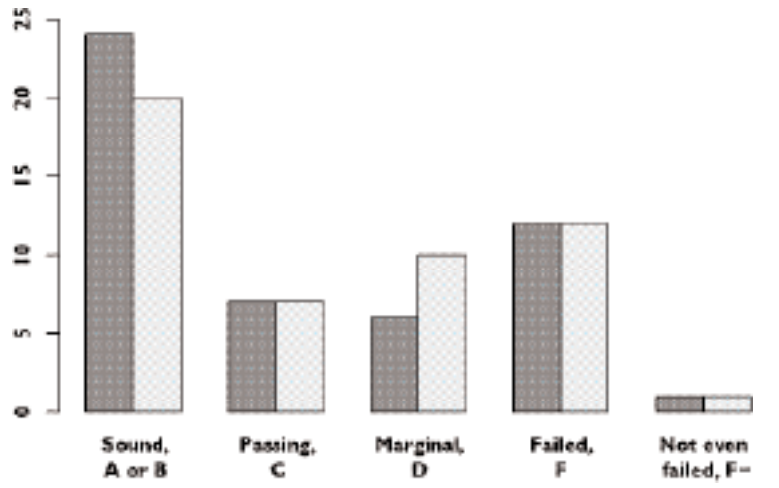

FIGURE 5
Treatment of evolution, 2000 and 2005

The Fordham report cuts to the heart of this disclaimer:

> Although this is focused on evolution, and it paraphrases the "critiques" of evolutionary biology currently advanced by "intelligent design" creationism, it quite effectively derogates every branch of science. (There are, for example, many basic, "unanswered questions" about the fundamental forces of nature. Do we, for this reason, warn students to

> be suspicious of, or to "wrestle with," the "unresolved problems" of physics?) The Alabama preface sows confusion and offers a distorted view of what science is and how it is pursued. The quoted paragraph is preceded by mention of Copernicus, Newton, and Einstein, all physicists or astronomers; it then launches into an attack by misdirection on (evolutionary) biology. (Gross and others 2005: 27)

Other school systems have mimicked Alabama, using either the language or the general approach in this disclaimer (for example, Cobb County, Georgia).

Kansas stands alone

With a history somewhere between melodramatic tragedy and low comedy, Kansas is a unique case. In 1998, when a creationist majority took control of the autonomous Kansas Board of Education, they took a workable set of science education standards and edited out all references to evolution. They went still further and deleted any subject connected to the age of the earth or the universe. This excision included such basic topics as radioactive decay (because it can be used to date objects much too old to fit a simple-minded view of the Book of Genesis) and the Big Bang (which took place long before Noah's Flood.) From this trashing of science comes the F-minus the Kansas science education standards earned in 2000.

The ensuing furor led to the voting out of creationist board members in 2000 and the re-establishment of a science-friendly majority. The new board reinstated the original standards, with slight modifications. This happened soon enough that the creationist efforts had no impact on science teaching.

In the following two elections, however, a creationist majority was reestablished. The new board took a somewhat more subtle tack than their predecessors; they adopted an "intelligent design" creationist approach, but did not stop there. They formally redefined all of science to include inquiry into the supernatural. This direct attack on science as a whole is even more blatant than the indirect attack that inheres in a mistreatment of biological evolution. These grotesque distortions stand today and have earned Kansas a brand-new F-minus. Many Kansans, including the governor, the university communities, and the great majority of the science teachers, were dismayed. In the 2006 state school board elections, those in favor of keeping evolution in the standards became a 6–4 majority of the board (see <http://www.ncseweb.org/resources/news/2006/KS/395_the_pendulum_swings_in_kansas_8_2_2006.asp>).

Conclusions

In conclusion, let me put science education standards in a broader context. Good standards are only one step toward quality education. It is a long way, after all, from the Department of Education in a state capital to the small rural schoolhouse in the mountains or the plains. And standards can be and have been used as a basis for writing undemanding exams, at least in language arts and mathematics. Many other matters need to be considered as well. Among these are finding and using quality textbooks, making sure teachers have adequate preparation in their subjects, and finding enough money to attract quality personnel to every aspect of public education. But if the standards are poor, it is difficult to assure quality education in all the schools of a state (an exception may be in schools in affluent neighborhoods, where well-educated parents raise well-prepared children).

With respect to the teaching of evolution in particular, poor, absent, or counterfeit treatments in science education standards are practically a guarantee that evolution will vanish from state exams, textbooks, and from many classrooms as well. There are plenty of creationists, "intelligent-design" or otherwise, who are eager to make this happen. In our day, as in the days of Scopes — or Galileo, for that matter — science needs its defenders.

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[For copies of any of the above publications, visit the Fordham Foundation's website, <http://www.edexcellence.net>, or call the Fordham Foundation at 888-823-7474.]

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[*Adapted from a presentation given as part of "Dispatches from the evolution wars," a colloquium at the annual meeting of the National Association for Research in Science Teaching in 2006.*]

BookReviews

Teaching about Scientific Origins: Taking Account of Creationism

edited by Leslie S Jones and Michael Reiss
New York: Peter Lang Publishing, 2007.
217 pages

Reviewed by Kimberly Bilica

Teaching about Scientific Origins: Taking Account of Creationism is a patchwork of thoughtful essays on evolution and creationism from some prominent voices in science education and philosophy. According to the editors of the volume, the aim of the book is to "address the challenges of teaching about scientific origins in the context of religious concerns" (p ix). This text is an excellent contribution to the *Counterpoints: Studies in the Postmodern Theory of Education* series because of its polyvocal representation of the evolution/creationism controversy.

Polyvocality is a postmodern textual representation that showcases multiple, often non-convergent, viewpoints (Guba and Lincoln 2005). The aim of a polyvocal text is to highlight the complexity of an issue by problematizing rather than resolving. Traditional texts offer solutions; polyvocal texts ask questions. The editors of *Teaching about Scientific Origins* prepare the reader for a polyvocal style by stating: "It needs to be stressed that there is not a single account of how the authors in this book see the relationship between science and religion nor of how we envisage that that relationship should be taught, if it is to be taught at all" (p 8).

Even without the projection of a single metanarrative, twelve of the thirteen chapters are written from the scientific consensus position, as supported by *National Science Education Standards* (National Research Council 1996) and by science organizations (AAAS 1990, 1993), that evolution is the cornerstone of the biological sciences and that teaching biology without evolution is a mismanagement of the science curriculum.

The first third of the book looks at the history, sociology, and politics of teaching evolution as viewed from outside of the classroom. The second third of the book shifts argumentation. Here the authors either present an argument for a particular position, such as teaching creationism or evolution, or they dissect the arguments that others have employed. Within this second portion of the book is a chapter presenting a creationist perspective on teaching evolution, notably the only chapter not reflecting the views of national and international science organizations. Finally, the last third views the professional and personal nature of the evolution/creationism controversy through the lens of teacher and student. These chapters describe the impact of the controversy in classrooms and recommend ways of dealing with it, such as insisting on respectful interpersonal relationships, particularly with students who may have creationist beliefs.

Beginning the first third of the book, Randy Moore and Michael Ruse examine the historic politics that led to the modern controversy. Moore describes the social discord between evolution and creationism as it was expressed in the late 19th century and in early 20th-century politics. In the second half of the chapter, he answers some questions that teachers have about the legal boundaries to teaching evolution (or creationism) in public schools.

Ruse writes specifically about "Christianity" and "Darwinism," emphasizing the contrasting epistemologies that define the modern evolution/creationism controversy. He challenges contemporary polarized debates about science and religion, referring to such conflicts as remnants of the 19th century. Using Richard Dawkins, a biologist and vocal atheist, as a focus, Ruse describes how arguments from the extreme ends of the belief spectrum — such as arguments between evolutionary dogmatists and fundamentalist creationists — anchor science and religion to a common, confrontational center point.

Chapters 4, 5, 6, and 7 shift the reader's attention toward the argumentation tactics used in the broad conflict between science and religion as well as strategies used by proponents within specific domains, such as creationists. David Mercer conducts a highly philosophical examination of the conflict between science and religion, criticizing the tendency to oversimplify the nature of both science and religion. Media sources and public science particularly are chastised for giving such oversimplified representations. Mercer recommends that we talk about science and religion in a more humanistic way that is representative of the manner in which the controversy is lived and that we think about the science curriculum through an inclusive social

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context that he calls "science studies" (p 53).

Robert Pennock traces the emergence of "intelligent design" (ID) creationism in schools and specifically focuses upon the ID proponents' argument to "teach the controversy" of biological evolution in science classrooms, dissecting, by way of example, a video developed by ID advocates intended to show teachers how to legally "teach the controversy about Darwin." Pennock describes the ID argument as "smoke and mirrors," contending that the ID argument intentionally and strategically neglects science in order to promote its non-scientific goals. In the concluding remarks, his perspective on the debate is clear: teach real science.

Michael Poole unpacks and redistributes what he calls "areas of difficulty" between science and creationism, where meanings are in conflict when considered from creationist versus scientific perspectives. They include understandings about the age of the earth, chance, atheism, naturalism, explanation, reification, and evolutionism. Poole develops the essay by first making a statement of conflict and then examining it from scientific and religious perspectives. For example, he examines ideas that connect science and atheism by discussing the statement "Science is often presented as an atheistic activity that makes no place for God" (p 83). I particularly appreciate how Poole resolves the conflict about science and atheism with a description of how the omission of religion from science is not a denial of religion: "It need be no more surprising to the religious scientist not to find God mentioned in science texts than to find that Henry Ford is not mentioned in the instruction booklet of that make of car" (p 84).

Shaikh Abdul Mabud argues that evolution, as it is taught in schools and represented in selected British textbooks, is treated as "fact" and does not provide science students with a balanced perspective, offering arguments for and against evolution. A creationist from the Islamic faith, he uses many of the arguments found in other creationist literature, such as challenges to homology, complex biochemical events, and natural selection. Mabud is the only strong anti-evolution voice in the text, but the inclusion of this chapter shows how polyvocal texts break from authoritarian truth notions.

The next five chapters examine the evolution/creationism controversy from the perspective of teacher and/or student. Several authors tell personal stories about their experiences with the evolution/creationism conflict in the classroom. Wolff-Michael Roth presents a discourse analysis of conversations with a high school physics student who deliberated on his personal conceptions of science and religion. Roth's analysis untangles some of the complex and multifaceted relationships between self, science, and religion, providing insight into how science and religion interact in lived experience. The chapter concludes by encouraging teachers to consider the complexity of human understanding of science and religion and recommending that teachers find ways to discuss what Roth calls the "different life domains" (science and religion) with students in the hope that such conversations will translate into students' having a personal understanding of how different domains interact in their own lives (p 122).

David L Haury emphasizes the role of curriculum in the evolution/creationism controversy. Observing that human evolution has been overlooked in science standards documents and biology curricula, Haury blames the human evolution gap in American biology curricula on the prevalence of creationist ideology and goes on to describe several concepts that, combined, serve as a rationale for teaching human evolution. These concept — which include the nature of science, evolutionary theory, human family, ecological identity, worldview, and spirit of discovery — mediate dichotomous arguments such as science versus religion (or evolution versus creationism). Like many of the other authors in this portion of *Teaching about Scientific Origins*, Haury's approach is scientifically grounded while remaining considerate of students' beliefs.

Lee Meadows explains that conflict management, rather than conflict resolution, is an appropriate instructional aim in biology classrooms. Meadows explains that conflict management shows respect for religious students who are likely to experience conflict with evolution. After a discussion of clashing religious and scientific worldviews, Meadows offers five recommendations for teachers who wish to adapt their teaching aims to incorporate conflict management: 1. Respect your students' religious beliefs, 2. Present evolution as an undeniable scientific understanding; 3. Model the difficult process of facing biases and conflicts of belief; 4. Consider teaching evolution as a case study in the nature of science; and 5. Don't push religious students who may not have the emotional maturity to deal with the conflicts between their religious beliefs and their science learning.

David F Jackson recounts his personal experiences as a teacher educator who moved from the liberal northeastern US to more conservative Georgia where many, if not most, of his students are practicing Christians. Jackson discusses the overlap and conflict that science teachers feel within "the personal and the professional" aspects of themselves. His approach to mediate controversy within the classroom is to be sympathetic to students' beliefs but maintain scientific integrity. Additionally, he encourages science teachers who are Christian to give voice to their own life experiences, exposing and exploring the personal and professional selves.

Co-editor Leslie S Jones presents a personal reflection on the impact of the evolution/creationism controversy in her college biology courses. Jones shares how she came to a deeper understanding of the conflict by learning about students whose creationist backgrounds have taught them to distrust science. By having personal conversations with her students, she was able to gain trust and open the door to learning evolution. Jones's essay shows how important it is for teachers to make a distinction between belief and understanding, especially when teaching

topics that potentially challenge students' beliefs.

In the concluding chapter, "Teaching about origins in science: Where now?", coeditor Michael Reiss synthesizes the first twelve chapters and identifies three themes that ran through many of the essays — teaching the nature of knowledge, teaching about controversial topics, and consideration for the personal significance of the controversy. Reiss offers insights into the relationship between controversy and uncertainty, explaining that naïve students assume that evolution is uncertain because of its association with controversy. By teaching about the relationship between science and religion, educators can inform students about the controversy without unnecessarily introducing a conflict between science and religion.

The controversy surrounding science and religion (and evolution and creationism) is a resilient social and political conflict. The many perspectives involved in this controversy make the arguments complex, highly emotional, and often deeply personal to individuals, regardless of their position on the controversy. Teachers, as intermediaries between science and the public, have a responsibility to develop their own understanding of the controversy's complexity. Well-informed teachers realize that absolutist notions of "right" and "wrong" are blurred by the chance to engage in dialog. This approach to teaching about evolution is a marked shift from more dogmatist approaches to teaching science in areas where belief and truth claims may come into conflict. Although a dogmatic approach to teaching science is not scientifically inaccurate, the approach could be insensitive to students' beliefs.

While *Teaching about Scientific Origins* may not be appropriate for use in a K–12 science classroom and does not offer any narrow, prescriptive directives for teaching evolution, the text provides valuable insights into the science–religion controversy, examining its complexity from a variety of educational vantage points. I think that diverse perspectives, such as those presented in this book, lubricate conversations, opening up safer spaces for us to discuss the otherwise hidden conflicts that educators and students experience with regard to creationism and origins.

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Creation and Evolution: A Conference with Pope Benedict XVI in Castel Gandolfo

compiled by Stephan Otto Horn and Siegfried Wiedenhofer
San Francisco: Ignatius Press, 2008. 210 pages

Reviewed by Daryl P Domning

Awaited with curiosity since initial news reports of this meeting, this book proves doubly disappointing. It is regrettable that top Catholic leaders seem drawn toward "intelligent design" (ID); but it is disturbing that they seem not even aware of relevant and better thinking within their own church.

As a former theology professor, Cardinal Joseph Ratzinger (now Pope Benedict XVI) has for the last thirty years met annually with his former students to discuss current theology and philosophy. This book, on the timely topic of evolution, documents for the first time the discussions of such a session, the one held September 1–3, 2006. It was first published in German as *Schöpfung und Evolution* (Augsburg: Sankt Ulrich Verlag, 2007), as noted in *RNCSE* 2006 Nov/Dec; 26 (6): 8.

This well-produced hardback English edition (from a right-wing Catholic publisher) merits attention not only for showcasing the views of the present pope, but even more those of Vienna's Cardinal Christoph Schönborn, who made a stir with an essay favorable to ID in *The New York Times* (2005 Jul 7). Schönborn seems to have dominated the 2006 discussion, and his opinions, more outspoken than the Pope's own, may reveal more about the thinking in Vatican inner circles.

The book comprises a foreword by Schönborn, papers read by four participants (including Schönborn), an edited and augmented transcript of the ensuing discussion, and an appended essay by theologian Siegfried Wiedenhofer, plus biographical and bibliographical notes. Its philosophical arguments are not always easy to follow, but deserve close attention because they constitute a version of ID now deeply entrenched at the top of one of the world's most influential organizations.

About 70% of Schönborn's foreword consists of quotes from earlier writings on evolution by Ratzinger, the Catholic Church's longtime monitor of orthodoxy. This anthology of the Pope's views is welcome, especially since he contributed relatively little to the discussion recorded later in the book. As quoted by Schönborn, he expresses himself in moderate, nuanced, even progressive-sounding terms, apparently embracing a mainstream view of theistic evolution, and rejecting philosophical materialism that erroneously claims to be the only view compatible with science: "The theory of evolution does not invalidate the faith, nor does it corroborate it" (p 16). Ratzinger's quarrel is

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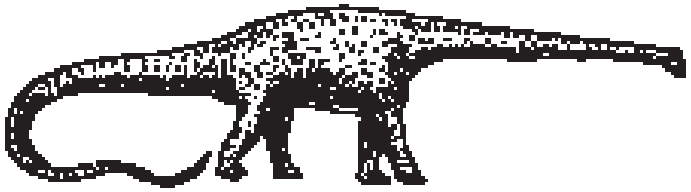

only with evolutionism as a materialistic worldview and universal explanation of reality.

Or so it seems at first glance. But he also reveals in passing a doubt about macroevolution (p 19), and then adopts the conventional false dichotomy between the world as a "meaningless" product of "chance and necessity" and as the product of "the creative power of [divine] reason" (p 20). As becomes clearer later on, he and his friends have not taken into account the insight of contemporary Christian "evolutionary theology" (see Domning 2002a, 2002b) that divine reason can employ that very "chance and necessity" (such as Darwinian selection) in order to create.

The first and longest formal paper, by chemist and Austrian Academy of Sciences president Peter Schuster, is an able and uncompromising exposition of "the state of the art in the theory of evolution." Schuster stoutly defends the efficacy of Darwinian processes. He reviews with clear diagrams the basics of molecular genetics; explains the phenomenon of self-organization as illustrated by cellular automata; and details the most important steps in macroevolution, citing Maynard Smith and Szathmáry (1995), whom Ratzinger had earlier misinterpreted. He emphasizes the "tinkering" aspect of evolution, and the important role of gene duplication. He concludes that evolution "goes on according to natural laws and needs no external intervention. Furthermore, the natural scientist at present is making not one single observation that could be explained compellingly only by the interference of a supernatural being, nor is one necessary for the extrapolation of our present knowledge to the interpretation of events in the past" (p 58). Only in regard to the narrow range of cosmological constants and planetary environments that is permissive of life does Schuster concede that there might "be room for a bridge … between theology and natural science" (p 59). This sophisticated briefing paper could have fruitfully served as the basis for the whole discussion; too often it met instead with skepticism and incomprehension.

Next, philosopher Robert Spaemann argues that integration of the natural sciences with the humanities is still premature, but that only the idea of creation unifies these two worldviews — science and our human self-understanding. That is, the same divine will accounts for both evolution and evolution's producing an intelligent being who acknowledges his Creator. Science can explain in Darwinian terms how humans and other species have evolved, but this does not exclude a separate explanation for the true, the good, and the beautiful.

The third essay is by Paul Erbrich, a Jesuit priest and professor emeritus of natural philosophy. Like the others, he concedes the fact of evolution and the efficacy of "Darwin's mechanism of *chance* and *natural selection*" (p 71; emphasis in original) as a "mechanism of optimization"; but with the reservation that this "presupposes something to be optimized": namely, "an innovation that must have come about in some other way" (p 72). For Erbrich, "evolution as a whole is goal-oriented …. For phylogenesis is an orthogenesis, a development toward a higher level … an ever greater *emancipation* from the constraints of the environment, certainly not for every species of living thing, but for the front-runners in the evolutionary crowd" (p 74). He cites the emancipation of amphibians and reptiles from water, amniotes' evolution of climbing and flight, adaptation to cold climates, and human intelligence. These advances he credits to true teleology, "purposefulness in the living things that are … selected", which makes competition possible — not a mere teleonomy or mechanical simulation of goal-seeking (p 72–3). Because "if there is purposefulness, then there is no more compulsion [for scientists] to keep appealing to chance" (p 76).

Erbrich infers a "leap" (from inorganic to organic) that he thinks evolutionists try to gloss over with the idea of self-organization. He doubts that "[a] really original totality could … come into being through composition": for example, fusion of egg and sperm "would not be the origin and first cause of a living thing," but only a prerequisite for "a new foundation in a radical sense," that is, a creation of God (p 83). Evolutionary theology would allow instead that "composition" is simply a way that creatures participate in God's creative act — no longer a shocking notion to many Christians, but one not easily grasped by this traditionalist strain of philosophy.

In his own essay, Schönborn takes up the same theme, with quotes from Isaac Newton attacking Cartesian materialism and deism and arguing for God's active governance of the world as inferred from "the appearances of things." For Schönborn, Newton's arguments contain in a nutshell "the essential questions that are still at issue today … between science, reason, and faith" — particularly in Schönborn's *New York Times* article (p 86). Unfortunately, he disregards the post-Newtonian answers to these questions; so what follows lags disappointingly behind where today's discussion ought to be.

Schönborn sets out "to release Darwin from Darwinism, free him from the ideological fetters" of a materialist worldview (p 90), which he says can only be done on the level of metaphysics. He explicitly disavows the "creationist" position, which is "based on an understanding of the Bible that the Catholic Church does not share" (p 91). "The possibility that the Creator also makes use of the instrument of evolution is admissible for the Catholic faith." He rejects Gould's "non-overlapping magisteria," insisting there must be "intersections" between theology and science, though "not every variation on the theory of evolution is consistent with faith in creation" (p 92). So far, so good: his objection is to atheistic evolutionism *à la* Dawkins, and I would agree.

But then he quotes with approval the view that origin of life from "blind matter … is incompatible with the Christian doctrine of creation," and argues that the strictly methodological materialism of science "cannot do justice to the whole of reality" because, as an intellectual act, it "presupposes reason, will, and freedom" (p 93). Of course, a methodological (rather than a philosophical) materialist would not claim that science can address the whole of reality. But in asserting that intellectual acts "cannot be the effect of forces that are of a purely material sort" (p 94–5), the cardinal reveals how deeply his thought, like much Christian philosophy, is tainted by the Gnostic heresy — which denies that anything good, let alone spiritual, can come from mere matter.

Schönborn affirms that there is "purpose" throughout nature, but at the cost of denying any real independence of internal natural laws (which are really the workings of an externally imposed divine design). He sees Aristotelian "substantial forms" as the underlying reality of things (for example, species), and strongly hints that it is the business of science today, as in Newton's time, "to read God's traces in creation" (p 100–2). These views are needlessly at odds with today's understanding of evolution and science in general.

Schönborn has plainly learned his biology from creationist sources. He parrots the canards that "the 'missing links' … simply do not exist"; reptiles could not have been rebuilt into birds by "innumerable small mutations"; "survival of the fittest" is problematic because survival is often a matter of luck; and therefore acceptance of evolution must be dictated by ideology (p 103). Only because he has no good explanation of suffering, and wants to spare God the blame for it, does he concede that "we should not be over-hasty about trying to point out 'intelligent design' everywhere" (p 105). But his commitment to a version of ID is clear.

The ensuing discussion consists largely of Schuster's answering objections to his account of biology, and rebutting views such as those of Erbrich about "leaps" and "goal-oriented activity" (p 144–52). One response by him is an apt summation: "people look for gaps in the science so as to hide in them subjective things that are inaccessible to natural science" (p 131).

When the Pope finally joins the discussion, he betrays a surprisingly weak grasp of how science works: "to a great extent the theory of evolution cannot be proved experimentally"; it "is still not a complete, scientifically verified theory" (p 162). Yet he also acknowledges that disorder and "the terrible element in nature" (for which he admits he has no philosophical solution) are problems for the notion of design (p 173). He gives the impression of being slightly less committed to the ID critique than Schönborn, and more open to modern theistic evolution if properly presented; or he may just be more guarded in his speech.

These critics of Darwin simply repeat the philosophy they were taught: a textbook of their time (Phillips 1948, ch 18) embodies the views and even the polemical tone adopted by Schönborn. Strikingly, they consider only the polar alternatives of materialism and divine intervention (today's ID) — altogether ignoring noninterventionist theistic evolution with its concept of a truly autonomous, "purposeless" creation that nonetheless accomplishes the purposes of its Creator. This is an idea that, in these minds trained in Scholastic philosophy, simply does not compute.

No new ground was broken at Castel Gandolfo. Ratzinger, Schönborn, and the other exponents of the Church's traditional philosophy are the rear guard, not the vanguard, of Catholic evolutionary thinking. Among these prelates and their conservative followers, the ancient Aristotelian/Scholastic notion of unchanging "essences" of things is still in vogue, and almost precludes a grasp of the evolutionary paradigm. The term "emergent properties" appears nowhere in this book, nor do contemporary Catholic evolutionary theologians such as John Haught and Denis Edwards (see Domning 2002a). Seemingly unaware of other forms of theistic evolution, the Pope's associates are pushed toward ID because the pro-evolution side is dominated by atheists like Richard Dawkins. This is understandable, but tragic, because theologians in their own church offer better solutions to these problems than the ones they learned in school, or borrow from the relatively alien ID movement.

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The Evolving World: Evolution in Everyday Life

by David P Mindell
Cambridge (MA): Harvard University Press, 2006. 341 pages

Reviewed by Andrew J Petto

The Evolving World was a book that needed to be written and ought to be read by everyone — but particularly those of us who promote evolution education to the general public. The main message for *this* audience is that other scientific theories, such as germ theory and heliocentrism, that are

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now widely — though perhaps not universally — accepted among the general public took much longer to gain acceptance than has evolution — at least so far. This conclusion may be a little skewed, since public access to published information and the variety of media options clearly worked against rapid dissemination of, say, heliocentrism even among members of the research community. Still, the point is well made in several examples: new scientific theories take time to get accepted, and this happens more readily when the new theories connect to issues and concerns that the general public has in everyday life.

The first 190 pages of this book make this point well with a variety of examples, and supporters of evolution education would do well to become familiar with these. They show the direct impact of evolutionary science on things that matter to everyday life: health and disease, food production, conservation, forensics, and more. Mindell argues that the resistance to evolution, when it occurs, happens at the most *personal* level and often derives from cultural narratives that purport to inform us about the meaning and purpose of life. And this is why it is so important for supporters of evolution education to find how the evolutionary sciences affect the issues that people find most important in life.

The next section of the book deals with other common usages of the word "evolution" in the sciences and in general discourse. This is useful in a way, because it shows that, like the word "theory", the e-word has a number of meanings, and that different people — and even different scholarly disciplines — may favor different ones. Part of the reason for the proliferation of meanings is what Mindell calls the "evolution metaphor" — the idea that Darwin's basic concept of differential success in various biological structures under different environmental conditions could be extended metaphorically to human cultural institutions as well. This section is helpful for making that point, but sometimes it is less clear that the extension of evolutionary ideas into these realms is metaphorical.

There are a few specific inferences that could generate significant disagreement. For example, Mindell suggests that evolutionary science has helped "to free religions of the burden of literalism" (p 245) because the evolutionary metaphor of cultural developments allows us to identify how religions change as a result of changes in human history rather than through divine intervention. However, it is evident that the move away from literalism did not depend on modern science for its engine. Theological traditions that eschew literalism usually do so for *theological*, not scientific reasons, though it is clear that scientific discoveries do make certain factual claims difficult or impossible to sustain as they are written in Scripture; for example, there are no "waters above the firmament" (which contains the stars and planets) as reported in Genesis 1:7. In contrast, the move of the mainline Christian churches away from strict literalism occurred long before there was any significant evolutionary science, and this view of Scripture was — and remains — a major complaint of reformed denominations. So the extent to which scientific discoveries about the material world affected interpretation and application of tenets of religious traditions — or rather the mutual influence of the intellectual evolution in science and theology, since it is clear that it was not a one-way street — would make a very interesting, and perhaps informative, discussion. However, it is difficult to justify non-literal theology as primarily caused by the application of the evolutionary metaphor.

Aside from such concerns, this is a book that would be very useful to anyone who needs to explain to a member of the general public why evolution matters. It matters because it reaches into many aspects of our everyday lives; and not just in a metaphorical way, but in a tangible way.

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Making Sense of Evolution: The Conceptual Foundations of Evolutionary Biology

by Massimo Pigliucci and Jonathan Kaplan
Chicago: University of Chicago Press, 2006. 300 pages

Reviewed by Roberta L Millstein

Making Sense of Evolution is an ambitious book synthesizing the views of a practicing biologist (Massimo Pigliucci) with those of a practicing philosopher of biology (Jonathan Kaplan). It begins with central concepts in evolution that are referred to throughout the book, and then moves on to such topics as how to measure natural selection, the debate over the units or "levels" of selection, adaptationism, functions, testing adaptive hypotheses in human evolution, and the concept of species.

Readers of *Reports of the NCSE* may be familiar with Pigliucci's *Denying Evolution* (2002); however, this book has a very different audience in mind — graduate students and professionals in biology and philosophy of biology. Indeed, laypersons who pick up *Making Sense of Evolution* based on the title alone are likely to walk away disappointed; it is replete with technical terms from both biology and the philosophy of biology. That being said, the authors do an admirable job in explaining much of the jargon; boxes and diagrams, although occasionally overused (as when they span multiple pages), are extremely helpful in highlighting key points and concepts.

I cannot help but remark that this is exactly the sort of book that creationists exploit, given its sting-

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ing criticism of contemporary evolutionary practice. The authors are aware that their words could be taken out of context and misused, but say that they seek to provide a more accurate picture of science as it really is: nuanced and provisional. Although I applaud and agree with this general sentiment — neither philosophers of biology nor biologists should hold back when there are criticisms to be made — in this case the authors are overly critical. Our current evolutionary models and methods are limited in various respects, and Pigliucci and Kaplan are right to point out these limitations. However, they deemphasize the utility of these models and methods. To give one simple example, it is true that some evolutionary models do not work well for making long-term predictions; however, these same models work quite well for short-term predictions. Pigliucci and Kaplan acknowledge this, but suggest that it is long-term predictions that we really care about. Yet that is far from obvious; indeed, it could reasonably be argued that the models of population genetics were *intended* to apply primarily to short-term predictions, so that the apparent limitation is not really much of a limitation at all. Someone who is not fully conversant with the models and methods in question might get the impression that evolutionary biology is in much worse shape than it actually is, whereas someone who is more familiar with these practices is likely to feel that the full story has not been told.

The picture of contemporary philosophy of biology that emerges is also somewhat misleading. Citations to key sources are spotty, so that a reader who wanted to follow up on the issues would have a difficult time doing so. For example, the view that natural selection is a "force" is introduced without a citation to Elliott Sober, evolution is described as a historical science without citations to Ernst Mayr and Stephen Jay Gould, and underdetermination is discussed without a citation to Pierre Duhem. To anyone who is familiar with the literature, these omissions are almost akin to discussing the development of the theory of natural selection without citing Charles Darwin. More substantively, some of the concepts that are used throughout the book — concepts that are supposed to provide clarification and insight into more complex issues — are unclear and not fully defended. For example, Pigliucci and Kaplan introduce two concepts of fitness, one at the level of individuals and one at the level of ensembles of populations, and, correspondingly, two concepts of natural selection. However, it is unclear why natural selection should not be seen simply as one kind of cause with corresponding effects at the level of ensembles of populations. And again, following the citations will be of little help — in this case, because Pigliucci and Kaplan have misinterpreted the position of the authors credited with developing these concepts, Matthen and Ariew (2002), who hold that natural selection is a statistical summation at the level of populations.

Another central concept, random genetic drift, is similarly ill-treated. We are told that the many biologists who think they are comparing the outcomes of selection and drift are confused, because drift is not a "force," a "cause," or a "process". Yet no argument is given; the authors simply take one definition of drift ("a name we give to certain outcomes that are at a particular place in the statistical distribution of likely outcomes") and point out that on this definition, it makes no sense to talk of drift as a process. But that definition ignores the fact that biologists identify "drift" with a number of biological processes — most commonly, the "random" (or more accurately, "indiscriminate") sampling of gametes in the process of fertilization; in such cases, heritable differences between gametes are causally irrelevant to which gametes are successfully joined (see Beatty 1984 and Millstein 2002, which are cited but not discussed). On this alternative definition, one need not reach the conclusion that generations of biologists are simply confused about what it is that they are doing.

Even though at times I found this book to be a frustrating read — for example, we are supposed

to think that it makes no sense to talk of developmental constraints simply because development makes selection possible (as though that which enables cannot simultaneously constrain) — I do think that there is some value in it. In particular, I applaud the authors' joint venture — certainly there is much to gain from collaborations between biologists and philosophers of biology — and their overall theme emphasizing the need for models and methods that reveal the causal processes underlying statistical patterns. We can be so dazzled by our statistical methods that we forget their limitations, and if representing nature is a goal of our science, retooling our models and methods to uncover the causes at work will help us achieve that goal. Nonetheless, conceptual and methodological clarity will have to wait for another day. But then again, this just means that evolutionary biology and its philosophical analysis are ongoing rather than static; this should be no surprise to anyone who is familiar with the true nature of science.

Acknowledgments

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