



REPORTS OF THE

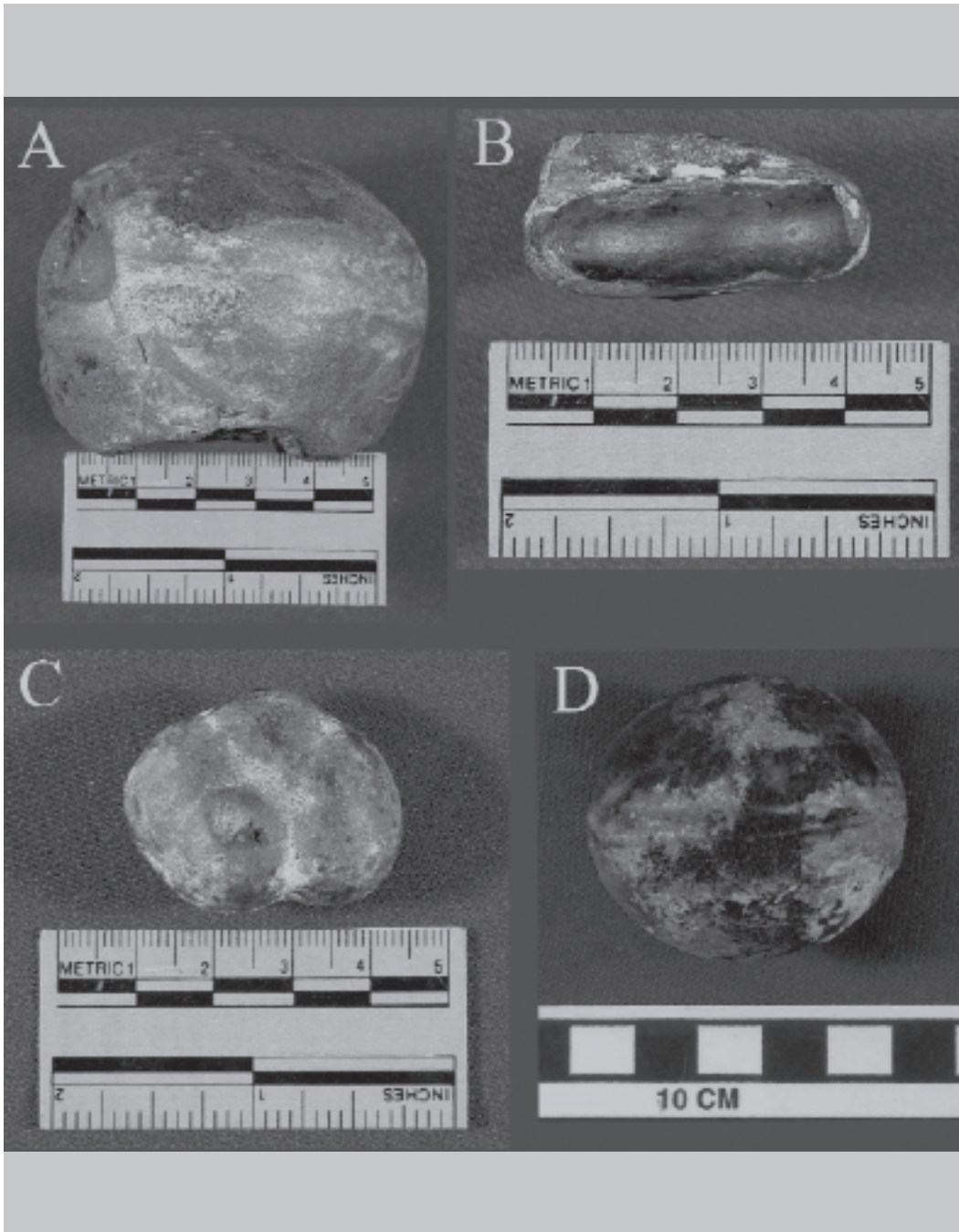
NATIONAL CENTER FOR SCIENCE EDUCATION

DEFENDING THE TEACHING OF EVOLUTION IN THE PUBLIC SCHOOLS

Volume 28, Number 1

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Not So
Mysterious

Texas Education
Agency Messes
with Evolution

The Launch of
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EDITOR

Andrew J Petto
Department of Biological Sciences
University of Wisconsin, Milwaukee
PO Box 413
Milwaukee WI 53201-0413
(414) 229-6784 fax: (414) 229-3926
e-mail: editor@ncseweb.org

BOOK REVIEWS EDITOR

Glenn Branch

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National Center for Science Education

PO Box 9477

Berkeley CA 94709-0477

(510) 601-7203

fax: (510) 601-7204

e-mail: ncse@ncseweb.org

http://www.ncseweb.org

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Cover: Four views of the Ottosdal mystery "spheres". Photos by Paul Heinrich.

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

Creationists have a problem, as one admitted recently on a special report on ABC's *Nightline* program: There is no support in the archeological or paleontological record for their Bible-based scenarios about ecological assemblages. In other words, humans and dinosaurs do not appear in the same geological strata. And, in fact, plants and animals that young-earth creationists say were created in a mere six 24-hour days fail to show anything even remotely like a paleontological record that would suggest that they lived and died at the same times. This is perhaps why creationists and other pseudoscientists are so enamored of OOPARTs — the "out-of-place" artifacts that supposedly defy explanation in the current scientific models and require some sort of supernatural or extraterrestrial agent to account for them. This is another example of the negative argumentation that presumes that any shortcoming in the natural scientific explanations for observed phenomena automatically validates the creationist alternative — though it is perhaps worth noting that there are many creationist "alternatives", several of which are mutually incompatible.

In this issue, geologist Paul Heinrich closely examines a much-touted case of OOPARTs — the "mystery spheres" of South Africa. As he suspected — and as *we* have come to expect — the original claims about the features and characteristics of the specimens are, at best, imprecise, and the assertion that no natural processes *could* have produced them is clearly false. Heinrich shows that the "perfect" spheres of "unusual" composition are neither. There are plenty of examples of similar objects with similar features produced by perfectly natural, terrestrial processes.

IN THE NEWS

Should a state education agency whose science education standards unequivocally require evolution in the public school curriculum develop a policy and inform its employees that the agency must "remain neutral" when discussing creationism or evolution? Apparently, the Texas Education Agency — equivalent to state departments of education elsewhere — thinks so. This was one of the salient issues in the recent resignation of the TEA's director of science curriculum, Chris Comer, who had a long track record as a public school teacher and a science education administrator



in Texas. The incident that kicked up the storm was Comer's forwarding an announcement from NCSE that Barbara Forrest would appear in Austin to discuss "intelligent design" creationism. Officials in the TEA contend that Comer was insubordinate, but

knowledgeable observers suspect that she was forced to resign by those seeking to weaken the support of evolution in the science education standards.

When an "intelligent design" advocacy group produces an "inquiry-based" curriculum on evolution, does it do as incompetent a job at inspiring productive inquiry as it does in its (mis)representations of the current state of the evolutionary sciences? Louise Mead — a teacher, a home-schooling parent, and, incidentally, the director of NCSE's Education Project — attended a "training" workshop based on the new "inquiry-based" textbook *Explore Evolution* and held recently at Biola University to find out. Her report confirms our suspicions: that the misunderstanding and misrepresentation of inquiry-based curriculum is every bit as complete and thorough as the misrepresentation of evolutionary science in the entire scope of the materials produced by "intelligent design" advocates.

EX LIBRIS

Our book reviews include a number of "classics". David Morrison reviews a posthumous collection of essays from Bob Schadeewald. Everyone who knew Bob was impressed by his ability to hone in on critical issues in the creationism/evolution controversy, to engage anti-evolutionists in detailed and relentless probing of their positions, and then to go out for a congenial quaff with those erstwhile adversaries. The new book of essays brings together Bob's thoughts on a number of issues related to the persistence of pseudoscientific ideas in society.

The National Academy of Sciences has released an expanded third edition of its background book on creationism and modern science. David Kopaska-Merkel reviews this edition, *Science, Evolution, and Creationism*. Two important features are a significant treatment of "intelligent design" and a section of Frequently Asked Questions (FAQ) phrased in the form that anti-evolutionists usually employ to influence citizens with a poor understanding of science in general, and evolution in particular.

RNCSE 28 (1) was printed in May 2008.



Texas Education Official Forced to Resign Over Evolution

Glenn Branch
NCSE Deputy Director

Chris Comer, the director of science curriculum for the Texas Education Agency, was forced to resign after forwarding a short e-mail message announcing a presentation in Austin by Barbara Forrest. The *Austin American-Statesman* (2007 Nov 29) reported, "Comer sent the e-mail to several individuals and a few online communities, saying, 'FYI.'" Less than two hours later, Lizzette Reynolds, the TEA's senior adviser on statewide initiatives, complained to Comer's supervisors, writing, "This is highly inappropriate ... I believe this is an offense that calls for termination or, at the very least, reassignment of responsibilities ... it assumes this is a subject that the agency supports."

The e-mail message that Comer forwarded, which was originally sent by NCSE (see sidebar, p 5), announced a talk by Barbara Forrest on the history of the "intelligent design" movement and her expert testimony in *Kitzmiller v Dover*, in which teaching "intelligent design" in the public schools was ruled to be unconstitutional. Forrest is a professor of philosophy at Southeastern Louisiana University and a member of NCSE's board of directors; she also is the coauthor (with Paul R Gross) of *Creationism's Trojan Horse* (New York: Oxford University Press, 2007).

The e-mail was then cited in a memorandum recommending Comer's termination, the *American-Statesman* noted: "They said forwarding the e-mail not only violated a directive for her not to

communicate in writing or otherwise with anyone outside the agency regarding an upcoming science curriculum review, [but] 'it directly conflicts with her responsibilities as the Director of Science.' The memo adds, 'Ms Comer's e-mail implies endorsement of the speaker and implies that TEA endorses the speaker's position on a subject on which the agency must remain neutral.'" Other reasons for recommending her termination were listed in addition.

But Comer told the newspaper that she thought that the long-standing political controversy over evolution education in Texas was the main cause of her termination: "None of the other reasons they gave are, in and of themselves, firing offenses," she said. NCSE's executive director Eugenie C Scott suggested that Comer's termination seemed to be a warning to TEA employees. "This just underscores the politicization of science education in Texas," Scott said. "In most states, the department of education takes a leadership role in fostering sound science education. Apparently TEA employees are supposed to be kept in the closet and only let out to do the bidding of the board."

Kathy Miller of the Texas Freedom Network, which advances a mainstream agenda of religious freedom and individual liberties to counter the religious right, also expressed her concern. "It's important to know whether politics and ideology are standing in the way of Texas kids getting a 21st century science education," Miller told the *American-Statesman*. Alluding to previous battles over the place of evolution in Texas science standards and textbooks, she added, "We've already seen a faction of the State Board of Education try to politicize and censor what our schoolchild-

ren learn. It would be even more alarming if the same thing is now happening inside TEA itself."

The news soon attracted further attention and comment. First to decry Comer's termination was Americans United for Separation of Church and State, which promptly called on the TEA to rehire Comer in a press release dated November 28, 2007. AU's executive director, the Reverend Barry W Lynn, remarked, "It's a sad day when a science expert can lose her job merely for recommending that people hear a speaker defend sound science ... Officials in Texas seem intent on elevating fundamentalist dogma over academic excellence and common sense."

Then, in a report dated November 29, 2007 (available online at <<http://www.texsscience.org/reviews/tea-science-director-resigns.htm>>), Steven Schafersman of Texas Citizens for Science contended that the real reason that Comer was forced to resign was her defense of the integrity of science education during her long tenure at TEA. Describing Comer as a martyr of science, he added, "But she will not be a victim," predicting that scientists and science teachers in Texas will be "outraged by her treatment by a state agency that is now publicly and officially forgoing accurate and reliable science to serve the ideological and religious biases of a small minority of state public education officials."

Barbara Forrest herself was aghast at the news, telling NCSE, "In my talk, I simply told the truth — about the history of the 'intelligent design' movement, about the complete rejection of its claims by the scientific community, and about the *Kitzmiller* trial and my involvement in it. Maybe the TEA can't afford to take a position on what constitutes good science education — maybe it must remain neutral on whether or not to lie to



The E-Mail

THE E-MAIL AT ISSUE IN THE COMER AFFAIR WAS SENT BY
NCSE DEPUTY DIRECTOR GLENN BRANCH ON OCTOBER 23, 2007.

To: Glenn Branch
From: Glenn Branch
Subject: Barbara Forrest in Austin 11/2
Cc:
Bcc: [redacted]
Attached:

Dear Austin-area friends of NCSE,

I thought that you might like to know that Barbara Forrest will be speaking on "Inside Creationism's Trojan Horse" in Austin on November 2, 2007. Her talk, sponsored by the Center for Inquiry Austin, begins at 7:00 pm in the Monarch Event Center, Suite 3100, 6406 North IH-35 in Austin. The cost is \$6; free to friends of the Center.

In her talk, Forrest will provide a detailed report on her expert testimony in the *Kitzmiller v Dover School Board* trial as well as an overview of the history of the "intelligent design" movement. Forrest is a Professor of Philosophy in the Department of History and Political Science at Southeastern Louisiana University; she is also a member of NCSE's board of directors.

For further details, visit: http://www.centerforinquiry.net/austin/events/barbara_forrest_inside_creationisms_trojan_horse_lecture/

Sincerely,
Glenn Branch
Deputy Director
National Center for Science Education, Inc.
420 40th Street, Suite 2
Oakland, CA 94609-2509
510-601-7203 x305
fax: 510-601-7204
800-290-6006
branch@ncseweb.org
<http://www.ncseweb.org>

Not in Our Classrooms: Why Intelligent Design Is Wrong for Our Schools
<http://www.ncseweb.org/nioic>

Eugenie C. Scott's Evolution vs. Creationism
<http://www.ncseweb.org/evc>

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

students about evolution — but if so, that's just sad."

Bringing the issue to national attention was *The New York Times*. Ralph Blumenthal reported (2007 Dec 3):

After 27 years as a science teacher and 9 years as the Texas Education Agency's director of science, Christine Castillo Comer said she did not think she had to remain

"neutral" about teaching the theory of evolution. But now Ms. Comer, 56, of Austin, is out of a job, after forwarding an e-mail message on a talk about evolution and creationism — "a subject on which the agency must remain neutral," according to a dismissal letter last month that accused her of various instances of "misconduct and

insubordination" and of siding against creationism and the doctrine that life is the product of "intelligent design".

"I don't see how I took a position by FYI-ing on a lecture like I FYI on global warming or stem-cell research," Comer told Blumenthal. "I send around all kinds of stuff, and I'm not accused of endorsing it." The article added, "But she said



that as a career science educator, 'I'm for good science,' and that when it came to teaching evolution, 'I don't think it's any stretch of the imagination where I stand.'"

The following day, the *Times* expressed concern about Comer's termination on its editorial page, and in Texas, too, newspaper editorials were critical of the TEA (for a sampling, see p 15). Additionally, the American Institute for Biological Sciences issued a press release on December 6, 2007, expressing outrage at the fact, expressed in the memorandum recommending Comer's termination, that "the TEA requires, as agency policy, neutrality when talking about evolution and creationism." "When it comes to science education, we absolutely cannot remain neutral on evolution. Evolution is the unifying principle of modern biology," asserted Douglas J Futuyma, president of the American Institute of Biological Sciences and Distinguished Professor of Ecology and Evolution at Stony Brook University. "Within biological science, the reality of evolution is not controversial."

And Barbara Forrest herself released a statement (see p 7) through NCSE on December 5, 2007, deploring the situation.

In forcing Chris Comer to resign as Texas Director of Science, the Texas Education Agency has confirmed in a most public, unfortunate way the central point of my Austin presentation, "Inside Creationism's Trojan Horse", the mere announcement of which TEA used as an excuse to terminate her: the "intelligent design" (ID) creationist movement is about politics, religion, and power. ... If anyone had any doubts about how mean-spirited ID politics is, this episode should erase them. ... For the last nine years at the TEA, after twenty-seven years as a science teacher, ... Comer was doing her part, and she got fired for doing it.

The coverage continued, with details emerging about what it was

like to work at the TEA. "We were actually told in a meeting in September that if creationism is the party line, we have to abide by it," Comer told the *Austin American-Statesman* (2007 Dec 6). Over the past year, she related, the TEA began increasingly to scrutinize and constrain the activities of its employees in the curriculum department: "We couldn't go anywhere. We couldn't speak," she said. "They just started wanting everything to be channeled." According to the newspaper, Comer maintained "that her ouster was political and that she felt persecuted for having supported the teaching of evolution in Texas classrooms." A spokesperson for the TEA was quoted by the *American-Statesman* as responding, "Obviously, there was a concern about the forwarding of that e-mail ... that she was supporting that particular speaker and [how] that could be construed ... as taking a position that could be misinterpreted by some people," and as contending that Comer evinced a lack of professionalism in other ways.

Comer then appeared on NPR's "Science Friday" on December 7, 2007, relating her story to the show's host, Ira Flatow. After receiving the e-mail announcing Forrest's talk, she said, "you know, I had a half minute and I said, gee, this is really interesting. And then, I looked up the credential on my computer, I Googled Barbara Forrest and I said, oh my goodness, this is quite a credential[ed] speaker. And then I thought to myself — you know, I'm telling my biology teachers almost on a weekly basis, teach the curriculum, teach the evolution curriculum because it's part of the state-mandated curriculum. And now, I should be — you know, I should be walking the talk here, and I — there's nothing wrong with this e-mail, of course."

Comer told Flatow that there were previous indications that the TEA was discouraging its employees from taking a stand on evolution. At a meeting during which employees were told that they must be careful about what they say and do, Comer recounted, she mentioned the topic of creationism: "And she said, I'm so glad you brought that up ... because it's important for us to realize that if

the company line is that we endorse creationism, then that's what we have to say. I was shocked. I said, my goodness, even the president's ... own science adviser, was not held to that standard. And she said, well, I'm just telling you." Comer was apparently referring to John H Marburger III, Director of the White House's Office of Science and Technology Policy, who told *The New York Times* (2005 Aug 3), "Evolution is the cornerstone of modern biology," adding, "intelligent design is not a scientific concept."

The TEA's commissioner Robert Scott was interviewed by the *Dallas Morning News* (2007 Dec 9). He denied that Comer was forced to resign just for forwarding the e-mail announcing Forrest's talk, alluding to "other factors" that he was not able to discuss. Asked, "Was her advocacy of evolution over creationism an element in her dismissal?" he replied, "She wasn't advocating for evolution. But she may have given the impression that ... we were taking a position as an agency — not as an individual but as an agency — on a matter." "Why shouldn't the agency advocate the science of evolution? Texas students are required to study it," the reporter asked. Scott replied, "You can be in favor of a science without bashing people's faith, too. I don't know all the facts, but I think that may be the real issue here." He did not explain how Comer's behavior was supposed to constitute faith-bashing.

While on "Science Friday," Comer thanked her supporters, saying, "Science educators and rational minds have really gone to bat and have written letters, made e-mails, and sent phone messages. It's really been an incredible response." More was to come.

The Society for the Study of Evolution released a statement (available on-line at <http://www.evolutionarysociety.org/download/ComerLtr_RP_JS_DW.pdf>) reading, in part:

Professional ethics demands that one not "remain neutral" when science is deliberately misrepresented by creationists. Chris Comer thus acted responsibly and professionally in forwarding the



announcement about an educational lecture regarding “Intelligent Design” creationism. In contrast, the administrators who called for her termination and who forced her resignation acted irresponsibly and in direct opposition to the professional standards expected of those who oversee science education. Their comments, quoted above, make it clear that they have sacrificed not only a dedicated public servant but also the facts and the very nature of science to partisan political ideology. It is a sad day for Texas when TEA administrators resort to Stalinist-style purging to suppress the truth about the bankruptcy of arguments.

Similarly, as the *Austin American-Statesman* (2007 Dec 11) reported, “More than 100 biology faculty members from universities across Texas signed a letter sent Monday to state Education Commissioner Robert Scott saying Texas Education Agency employees should not have to remain neutral on evolution.” Daniel Bolnick of the University of Texas, Austin, told the newspaper, “I’m an evolutionary biologist, and I and many others simply feel that good evolution education is key to understanding biology as a whole,” and his colleague David Hillis added that the Comer controversy represented “an enormous black eye in terms of our competitiveness and ability to attract researchers and technologies.” The letter was signed by biologists from across Texas, at both public and private universities.

Alan I Leshner, the chief executive officer of the American Association for the Advancement of Science, drove the message home, writing in the *Fort Worth Star-Telegram* (2007 Dec 11):

As Texas prepares to reconsider what youngsters statewide should know about science, the forced ouster of science curriculum director Chris Comer of the Texas Education Agency, apparently for standing up for the integrity of science education, stands as both

shocking and sad. Even more disturbing, perhaps, is the official explanation for it. ... Should anyone in charge of science curriculum be expected to remain neutral regarding efforts to insert religious viewpoints into science classrooms? The answer is ‘no.’ ... If today’s students are to thrive, education leaders cannot pick and choose which scientific facts they want to accept.

A common theme in the coverage of the Comer controversy is that it foreshadows a likely clash over the place of evolution in the science portion of the Texas Essential Knowledge and Skills (TEKS), the state science standards that determine both what is taught in Texas’s public school science classrooms and the content of the biology textbooks approved for use in the state. The *Dallas Morning News* (2007 Dec 13) summarized, “The resignation of the state’s science curriculum director last month has signaled the beginning of what is shaping up to be a contentious and politically charged revision of the science curriculum, set to begin in earnest in January. ... in disciplinary paperwork [officials at the TEA] stressed that she needed to remain neutral in what was becoming a tense period leading up to the first review of the science curriculum in a decade.”

In 2003, there were concerted, if ultimately unsuccessful, attempts to misuse the TEKS to compromise the treatment of evolution in the textbooks then under consideration (see *RNCSE* 2003 Sep-Dec; 23 [5-6]: 4-7), and it is expected that such attempts will recur — especially since the new president of the board, Don McLeroy, is himself a vocal creationist (see *RNCSE* 2007 May-Aug 2007; 27 [3-4]: 6-9).

Although creationists in Texas, including McLeroy, have disavowed any intention of trying to include creationism in the TEKS, there are clear signs that they will press to include language attempting to instill scientifically unwarranted doubts about evolution. Mark Ramsey, representing a group styling itself Texans for Better

Science Education, was characterized, for example, as wanting “weaknesses in evolution” to be taught. (Ramsey is also associated with the Greater Houston Creation Association, as Texas Citizens for Science reported.) NCSE’s executive director Eugenie C Scott told the *Dallas Morning News* (2007 Dec 13), “It all boils down to the idea that to counter evolution you teach students that evolution is crummy science in the hopes that students will reject it ... It’s a way of getting creationism in without the ‘C’ word.”

For her part, Comer told the *Morning News*, “Any science teacher worth [her] salt that has any background in biology will tell you there is no controversy” over the scientific status of evolution. That, she said, was her approach during her tenure at the TEA, where she frequently responded to questions about evolution education in Texas: “We have teachers afraid to teach it, parents who don’t want it taught and parents who do want it taught. It comes from all different angles.” She added, “For all the years I was there, I would always say the teaching of evolution is part of our science curriculum. It’s not just a good idea; it’s the law.” But now she is not optimistic about the future of science education in Texas, lamenting, “The way things are being done these days I don’t think rational minds have a chance.”

AUTHOR’S ADDRESS

Glenn Branch
NCSE
PO Box 9477
Berkeley CA 94709-0477
branch@ncseweb.org

A Sorry State of Affairs

Barbara Forrest

In forcing Chris Comer to resign as Texas Director of Science, the Texas Education Agency has confirmed in a most public, unfortunate way the central point of my Austin presentation, “Inside Creationism’s Trojan Horse,” the mere announcement of which TEA used as an excuse to terminate her: the “intelligent design”



(ID) creationist movement is about politics, religion, and power. If anyone had any doubts about how mean-spirited ID politics is, this episode should erase them. Texas school children depend on the adults at the TEA to protect the quality of their education. For the last nine years at the TEA, after twenty-seven years as a science teacher, Comer was doing her part, and she got fired for doing it. The children are ultimately the losers.

The fact that this current episode has happened in Texas is not at all surprising given Texas Board of Education chair and ID supporter Don McLeroy's statements in a 2005 pro-ID lecture at Grace Bible Church:

Creationists have been making these design arguments, but the birth of the "intelligent design" movement probably did start at SMU [Southern Methodist University, site of the ID movement's first conference], [in] 1992. It was here that [Phillip Johnson] and Michael Behe, Stephen Meyer, and William Dembski, debated with ... influential Darwinists the proposition that neo-Darwinism [depends] on a prior commitment to naturalism. Johnson ... states, "Once it becomes clear that Darwinism rests on a dogmatic philosophy rather than on the weight of the evidence, the way will be opened for dissenting opinions [i.e., intelligent design creationism] to get a fair hearing." They hadn't got there yet. We don't have a fair hearing yet. But, we gotta keep working on it. This is not something that happens overnight. (The transcript and the audio recording of McLeroy's speech are available on-line at <<http://www.tfn.org/publiceducation/textbooks/mcleroy/index.php>>.)

With Comer's termination, the process of gaining that hearing appears to have advanced quite a bit.

The rationale given by TEA employee Monica Martinez, who wrote the memo recommending Comer's termination, is not credible. Martinez contends that "Comer's email implies endorsement of the speaker and implies that TEA endorses the speaker's position on a subject on which the agency must remain neutral." First, Comer's merely passing along an "FYI" about a public lecture implies nothing of the sort. (For the text of the announcement from the National Center for Science Education that she sent, see <http://www.ncseweb.org/resources/news/2007/TX/950_texas_education_official_force_11_29_2007.asp>, or sidebar, p 5.) But that point notwithstanding, since my Austin talk was about the "intelligent design" creationist movement, one wonders why TEA would even want to remain "neutral" concerning the ID movement's goal of undermining the integrity of science education in the very public schools that TEA should be protecting from that movement's efforts.

Martinez continued, "Thus, sending this e-mail compromises the agency's role in the TEKS revision process by creating the perception that TEA has a biased position on a subject directly related to the science education TEKS." But why would the TEA be concerned about being biased in favor of teaching children the truth about science? The TEA's proper role is to ensure the quality and integrity of what is taught in Texas science classes. My Austin presentation was most certainly not a threat to that role, but in fact highly supportive of it. I presented the truth about ID as established by years of scholarly research. Has the process of administering the public education system in Texas become so politicized that even the truth is a threat to people's jobs? One can only conclude that it has.

Ultimately, the TEA's firing of Chris Comer is a by-product of the relentless promotion of ID for

more than a decade by creationists at the Discovery Institute. In the wake of court decisions ruling that it is unconstitutional to teach creationism in the public schools, ID creationists, a significant number of whose central figures live in Texas, launched the effort that they formalized in their 1998 "Wedge Strategy" document, which outlines their twenty-year plan to "wedge" ID into the cultural and educational mainstream. (See <<http://www.antievolution.org/features/wedge.html>>.) First Kansas, then Ohio, and most recently Dover, Pennsylvania, have experienced firsthand the attacks on their school systems that were produced, either directly or indirectly, by the Discovery Institute's campaign, as stated in that document, "to see [intelligent] design theory permeate our religious, cultural, moral and political life."

In 2003, Discovery Institute creationists tried, unsuccessfully, to influence the adoption of Texas biology textbooks. Texans should now prepare themselves for an attempt by the same people (and/or newly recruited supporters) to influence the upcoming review of state science standards. In order to be ready, the good citizens of Texas who value their public schools and the US Constitution must familiarize themselves with the ID code terms they are likely to hear, all of which signal the ID movement's attack on the teaching of evolution. ID supporters will declare that they certainly do not favor eliminating evolution or teaching intelligent design, but rather that they simply want children to hear "both sides" of the "controversy" and to learn to "critically analyze" evolutionary theory, so that they can understand the "strengths and weaknesses" of evolution, and all of this will be for the sake of "fairness" and "academic freedom." (For an explanation of these ID code terms, see p 19-22 of my article, "Understanding the Intelligent Design Creationist Movement: Its True Nature and Goals," available on-line at <<http://www.centerforinquiry.net/uploads/attachments/intelligent-design.pdf>>.)

In fact, some members of the Texas Board of Education seem to

Barbara Forrest is Professor of Philosophy at Southeastern Louisiana University, and the coauthor, with Paul R Gross, of Creationism's Trojan Horse (New York: Oxford University Press, 2004). She testified for the plaintiffs in Kitzmiller v Dover, and she serves on NCSE's board of directors.



have already mastered the Discovery Institute's code language. McLeroy recently stated that "Anything taught in science has to have consensus in the science community — and intelligent design does not" (*Dallas Morning News*, 2007 Aug 23). He added, however, that he was dissatisfied with the fact that current biology textbooks do not cover the "weaknesses" of the theory of evolution. His reference to the "weaknesses" of evolution is creationist code talk. Board vice chairman David Bradley also avowed that he would not support the teaching of ID in science classes. However, Bradley also appears to know the terminology: "I do want to make sure the next group of textbooks includes the strengths and weaknesses of evolution" (*Dallas Morning News*, 2007 Aug 23).

McLeroy and Bradley are overlooking the fact that evolutionary theory has survived one hundred and fifty years of scientific scrutiny for its "strengths and weaknesses," whereas ID could not survive even six weeks of legal and scientific scrutiny in a Pennsylvania courtroom. Stephen Meyer and William Dembski, who, according to McLeroy's lecture, are seeking a "fair hearing" for ID, were given a chance to present their best pro-ID arguments in that very courtroom. They just didn't show up. (See Barbara Forrest, "The 'Vise Strategy' Undone: *Kitzmiller et al v Dover Area School District*," available online at <<http://www.csicop.org/intelligentdesignwatch/kitzmiller.html>>.)

McLeroy's 2005 ID church lecture is much more instructive than his more recent comments to the *Dallas Morning News*. In this lecture, he declared himself to be in the "big tent" of "intelligent design": "Whether you're a progressive creationist, recent creationist, young earth, old earth, it's all in the tent of 'intelligent design'.... And that's one thing that I really enjoyed about our group is that we've put that all in the big tent, we're all working together." (This "big tent" is the political alliance that ID leader Phillip Johnson has tried to forge among the creationists with whom McLeroy has enjoyed working.)

McLeroy then professed his wonderment that during the 2003 textbook adoption process, "all the arguments" by "all the creationist intelligent design people" speaking before the Board of Education (among whom he specifically named "our good friend Walter Bradley," a Texas resident and long-time Discovery Institute fellow) were not taken seriously by "my fellow board members who ... were not impressed by any of this. ... Amazing." McLeroy was further amazed that "all the arguments are dismissed like this here is a subversive, secret attempt to force religion into science." Now, why on earth would anyone draw that conclusion? Amazing.

The incident now involving Comer exemplifies perfectly the reason my co-author Paul R Gross and I felt that our book, *Creationism's Trojan Horse: The Wedge of Intelligent Design*, had to be written. By forcing Comer to resign, the TEA seems to have confirmed our contention that the ID creationist movement — a religious movement with absolutely no standing in the scientific world — is being advanced by means of power politics. In December 2005, Judge John E Jones III validated our contention that ID is creationism, thus a religious belief, when he ruled in *Kitzmiller et al v Dover Area School District* that the teaching of ID in public school science classes is unconstitutional. Judge Jones recognized that ID has nothing whatsoever to do with science; its proponents are merely using public education — the public education of other people's children — as the vehicle for their plan to undermine the teaching of evolution.

The one thing that should not be forgotten in this episode is that Comer herself has been injured, and Texas children have lost a valuable advocate for quality science education. I regret deeply that the TEA chose to use my work as an excuse to hurt Comer. Even more, I am incensed by it. However, what happened to her may be just the tip of the iceberg. This country has reached a sorry state of affairs when one of the largest, most prominent departments of education in the country fires a public servant for doing her job. But while

I regret that the information I related in my presentation in Austin and in my book has been confirmed in such a sad way, my co-author and I have every intention of continuing our efforts as scholars and citizens to inform the American people about the threat that the intelligent design creationist movement continues to pose to public education and to the constitutional separation of church and state.

AUTHOR'S ADDRESS

Barbara Forrest
Department of History and Political Science
SLU 10484
University Station
Hammond LA 70402
bforrest@selu.edu

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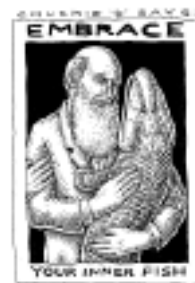
The E-mail That Ended a Career

Glenn Branch
NCSE Deputy Director

I send a lot of e-mail in an average day, and ordinarily nobody is fired as a result. But I'm not always so lucky.

I work at the National Center for Science Education, a non-profit organization that defends the teaching of evolution in the public schools. Even 82 years after the Scopes trial, the job keeps us busy. In a 2005 survey conducted by the National Science Teachers Association, for example, 30% of the respondents indicated that they experienced pressure to omit or downplay evolution and related topics, while 31% indicated that they experienced pressure to include nonscientific alternatives to evolution, such as "creation science" or "intelligent design," in their science classrooms.

Sometimes the pressure is not so quiet. In 2004, after efforts to have a creationist textbook adopted were stymied, a creationist majority on the school board in Dover, Pennsylvania, passed a policy calling evolution "a theory ... not a fact" and recommending "intelligent design" — the latest incarnation of creationism — as a scientific



ically credible alternative, and tried to force the science teachers to read a disclaimer to that effect.

Eleven Dover parents filed a lawsuit, contending that the policy violated the Establishment Clause of the First Amendment. NCSE consulted *pro bono* for the plaintiffs, and no fewer than three members of NCSE's board of directors served as expert witnesses. Among them was Barbara Forrest, a professor of philosophy at Southeastern Louisiana University and the coauthor, with Paul R. Gross, of *Creationism's Trojan Horse* (New York: Oxford University Press, 2004) — the definitive exposé of the "Wedge strategy" of the "intelligent design" movement.

The *Kitzmiller* verdict was devastating for the ambitions of "intelligent design." The judge was scathing, both about the behavior of the defendants (who were castigated for "breathhtaking inanity" in adopting the objectionable policy) and about the scientific credibility of "intelligent design" (which, the judge wrote, "is not science and cannot be adjudged a valid, accepted scientific theory as it has failed to publish in peer-reviewed journals, engage in research and testing, and gain acceptance in the scientific community").

Forrest's testimony was instrumental, as the judge noted: "Barbara Forrest ... has thoroughly and exhaustively chronicled the history of ID in her book and other writings for her testimony in this case. Her testimony, and the exhibits ... admitted with it, provide a wealth of statements by ID leaders that reveal ID's religious, philosophical, and cultural content."

In the wake of the *Kitzmiller* case, Forrest continued to speak about the career of the "intelligent design" movement, lecturing at institutions like Columbia University and Loyola University and to groups like the American Society of Cell Biology and the American Association for the Advancement of Science. (She also featured prominently in the recent PBS documentary about the case, *Judgment Day: Intelligent Design on Trial*.) So when she mentioned to me that she was going to be giving a talk in Austin entitled, "Inside Creationism's Trojan Horse," I

dropped a quick note to people in the area, as is my usual procedure.

"Dear Austin-area friends of NCSE," it began. "I thought that you might like to know that Barbara Forrest will be speaking in Austin on November 2, 2007." After giving the details of the place, time, and sponsor, it explained, "In her talk, Forrest will provide a detailed report on her expert testimony in the *Kitzmiller v. Dover School Board* trial as well as an overview of the history of the 'intelligent design' movement. Forrest is a Professor of Philosophy in the Department of History and Political Science at Southeastern Louisiana University; she is also a member of NCSE's board of directors."

Among the people to receive the note was Chris Comer. Apparently she did not have a good idea who Forrest was — she later told "Science Friday" that she searched the web to find out — and was impressed with Forrest's credentials and accomplishments. Having satisfied herself that Forrest was a worthwhile speaker, she promptly forwarded my e-mail to a few individuals and mailing lists, adding, "FYI."

Comer works at the Texas Education Agency, as its director of science curriculum — or, rather, she *worked* there. Less than two hours after sending the e-mail, she was called on the carpet and instructed to send a disclaimer. And then she was forced to resign. Although a memorandum recommending her dismissal referred to various instances of alleged "misconduct and insubordination", it was clear what her real offense was: "the TEA requires, as agency policy, neutrality when talking about evolution and creationism."

It is absurd, of course, to regard Comer's forwarding of my announcement of Forrest's talk as endorsing Forrest's view (ask a linguist — according to Bill Poser, writing at the Language Log blog, "Forwarding email is approximately like quotation; the only inference that can reliably be drawn is that the forwarder thinks that the recipient may be interested in the information"). But that absurdity pales in comparison to the absurdity of the Texas Education Agency's trying to adopt a position

of "neutrality" on evolution, when (as the National Academy of Sciences observes) "The scientific consensus around evolution is overwhelming." As Forrest commented, "Maybe the TEA can't afford to take a position on what constitutes good science education — maybe it must remain neutral on whether or not to lie to students about evolution — but if so, that's just sad."

Both Comer and the TEA kept quiet about her resignation, but eventually the *Austin American-Statesman* got wind of it, and a spate of reportage and editorials followed. The interest was not only due to Comer's plight, however, but also due to what it foreshadows about the upcoming revision of Texas's state science standards. This process will be overseen by Don McLeroy, the chair of the state board of education, and himself a creationist.

Texas is not the only state preparing to revise its state science standards; Florida is, too. Trouble is on the horizon there as well: it was recently revealed that a state education official abused her position to rally public opposition to the section of the draft standards that present evolution. (Was she forced to resign? No: she was "counseled".) And with a constant climate of ignorance of, skepticism about, and hostility toward evolution across the country, it looks as though my colleagues at NCSE and I will not be looking for other work any time soon. So we will continue to defend the teaching of evolution in the public schools, and to help concerned teachers, parents, and citizens in general to do the same.

And we will keep the e-mails coming, too.

AUTHOR'S ADDRESS

Glenn Branch
NCSE
PO Box 9477
Berkeley CA 94709-0477
branch@ncseweb.org

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Explore Evolution: Notes from the Field

Louise S Mead

Fieldwork, for me, used to mean putting on a pair of hiking boots and crawling through entangled masses of rhododendron in the Southern Appalachian Mountains to catch the elusive Mountain Dusky salamander. As Education Project Director at the National Center for Science Education, fieldwork looks entirely different these days. During the first weekend in August 2007, I attended the Science Teacher Symposium at Biola University in La Mirada, California, for the unveiling of *Explore Evolution*, a slick new supplementary textbook being peddled by the Discovery Institute. (Nick Matzke gave advance warning of it in *RNCSE* 2006 Nov/Dec; 26 [6]: 28-30.)

When I arrived at the symposium, I was not sure whether I should announce my association with the National Center for Science Education. The registration form asked whether applicants were teachers and where they taught. I qualified: I am a teacher, and I was then teaching an on-line course entitled "Teaching Evolution" for teachers through Montana State University.

My intention was certainly not to keep my identity secret, but it became clear quite early in the symposium that I was in an environment that was very discordant with my religious and spiritual beliefs as well as my training as an evolutionary biologist — I might add, in *that* order. As the symposium proceeded, the climate became overtly hostile toward people who accept evolution, and specifically NCSE, and I decided it best to keep my NCSE affiliation quiet.

The uncomfortable feeling I experienced when the symposium opened with an evening prayer to "Our Lord, Jesus Christ" might be thought to parallel those of students with religious fundamentalist beliefs who enter a biology classroom and learn that all organisms

share a common ancestry. But there is a huge difference: the biology student can still believe in God and accept evolution. Evolution is a scientific endeavor dealing with natural explanations for natural phenomena; it cannot make any statements about the existence of God. That was not the attitude of the presenters at the Teacher Symposium, however; they claimed that humans do not share common ancestry with other organisms, and those scientists who have publicly expressed their belief in God and their acceptance of evolution are being dishonest about either their acceptance of evolution (for fear of retribution by the scientific community) or their faith.

Following the evening prayer, we were treated to a lecture by Jonathan Wells on "Evolution and Intelligent Design in Public Education". *Kitzmiller v Dover* may have been a nail in the coffin of attempts to get "intelligent design" into the public school classroom, and Wells at least acknowledged the verdict as a temporary disaster, but those on the evolution/creationism frontlines have been bracing for the next attack on science education, which will be waged beneath a banner reading "Teach the strengths and weaknesses of evolution".

Wells's talk might have been taken from the chapters of *Explore Evolution*, but included only the "reply" sections, which outline the *weaknesses* of evolution. Despite the title of his talk, "Evolution and Intelligent Design in Public Education", and the subtitle of *Explore Evolution*, "The Arguments For and Against Neo-Darwinism" (emphasis mine), not once did Wells mention the overwhelming evidence, the thousands of peer-reviewed scientific papers, and the statements by numerous scientific establishments in support of evolution as the best explanation we have for the diversity of life on earth. Nor did Wells address the requirements to teach evolution, clearly enunciated by the major professional associations of science teachers and outlined in all sets of state science standards receiving high ratings from the Fordham Foundation. Mike Keas, a faculty member at Biola University

and organizer of the Science Teacher Symposium, argued that students should be encouraged to treat evolution as a jury would, forming an opinion given the evidence — as though a vote on the issue were an appropriate method of evaluation. Of course, neither Wells nor Keas nor the *Explore Evolution* text speak authoritatively or comprehensibly on the scientific evidence for evolution.

EVOLUTION IS ...

What was overwhelmingly clear at the conference, although perhaps only to me given my training in organismic and evolutionary biology, was that neither Wells nor Keas understands evolution. Neither do the authors of *Explore Evolution*, as NCSE discovered in reviewing this new textbook that supposedly presents the arguments for and against "neo-Darwinism". The "arguments against evolution" were created by misrepresenting or misinterpreting the evidence for and predictions of evolution. For example, when asked about the whale fossil record as evidence for evolution, Wells's response was that "all whale fossils have adaptations that take them off the line of descent," which according to Wells, challenges this as an example of evolution. However, the whale fossil record is actually exactly as evolution predicts. Lineages that go extinct have combinations of traits representing adaptations no longer present in extant forms. Furthermore, it is the similarities, not the differences, that inform our hypotheses about common ancestry. Wells was able to perpetuate such anti-evolution propaganda largely because the audience could not recognize the falsity of his claims and the absurdity of his explanations. I thought about challenging Wells, but feared I might be thrown out of the symposium for my acceptance of evolution and association with NCSE — at one point called "the Gestapo" by Wells and Keas.

Wells also presented evidence for "intelligent design", which is *not* to be found in the *Explore Evolution* textbook. He claimed that ID does not rely on biblical authority or religious doctrine and does not tell us the nature of the designer, but went on to inform



Louise S Mead is NCSE's Education Project Director.

participants that for him, the designer is the God of the Bible. Of course the Science Teacher Symposium on *Explore Evolution* had absolutely “no religious agenda” — a claim continually made by Keas, Wells, and John Bloom, head of the Science and Religion Program at Biola, formerly the *Bible Institute* of Los Angeles.

The final piece of Wells’s advice to participants was what to teach about evolution in the public school science classroom. Only a few of the thirty-odd participants in the room actually taught in a public institution, based on a show of hands. A few teachers, currently teaching at private Christian schools, were concerned about their “rights” should they teach in a public school, as though their rights might somehow include the right to instruct students in the specific doctrines of their Christian denominations. Wells’s recommendations, reiterated by Keas in the next sessions of the symposium, were predictable. Teach “critical analysis”, the evidence for and against neo-Darwinism, but not “intelligent design”, unless at a private institution supportive of creationism.

EXPLORE EVOLUTION GOES TO SCHOOL

The remainder of the symposium was very disappointing. The organizers advertised that teachers would be supplied with curriculum materials to accompany *Explore Evolution*, but the materials turned out to be just two handouts and a DVD titled *Investigating Evolution*. The first handout included the schedule for the symposium, a section on “How to Teach Evolutionary Biology to High School Students” complete with advice to “teach the controversy” (as supposedly encouraged by the Santorum Amendment; see Glenn Branch and Eugenie C. Scott, “The antievolution law that wasn’t”, *The American Biology Teacher* 2003; 65 [3]: 165–6), a list of “Resources on Neo-Darwinism and Intelligent Design” (the standard list of anti-evolution books by the usual suspects), and finally a page entitled “Tell Me More”, an evaluation survey for the present symposium and an announcement for the next (*yikes!*) Biola Science Teacher Symposium,

to be held in 2008. The second handout included a variety of documents intended to help teachers use *Explore Evolution* in the classroom: an “Ancillary Introduction”, “Lecture Outline to *Explore Evolution*”, “Biology Textbook and Supplement Correlation”, “Sample Lesson Plans to *Explore Evolution*”, and finally a “Test Bank to *Explore Evolution*”, all of which simply restate the erroneous information presented in the text.

On a pedagogical note, *Explore Evolution* was promoted, both on the *Explore Evolution* website and at the symposium, as “the first inquiry-based curriculum to key aspects of Darwin’s theory”. Most inquiry-based learning involves encouraging students to generate open-ended questions, thereby offering them the opportunity to direct their own investigations and find their own answers. *Explore Evolution* fails on every front with respect to claims of being an “inquiry-based” curriculum. There are no questions, only assertions. Students do not find their own answers; they are provided with incorrect information and/or quotes from scientists taken out of context, and then asked to regurgitate the information. For example, the “Lecture Outline” asks students to fill in the blanks:

Evolution #1: ____ Over Time;
Evolution #2: ____ Descent;
Evolution #3: ____ of Change:
Natural ____ acting on random ____.

This type of “fill in the blank” learning is definitely not “inquiry-based”; instead, it is an intellectual insult to students, teachers, and scientists, as is the content of *Explore Evolution*. In my judgment, science and science education will suffer disastrous consequences should the creationist agenda presented in *Explore Evolution*, and promoted at the Teacher Symposium at Biola University, be included in any science curriculum.

AUTHOR’S ADDRESS

Louise S Mead
NCSE
PO Box 9477
Berkeley CA 94709-0477
mead@ncseweb.org

The German Anti-Darwin Industry: Twentieth Anniversary of a Multi-Media Business

Ulrich Kutschera

In June 2004, a German television show focused on creationism in the United States. One episode, filmed at an anti-evolution propaganda meeting, was very impressive and revealing. Accompanied by a cowboy-hat-wearing guitarist, groups of happy American children, supported by their devoted parents, were shown singing a country song that culminated in the refrain “I don’t believe in evolution, I know creation’s true.” A few months earlier, a German video film entitled *Was Darwin nicht wissen konnte* (*What Darwin Could Not Have Known*) was released, wherein the Munich microbiologist Siegfried Scherer rephrased the song quoted above as follows: “I don’t believe in evolution, but in creation.” This film is part of a series of films promoted by a small but influential group of German young-earth creationists, the Studiengemeinschaft Wort und Wissen (Word and Knowledge Society; see <<http://www.wort-und-wissen.de>> in German, and the supplementary web site <<http://www.genesisnet.info>> in German, English, and Spanish). In their first opus, entitled *Hat die Bibel doch recht? Der Evolutionstheorie fehlen die Beweise* (*Is the Bible Right? There is No Evidence for the Theory of Evolution*, 1998), the main actor is Scherer, who is supported by the geneticist Wolf-Ekkehard Lönnig, and claims that “there is no evidence for macroevolution”. Charles Darwin and Ernst Haeckel

Ulrich Kutschera is Full Professor of Plant Physiology and Evolutionary Biology at Universität Kassel, Germany; he was recently a visiting scientist at the Carnegie Institution and the Department of Plant Biology at Stanford University. He is the author of seven textbooks and about 140 scientific publications.



are described as the spiritual fathers of the Nazi Holocaust; this episode is accompanied by moving scenes showing Jews in concentration camps. At the end of the film, a Bible appears and the narrator remarks: "There is a book wherein the origin of species is reliably described ... all living beings were created according to their own kind." More than 50 000 copies of this award-winning film were sold. An enthusiastic *laudatio*, authored by John C Lennox of Oxford University, is published on the internet. Videotape and DVD versions are available in German, English, Russian, and Persian. The implicit claim of this and other German anti-evolution films is that Darwinism — "a pseudo-scientific construction" — is largely equivalent to "atheism, materialism, and Hitler's Nazi ideology" (see <<http://www.dreilindenfilm.de>>).

In addition to the Bible, a second book is promoted via these videos: *Evolution — Ein kritisches Lehrbuch* (*Evolution — A Critical Textbook*). Now in its sixth edition (Giessen: Weyel, 2006), the book was written and edited by Reinhard Junker and Siegfried Scherer, both affiliated with Word und Wissen (see *RNCSE* 2003 Nov/Dec; 23 [5-6]: 17-8 for details). They are supported by a team of co-authors; several are scientists at German universities, but no professional evolutionary biologists are among them. The aim of this book is summarized in the preface of the fifth edition (2001), wherein the authors point out that "there exists an alternative to the (unproven) assumption of macroevolution that is motivated by the revelations of the Bible — the theory of creation." The first edition was published two decades ago under the title *Entstehung und Geschichte der Lebewesen: Daten und Deutungen für den schulischen Bereich* (*Origin and History of Organisms: Data and Interpretations for Biology Classes*; Giessen: Weyel, 1986). In this book, aimed at teachers and pupils as target audience, a radical version of young-earth creationism is presented. In accordance with the US "intelligent design" (ID) movement, the contents of the fourth (1998) and subsequent edi-

tions were updated and a new, broader title was chosen, with explicit references to "the Designer" and the "ID theory". Earlier editions of the Junker and Scherer volume have been translated into several languages: this text, which was awarded a German schoolbook prize, has become one of the pillars of the European anti-evolution movement (see *RNCSE* 2004 Sep/Oct; 24 [5]: 11-2).

Throughout their book, Junker and Scherer argue against the unscriptural "atheistic belief" in macroevolution (that is, the emergence of novel body plans as documented in the fossil record; for instance, the transition of theropod dinosaurs into early birds during the Cretaceous). Then the authors propose their theistic alternative. The "Intelligent Designer" (the God of the Bible) created "Basic Types", such as horses, ducks, dogs or humans, "after their own kinds" (see *RNCSE* 2006 Jul/Aug; 26 [4]: 31-6 for discussion).

It must be acknowledged that the authors refer to and describe the contents of a selection of recent key publications on molecular and organismic evolution. However, due to their firm Bible-based belief, they misrepresent and re-interpret biological facts to such an extent that a web of science and religious dogmas is woven that is difficult to entangle. To the chagrin of most biologists, this flagship of Euro-ID creationism has been mistaken by non-specialists for a serious textbook on evolution. For instance, Joseph Cardinal Ratzinger, now Pope Benedict XVI, referred to the Junker and Scherer book in a published lecture delivered on November 27, 1999, at the Sorbonne in Paris. In this speech,

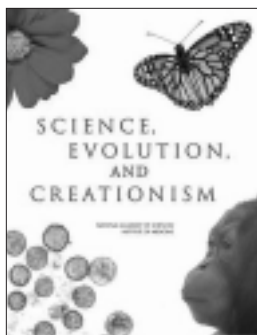
Ratzinger quoted from the preface of the fourth edition (1998) and summarized some of the standard arguments "against macroevolution" that it presents.

The twentieth anniversary edition (2006) is accompanied by a new website that provides supplementary information free of charge for students and teachers (see <<http://www.evolutionslehrbuch.info>>; in response to this novel propaganda instrument of the German creationists, I established a counter-website (see <<http://www.evolutionslehrbuch.com>>) where I describe my own textbook on evolutionary biology. The 2006 version of the ID textbook will again cause trouble in public schools, where copies of previous editions of this book, submitted as a gift by members of Word und Wissen, have already been deposited in the libraries. In encounters similar to creationist activism in the US, religiously motivated pupils in Germany have confronted their biology teachers with this "academic weapon against Darwinism". Moreover, at some high schools in Germany, this book is used as a supplement to a conventional biology text. But at this point, the real impact of this colorful Bible of the European ID movement is unknown. If the evidence in the form of internet and print journals that look like scientific periodicals and professional video productions tells us anything, it is that creationism made in Germany is an ongoing success story.

AUTHOR'S ADDRESS:

Ulrich Kutschera
Institute of Biology
University of Kassel
Heinrich-Plett-Strasse, 40 D-34109
Kassel, Germany
kut@uni-kassel.de





Science, Evolution, and Creationism: A Welcome Defense of Evolution

Glenn Branch
NCSE Deputy Director

The National Academy of Sciences and Institute of Medicine recently released *Science, Evolution, and Creationism*, a book designed to give the public a comprehensive and up-to-date picture of the current scientific understanding of evolution and its importance in the science classroom. In a January 4, 2008, press release, National Academy of Sciences President Ralph Cicerone was quoted as saying, “*Science, Evolution, and Creationism* provides the public with coherent explanations and concrete examples of the science of evolution. The study of evolution remains one of the most active, robust, and useful fields in science.”

As its title suggests, the book also addresses creationism in its various forms, including young-earth, old-earth, and “intelligent design” creationism, and concludes, “No scientific evidence supports these viewpoints.” Observing that “[c]reationism in its various forms is not the same thing as belief in God because ... many believers as well as many mainstream religious groups accept the findings of science, including evolution,” *Science, Evolution, and Creationism* also quotes both leading scientists of faith (including Francis Collins and NCSE Supporter Kenneth R. Miller) and religious leaders and groups (including the late Pope John Paul II and the over 10,000 signatories of the Clergy Letter Project), who see no conflict between their faith and science.

Science, Evolution, and Creationism takes a decidedly firm line on the necessity of including evolution in science education, warning, “Many teachers are under considerable pressure from policy makers, school administrators, parents, and students to downplay or

eliminate the teaching of evolution. As a result, many US students lack access to information and ideas that are both integral to modern science and essential for making informed, evidence-based decisions about their own lives and our collective future. ... Given the importance of science in all aspects of modern life, the science curriculum should not be undermined with nonscientific material.”

This third edition is twice as long as the second edition, issued in 1999. The current book was written by a committee including a number of NCSE Supporters and members and chaired by NCSE Supporter Francisco Ayala, the Donald Bren Professor of Biological Sciences at the University of California, Irvine, and the author most recently of *Darwin's Gift* (Washington [DC]: Joseph Henry Press, 2007).

After its release, stories about *Science, Evolution, and Creationism* appeared in such major media outlets as *The New York Times* (2008 Jan 4), Reuters (2008 Jan 3), ScienceNOW (2008 Jan 4), United Press International (2008 Jan 4), and the Associated Press (2008 Jan 3), which noted, “Josh Rosenau, a spokesman for the California-based National Center for Science Education, which supports the teaching of evolution, said the new report is important because the debate over evolution in school is not going away.”

Both NBC and ABC ran segments about the book on their nightly newscasts on January 3, 2008. Robert “Mac” West, a paleontologist and museum consultant who serves on NCSE's board of directors, told ABC's Dan Harris, “We don't want to be in the position of misleading our youngsters about what science is and what it can tell us about how the world works.” NCSE's deputy director Glenn Branch told NBC's Pete Williams, “This is a definitive statement from a leading scientific authority about the scientific bankruptcy of intelligent design creationism.”

The journal *Nature* offered three cheers on the publication of *Science, Evolution, and Creationism* in its January 10, 2008, editorial, remarking, “The document succinctly summarizes what is and isn't science, provides

an overview of evidence for evolution by natural selection, and highlights how, time and again, leading religious figures have upheld evolution as consistent with their view of the world,” and also citing Kevin Padian's testimony in *Kitzmiller v. Dover* as “a more specific and also entertaining account of evolutionary knowledge.”

In its January 12, 2008, editorial, *New Scientist* also praised the book, focusing on its avoidance of portraying science as opposed to religion (“The US is a religious country and, as Glenn Branch of the advocacy group National Center for Science Education points out, if the issue was ‘God versus science’ many Americans would choose God”) and its emphasis on the practical applications of evolutionary theory (“understanding evolution is critical to agriculture, medicine and specifically to tackling viruses such as SARS and HIV”).

Newspapers across the country took the opportunity presented by the publication of *Science, Evolution, and Creationism* to reaffirm their editorial commitment to the integrity of science education, including the *Seattle Post-Intelligencer* (2008 Jan 6), the *Tuscaloosa News* (2008 Jan 6), the *St. Louis Post-Dispatch* (2008 Jan 7), and the *Toledo Blade* (2008 Jan 9), which wrote, “Regrettably for American students caught in the middle, education on evolution could be watered down unless the National Academy of Sciences and others without a religious ax to grind get the last word.”

Copies of *Science, Evolution, and Creationism* are available from the National Academies Press (call 202-334-3313 or 1-800-624-6242; or visit the National Academies Press's website), for \$12.95; a PDF version is also available for free download at the National Academies Press's website (<<http://www.nap.edu/sec>>).

AUTHOR'S ADDRESS

Glenn Branch
NCSE
PO Box 9477
Berkeley CA 94709-0477
branch@ncseweb.org

NEWS

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Reaction from the Press

The forced resignation of Chris Comer — and its implications for the integrity of science education in Texas — elicited editorial comment from newspapers throughout Texas and across the country. Here is a sampling.

A RETREAT INTO THE DARKER AGES?

Is Texas about to become the next state to undermine the teaching of evolution? That is the scary implication of the abrupt ousting of Christine Comer, the state's top expert on science education. ... It was especially disturbing that the agency accused Ms Comer — by forwarding the e-mail message — of taking a position on “a subject on which the agency must remain neutral.” Surely the agency should not remain neutral on the central struggle between science and religion in the public schools. It should take a stand in favor of evolution as a central theory in modern biology. Texas's own education standards require the teaching of evolution. ... We can only hope that adherents of a sound science education can save Texas from a retreat into the darker ages.

— *The New York Times*,
December 4, 2007

EGREGIOUSLY WRONG

... from all appearances, Comer was pushed out because the agency is enforcing a political doctrine of strict conservatism that allows no criticism of creationism. ... terminating someone for just mentioning a critic of “intelligent design” smacks of the dogma and purges in the Soviet era. Forcing Comer out of her job because she passed on an e-mail about the critic's presentation is egregiously wrong. ... It looks like the Texas Education Agency has fallen victim to a smelly little orthodoxy, to quote author George Orwell. And that cannot be good for the schools or the schoolchildren of Texas. If this agency is indeed in the grip of an unforgiving political ideology, it bears close scrutiny by all Texans.

— *Austin American-Statesman*,
December 1, 2007

MORE THAN SAD

Comer was simply alerting people to a relevant presentation by a reputable education writer. ... Since Texas policy supports the inclusion of evolution in science curriculum, it's hard to see how Comer was violating state policy by circulating an event notice sent out by a group that also endorses teaching evolution. ... It will be more than sad if the Texas Education Agency is leaning toward taking an anti-evolutionary stance and allowing religious doctrine to be taught side by side with valid science in the state's classrooms.

— *Houston Chronicle*,
December 4, 2007

BE ON GUARD

Texas parents, teachers and lawmakers should be extremely upset over the recent dismissal of the Texas Education Agency's director of science curriculum ... Because the State Board of Education will review the state science curriculum next year and set standards for classroom instruction and textbook selection, Comer's abrupt removal could signal an opening for the insertion of creationism or intelligent design into science classrooms in Texas. Texas parents, teachers and lawmakers should be on guard that the state avoids the mistakes that led to the 2005 Dover PA lawsuit.

— *Waco Tribune*,
December 6, 2007

A WORRISOME TREND?

We hope this isn't the beginning of a worrisome trend within the new leadership of the TEA and State Board of Education ... If Ms Comer was incompetent, it's certainly not reflected by her 27-year career as a teacher and nine years of service as director of science. The impression we get is that her bosses were gunning for her, and the forwarded e-mail was the most expedient excuse they could find. This action could not have sent a worse message to our state's educators, when we should be doing everything possible to encourage people to choose teaching as a career, not frightening or bullying them into leaving.

— *Dallas Morning News*,
December 7, 2007

REPAIR THE DAMAGE

[T]here is no doubt that the e-mail incident riled an influential boss at TEA and played a role in Comer's resignation. ... Current science standards specify that students be taught biological evolution, and TEA Commissioner Robert Scott told us there is no reason to believe that new standards would not do the same. If that is true, then why shouldn't anyone at the agency be permitted to pass along information that is helpful in debunking myths about intelligent design? ... Instead of warning employees against standing up for science, TEA and the state board should be focused on repairing that damage and preventing it from spreading to the curriculum, where it could set back science education for Texas students.

— *Austin American-Statesman*,
December 8, 2007

STAND UP FOR HUMAN EVOLUTION

Human evolution — where would we be without it? And where, for that matter, would we be without the paleoanthropologists, archaeologists, and primatologists who have contributed, and continue to contribute, to our knowledge of the human career? Darwin's tentative prophecy in the *Origin of Species* — “Light will be thrown on the origin of man and his history” — now seems to have been ludicrously understated: evolutionary theory informs, pervades, and unifies these disciplines, helping us to understand our history as a species as never before. Recommended here is a sampling of recent books that discuss the information contained in the fossil record of hominins, the new revelations about human prehistory afforded by genomics, and the lessons to be learned about ourselves from studying our ape cousins. 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.

INTRODUCING HUMAN EVOLUTION

From Lucy to Language,
revised edition
by Donald Johanson and
Blake Edgar

Donald Johanson and Blake Edgar discuss human prehistory — from the appearance of bipedal walking to the origin of language — in a volume lavishly illustrated with original (and often life-size) photographs of fossils and artifacts. The first part of the book concentrates on the interpretation of the paleoanthropological evidence, considering such topics as migration, diversity, anatomy, society, bipedalism, tools, customs, and “imponderables” (such as clothing and the problem of consciousness). The second part comprehensively summarizes the evidence on which our knowledge of human prehistory is based. A revised, updated, and expanded edition, which *Scientific American*’s reviewer described as “even more awe-inspiring than the earlier version.”

The Human Career,
second edition
Richard G Klein

Simply the single best reference and advanced introduction to paleoanthropology — the subject of human biological and cultural evolution, the area where physical

anthropology and prehistoric archeology overlap. Writing in *Evolution*, Henry McHenry describes it as “by far the best book of its kind”; writing in *Antiquity*, RA Foley describes it as “the best introduction to the problems and data of modern palaeoanthropology yet published”. And no wonder: unmatched for breadth, range, and reliability, with more than 2500 references cited in 800 pages, *The Human Career* is indispensable for any serious student of human evolution.

Human Evolution: An Illustrated Introduction, fifth edition
by Roger Lewin

As Kenneth Kennedy writes, Roger Lewin is “one of the very few scientific journalists I know who has been successful in relating, with accuracy and an exciting writing style, the principles of paleoanthropology to a broad reading audience of scholars and laymen.” Unsurprisingly, then, his *Human Evolution* is a fine introduction to its subject. Containing brief but accurate accounts of contemporary research and results, as well as copious references and illustrations, it is eminently useful both as a general source of information and as a supplementary textbook. Lewin’s other books include *Bones of Contention* and (with Richard Leakey) *Origins Reconsidered*.

The Last Human
created by G J Sawyer and
Viktor Deak

From the publisher: “This book tells the story of human evolution, the epic of *Homo sapiens* and its colorful precursors and relatives. The story begins in Africa, six to seven million years ago, and encompasses twenty known human species, of which *Homo sapiens* is the sole survivor. Illustrated with spectacular, three-dimensional scientific reconstructions portrayed in their natural habitat developed by a team of physical anthropologists at the American Museum of Natural History and in concert with experts from around the world, the book is both a guide to extinct human species and an astonishing hominid family photo album.”

INVESTIGATING HUMAN PREHISTORY

The Great Human Diasporas
by Luigi Luca Cavalli-Sforza and
Francesco Cavalli-Sforza

The lifework of Luigi Luca Cavalli-Sforza has been to investigate the history of humanity through its genetic makeup; *The Great Human Diasporas*, written in collaboration with his filmmaker son and translated from the Italian, distills his prodigious scientific knowl-

edge into a form accessible to the general reader. A central chapter explains how Cavalli-Sforza used archaeological and genetic data to reconstruct the human population movements of the last ten thousand years (especially in Europe). *The Great Human Diasporas* also touches on the fundamentals of evolutionary theory as well as issues of eugenics, linguistics, racism, and genetic engineering.

Mapping Human History

by Steve Olson

From the publisher: "In this sweeping narrative of the past 150 000 years of human history, Steve Olson draws on new understandings in genetics to reveal how the people of the world came to be. ... He shows how groups of people differ and yet are the same, exploding the myth that human races are a biological reality while demonstrating how the accidents of history have resulted in the rich diversity of people today. Celebrating both our commonality and our variety, *Mapping Human History* is a masterful synthesis of the human past and present that will forever change how we think about ourselves and our relations with others."

The Seven Daughters of Eve

by Bryan Sykes

From the publisher: *The Seven Daughters of Eve* reveals the remarkable story behind a groundbreaking scientific discovery. After being summoned in 1997 to an archaeological site to examine the remains of a five-thousand-year-old man, Bryan Sykes ultimately was able to prove not only that the man was a European but also that he has living relatives in England today. In this lucid, absorbing account, Sykes reveals how the identification of a particular strand of DNA that passes unbroken through the maternal line allows scientists to trace our genetic makeup all the way back to prehistoric times, to seven primeval women, the Seven Daughters of Eve."

Deep Ancestry: Inside the Genographic Project

by Spencer Wells

In *Deep Ancestry*, Spencer Wells, the director of the National

Geographic Society's Genographic Project, clearly explains the science behind the project — which is collecting DNA from a wide sample of the world's population in order to understand the evolution of the human genome — and also engagingly relates the stories of five of its volunteers. Describing the book as "concise and well-written," the reviewer for *Publishers Weekly* writes, "It is a remarkable journey that will appeal to readers of all backgrounds interested in exploring the science and research behind human evolution." Wells's first book was *The Journey of Man*.

HUMANS AND THEIR KIN

Our Inner Ape

Frans de Waal

In *Our Inner Ape*, Frans de Waal — a leading primatologist — entertainingly and thoughtfully ponders what we can learn about ourselves from the behavior of our closest relatives: chimpanzees and bonobos. NCSE's Anne D Holden writes (in *RNCSE* 2007 Sep-Dec; 27 [5-6]: 45-6), "de Waal's argument that humans exhibit important qualities of both chimpanzees and bonobos is well-developed, organized, and is complemented by excellent examples from his years in close contact with these animals. As a result, the reader is left with a solid understanding of what it means to be human, as well as what it means to be an ape."

Tree of Origin

edited by Frans de Waal

Nine primatologists — Richard W Byrne, Robin IM Dunbar, William C McGrew, Anne E Pusey, Charles T Snowdon, Craig B Stanford, Karen B Strier, and Richard W Wrangham — consider the implications of primate behavior for understanding human evolution. Topics of the individual essays include reproduction, food and diet, tool use, intelligence, communication and language, and culture. "If you want a source that cogently discusses human intelligence in the context of the behavior of other primates," writes Ian Tattersall, "*Tree of Origin* is the place to turn."

What It Means to Be 98 Percent Chimpanzee: Apes, People, and Their Genes

by Jonathan Marks

Matt Cartmill writes, "In this clever, entertaining, and thoughtful book, Marks lays out some important limitations of science in general and genetics in particular. Using terms that everybody can understand, he demolishes the pretensions of scientists who try to use genetics to answer questions about the kinship of nations, the rights of animals, the racial identity of Kennewick Man, the hereditary Jewish priesthood, and the existence of God. Marks has a lot of fun with all this — and so will his readers." A member of NCSE, Marks teaches at the University of North Carolina at Charlotte.

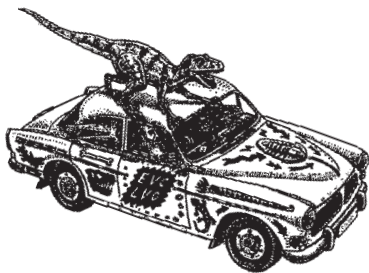
Significant Others: The

Ape-Human Continuum and the Quest for Human Nature

by Craig Stanford

Stanford, a veteran field primatologist, argues "that the gap between apes and humans is very narrow indeed, and the insistence on seeing it as vast and unbridgeable is more a product of fashion and prejudice than of clear thinking." Divided into three sections, dealing with "the forces that drive the societies of great apes and other primates," "contentious questions about the connection of great ape behavior to our understanding of what people do," and "the fate of the apes". The author is professor of anthropology at the University of Southern California and codirector of the Jane Goodall Research Center.





NCSE on the Road

A CALENDAR OF SPECIAL EVENTS, PRESENTATIONS, AND LECTURES

DATE August 21, 2008
CITY Chautauqua NY
PRESENTER Eugenie C Scott
TITLE TBA
EVENT Darwin, Linnaeus, and Their Impact on Our View of the Natural World program
TIME 2:00 PM
LOCATION Chautauqua Institution
CONTACT Maureen Novengo, mrovengo@ciweb.org

DATE September 11, 2008
CITY Oxford OH
PRESENTER Eugenie C Scott
TITLE Science, Evolution, and Religion
EVENT Public lecture
TIME 4:30 PM
LOCATION Hall Auditorium, Miami University of Ohio
CONTACT Mary Jane Berman, bermanmj@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

NCSE SPEAKERS AVAILABLE

NAME Eugenie C. Scott
TITLE NCSE Executive Director
CONTACT scott@ncseweb.org

NAME Andrew J Petto
TITLE NCSE Board Member
CONTACT editor@ncseweb.org

NAME Glenn Branch
TITLE NCSE Deputy Director
CONTACT branch@ncseweb.org

NAME Philip Spieth
TITLE NCSE Director of Operations
CONTACT spieth@ncseweb.org

NAME Joshua Rosenau
TITLE NCSE Public Information Project Director
CONTACT rosenau@ncseweb.org

NAME Susan Spath
TITLE NCSE Public Information Project Director
CONTACT spath@ncseweb.org

NAME Peter MJ Hess
TITLE NCSE Faith Project Director
CONTACT hess@ncseweb.org

NAME Louise S Mead
TITLE NCSE Education Project Director
CONTACT mead@ncseweb.org

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

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A New Standard in Florida: Evolution is Fundamental

Glenn Branch
NCSE Deputy Director

The recent battle over the place of evolution in Florida's state science standards wasn't *quite* ripped from the pages of a Carl Hiaasen novel — as far as I could tell from my office in California, at any rate, there were no greedy developers, lubricious politicians, or redneck gangsters involved, and no feral ex-governors emerging from the swamp to save the day. But zaniness was abundant among the creationist opponents of the standards, from the fellow who testified that, according to evolution, oranges are "the first cousin to somebody's pet cat," to the student who argued that evolution was unprovable because "no one was around 6000 years ago." (Then who was it who left a bottle gourd at the Windover site outside Titusville, Florida, about 7290 years ago?) Ultimately, however, on February 19, 2008, the state board of education voted to accept a new set of state science standards that recognize evolution as a fundamental concept underlying all of biology.

That's quite a change. The previous set of state science standards sedulously avoided even using the e-word, and when the Thomas B. Fordham Foundation conducted its review of state science standards in 2005, it commented, "The superficiality of the treatment of evolutionary biology alone justifies the grade 'F'." But hostility toward evolution education in the Sunshine State is nothing new: after William Jennings Bryan retired to Florida in 1920, he lobbied for legislation prohibiting "the teaching as true of Darwinism or any other evolutionary hypothesis that links man in blood relation with any form of animal life below man." Bryan was only partly successful; in 1923, the legislature passed a resolution that described such teaching as "improper and subversive," but stopped short of prohibiting it altogether. Two years later, the Tennessee legislature passed a law outright banning the teaching of evolution, and the Great Commoner eventually

hailed himself from Florida to Dayton, Tennessee, for the trial of John Thomas Scopes.

Note, in Bryan's proposal, the phrase "as true." In a letter to a Florida state senator (quoted in Edward J. Larson's excellent *Trial and Error*), he explained, "A book which merely mentions [evolution] as a hypothesis can be considered as giving information as to views held, which is very different from teaching it as fact." Bryan died just after the Scopes trial, but his position — that it's okay to teach about evolution, but only as a theory, something conjectural or speculative, and not as a fact — continues to resonate. Creationists who weren't pressing for creationism (whether in the old-fashioned form of creation science or in the new-fangled form of intelligent design) to be added to the Florida state science standards were following Bryan in trying to stigmatize evolution as just a theory. A father in the Panhandle gave a Möbian twist to the slogan, saying of his daughters, "I just don't want them to hear a one-sided fact."

As the biologist T. Ryan Gregory recently observed, "That evolution is a theory in the proper scientific sense means that there is both a fact of evolution to be explained and a well-supported mechanistic framework to account for it. To claim that evolution is 'just a theory' is to reveal both a profound ignorance of modern biological knowledge and a deep misunderstanding of the basic nature of science." Nevertheless, responding to the creationist pressure in Florida, someone — the details are still hazy — proposed a revision, just days before the state board of education was scheduled to vote on the new state science standards. The proposed changes involved inserting the phrase "the scientific theory of" before mentions of evolution. As the *Orlando Sentinel* reported, "By adding the word theory, which many opponents of the standards had argued for, the new version may appease those who do not view evolution as a scientific fact or those whose religious beliefs are in conflict with evolution."

Clumsy, unnecessary, and apparently opposed by a majority of the writing committee, the revisions were accepted anyway, despite a valiant effort on the part of board member Roberto Martinez, who described the revisions as "an effort by people to water down our standards." As the dust settled, though, it was increasingly clear that the revisions did not, after

all, succeed in materially compromising the scientific integrity of the standards. Evolution wasn't invidiously singled out for attention: plate tectonics, cell theory, atomic theory, electromagnetism, and the Big Bang all received the same treatment. Evolution is still described, correctly, as "the organizing principle of life science" and as "supported by multiple forms of evidence." And the standards distance themselves from the pejorative sense of "theory" that creationists from Bryan onward like to exploit: "a scientific theory is the culmination of many scientific investigations drawing together all the current evidence concerning a substantial range of phenomena; thus, a scientific theory represents the most powerful explanation scientists have to offer."

Small wonder, then, that Florida Citizens for Science rejoiced: "Florida won! Science education won! Teachers, students, Florida's future economy, etc. all won! No, it wasn't a clean victory, but it was a victory nonetheless." And small wonder, then, that Donna Callaway, the most strident voice against evolution on the board of education, lamented, "Evolution won." But the battle isn't over yet: a handful of state legislators have threatened to introduce legislation to amend the standards. In late January, the *St. Petersburg Times's* Ron Matus interviewed the chair of the House Schools and Learning Council, Joe Pickens (R-Palatka) about the prospect of such legislation. "Among scientists, there is virtually no debate about the fundamental soundness of Darwin's theory," Matus reported, before quoting Pickens as saying, "most of the people who are our constituents, and who vote for us, are not scientists." It's to be hoped, though, that even Floridians who aren't scientists still care about the integrity of science education enough to let their representatives know.



AUTHOR'S ADDRESS

Glenn Branch
NCSE
PO Box 9477
Berkeley CA 94709-0477
branch@ncseweb.org

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UPDATES

California, Ventura County:

Citing a need to take care of his elderly parents, Ron Matthews resigned from his post on the Ventura County Board of Education before the end of his third four-year term, according to the *Ventura Star* (2008 Feb 8). Matthews told the newspaper that one of his successes was keeping “the dialogue for ‘intelligent design’ open”: “He said he wanted the county board to take a stand and send a resolution in support of creationism to the state Board of Education, which sets policy for state schools. He said he knows the county board alone couldn’t have succeeded in adding creationism or ‘intelligent design’ to science curriculum. The law forbids it, even if the county board had supported the move.” In 2007, Matthews was the sole member of the board to vote against adopting a seventh-grade science textbook that was opposed by local creationists (see *RNCSE* 2007 Jan-Apr; 27 [1-2]: 4-9); in previous years, he expressed interest in teaching creationism alongside evolution (see *RNCSE* 2004 Sep/Oct; 24 [5]: 12-5; 1999 Nov/Dec; 19 [6]: 9-12). Such a change would have directly affected only the educational programs supervised by the board — special education, job-training, and juvenile offender programs — but, Matthews hoped, would have inspired local school districts to follow suit.

Colorado, Boulder: A harassment campaign against evolutionary biologists at the University of Colorado, Boulder, is, perhaps, over. In July 2007, threatening notes marked with skulls and crossbones and comparing biology professors to child molesters were e-mailed to and left at laboratories in the Ecology and Evolutionary Biology Department on the University of Colorado, Boulder, campus (see *RNCSE* 2007 May-Aug; 27 [3-4]: 6-9). The chief suspect, Menachem (or Michael) Korn, disappeared, only to send e-mail to the biology department in November 2007, railing wildly

against capitalism, communism, Darwinism, and Zionism. The *Colorado Daily* (2008 Jan 17) reported that on December 6, 2007, officials at the university sent a letter by e-mail to Korn, telling him not to contact faculty any more and warning that the university would initiate civil proceedings against him otherwise. Korn wrote in response, “i [sic] have read your letter and understand its terms. ... i appreciate your warning, and i will heed it even as i am saddened by the refusal of the CU faculty to conduct open and honest discourse on this matter.” He neither admitted nor denied having threatened the professors, but acknowledged calling a professor a child molester and having entered university buildings. According to the *Daily*, one of the professors targeted by Korn, Jeffrey B Mitton, previously sought to obtain a restraining order against Korn, but he could not be located: “Various leads pointed to Korn[’s] being in Denver, Nederland, Kansas City, North Carolina, or Israel.”

Florida: After she was passed over for the job of Education Commissioner of Florida, Cheri Pierson Yecke decided to step down from her present job as K-12 Chancellor at the Florida Department of Education, accord-

ing to the *Orlando Sentinel’s* education blog (2007 Dec 20). The new Education Commissioner of Florida, Eric Smith, appointed Frances Haithcock, a former administrator for Broward County Public Schools, as Yecke’s replacement. The *Sentinel’s* blog reported, “Yecke is in negotiations for a job at the ‘university level’ but does not want to say more yet, officials said.” While Commissioner of Education in Minnesota, Yecke was widely criticized for comments supporting creationism (see *RNCSE* 2003 May-Aug; 23 [3-4]: 5-10); in 2004, she was not confirmed, and thus immediately removed from office, by the state senate (see *RNCSE* 2004 Mar/Apr; 24 [2]: 14-7). She was dogged by her record in Florida, both after her appointment in 2005 by then-governor Jeb Bush and as she sought the post of Education Commissioner, although she was among the three finalists for the job (see *RNCSE* 2007 Sep-Dec; 27 [5-6]: 20-1).

Massachusetts: The *Boston Globe* (2007 Dec 7) reported that a former researcher at Woods Hole Oceanographic Institution is suing the research center, claiming that he was fired, in violation of his civil rights, for not accepting evolution. Nathaniel Abraham, who earned a PhD in biology from St John’s University in 2005, was employed as a post-doctoral researcher in the laboratory of Mark Hahn; according to the *Globe*, “He was hired by Hahn’s marine biology lab in March 2004 because of his expertise working with zebra fish and in toxicology and developmental biology, according to court documents. He did not tell anyone his creationist views before being hired.”

Abraham’s views become apparent to Hahn in a casual conversation in October 2004, however, and the next month, Hahn asked him in a letter to resign, citing Abraham’s “wish not to work on evolutionary aspects of my grant” and writing, “You have indicated that you do not recognize the concept of biological evolution and



FLORIDA PUBLIC MEETING VIDEO

For those interested in seeing the blow-by-blow of the Florida board of education’s debate over the Sunshine State’s new state science standards, which now include the e-word for the first time, visit <http://www.fldoe.org/board/meetings/2008_02_19/meetingArchive.asp>. And the next issue of *RNCSE* will contain a detailed report by Josh Rosenau on the controversy over evolution in the standards.

you would not agree to include a full discussion of the evolutionary implications and interpretations of our research in any co-authored publications resulting from this work. ... This position is incompatible with the work as proposed to NIH and with my own vision of how it should be carried out and interpreted."

In June 2006, Abraham filed a complaint with the Massachusetts Commission Against Discrimination, which ruled against him in April 2007, stating that there was insufficient probable cause to find that Hahn and Woods Hole engaged in unlawful discriminatory practices. Represented by two lawyers, including David C Gibbs III of the Christian Law Association (which seeks "to provide free legal assistance to Bible-believing churches and Christians who are experiencing legal difficulty in practicing their religious faith"), Abraham then filed suit in federal district court on November 30, 2007, alleging that his rights were violated under Title VII of the Civil Rights Act of 1964 and seeking compensatory and punitive damages.

In his complaint, Abraham claimed that acceptance of evolution "was in no way a *bona fide* occupational qualification of employment, was not previously mentioned or implied as a requisite of hiring, and was never listed among necessary criteria for the advertised position." In his November 2004 letter to Abraham, however, Hahn wrote, "The research proposed ... has as its foundation the orthologous and paralogous (i.e. evolutionary) relationships among aryl hydrocarbon receptor signaling proteins in the various species proposed as models. The importance of these relationships is clearly evident in our previous papers, which were cited in the advertisement for the position, and in the grant proposal itself."

NCSE's executive director Eugenie C Scott told the *Globe*, "It is inconceivable that someone working in developmental biology at a major research institution would not be expected to deal intimately with evolution. ... A flight school hiring instructors wouldn't ask whether they accepted that the earth was spherical; they

would assume it. Similarly, Woods Hole would have assumed that someone hired to work in developmental biology would accept that evolution occurred. It's part and parcel of the science these days." And the philosopher Michael Ruse was quoted as asking, "what is a person doing in an evolutionary lab when they don't believe in evolution ... and didn't tell anybody they didn't believe in evolution?"

South Carolina: The South Carolina board of education voted on January 9, 2008, to add Kenneth R Miller and Joseph Levine's popular high school textbook *Biology*, published by Prentice-Hall, to the official list of textbooks approved by the state. "Science teachers from across the state erupted in applause after the vote," the Associated Press (2008 Jan 9) reported. At its previous meeting, on December 12, 2007, the board withheld its approval of the book after receiving a critique of it from a retired professor at Clemson University, even though it was approved by the state's high school biology textbook evaluating committee and even though a previous edition of the book is already used in roughly half of South Carolina's public high schools.

The critique focused almost entirely on the textbook's treatment of evolution, complaining of Darwin's lack of scientific credentials, adducing the subtitle of the *Origin of Species* as evidence for Darwin's racism, and alleging problems with the book's discussion of vestigial organs, developmental homologies, and the origin of life. In a written response, after responding to the critique point by point, Miller concluded, "Although the reviewer has made a few helpful criticisms which we will be glad to incorporate in our text, the concerns and objections to the treatment of evolution in our textbook expressed by this reviewer are without scientific merit."

Miller also attended the January 2008 meeting of the board to defend his textbook. *The State* (2008 Jan 10) reported, "He said his presentation about how to teach evolution, survival of the fittest, the origin of species and fossil records can be backed up by widely recognized research over the past 150

years." Also speaking in defense of the textbook were Jerry Waldvogel of Clemson University, who presented a statement signed by 130 members of the Clemson faculty repudiating the critique; Linda Mobley, the chair of the state's high school biology textbook evaluating committee; and Robert T Dillon Jr of the College of Charleston, the president of South Carolinians for Science Education.

Miller and Levine's textbook was finally approved on a voice vote; it is unclear what the tally was — *The State* reported it as 10-6; the Associated Press reported it as 9-7. In any case, one of the majority, Trip DuBard, told the Associated Press, "It's almost shameful to me that we're spending so much time questioning whether evolution should be taught in school in 2008." The victory for science education was not complete, however: a college-level textbook used in high school advanced placement biology classes — Raven, Johnson, Losos, and Singer's *Biology*, published by McGraw-Hill — was similarly attacked in December 2007 and then withdrawn by the publisher.

Details on the whole episode, including the critique and Miller's response as well as video from the January 2008 meeting of the board of education, are available on South Carolinians for Science Education's website: <<http://www.sc-scied.org/>>.

Texas: Facing possible bankruptcy, Joe Taylor, the proprietor of the creationist Mt Blanco Fossil Museum in Crosbyton, Texas, decided to part with one of his treasures: Lone Star, a four-tusked mastodon skull found in a gravel pit in La Grange, Texas, reportedly the largest of its kind yet discovered. The fossil was sold at auction on January 20, 2008; according to the *Dallas Morning News* (2008 Jan 21), the final bid was \$191 200, with 19.5% going to the auction house. Other items were auctioned off as well, including "a 30-million-year-old fossilized lizard found in the Dominican Republic and encased in perfectly preserved amber," which sold for \$143 440. Before the auction, the Associated Press (2008 Jan 17) reported that Taylor needed the money because



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!

NCSE congratulates **Bruce Alberts** of the University of California, San Francisco, on his appointment as editor-in-chief of *Science*, published by the American Association for the Advancement of Science. He suc-

ceeds **Donald Kennedy**, who served as editor-in-chief since 2000. According to a December 21, 2007, report in *Science*, “Alberts, 69, earned a doctorate from Harvard University in 1965, spent 10 years on the faculty of Princeton University, and moved to UCSF in 1976. He has published more than 150 research papers and is one of the original authors of a leading textbook, *Molecular*

Biology of the Cell. He served two terms as president of the National Academy of Sciences, from 1993 to 2005. Then he returned to UCSF to continue working on issues he emphasized during his tenure at the academies: internationalizing science — especially building links to scientists in the developing world and strengthening scientific infrastructures — and improving science education.” A Supporter of

UPDATES

he was ordered to pay \$136 000 in a legal dispute over finder’s rights to a fossil discovered in Colorado: “If the mastodon auction doesn’t cover the judgment, Taylor said local authorities will seize his museum and sell off its contents in February. Taylor said the closure of his museum would leave an irreplaceable void [!] in creationist education.” Even the proceeds of the auction may not be enough, however; the Associated Press reported, “But Taylor also said he doesn’t know how long the museum can stay afloat. ‘We’ve struggled so long here just to keep this thing going,’ Taylor said. ‘We’re kind of losing interest. You can just tread water for so long.’”

Switzerland: A report from Swiss Radio International (2007 Nov 28) indicates that there was a controversy over creationism in the public schools in the Canton of Berne. Either a textbook or a brochure included in the textbook (the report is unclear) contained a passage that “presented creationism and evolution as two ways of ‘explaining’ the origin of the universe and life on earth. Critics of teaching creationism in science classes say it suggests there is a controversy when there isn’t one since evolution has been proven beyond all reasonable doubt.” The passage was subsequently revised. At 28%, the rate of rejection of evolution in Switzerland is high compared to the rest of Europe (see Jon D Miller, Eugenie C Scott, and

Shinji Okamoto’s 2006 article “Public acceptance of evolution,” *Science* 313 [5788]: 765–6), and the country is home to Pro Genesis, a young-earth creationist group that is hoping to build a Genesis theme park. Interviewed for the report was Martin Scheidegger, a Protestant pastor and expert on evangelical movements and sects. “According to Scheidegger, evangelical Christian churches are the driving force behind a literal translation of the book of Genesis and the rejection of evolution. He says more Swiss are joining these movements, even if their popularity is still limited. According to the most recent poll, 2.2% of Switzerland’s 7.5 million inhabitants belong to a free (non-state recogni[z]ed) church.”

United Kingdom, Northern Ireland: The creationism/evolution debate in Northern Ireland, lately manifest in the Belfast suburb of Lisburn (see *RNCSE* 2007 Sep–Dec; 27 [5–6]: 24), seems now to be expanding to the Giant’s Causeway. Reportedly the most popular tourist attraction in Northern Ireland, the causeway was constructed by Fionn mac Cumhail (Finn McCool) to provide a route for him to travel to Scotland to fight the Scottish giant Benandonner — although geologists obstinately regard the interlocking hexagonal basalt columns as the product of volcanic activity in the Paleogene period, between 65 and 23 million years ago. Now a

third view is on offer. According to the *Belfast Telegraph* (2007 Nov 30), “momentum is growing in Ulster for an alternative theory of the origin of the causeway; one which echoes a wider and deepening dispute between conventional evolutionary science and fundamental Christianity.” A young-earth creationist organization called the Causeway Creation Committee is lobbying for the inclusion of leaflets expounding a creationist account of the causeway at the causeway visitor center and at similar tourist sites; it is also hoping for a revision of exhibitions in the Ulster Museum. Asked by a member of parliament for her assessment of the age of the causeway, the Environment Minister Arlene Foster ambiguously answered, “Geologists generally agree that the Giant’s Causeway is some 60 million years old. As you will be aware, however, there are alternative views in relation to the age of the Giant’s Causeway.” The causeway itself is owned and managed by the National Trust. “But a longer term goal for the committee,” the *Telegraph* added, “is to have intelligent design theories taught as science as part of the curriculum in our schools. Its website states: ‘We also desire to see the fact of ‘Intelligent Design’ being taught alongside the Theory of Evolution in our local schools.’”

[NCSE thanks Sean Mabey for information used in this article.]

NCSE, Alberts received its Friend of Darwin award in 2004, in recognition of his support of and advocacy for the integrity of science education while at the National Academy of Science, when it published both *Teaching about Evolution and the Nature of Science* (1998) and the second edition of *Science and Creationism* (1999).

On November 10, 2007, **Daryl Domning** of Howard University spoke at a public symposium, which he co-organized, on “Evolution and Racial Equality” sponsored by the Washington Theological Consortium and its Science and Religion Faculty Discussion Group, and held

at the Washington Theological Union in Washington DC. The event was part of the run-up to the 2009 joint bicentennial celebration of the births of Charles Darwin and Abraham Lincoln (both were born on February 12, 1809) being organized by the Alliance for Science. The other speakers were **Erik P Scully** of Towson State University and Irving Wainer of the National Institutes of Health and chairman of Alliance for Science’s board of directors. A lively and enjoyable discussion ensued among the two to three dozen attendees, Domning reports.

Daryl Domning also collaborated with the Reverend Joseph F Wimmer to produce “Evolution

and Original Sin: Accounting for Evil in the World” — a discussion guide on original sin in which they seek to “recount the history of this doctrine, discuss what theologians are saying about it today, describe evidence from evolutionary biology that gives important new insights into human nature, and outline a new way of thinking about original sin that does justice to both modern science and the Christian tradition.” They add, “We take the position that, although the story of Adam and Eve can no longer be understood as literal history, the doctrine of original sin itself is more clearly true now than ever before. The doctrine of origi-

NCSE’s New Logo

Carrie Sager, NCSE



This issue marks the first appearance of NCSE’s new logo in *RNCSE*. In July 2007, NCSE’s board of directors decided to consider replacing or re-imagining our logo. NCSE invited our members and other interested individuals to submit designs for a new logo for the board’s consideration.

To give the widest scope for the creativity of our participants, we gave only a very general set of guidelines. We asked that entries not contain misleading motifs, such as the image of marching hominins (evolution is a branching process). We also asked participants to try to avoid images that are overused, like dinosaurs, and warned that skeletons in general evoke the image of death for many people and are thus unsuitable. However, these were guidelines, not rules; one submission used both dinosaurs and a skeleton, and it was selected as a finalist.

Submissions ranged from abstract symbols to photographic montages. Several people submitted re-imaginings of our old logo; DNA and trees of life were other popular themes. A number of people submitted logos with apples, presumably to represent education; unfortunately, the apple also has certain biblical implications that we would rather avoid!

The winning entry is by graphic artist Andrew Conti. He described his entry as follows:

I have taken Charles Darwin’s original notebook sketch of the tree of life and reworked it with rounded and more organic lines. By

doing so, it is my intention to give a sense of open-minded and creative playfulness, while at the same time tying a direct link to the science and history of scientific understanding that is the focus of the NCSE.

All of us in the NCSE family extend our gratitude to Conti and our deepest thanks to all our participants for their continuing support of NCSE and science education.

AUTHOR’S ADDRESS

Carrie Sager
NCSE
PO Box 9477
Berkeley CA 94709-0477
sager@ncseweb.org

nal sin remains central to the Christian view of our nature and our need for salvation. While not derivable from science, it is fully in accord with scientists' present understanding of the cosmos and humanity." Produced under the auspices of the Washington Theological Consortium, the guide is available on-line at <<http://www.congregationalresources.org/EvolutionOriginalSin/About.asp>>. Domning is the coauthor (with Monika K Hellwig) of *Original Selfishness: Original Sin and Evil in the Light of Evolution* (Aldershot [United Kingdom]: Ashgate, 2006; reviewed in *RNCSE* 2007 Jan-Apr; 27 [1-2]: 54-5).

Taner Edis contributed "Islamic creationism: A short history" to the newsletter of the History of Science Society (2008 Jan; 37 [1]; available on-line at <<http://www.hssonline.org/publications/Newsletter2008/NewsletterJanuary2008Creationism.html>>). "Islam has been the world religion that has proved most resistant to Darwinian evolution," Edis wrote. "Creationist distortions of science enjoy considerable support among modern Muslims. Among devout Muslim intellectuals, anti-evolutionary views are not fringe ideas but mainstream options. And Islamic versions of creationism have enjoyed official support to a degree that is the envy of American creationists. In many ways, the world's most successful creationists are those who rise up to defend Islam, not Christianity." Edis, who teaches physics at Truman State University, is also *RNCSE's* associate editor for physics; his most recent book is *An Illusion of Harmony: Science and Religion in Islam* (Amherst [NY]: Prometheus Books, 2007). [*Thanks to Larry Lerner for the news.*]

Donald Kennedy was presented with the Public Understanding of Science Award from the Exploratorium. Founded by physicist and educator Frank Oppenheimer in 1969, the Exploratorium (located in San Francisco) has achieved worldwide recognition as the prototype for hands-on science museums around the world; it serves over 500 000 annual museum visitors

from around the world. The Bing Professor of Environmental Science and President Emeritus at Stanford University, Kennedy recently stepped down as editor-in-chief of the journal *Science*, published by the American Association for the Advancement of Science; his successor is NCSE Supporter **Bruce Alberts** (see above).

Adding to the chorus of informed criticism of Michael Behe's latest book, *The Edge of Evolution* (New York: Free Press, 2007), was **Nick Matzke**, writing in *Trends in Ecology and Evolution* (2007 Nov; 22 [11]: 566-7). In his brief review, Matzke focuses on Behe's central thesis, that "anything as complex as a three-protein complex is beyond the reach of random mutation aided by natural selection," and contends that Behe's argument "collapses at every step," concluding that "Behe is driven not by a truly scientific investigation, but instead by metaphysics." Writing on The Panda's Thumb blog (2007 Oct 27; <<http://www.pandas-thumb.org/archives/2007/10/behe-review-in-tree.html>>), Matzke commented, "There are a great many things wrong with Behe's book, and attempting to hit the most important points effectively, with just 750 words to work with, was quite a challenge."

Because a preprint version of his review was available on-line, both on the *Trends in Ecology and Evolution* website and at The Panda's Thumb blog (2007 Oct 30; <<http://pandas-thumb.org/archives/2007/10/full-text-of-th.html>>), before the official version was published, Behe was able to respond to Matzke's review on his own blog. In Matzke's rejoinder posted on The Panda's Thumb (2007 Nov 6; <<http://www.pandas-thumb.org/archives/2007/11/behe-replies-to.html>>), he summarizes, "By my count, Behe only bothered to give it a try on 3/8 points, only gave it a significant shot on one, and was easily shot down on all three. If anyone wonders why Behe has repeatedly failed to convince when he has informed opposition — for example, in the scientific community, or in court — now you have your

answer. He gives excuses rather than answers, and when problems are pointed out, he mostly just hopes that his fans will remain ignorant of them."

Now a graduate student in the Department of Integrative Biology at the University of California, Berkeley, Matzke worked for NCSE from 2004 to 2007. While at NCSE, he coauthored articles for *Nature Immunology*, *Nature Reviews Microbiology*, *Proceedings of the National Academy of Sciences* (USA), and *Not in Our Classrooms*, and contributed a chapter to the new edition of *But Is It Science? The Philosophical Question in the Creation/Evolution Controversy* (Amherst [NY]: Prometheus Books, forthcoming). *Seed* magazine profiled him in 2006 as one of its nine "Revolutionary Minds." And he was the lead NCSE staffer working on the *Kitzmiller v Dover* case, providing a wealth of scientific expertise and practical advice to the legal team representing the ultimately victorious plaintiffs.

For **David E Levin's** review of *The Edge of Evolution*, see *RNCSE* 2007 Jan-Apr; 27 [1-2]: 38-40. Further members and Supporters of NCSE who have reviewed the book include **Sean B Carroll**, **Jerry Coyne**, **Kenneth R Miller**, and **Michael Ruse** (for a summary, see *RNCSE* 2007 May-Aug; 27 [3-4]: 11-4) and **Paul R Gross** (for a summary, see *RNCSE* 2007 Sep-Dec; 27 [5-6]: 27-30). Also worth reading are Richard Dawkins's no-holds-barred review from *The New York Times* Sunday Book Review (2007 Jul 1) and Neal W Blackstone's review in *The Quarterly Review of Biology* (2007 Dec; 82 [4]: 412-4).

NCSE Supporter **Richard Lewontin** reviewed **Stephen Jay Gould's** posthumous *The Richness of Life* (New York: WW Norton, 2007) and *Punctuated Equilibrium* (Cambridge [MA]: Belknap Press, 2007) for *The New York Review of Books* (2007 Feb 14; 55 [2]: 39-41). "There is hardly a chapter in the main body of *The Richness of Life* that does not repay a careful reading," Lewontin wrote; he described the topic of *Punctuated Equilibrium* as "Gould's main claim to profession-



al fame.” Lewontin is the Alexander Agassiz Research Professor at Harvard University.

Randy Moore reviewed *Not in Our Classrooms: Why Intelligent Design is Wrong for Our Schools* for *BioScience* (2007 Nov; 57 [10]: 885–6), writing, “*Not in Our Classrooms* is a small, impressive book that will be a valuable resource for anyone interested in the various aspects of ‘intelligent design’ and the evolution-creationism debate.” He was especially enthusiastic about **Eugenie C Scott’s** contribution (“one of the best summaries available for the history of the modern controversy”) and Jay Wexler’s contribution on the legal issues surrounding the evolution/creationism (“should be required reading for all teachers, school administrators, and school-board members”). Moore concluded, “*Not in Our Classrooms* is a powerful, accessible introduction to the many facets of intelligent design. ... If you read just one book about this subject, read this one. Then give the book to others and urge them to do the same.” Moore is a professor of biology at the University of Minnesota. *Not in Our Classrooms* was edited by NCSE’s executive director **Eugenie C Scott** and deputy director **Glenn Branch**, and contains essays by them as well as by **Nicholas J Matzke** and **Paul R Gross**, Martinez Hewlett and Ted Peters, Jay D Wexler, and **Brian Alters** (a member of NCSE’s board of directors). The foreword was contributed by the Reverend **Barry W Lynn** of Americans United for Separation of Church and State. Praising the book, **Bill Nye** the Science Guy wrote, “If you’re concerned about scientific literacy, read this book. The authors of *Not in Our Classrooms* are authorities on the various battles fought over the teaching of evolution — biology’s fundamental discovery.”

Randy Moore also contributed “Creationism in the biology classroom: What do teachers teach and how do they teach it?” to *The American Biology Teacher* (2008 Feb; 70 [2]: 79–84), reporting on a survey he conducted among students at the University of Minnesota’s Twin Cities campus.

Encouragingly, 80% of respondents “believe that evolution has a valid scientific basis and want evolution to be taught in public schools”. Less encouragingly, 24% of their high school biology teachers included both evolution and creationism, while 22% included neither; and 54% of respondents who were taught creationism were taught that creationism is a scientific alternative to evolution. Moore concluded, “there’s no reason to believe that continued scientific evidence, professional standards, court decisions, or anything else will stop some teachers from substituting their personal religious beliefs for science and, in the process, cheating students out of an understanding [of] the unifying theory of the history of life on Earth.” Of interest in the same issue was Jane Butler Kahler’s editorial “Science or pseudo-science: Yes, it matters!” (70–1), using the fuss over the newly opened Creation Museum in northern Kentucky as a springboard to review the history of the response of the National Association of Biology Teachers (which publishes *The American Biology Teacher*) to creationism.

Preparing for the impending bicentennial of Darwin’s birth, the journal *Nature* (451: 632–4) commissioned **Kevin Padian** to consider Darwin’s enduring legacy. “As we prepare to mark next year the 200th anniversary of Darwin’s birth and the 150th of the publication of *On the Origin of Species*,” Padian wrote, “it is an opportune time to reflect on just what constitutes Darwin’s enduring greatness in Western thought.” He proceeded to discuss ten topics — natural selection, one tree of life, genealogical classification, selective extinction, deep time, biogeographical distributions, sexual selection, coevolution, economy of nature, and gradual change — before wondering, “has any single individual made so many lasting contributions to a broad area of science as Darwin did to biology?”

Acknowledging that comparisons are impossible, Padian concluded, “Darwin moved intellectual thought from a paradigm of untestable wonder at special creation to an ability to examine the workings of that natural world,

however ultimately formed, in terms of natural mechanisms and historical patterns. He rooted the classification of species within a single branching tree, and so gave systematics a biological, rather than purely philosophical, rationale. He framed most of the important questions that still define our understanding of evolution, from natural selection to sexual selection, and founded the main principles of the sciences of biogeography and ecology. His work is still actively read and discussed today, inspiring new students and scientists all over the world. Few authors can claim so much. ... it is for his innumerable scientific insights, most still as valid and stimulating as the day he coined them, that we look forward to celebrating him next year.”

A story by David Perlman about Padian’s article appeared in the *San Francisco Chronicle* (2008 Feb 11), beginning, “Exactly one year shy of Charles Darwin’s 200th birthday, scientists are looking ahead to the anniversary to call for renewed understanding of the scientist’s powerful impact on Western civilization. None of modern biology, no advances in medical research, nor success for the Human Genome Project, nor the achievements of biotechnology could exist today without the insights first advanced by that reclusive genius of the Victorian era, the scientists agree. Now, a UC Berkeley paleontologist named Kevin Padian argues that the coming bicentennial is the ideal time ‘to reflect on just what constitutes Darwin’s enduring greatness in Western thought.’” Accompanying the story is a podcast (available online at <http://www.sfgate.com/cgi-bin/blogs/sfgate/detail?blogid=5&entry_id=24072>) in which Padian discusses dinosaurs and Darwin with Perlman, the *Chronicle’s* science editor.

Padian also published a commentary in the February 2008 issue of *Geotimes* (available online at <<http://www.geotimes.org/feb08/article.html?id=comment.html>>), arguing that the way to improve evolution education is to start with the textbooks. Discussing his testimony in *Kitzmiller v Dover*, he wrote, “In



reviewing for the judge the creationist 'textbook' *Of Pandas and People*, I explained in some length — and in conversational language — the actual evidence for how birds evolved from dinosaurs, how whales evolved from land mammals, and how vertebrates came onto land, as well as the methods that we use to test our hypotheses. The judge and the reporters covering the trial were intrigued by this testimony and that of all of the expert witnesses. Most of what we know of the history of earth and its life is not being taught to Americans — despite their desire to learn it."

But, Padian continued, "They're not getting it in textbooks, not even the ones that focus on evolution and paleontology, as I found in a recent study." Displaying a figure like those he used in the *Kitzmiller* trial (which are available on-line at <http://www2.ncseweb.org/kvd/exhibits/Padian/Padian_transcript.html>), he wrote, "It shows the fossils themselves, so people can see the basis for our work. It shows the comparable parts of the skeletons color-coded, so the evolution of form is clear. It gives reconstructions of the animals in life. And it bases all this on an evolutionary tree that is derived from independent evidence. It illustrates what we practice: a highly integrative science that depends on the reconciliation of many independent lines of evidence." He concluded, "Let's fight the anti-evolutionists by putting the right evidence in front of the public and alleviating ignorance."

In addition to serving as president of NCSE's board of directors, Padian is Professor of Integrative Biology at the University of California at Berkeley and also Curator of Paleontology at the University of California's Museum of Paleontology. He testified for the plaintiffs in *Kitzmiller v Dover*, the 2005 case establishing the unconstitutionality of teaching "intelligent design" in the public schools. In his decision, Judge John E Jones III wrote, "Dr Padian's demonstrative slides, prepared on the basis of peer-review[ed] scientific literature, illustrate how *Pandas* systematically distorts and misrepresents established, impor-

tant evolutionary principles." He also noted that "Padian bluntly and effectively stated that in confusing students about science generally and evolution in particular, the disclaimer makes students 'stupid.'"

Andrew J Petto was interviewed by *MKE* (2008 Feb 7), a weekly newspaper in Milwaukee, Wisconsin, about his advocacy for evolution education and his role in establishing a Darwin Day event in Milwaukee (which in 2008 featured **Martha Heil** of the American Institute for Physics). Asked, "How do you feel about the fact that 43 percent of Americans reject evolution?" he answered, "Partly I think it's we don't do as well as we could training science teachers. The other problem is you have people out there who, for theological reasons, are convinced that if your kids learn evolution, they're going to go to hell. That's a serious problem, and perhaps we don't take that seriously enough. Science is unable to tell us what the meaning of life is. It just tells us the history of life, not the purpose of life. That's not a scientific question. That's a philosophical and theological question." A member of NCSE's board of directors and editor of *RNCSE*, Petto teaches at the University of Wisconsin, Milwaukee; with **Laurie R Godfrey** he edited *Scientists Confront Intelligent Design and Creationism* (New York: WW Norton, 2007).

Scientists Confront Intelligent Design and Creationism, edited by **Andrew J Petto** and **Laurie R Godfrey**, received a favorable review from Kenneth W Krause, writing in the March/April 2008 issue of *Skeptical Inquirer* (32 [2]: 60-1). Quoting from Massimo Pigliucci's introduction to the book, he wrote, "public outreach is 'not merely an option,' it is a 'moral obligation'." Seventeen experts in the fields of anthropology, biology, genetics, geology, physics, and science history have apparently agreed, and in *Scientists Confront*, they join Pigliucci's effort to contest creationism in all of its major manifestations." A paperback version of the book, retitled *Scientists Confront Creationism: Intelligent Design and Beyond*, is now available. Also of interest in the same

issue of *Skeptical Inquirer* are a news story on the dismissal of Chris Comer (9) and Martin Gardner's review of Frank Tipler's *The Physics of Christianity* (57-9).

After reading the *Baltimore Sun's* coverage (2008 Jan 5) of *Science, Evolution, and Creationism*, the new publication from the National Academies of Science and the Institute of Medicine, **Gregory Pokrywka** was moved to protest at the newspaper's statement "Despite what the NAS says is incontrovertible scientific evidence, nearly 150 years after Charles Darwin first proposed his ideas in his paper [*sic*], *On the Origin of Species*, a controversy still swirls." "There is absolutely no controversy among scientists that evolution by natural selection has in fact occurred and explains the diversity and complexity of life on earth today," he wrote in response. "The 'theory' of evolution is as accepted by science as the 'theory' that the earth is round and the 'theory' that the sun will rise tomorrow morning." Pokrywka is Assistant Professor in the Johns Hopkins University School of Medicine; his letter was published on January 12, 2008.

Jason Rosenhouse reviewed two books by NCSE Supporters for *Skeptic* (2008; 13 [4]: 75-6): **Francisco Ayala's** *Darwin and Intelligent Design* (Minneapolis: Fortress Press, 2006) and **Philip Kitcher's** *Living with Darwin* (New York: Oxford University Press, 2007). He concluded, "I can recommend both of these books to people looking for a fast overview of the basic issues. Though Ayala has not adequately considered the full force of the scientific case against religious faith, the remainder of his short book is admirably clear and readable. Kitcher deserves credit not only for his forthright consideration of the difficulties posed to traditional religion by modern science, but also for his blunt, and in my view correct, conclusion that the difficulties are insurmountable without fundamentally altering the nature of Christian faith." Rosenhouse teaches mathematics at James Madison University. Of interest in the same issue of



Skeptic are L Kirk Hagen's news report "Are the textbook wars over?" (15), a exchange between David Sloan Wilson (42-50) and Richard Dawkins (51) on Dawkins's views on evolution and religion, **William D Stansfield's** article on whether Benjamin Franklin really flew a kite in a thunderstorm (64-6), and Donald Simanek's review of two books on deviant views about the shape of the earth (68-71).

Stanley A Rice's *Encyclopedia of Evolution* (New York: Facts on File, 2007) was among the Honor Books for 2007 of the Society of School Librarians International Book Awards Program, in the Science, grades 7-12 category. "Written in an engaging style at a level accessible to a nonspecialist audience, the volume provides a bridge between nonscientific and scholarly works. ... Notable for its accessibility, the volume is recommended for high-school, public, and undergraduate academic libraries," wrote the reviewer for *Booklist*. And reviewing the book for *RNCSE* (2007 May-Aug; 27 [3-4]: 48-9), **Tim M Berra** wrote, "Rice's coverage is broad, interesting, relevant, and informative ... I wholeheartedly recommend this book." It is available also in paperback (New York: Checkmark, 2007). Rice teaches biology at Southeastern Oklahoma State University.

NCSE's executive director **Eugenie C Scott** was invited by *Esquire* magazine to contribute to its "What the hell is wrong with you people?" feature, which pairs an expert and a comedian to offer "candid responses to a perplexing reality"—here the fact that some people still do not accept evolution. Noting that "[t]he percentage of Americans who reject evolution is close to 50 percent," due to either insistence on a literal interpretation of the Bible or human exceptionalism, Scott commented, "if people understood more about animals, they'd appreciate that it's hard to find lines that demarcate us from them." Comedian Mike Birbiglia, for his part, wondered, "What would these people need to see to believe in evolution? Would they like to see a gorilla giving birth to a human baby?" The col-

umn appeared in the April 2008 issue of *Esquire*.

TO Shanavas was invited to speak on "Human origin by evolution: Is it an Islamic blasphemy?" by the Muslim Student Association at the Thomas Jefferson High School for Science and Technology in Alexandria, Virginia, on January 4, 2008. Shanavas is the author of *Creation and/or Evolution: An Islamic Perspective* (Philadelphia: Xlibris, 2005).

NCSE Supporter **Elliott Sober**, Hans Reichenbach Professor and William F Vilas Research Professor in the Department of Philosophy at the University of Wisconsin, Madison, was awarded the 2008 Prometheus Prize. Sober will receive a \$10 000 cash award and deliver a lecture, "Evolution without Metaphysics?", at the APA Pacific Division meeting in Pasadena, California. Established by the American Philosophical Association and Prometheus Books, the prize is awarded biannually "to honor a distinguished philosopher in recognition of his or her lifetime contribution to expanding the frontiers of research in philosophy and science." Sober is the second recipient of the prize; the first was NCSE Supporter **Philip Kitcher** of Columbia University in 2006.

William D Stansfield contributed "Creationism, catastrophism, and Velikovsky" to the January/February 2008 issue of *Skeptical Inquirer* (32 [1]: 46-50). "As a skeptic and evolutionary biologist," he wrote, "I naturally wanted to know how creationists initially reacted to Velikovsky's book in 1950 and why they responded as they did thereafter." Stansfield is emeritus professor of biological sciences at California Polytechnic State University, San Luis Obispo. Of interest in the same issue of *Skeptical Inquirer* are Massimo Pigliucci's "Is intelligent design creationism?" (13-4), Irwin Tessman's discussion of Richard Dawkins's *The God Delusion* (37-42), a review of a new **Stephen Jay Gould** anthology (51-3), and Gary Bauslaugh's discussion of the incident in which the reviewers for a Canadian funding agency revealed, in denying a research grant to **Brian Alters**, a degree of apparent

sympathy for "intelligent design" (57-8; see also *RNCSE* 2007 Jan-Apr; 27 [1-2]: 31-3).

Dave Thomas was interviewed for a story about New Mexicans for Science and Reason (<<http://www.nmsr.org>>), a skeptical group of which he is president, appearing in the February 14-20, 2008, issue of the alternative weekly *Alibi*. "Our group seeks to promote scientific reasoning and making decisions based on data instead of emotions," Thomas told the *Alibi*. "We work on employing the scientific method to look at things like homeopathy and creationism." With respect to creationism, he said, "God is beyond science, and it's perfectly fine to be a scientist or anyone else and believe in religion, because they're separate ... The trouble comes when people try to combine them." Creationism's appeal, he conjectured, comes from religious insecurity: "They're not sure the Bible is true or that they're going to heaven. They look around to see how they can prove things, and they say, Aha! Science is how you prove things." [*Thanks to Gary Bennett for the news.*]

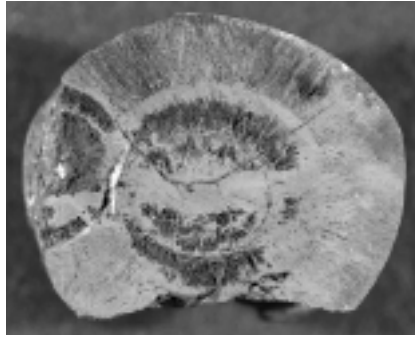
Jason Wiles and NCSE deputy director **Glenn Branch** collaborated on "Teachers who won't, don't, or can't teach evolution properly: A burning issue," published in the January 2008 issue of the *American Biology Teacher* (70 [1]: 6-7); copies are available from the NCSE office. They began in Dover, Pennsylvania — "Flames have a way of concentrating the attention. In 2002, high school biology teachers in Dover, Pennsylvania, were horrified to learn that a student's mural depicting hominid evolution ... had been torched on the orders of a school administrator. A creationist member of the school board boasted that he 'gleefully watched it burn'" — before introducing their main theme: "there are too many biology teachers who won't, or don't, or can't teach evolution properly — as a central, unifying, and well-tested principle of biology." Wiles runs the Evolution Education Research Centre at McGill University and is shortly to begin teaching in the Department of Biology at Syracuse University.





The Mysterious “Spheres” of Ottosdal, South Africa

Paul V Heinrich



Cut face of Ottosdal concretion showing typical radial fibrous internal structure of these objects. Like some of the Ottosdal concretions, this specimen consists of two intergrown concretions. This specimen is 6.2 cm wide.

INTRODUCTION

The “Ottosdal objects” are spherical and subspherical objects that were found in 3.0 to 3.1 billion-year-old (Precambrian) pyrophyllite deposits in South Africa (Jackson 1992). The objects have been the subject of much attention and speculation by various fringe groups, including Christian and Hindu creationists and advocates of “ancient astronauts”. These fringe groups argue that the objects are either actual or possible “Out-of-Place Artifacts” (OOPARTs), which are supposedly direct evidence of a civilization that existed either billions of years ago or before the Biblical Flood. Advocates of “ancient astronauts” further speculate that the Ottosdal objects were manufactured by intelligent extraterrestrials.

The oldest known article that advocates an artificial origin for the Ottosdal objects is Barritt (1979). This article appears in the October 2, 1979, issue of the *National Enquirer* as a short version of Barritt (1982), which repeats and adds much additional material to the descriptions and discussion presented in Barritt (1979).

Barritt (1982) was published in the June 11, 1982, issue of *Scope Magazine*. In 1982, this magazine was well known for its sensational stories and photographs. In addition to comments by an anonymous Wonderstone “mine official”, Barritt (1982) includes comments from Brenda Sullivan, a South African rep-

resentative of the Epigraphic Society of Arlington, Massachusetts, and Roelf Marx, Curator of the Klerksdorp Museum. According to this article, Sullivan speculated that the objects were artifacts and clear evidence of “a higher civilisation, a pre-flood civilisation about which we know virtually nothing.” Barritt (1982) noted that Marx and JR McIver, a professor in the Department of Geology of the University of the Witwatersrand, in Johannesburg, South Africa, lacked a satisfactory explanation for the origin of the objects. Barritt (1982) also quoted Marx as allegedly stating that a specimen of the Ottosdal objects slowly rotated on its axis while locked in a “vibration-free” Klerksdorp Museum display case.

Later, Jochmans (1995), a young-earth creationist, included the Ottosdal objects in his list of “top ten out-of-place artifacts” and described the objects as being composed of “manufactured metal” and a “nickel-steel alloy which does not occur naturally.” He clearly claims that these objects are artificial in origin. In his short discussion of the objects, Jochmans (1995) repeats the claim, possibly taken from Barritt (1979, 1982), that Marx had observed one of the objects slowly rotating on its axis while locked in a “vibration-free” display case.

Inspired by Jimison (1982) — whose 1982 article appeared shortly after Barritt’s and may have been derived from it — Hindu creationists Cremo and Thompson (1993, 1999) published a short description of the Ottosdal objects after corresponding with Marx. They argued that the Ottosdal objects are a possible example of artifacts having been found in geologic strata as old as 2.8 billion years. They discounted the identification of these objects as limonite concretions made by AA Bisschoff, a geologist at the University of Potchefstroom, because the objects were supposedly harder than steel, had grooves that appeared unnatural, and did not have the form and other characteristics of concretions.

On February 25, 1996, the National Broadcasting Company, a US television network, broadcast “The

Paul V Heinrich is a geologist. He has a BS (Louisiana State University) and MS (University of Illinois) in geology and over 20 years experience as a geologist. His work experience includes research in archaeological geology. He is a registered professional geologist in Tennessee and Arkansas. On the side, he has been interested both in various reports of “Out-of-Place Artifacts” and how common geological phenomena — for example, concretions, Liesegang rings, and orthogonally jointed bedrock — are mistaken by nongeologists for man-made artifacts and ruins.

Mysterious Origins of Man” (for a description, see BC Video, 1996). The program contained a short segment on the Ottosdal objects. It described these objects as “metallic spheres” with fine grooves encircling them. The program claimed that anonymous “lab technicians”, later revealed by Cremo as working for the Emerald City Metallurgical Engineering Company, could not find any explanation for the grooves. BC Video (1996) confused the Klerksdorp Museum with the Ottosdal pyrophyllite mines by stating that the objects were found in mines at Klerksdorp. The “Stratographic Column” [*sic*] web page (BC Video 2003) stated: “Perhaps the oldest artifacts ever discovered are these metallic spheres found in Klerksdorp, So. Africa.”

In a web site, which briefly appeared on the Internet (Anonymous 2001), a three-grooved Ottosdal object was promoted as an alien artifact called the “Cosmos”. In addition to rehashing material from a number of other sources, this web page offered the opinion of Elizabeth Klarer, a South African psychic and UFO enthusiast. She proposed that this Ottosdal object had been placed in the pyrophyllite by an “advanced race” and has an “optic disc”, which “contains secrets of the universe”. She predicted that a “chosen person” would open the optic disc and use its “secrets” to save the earth. Most importantly, the “Cosmos” web site (Anonymous 2001), contained several close-up photographs of a three-grooved Ottosdal Object from various angles.

For a brief period of time, a Klerksdorp Museum web page (Klerksdorp Museum 2002), contained the text from a letter from John Hund of Pietersburg, South Africa. This letter provided an account, which remains unsubstantiated, of the alleged results of an examination of an Ottosdal object by the California Space Institute, a multi-campus research unit of the University of California. The letter stated that scientists at the California Space Institute tested an Ottosdal object and concluded that its balance “... is so fine, it exceeded the limit of their measuring technology ...” and “... to within one-hundred thousandths of an inch from absolute perfection ...” This implication of these alleged findings is that no known natural process can explain the formation of the Ottosdal object. The letter also stated, by way of further qualifications, that the California Space Institute was the organization that made gyroscopes for the National Aeronautics and Space Administration (NASA).

Numerous other web pages and message boards have discussed the Ottosdal object after Klerksdorp Museum (2002). Typically, they consist of rehashed, quoted, or paraphrased material from Cremo and Thompson (1993, 1999), Jochmans (1995), Govradhan Hill Publishing (1996), Heinrich (1996), Klerksdorp Museum (2002), or some combination of these sources. However, little of what is on these pages represents any new or better information.

SCIENTIFIC STUDY OF THE SPHERES

Discussion of the physical nature and origin of the “spherical” objects by conventional scientists is limited to Nel and others (1937) and popular articles by Cairncross (1988), Pope and Cairncross (1988), and

Heinrich (1996, 1997). Nel and others (1937), who first described the geology and physical characteristics of the pyrophyllite deposits, simply report the occurrence of pyrite concretions within them. In response to Barritt (1982), another article, and an episode of a 1980s South African Sunday television program called “50-50”, Cairncross (1988) and Pope and Cairncross (1988) argued that the Ottosdal objects are natural concretions. Cairncross (1988) noted that the grooves on these objects are often exhibited by concretions and reflect the layering of the sediments in which they grew. In an internet report on these objects, Heinrich (1996) speculated that the objects were possibly of metamorphic origin. Firsthand observations of specimens of the Ottosdal objects by Heinrich (1997) noted that these objects are neither the “perfectly round” nor “singular” objects as claimed by creationists and other fringe groups. To demonstrate the true nature of these objects, it is necessary to examine both the objects and the literature that has grown around them systematically.

METHODOLOGY

To investigate the physical nature and origin of the Ottosdal objects, the pertinent literature was reviewed. This review included studying popular articles, books, and web pages, and various scientific papers on the geology of the Precambrian strata containing them, relevant mineralogy, concretion formation, and various other topics. Additionally, attempts were made to verify the various opinions and observations, which had been posted to various web pages, for example at the Klerksdorp Museum (2002).

I was also able to examine the actual specimens of the Ottosdal objects to determine their physical properties. Susan J Webb of the University of the Witwatersrand and Allan Frazier of Online Minerals acquired five Ottosdal objects for me to examine. After being photographed, three of these specimens were sliced on a trim saw. A sample from one specimen was analyzed using petrographic techniques. Samples from two specimens, Ottosdal-2 and Ottosdal-4, were analyzed using X-ray diffraction techniques. In addition, a sample of pyrophyllite taken from the same mine as the objects was analyzed with petrographic and X-ray diffraction techniques.

OCCURRENCE

Barritt (1982) shows a photograph exhibiting the empty spaces left by Ottosdal objects in the face of a cut in the pyrophyllite quarry. The photograph shows that the objects are not randomly scattered through the pyrophyllite, but occur as a very narrow layer, perhaps in volcanic deposits that were later metamorphosed to pyrophyllite.

SHAPE AND SIZE

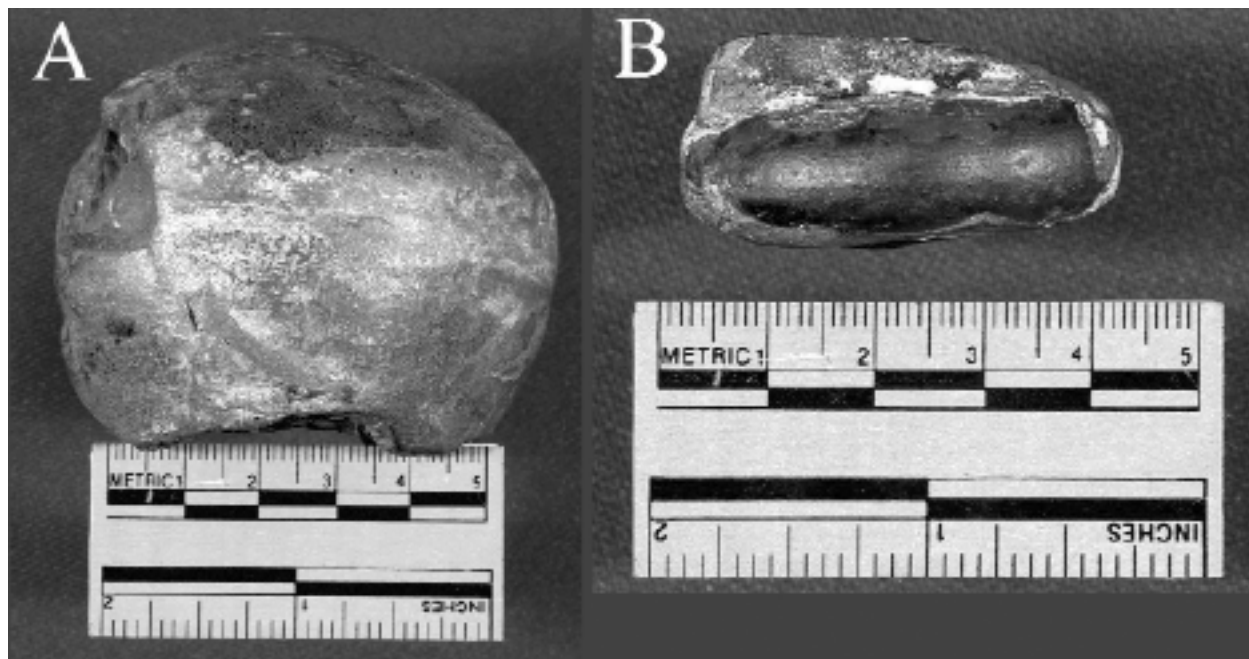
A number of sources describe the Ottosdal objects as being spherical. Barritt (1982) initially describes them as having three longitudinal grooves and being “... so perfectly made that they look though they were cast from a mould”. Barritt (1982) quotes both Marx and Sullivan as referring to these objects as “spheres”. Pope

and Cairncross (1988) describe the objects as being “almost perfect spheres”, while Cairncross (1988) simply described them as being “round.” Cremo and Thompson (1993, 1999) and Govradhan Hill Publishing (1996) further claim that the Ottosdal objects are “metallic spheres” and are “isolated and perfectly round”. They state that at least one of these objects exhibits three grooves. They show a photograph in which it appears spherical. BC Video (2003) and John Hunt, as quoted in Klerksdorp Museum (2002), simply described the objects as “metallic spheres”.

In contrast, various sources also describe the Ottosdal objects as having shapes that are neither true spheres nor “perfectly round”. For example, a photo-

graphically spherical as various authors claim. Judging from the photographs, this three-grooved object appears to consist of two Ottosdal objects that have closely intergrown together. Additional photographs of another grooved Ottosdal object in the Klerksdorp Museum, which were sent to me by van Heerden (personal correspondence, including an article, an “information sheet,” and pictures of Ottosdal objects, in 2007), also clearly show that the object is not perfectly spherical.

Hund, as cited in Klerksdorp Museum (2002), claimed that an Ottosdal Object examined by the California Space Institute was balanced “... so fine, it exceeded the limit of their measuring technology ...” and “... to within one-hundred thousandths of an inch



Examples of concretions from the Ottosdal pyrophyllite quarries showing variations in size and morphology. A. Sub-spherical Ottosdal concretion with poorly developed

longitudinal groove. This is the same concretion whose internal structure is shown on page 28. B. Disk-shaped Ottosdal concretion composed of bematite.

graph on the last page of Barritt (1982) shows a three-grooved Ottosdal object that is clearly an ellipsoid. Barritt (1982) also gives the dimensions of a specimen in the Klerksdorp Museum as being “exactly” 3.3 cm (1.3 inches) high and 4.0 cm (1.6 inches) long. Barritt (1982) further contradicts himself and other fringe publications by quoting an anonymous mine official as stating that all of these objects are “oval” in shape. Jochmans (1995) also contradicts himself by describing them as “... metallic spheroids look [*sic*] like flattened globes ...” Finally, Roelf Marx (personal correspondence in 1996, including an “information sheet” on Ottosdal objects) notes that the Ottosdal objects, which he has observed, are not all spheres, but “some” of them are “oblong in form”. From these descriptions, it is apparent that the authors have either greatly exaggerated the spherical nature of these objects or have been very careless in their descriptions of their shapes.

As shown in photographs that were once posted to the Cosmos web page, Anonymous (2001), the Ottosdal object exhibiting three grooves is not per-

fectly spherical as various authors claim. Judging from the photographs, this three-grooved object appears to consist of two Ottosdal objects that have closely intergrown together. Additional photographs of another grooved Ottosdal object in the Klerksdorp Museum, which were sent to me by van Heerden (personal correspondence, including an article, an “information sheet,” and pictures of Ottosdal objects, in 2007), also clearly show that the object is not perfectly spherical.

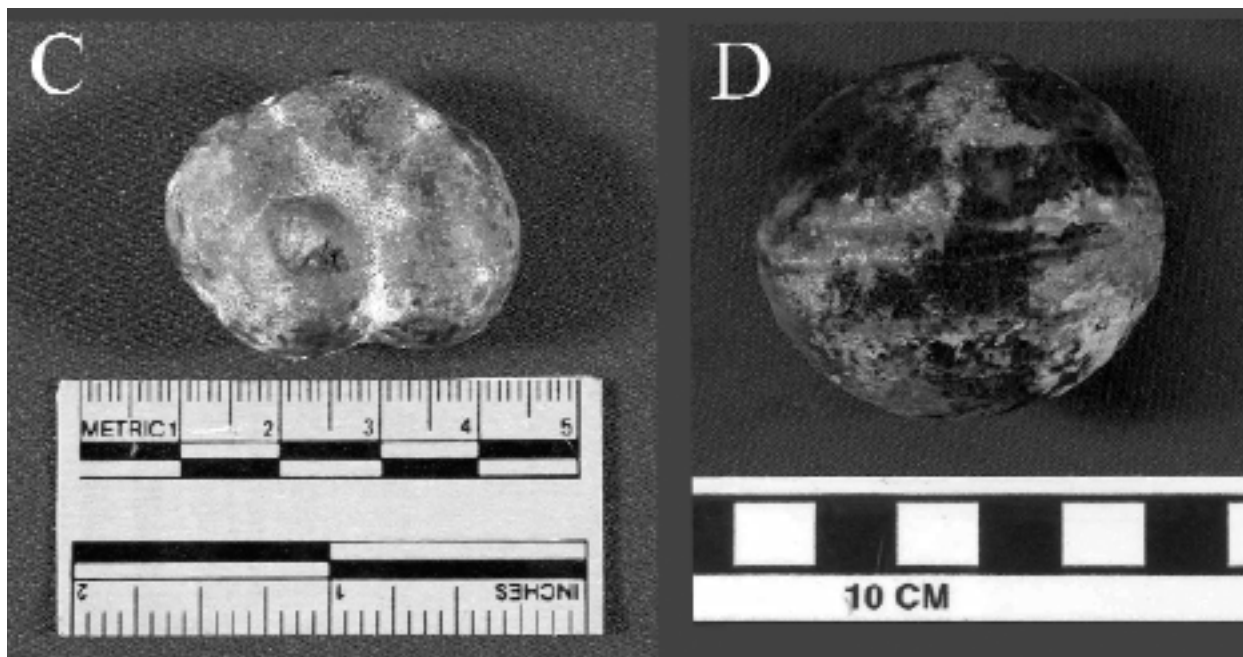
Hund, as cited in Klerksdorp Museum (2002), claimed that an Ottosdal Object examined by the California Space Institute was balanced “... so fine, it exceeded the limit of their measuring technology ...” and “... to within one-hundred thousandths of an inch

from absolute perfection ...” In personal correspondence in 2002, Arnold, who works at the California Space Institute, indicated that he remembered examining an Ottosdal Object, that Hund had loaned them. However, Arnold denied that anyone told Hund that the object had the extraordinary properties described in the letter as quoted by Klerksdorp Museum (2002). He suggested that there was “some error in transmission” and that Hund had completely misunderstood what had been told him. In addition, Arnold noted that the claim made by Hund that the California Space Institute makes gyroscopes for NASA is completely false. Judging from my correspondence and from personal examination of actual Ottosdal objects, the claim that the California Space Institute found them to be perfectly balanced and shaped spheres lacks any substance and credibility.

by Webb and Frazier, exhibit a wide range of shapes including spheres, flattened spheres, discs, and clusters of two to four spheres grown together like soap bubbles. Although three specimens are roughly spherical, they definitely are not “perfectly round” as various fringe group authors claim. All of these Ottosdal objects, including the “Cosmos” illustrations by Anonymous (2001), are well within in the range of shapes exhibited by natural concretions.

The size of the Ottosdal objects varies over a relatively small range. Cairncross (1988) notes that these objects vary in size from a few millimeters to several centimeters. Barritt (1979, 1982) reports that they are as large as 10 cm (4 inches) in diameter. Marx (per-

bluish-white “metal” having a reddish tinge and embedded flecks of white “fibres”. The second type was hollow with a thin skin and was more common. Barritt (1979, 1982) adds that this “skin” is about 0.5 centimeter (0.2 inch) thick with a sponge-like whitish center. Descriptions of these objects given by Cremo (1993, 1999) and Govradhan Hill Publishing (1996) appear to be a summary of the descriptions given by Barritt (1982). Marx (personal correspondence in 1996) reports that the Ottosdal objects have a hard concentric shell that exhibit “perfectly concentric grooves” that surround either a spongy substance or material resembling charcoal. Cairncross (1988) describes two types of Ottosdal objects. One type



C. Specimen composed of individual Ottosdal concretions intergrown like soap bubbles.

D. Ottosdal concretion with single longitudinal groove. This specimen is composed of wollastonite.

sonal correspondence in 1996) reports that these objects vary in size from 3 to 5 cm (1.2 to 2 inches) in diameter. The five specimens that were studied for this paper varied from 3.6 to 8.5 cm (1.4 to 3.3 inches) in length and 1.3 to 5.2 cm (0.5 to 2.0 inches) in height. The ratio of height to maximum length of the five objects studied varied from 0.30 to 0.83.

COMPOSITION AND INTERNAL STRUCTURE

A variety of descriptions of the composition of the Ottosdal objects have been published. For example, Jochmans (1995) claims that the Ottosdal objects are composed of a “... nickel-steel alloy, which does not occur naturally ...”. The source of this claim is unknown, although it might be an imaginative elaboration of the descriptions by Barritt (1982), where they are described as “metal spheres”. According to Barritt (1979, 1982), an anonymous mine employee reported that there were two types of Ottosdal objects. The employee described the first type as being solid all of the way through and composed of a

exhibits a brassy metallic color and the other exhibits a dark earthy brown color. Based only upon visual inspections, Cairncross (1988) speculated that the former might be composed of pyrite (an natural iron sulfide mineral) and the latter of siderite (natural iron carbonate). According to Marx (personal correspondence in 1996) and Cremo and Thompson (1993, 1999), Bisschoff concluded that the specimens, which he examined, consist of limonite. The color of the five specimens of Ottosdal objects that were studied by the author were dark reddish-brown, red, and dusky red as defined by the color chart of the Munsell Color Company (1975).

The internal structure of three Ottosdal objects, specimens Ottosdal-1, Ottosdal-2, and Ottosdal-4, was determined by cutting them open with a trim saw. All three of these objects exhibit a spectacular radial structure, which breaks into concentric shells. They are clearly natural concretions. Internally, the concretions were found to be both porous and friable. One of two noticeably “grooved spheres” which was cut on the trim saw exhibited faint ghosts of flat laminations

cross-cutting its radial structure. A prominent internal lamination was specifically associated with the external groove. The cut surface also failed to support the claim that grooves had been artificially cut into the specimen.

The analysis of two Ottosdal objects, specimens Ottosdal-2 and Ottosdal-4, by X-ray diffraction techniques revealed that they consist of two different minerals. As confirmed by petrographic and two X-ray diffraction analyses, specimen Ottosdal-2 consisted of hematite, a common naturally occurring iron oxide. X-ray diffraction analyses by MA Holmes of the Geosciences Department at the University of Nebraska (personal correspondence in 2007, including X-ray diffraction data and diagrams) demonstrated that specimen Ottosdal-4 consists of wollastonite (CaSiO_3), a common metamorphic mineral, along with minor amounts of hematite and goethite, a hydrated iron oxide. Holmes also confirmed that Ottosdal-2 consisted of hematite.

HARDNESS

Marx (personal correspondence in 1996), Cremo and Thompson (1993, 1999), and Govradhan Hill Publishing (1996) also claim that some of the Ottosdal objects are harder than steel. Marx further implies that this hardness is typical of all, not just one or some, of the Ottosdal objects. An examination of the five Ottosdal objects collected for this study found none of them to be harder than 4.0–5.0 on the Mohs scale (a rating of 7–8 is typical of hardened steel). Marx, who openly admits to having “no geological training”, and Cremo and Thompson (1993, 1999), and Govradhan Hill Publishing (1996), whose source for the hardness claim was apparently Marx, are clearly mistaken about these objects’ being harder than steel.

POWER OF ROTATION

In correspondence sent to Bruce Cairncross (1988) and me, Marx stated that a reporter had falsely quoted what he had said about the rotation of the objects. According to him, it was true that the Ottosdal objects had rotated in their museum cases. However, he unequivocally stated that the claim by Barritt (1979, 1982) that the Klerksdorp Museum display cases were free of outside vibrations is completely false. According to his correspondence, Marx clearly told the reporter that vibrations from underground blasting in local gold mines regularly vibrated the museum’s display cases and caused the Ottosdal objects to rotate. Judging from Marx’s firsthand accounts, it is clear that the claim that these objects rotated under their own power is completely false.

DISCUSSION

The descriptions of the physical characteristics and properties of the Ottosdal objects found in the literature of fringe groups badly distort reality. They also show a profound lack of expertise by fringe authors in making basic observations concerning the physical characteristics of the objects that they are discussing.

The first-hand evidence indicates that the Ottosdal objects are composed largely of hematite, wollas-

tonite, pyrite, or some combination of these minerals. Trained geologists, Nel and others (1937) and Cairncross (1988), concluded that the Ottosdal objects are composed of pyrite within the pyrophyllite deposits. The presence of Ottosdal objects composed of hematite and wollastonite is proven by X-ray diffraction and petrographic analyses. Given the difficulty of identifying fine-grained minerals from visual inspection alone, it is understandable that Cairncross (1988) confused either hematite or wollastonite with siderite. In addition, hematite and goethite are often called “limonite” when they occur as a massive earthy mass lacking any observable crystals. Thus, the identification of some of these objects as consisting of limonite by AA Bisschoff is a general specimen description for these minerals when detailed mineralogical analyses are lacking.

The internal structure of the hematite Ottosdal objects indicates that they are natural concretions that are pseudomorphs after original pyrite concretions. It is well known that limonite, goethite, and hematite will form such pseudomorphs in these situations. This transformation occurs when oxidizing chemical reactions transform pyrite into limonite, goethite, or hematite while keeping the external shape of the pyrite. The porous and friable nature of the hematite concretions is likely the result of a decrease in the volume of the concretions as they were transformed from pyrite to hematite.

The Ottosdal object composed of wollastonite is also readily explained as a natural concretion. The Wollastonite often forms as the result of the interaction of silica-rich fluids with calcium carbonate during the metamorphism of volcanic deposits to pyrophyllite, which also silicified adjacent beds of lava (Nel and others 1937). The relict structure of the object is also typical of natural deposits.

In contrast to the various observations provided by the fringe-group literature, the sizes and shapes of the Ottosdal objects fall within the range of shapes observed for natural concretions. The intergrown nature, which some of the objects exhibit, is quite typical of natural concretions. The observed and reported sizes of these objects fall well within the size range of concretions, which can vary from a few millimeters to over 6 meters (up to 18 feet) (Dietrich 1999; Raiswell and Fisher 2000).

The longitudinal grooves exhibited by some of the Ottosdal objects, as noted by Cairncross (1988), were caused by sediment laminations. The grooves in the concretions represent individual laminae within the host sediments. These laminae were slightly finer-grained than overlying and underlying sediments. As the concretion grew within the sediments, it grew at a slightly slower rate within these laminae than in adjacent layers, which resulted in the formation of the grooves. How this process can produce longitudinal grooves and ridges on spherical and subspherical concretions is well illustrated by innumerable iron oxide concretions found within the Navajo Sandstone of southern Utah called “Moqui marbles” (Chan and others 2004). The longitudinal ridges and grooves exhibited by these concretions are more pronounced and irregular than those in Ottosdal objects because the

sediment in which they grew is coarser than the sediments in which the Ottosdal objects formed.

It is also clear from this investigation that the fringe-groups literature contain blatantly incorrect information about the physical character of these objects. For example, the various claims that the Ottosdal objects are perfectly round are refuted by both direct observation of the actual specimens and published photographs of them. In addition, the supporters of these objects are non-natural in origin are completely wrong in their claims that the objects rotate in "vibration-free" cabinets, are "perfectly balanced," "are hard as steel", and are composed of a "... nickel-steel alloy, which does not occur naturally ..." Jochmans (1995) even incorrectly noted that the objects were found in a silver mine. It is quite clear that the those who argue for an artificial origin for these objects have based their interpretation on misconceptions and misinformation about the physical characteristics of these objects. As a result, they completely failed to make a credible case that these objects are anything other than interesting, but completely natural, geological concretions.

Finally, the case of the Ottosdal objects is not unique. It appears that lay people often mistake concretions of various shapes for intelligently designed and manufactured artifacts. For example, the Moeraki Boulders of New Zealand, which are natural "cannon-ball" concretions, have been mistaken for the sail weights of Chinese junks. Natural concretions found by explorers on Seymour Island, Antarctica, were misidentified as artifacts. Concretions from the bottom of the Bay of Cambay (Khambhat) have also been mistaken for ancient artifacts (Heinrich 2002). In a similar case, Kuban (2006) argues that an alleged shoe print mentioned by Cremo and Thompson (1993, 1999) and other fringe archaeologists and creationists, as having been found in Triassic strata within Nevada, is "... most likely a broken ironstone concretion ..."

CONCLUSION

An examination of the Ottosdal objects indicates that they and their grooves lack any indication of being artificial. They are just another example of how concretions have been mistaken for intelligently designed and manufactured objects. The misidentification of natural objects as the by-products of "intelligent design" is an important lesson that needs to be learned by many fringe group members.

ACKNOWLEDGMENTS

I thank Allan Fraser, Susan J Webb, and Desmond Sacco for their successful efforts at obtaining specimens of Ottosdal objects for my study. I also thank H van Heerden for pictures of Ottosdal concretions currently on display in the Klerksdorp Museum and Roelf Marx and Frans Waanders for giving copies of hard-to-get handouts and articles concerning these concretions. Finally, I thank Kevin R Henke for taking the time and trouble to review this article for me.

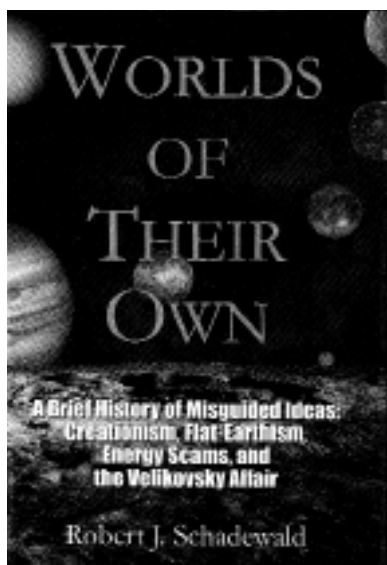
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AUTHOR'S ADDRESS

Paul V Heinrich
9887 Kinglet Drive
Baton Rouge LA 70809
inselberg@cox.net





WORLDS OF THEIR OWN: A BRIEF HISTORY OF MISGUIDED IDEAS: CREATIONISM, FLAT-EARTHISM, ENERGY SCAMS, AND THE VELIKOVSKY AFFAIR

by Robert Schadewald,
edited by Lois Schadewald
Philadelphia: Xlibris, 2008.
240 pages

Reviewed by David Morrison

It is a pleasure to recommend this book by Robert Schadewald, who died several years ago at age 57, before he was able to publish these essays together. Schadewald, a free-lance technical writer by profession, was an avid student of pseudoscience and advocate for a more rational world. The publisher describes this book as a distillation of a lifetime of research into why some people extend their views of reality beyond the evidence, or deny the common reality and create their own.

Bob's sister, Lois Schadewald, compiled this book from a variety of sources. Many chapters are previously published essays, spanning 30 years. She also found notes for unfinished books on the subjects of alternative science, perpetual motion, scientific creationism and flat earth theories. She organized this diverse material and wrote short introductions to each section. The result thus does not present a unified perspective or consistent outlook in time, and some

BOOKREVIEWS

sections seem dated. But no matter; these essays express the unified vision of Bob Schadewald, and that is what matters.

The book deals with four examples of pseudoscience. The early chapters are devoted to Immanuel Velikovsky, including the last interview with Velikovsky a week before he died. Next is a detailed historical review of perpetual motion machines, both those put forward by honest, if confused, inventors who just have not quite made their machines work, and those with hidden batteries or motors built to defraud potential investors. The third topic, discussed in more detail in the following paragraphs, is flat-earth theories. Finally, there are several interesting chapters on "scientific creationism", providing useful background for current debates on "intelligent design".

Schadewald provides an illuminating perspective on creationism by exploring its 19th-century predecessor, flat-earth theory. Characteristically, he includes the human history, narrating the story of the "proof" of the sphericity of the earth conducted by Alfred Russel Wallace in 1870 at the Old Bedford Canal, and visiting the century-old flat-earth oasis of Zion, Illinois. The Old Bedford test was simple: to observe with a small telescope the marks on three poles, each the same height above the water, along a 6-mile straight stretch of the canal, to ascertain if they define a straight line. Simple, perhaps, but Wallace almost lost the £500 wager, because the criteria for judging the experiment

were not precisely defined in advance. As Schadewald writes, "The naïve and idealistic Wallace assumed his opponent was rational and a gentleman, so he began losing points immediately."

Schadewald himself assumes that many pseudoscientists are, if not rational, then gentlemen. One of the strengths of his book is the way the author related personally to so many people with whom he disagreed. One such honorable opponent was Charles K Johnson, president of the International Flat Earth Research Society. Johnson explains that his beliefs are grounded in the Bible. He says that the Bible describes a flat earth under a dome or vault (what the King James Bible calls the firmament), and like many creationists he asserts that we can have no moral purpose outside literal acceptance of this written word of God.

Unlike many ancient religious texts, the Bible does not describe its cosmology. However, Schadewald shows how consistently the Bible assumes the Babylonian cosmology of an immobile, flat earth under a low, solid dome of the sky. Thus we have "He has fixed the earth firm, immovable" and "Thou didst fix the earth on its foundation so that it can never be shaken." The creation story in Genesis states that the earth was created on the first day, and the vault on the second day to divide the waters above from those below. Only on the fifth day were the sun, moon, and stars created, and they were placed in, not above, the vault. In Job we note that God beat out the vault of the skies, hard as a mirror of cast metal, and that God walks to and fro on the vaulted roof, where he looks down on the stars. Schadewald quotes biblical references to the ends of the earth and to windows through which wind

David Morrison is the senior scientist at NASA's Astrobiology Institute. He was awarded the Carl Sagan Medal in 2004 by the Division for Planetary Sciences in recognition of his success at communicating science to the public.

and rain can penetrate the vault. He also explores more explicit descriptions of the Hebrew cosmology in the first century BCE Ethiopic Book of Enoch, in which the author (with an angel as guide) visits the ends of the earth on which the heavens rest and views “the storerooms of the sun and the moon, from what place they go out and to which place they return.”

Twenty-first-century creationists make the same case that their moral and ethical foundations require the literal truth of the Bible, yet they generally accept a spherical earth and heliocentric cosmology. This book makes a compelling case that the flat earth is better grounded in biblical literalism than is creationism, that Copernicus is a greater challenge to literalists than Darwin. If one puts the literal meaning of the Bible first, then the earth is flat as well as young, and God sits on a throne atop the solid dome of the sky.

Schadewald became a board member of the NCSE in 1986, and he devoted his talents and energy increasingly to combating creationism. Velikovsky and flat-earthers and the purveyors of perpetual motion machines are well recognized as cranks, and no one is arguing that their ideas should be taught in public school. In a 1982 letter, he wrote, “I consider Velikovskyism a relatively harmless delusion. The same cannot be said for the pernicious “scientific creationism”. I will return to [other pseudosciences] when the creationists have been driven back into their caves.” That objective seems more elusive now than it did two decades ago.

Most creationists receive little sympathy from Schadewald, who is especially hard on those who willfully distort scientific data and “lie for God”. He writes that “[c]reation scientists ... behave much like ordinary cranks. Like secular cranks they ground their beliefs in exaggerated self-esteem and plot theories and maintain them by mangling logic and ignoring evidence.” He calls scientific creationism “the best organized movement in the history of American pseudoscience, and thus the most dangerous.” He provides an excellent summary of the differences between

science and pseudoscience and concludes that true dialog between them is all but impossible.

Because of its diverse sources and the long time span over which the essays were written, this is perhaps not the most coherent introduction to crackpot science. However, it is a great book for readers of *Reports of the NCSE* and others embroiled in the evolution/creationism controversy. Schadewald provides us a valuable perspective on the nature of pseudoscience and its advocates, including the creation science of 30 years ago.

AUTHOR'S ADDRESS

David Morrison
c/o NCSE
PO Box 9477
Berkeley CA 94709-0477
ncseoffice@ncseweb.org

SCIENCE, EVOLUTION, AND CREATIONISM

by the National Academy of Sciences and Institute of Medicine
Washington: National Academies Press, 2008. 88 pages

Reviewed by

David C Kopaska-Merkel

Science, Evolution, and Creationism is the latest offering from the National Academy of Sciences in an ongoing program to inform the public about evolution. The book first discusses the nature of science in the context of evolution and then considers evidence for biological evolution. This is followed by an analysis of creationism, a brief conclusion section, and supporting materials.

Chapter 1 presents as good an explanation of the nature of science and the relationship between science and religion as I have seen. For example, from a discussion of genetic distances among species: “... some genes that control the production of biochemicals or chemical reactions ... essential for cellular functioning show little variation across species ...” Scientists involved with education

David C Kopaska-Merkel earned his PhD in geology from the University of Kansas. He works as a geologist, and writes science fiction, fantasy, and poetry on the side.

and many science educators will have seen all this before in similar forms (Cartwright and others 2000; Pojeta and Springer 2001). One notable addition is an extensive discussion of *Tiktaalik*, the fish/amphibian transitional fossil discovered a few years ago in the Canadian Arctic. Many “intermediate forms” have been discovered, but this is one of the most important. Because it is new, its addition to the book is valuable. I could wish that the explanation included a graphic comparing the limb bones of lobe-fin fish, *Tiktaalik*, and amphibians.

Chapter 2 does a significantly smoother and more comprehensive job of presenting evidence than other similar publications I have read. Each line of evidence is clearly developed, so a literate reader should easily follow the argument. The authors avoid the laundry-list approach of briefly presenting a lot of information in superficial detail. Instead, very nice explanations of methods, such as radiometric dating, and particular examples, such as human evolution, make a compelling case by showing enough of the evidence and inference that lies behind the modern theory of evolution to give a flavor of its richness. There are a couple of minor errors. The scope of origin of sedimentary rocks is misrepresented. Some sedimentary rocks, like rock salt, form in place and are not made of particles deposited from fluids. The book also states that the sun is the center of the solar system. The sun’s displacement from the center is quite significant for orbital dynamics and, ultimately, for the earth’s climate.

Chapter 3 concerns creationism. Evidence supporting the theory of evolution is contrasted with the observation that young-earth creationists reject any facts that contradict their interpretation of the Bible. Because the theory of evolution is open to falsification by contradictory evidence (if any were to be found), whereas creationism must be accepted on faith, evolution is scientific and creationism is not. In response to the often-made claim that “no one has seen evolution”, the authors refer to the regular emergence of resistant strains of microorganisms: evo-



lution in action. This is a strong point, but it could be even stronger if they mentioned the development of polyploid plant species in historical time, and the evolution of the HIV virus, a macroevolutionary jump that took place in the 1970s or early 1980s.

"Intelligent design" is demolished even more effectively. "Intelligent design" assumes that scientific questions can have only two possible answers: undirected evolution or design. However, failure of scientists to identify a specific mechanism for evolution of a complex structure like the vertebrate eye does not automatically validate "intelligent design". In addition, there is still no evidence to support any "intelligent design" assertions, and all of this is made very clear in this chapter. Chapter 3 concludes with a reminder that the courts have consistently ruled that creationism (including "intelligent design") is religion and therefore not allowed in a science classroom.

The rest of the book consists of a brief conclusions section, a list of frequently asked questions, additional readings, biographies of committee members, and an index. The conclusions are simply a succinct summary of the first three chapters. The FAQ list will be more valuable, because most of the questions are the sort that creationists feed to their listeners, and the answers are clear and apt. Most of the additional resources are articles from the scientific literature and books written at a popular level, so they will be more accessible to the nonscientist. They are organized into broad subject categories, such as "books on evolution" and "books on the origin of the universe and the earth." Most of the books listed are less than ten years old; some older classics (such as Gould 1980) are included as well. The reader is referred to the National Academies of Sciences website for a list of science education and evolution websites. Many of these links are already broken, but the links to government websites and to reputable organizations such as NCSE should be stable.

Any open-minded reader will become convinced that evolution is the only persuasive scientific explanation of the diversity of life

on earth. The difficult work that faces scientists and science educators consists in reaching those who do not want to listen. I have become convinced over the years that books like this one are necessary but far from sufficient tools. Their greatest value is in informing willing teachers of the strong arguments and evidence supporting the theory of evolution. This book also will help youngsters educate themselves and give them the evidence and arguments they need to challenge the dogma of their peers.

In conclusion, *Science, Evolution, and Creationism* results from no macroevolutionary leap. It is the sympatric daughter species of its predecessor (NAS 1999). Larger, more versatile, and better adapted to its sociopolitical environment, this book should do well in a shifting landscape.

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AUTHOR'S ADDRESS

David C Kopaska-Merkel
1300 Kicker Rd
Tuscaloosa AL 35404
jopnquog@gmail.com



ORIGINS: A REFORMED LOOK AT CREATION, DESIGN, & EVOLUTION

by Deborah B Haarsma and Loren D Haarsma
Grand Rapids (MI): Faith Alive Christian Resources, 2007.
255 pages

Reviewed by Rebecca J Flietstra

During my first semester as a freshman at a Christian college I was exposed, for the first time, to a positive description of evolution. For some reason, this unexpected defense of Darwin's theory did not disturb me, but instead piqued my curiosity. Shortly after that initial lecture, I sought out my professor to find out more. Several discussions later I found myself embracing what I had previously regarded as an evil theory. Interestingly, the more I learned about evolution — the more I got excited about the grandness of the theory — the deeper my faith grew in a divine, awesomely creative Creator.

Of course, not all of my classmates, nor the college's constituency, appreciated such advocacy for evolutionary theory. During my years as an undergraduate at Calvin College (in Grand Rapids, Michigan), a physics professor by the name of Howard Van Till published *The Fourth Day: What the Bible and the Heavens Are Telling Us About Creation* (Grand Rapids [MI]: Eerdmans, 1986), a book that discussed evidence for an old universe. Although Van Till's book focused on the inanimate, avoiding an in-depth analysis of biological evolution, it still stirred up the wrath of parents, donors, and members of the Christian Reformed Church (CRC), the sponsoring denomination of Calvin College. Although Van Till kept his job, he endured years of ugliness.

Two decades later, two physicists at my alma mater, Deborah and Loren Haarsma, have published *Origins: A Reformed Look at Creation, Design, & Evolution*. Although some evangelical and fundamentalist Christians will cer-

Rebecca J Flietstra is Professor of Biology at Point Loma Nazarene University.

tainly reject their message, this book will probably not create the stir that Van Till's book did. For, although creationism remains strong in the United States, evolutionary theory is no longer big news at many Christian colleges, including Calvin. While evolution is still a taboo subject at some Christian schools, evangelical students at many schools are more accustomed to hearing about evolutionary theory than they were even twenty years ago. Many can recognize that, even if they personally reject evolutionary theory, this issue need not define and divide Christians. One must be careful, therefore, not to lump all Christians, or even all evangelicals, together.

The Haarsma and Haarsma book is intended for use as a textbook in Christian classrooms, particularly for schools within the Reformed tradition. The authors are very frank about the particularity of their belief system and how it affects their scholarship and understanding of the world. This particularity serves both as a strength and as a limitation. By speaking from a very specific location within Christianity, they can set up specific criteria for critiquing various positions. But this specific position also limits their audience. Not only are they Reformed, they are Christian Reformed — drawing on specific rulings by the denomination and referring to specific persons and historical incidents. Unless one is part of the community (or grew up in it), much of the dialog will feel like an eavesdropped conversation.

The authors have further assumed an audience of undergraduates who are not majoring in the sciences. As such, their language and arguments are quite basic and easy to follow. Each chapter has a number of sidebars that typically offer internet links for further discussion and research. At the end of the each chapter they list some "Questions for Reflection and Discussion" (that is, homework assignments) and a list of additional resources. The book thus can serve as a launching pad for a more in-depth exploration of the creationism/evolution dialog.

I've used the term "dialog" deliberately. Although the authors recognize and describe the faith-vs-science wars, and offer various arguments in support of evolutionary theory, they tend to assume the accuracy of evolutionary theory. Instead of spending most of their energy defending evolution, they instead take for granted the reality of natural selection and evolutionary theory. Thus, with both God and evolution as "givens", they have no choice but to believe that these two realities will not ultimately conflict.

In each chapter the Haarsmas offer various options for reconciling different aspects of evolutionary theory and Christian belief. They begin with discussing the worldviews that shape how persons understand both their faith commitments and their scientific interpretations. "A worldview," state the authors, "is defined as a belief system that a person uses to answer the big questions of life." In many ways, a worldview is similar to a scientific paradigm — it's the overarching context for interpreting life's data. Although the authors mention a number of non-Christian belief systems, their discussions focus on just two worldviews: Christian and atheistic. Although this approach helps to streamline the discussion, it sometimes appears as if the authors have parceled out all persons into these two categories.

After exploring alternate ways of interpreting Scripture, the authors move to discuss the age of the universe, evolution by natural selection, "intelligent design", and human evolution. The Haarsmas seek to be as even-handed as possible, presenting each reconciliation strategy in a positive light, even as they critique each position. They openly admit that they are not fully satisfied with any of the strategies, but they are still seeking reconciliation. For them, the process of discussion and seeking is more important than absolute certainty.

At the same time, there appear to be limits to the Haarsmas' seeking. At the beginning of this review, I mentioned that *Origins* will most likely not be as controversial as Van Till's book was twenty

years ago. In some academic Christian circles, evolution is not as startling or threatening as it once was. Human evolution, however, remains a touchy subject. As employees at a denominational school, the Haarsmas are bound by denominational rulings. They thus admit in Appendix B that they have been careful not to advocate pre-human ancestry, which would be a violation of church statements. Instead, the Haarsmas are very careful in the human evolution chapter to speak theoretically about the various options Christians have chosen, including the acceptance of a more extensive family tree. Maybe in another twenty years this too will change.

AUTHOR'S ADDRESS

Rebecca J Flietstra
Biology Department
Point Loma Nazarene University
3900 Lomaland Drive
San Diego CA 92106-2899



THE MAKING OF THE FITTEST: DNA AND THE ULTIMATE FORENSIC RECORD OF EVOLUTION

by Sean B Carroll
New York: WW Norton, 2006
(paperback 2007). 288 pages

Reviewed by Louise S Mead

Just as fossils provide a window into the past, evolution leaves a footprint on DNA. In *The Making of the Fittest*, Sean Carroll explains some of the overwhelming evidence for evolution provided in DNA, bringing to life new examples from sequences of DNA that

Louise S Mead is NCSE's Education Project Director.

once coded for genes no longer used, remnants of ancestral lives, and evidence of evolutionary change. As Carroll explains, “every evolutionary change between species, from physical form to digestive metabolism, is due to — and recorded in — changes in DNA” (p 14). Using this forensic evidence of evolution, Carroll reveals how these relics provide new “sources of insights into traits and capabilities that have been abandoned as species evolved new lifestyles” (p 16). Carroll also deals a blow to the claim that evolution occurs completely at random, and that order and complexity of nature are surely outside the realm of random processes. The descriptions offered in *The Making of the Fittest* provide powerful examples of how evolution actually works, and why evolution matters. A few are discussed below, but definitely read *The Making of the Fittest*, and evaluate the data for yourself.

HOW THE ICEFISH LOST ITS BLOOD

Carroll’s first example, of bloodless fishes in the Antarctic, shows the wonderful way science operates. An unconfirmed observation of bloodless fishes living in the cold waters of the Antarctic challenged the working hypothesis that all vertebrates must have red blood cells, contingent on their requirement for the oxygen-carrying molecule hemoglobin. Years passed, with no verification of these strange fish. However, eventual proof of the actual existence of bloodless fishes — which turned out in fact to have blood that lacked red blood cells and hemoglobin — then fueled more empirical work. Scientific research, in the form of actual observations, data, and facts, provided an explanation of how these fishes came to exist without hemoglobin, in a story that is a much more awesome and compelling than any just-so story that could be written.

The evolutionary explanation, described by Carroll, shows, in uncontested detail, how bloodless icefish have evolved in response to “opportunity and necessity”. This evolutionary narrative takes place over the past 55 million years, during which tem-

peratures of the Antarctic Ocean have dropped, from about 20° C to less than 0° C in some locales. A cold environment presents challenges to living organisms, which have to adapt in response: for example, since fluids like blood move much more slowly in colder temperature, animals in such environments compensate by evolving less viscous blood and/or increasing the surface area for oxygen exchange.

The protagonists of our evolutionary narrative are fishes of the teleost suborder Notothenioidei, commonly known as icefish, which dominate the fish fauna of the freezing coastal regions of the Southern Ocean. Notothenioid fishes in the Antarctic have either much lower hematocrit percentages (that is, a lower percentage of red blood cells in their blood) or no hemoglobin-containing red blood cells in their blood (and are therefore considered bloodless). The bloodless icefish have relatively large gills and scaleless skin with unusually large capillaries. Modifications in the heart and gills facilitate the transfer of oxygen from water to tissue. Icefish also synthesize antifreeze glycoproteins (AFGP1-AFGP8) that inhibit growth of ice crystals and therefore prevent freezing of tissues.

Enter DNA ... providing a window into the past and evidence of change. Bloodless icefish in the Antarctic have genes for hemoglobin, but the genes have accumulated mutations, and are now functionless. The presence of relict hemoglobin genes points to an ancestral way of life, no longer followed by the fish, and provides evidence for descent with modification. Moreover, the DNA sequence of the antifreeze glycoprotein (AFGP) informs us how the evolutionary change occurred. The notothenioid AFGPs (a family of at least eight different isoforms — various forms of the same protein) are composed of a simple glycotriptide repeat, (Thr-Ala/Pro-Ala)_n, with the disaccharide galactose-N-acetylglucosamine attached to each Thr, and the dipeptide Ala-Ala at the N terminus (Chen and others 1997). The smallest AFGP isoform consists of four repeats; the largest of 55 repeats.

Variation abounds among these isoforms, and AFGP polypeptide precursors contain various combinations of these isoforms. Additionally, there are multiple genes and multiple AFGP copies per gene, which contribute to high levels of circulating proteins and suggest extensive duplications gave rise to this protein family (Chen and others 1997).

The first AFGP gene characterized was from the Antarctic notothenioid *Notothenia coriiceps* (Hsiao and others 1990), and a search of Genbank found that the 3’ flanking sequence of the *Notothenia coriiceps* AFGP gene, starting from the termination codon to about 100 nucleotides downstream, to be about 80% identical to the coding sequence of the C terminus (50 residues) of the trypsinogen cDNA of Atlantic plaice, providing a potential pathway for evolution of the antifreeze protein from a digestive protein. Analysis of both the AFGP gene and the trypsinogen gene from the giant Antarctic notothenioid *Dissostichus mawsoni* showed 4–7% sequence divergence (Chen and others 1997). And, as can only be predicted and tested within an evolutionary framework, a transcriptionally active chimeric gene that encodes both the AFGP polypeptide and the trypsinogen protease was found (Cheng and Chen 1999). Evolution works “by tinkering with materials that are available — in this case a little piece of another gene’s code — rather than by designing new things completely from scratch” (p 26). *The Making of the Fittest* is full of similar descriptions of evolution in action. Mutation, heritable variation, and differential survival in a changing environment provide an explanation of evolutionary change that is overwhelmingly consistent with, and supported by, our observations across all major groups of organisms.

THE RANDOM DOUBTERS

A common misconception about evolution is that it proceeds by random chance, and many creationists use this myth to discredit evolution. Carroll dismisses this misconception, offering a clear and understandable description of



the mathematical power of evolution to produce change. Carroll uses everyday examples — winning the lottery, dying in various kinds of accidents, and saving money — to address commonly held misconceptions about the probability of evolution, specifically the potential for random events to generate complexity and the ability of selection to cause significant change. Critics of evolution want people to believe that mutations cannot lead to new information. Carroll clearly shows where these arguments fall apart. He first points out that while mutations are random, selection determines what chance occurrences are retained. “Given enough time identical or equivalent mutations will arise repeatedly by chance and their fate (preservation or elimination) will be determined by the conditions of selection upon the traits they affect” (p 155). Carroll also draws an analogy between the power of natural selection and that of compounding interest, explaining that “small differences among individuals, when compounded by natural selection over time, really do add up to the large differences we see among species” (p 43). Understanding the power of selection as an analogy to the practice of compounding interest could better prepare everyone for an age of global climate change as well as a global economy.

BEYOND NATURAL SELECTION

Carroll states, quite rightly, that “DNA decisively confirms [Darwin’s] picture of evolution” (p 16), and shows how molecular data continue to inform our understanding of how natural selection operates as a mechanism of evolutionary change in his discussions of the distribution of color vision and olfactory sensitivity in groups of mammals, population responses to environmental change, microbial resistance to antibiotics, and sickle-cell trait in humans. Expecting natural selection to explain all evolutionary change, however, would be terribly near-sighted, ignoring much of the results of research in evolutionary biology, population genetics, and molecular biology over the last 150 years. Development, mutation, gene

duplication, gene rearrangement, and genetic drift must be incorporated into a complete understanding of evolutionary change.

Carroll has two other books (Carroll and others 2001; Carroll 2005) that address some of these topics in more depth. It is unfortunate that, in a time when evolutionary biology forms the backbone of so much research into medical advances and provides a greater understanding of the genetic components of human health and disease, Carroll felt the need to include a chapter on discussing creationism, including “intelligent design”. The chapter is, however, sadly needed, as anti-evolution groups continue to undermine sound science education. Critics of evolution continually disregard the predictive power of evolutionary explanations, which, as Carroll clearly shows, explain how icefish evolved from ancestors with the capacity to synthesize hemoglobin, later lost as they adapted to living in freezing cold water. To be sure, those voicing dissent will not be satisfied until every nucleotide substitution and gene duplication event is historically identified and mapped, and in the interval will insist that we reject the entire evolutionary explanation in favor of a supernatural explanation with no evidence at all. Believing that the adaptations of icefish were designed by an intelligent agency is about as scientific, and intellectually satisfying, as Kipling’s explanation of how the leopard got its spots.

The scientific evidence for evolution provided by Carroll will probably not enlighten those who refuse to accept the nature of scientific investigation and oppose Darwinian evolution. But *The Making of the Fittest* should be required reading for those teetering on the edge of accepting evolution, as well as anyone interested in learning more about the great epic of life. Its appeal to a wide audience also makes the book of great value to teachers who can mine the text — available in a quite affordable paperback version, happily — for opportunities to teach students about the nature of science and fresh and exciting examples of how evolution works.

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AUTHOR’S ADDRESS

Louise S Mead
NCSE
PO Box 9477
Berkeley CA 94709-0477
mead@ncseweb.org

BEDROCK ARCHEOLOGY

In a recent course in general anthropology, the following true-or-false question about the extinction of the Neandertals appeared on the examination:

One factor that contributed to the demise (extinction) of the Neandertals was the fact that dinosaur hunting was extremely dangerous and many individuals were killed in the pursuit of these animals.

STUDENTS’ ANSWERS

True 11.11%
False 88.89%

About a ninth of the students, then, would seem to have been taking *The Flintstones* to be a documentary.

[Thanks to Ron Kephart of the University of Northern Florida, whose students’ answers illustrate why Florida needed better science education standards that included evolution.]

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EDITOR

Andrew J Petto
Department of Biological Sciences
University of Wisconsin, Milwaukee
PO Box 413, Milwaukee WI 53201-0413
(414) 229-6784; fax (414) 229-3926

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