REPORTS OF THE NATIONAL CENTER FOR SCIENCE EDUCATION

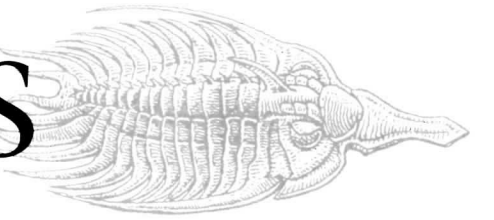
DEFENDING THE TEACHING OF EVOLUTION IN THE PUBLIC SCHOOLS

Volume 24, Number 1

JAN-FEB, 2004

CONTINUES *NCSE REPORTS* & *CREATION/EVOLUTION*

CONTENTS



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FROM THE EDITOR

This first issue of 2004 returns to a long-standing theme in contemporary anti-evolutionism — geologic evidence for the age of the earth and the formation of its major physical features. It is not unusual for those who study "creation science" and its various manifestations to trace its origins to *The Genesis Flood* by Morris and Whitcomb, which drew heavily on George McCready Price's "flood geology". Among the perennial subjects for flood geologists to flog in their opposition to evolution is the formation of the Grand Canyon. The goal is to show that this geological feature was produced over the course of a very short time only a few thousand years ago, and to accomplish this, the Canyon has been one of the most "researched" natural features in the annals of "creation science". Of course, the great interest in the Grand Canyon among anti-evolutionists is due to the fact that it demonstrates that the earth *is* billions of years old — plenty long enough for evolution to have produced the diversity and complexity of living things that we have observed throughout its history. Because geological arguments in general — and those about the Grand Canyon in particular — are such important weapons in the anti-evolution arsenal, we bring you this special issue that focuses once again on the geology of the Grand Canyon.

In our lead feature, Wilfred Elders — Professor Emeritus of Geology at UC Riverside, long-time NCSE member, and co-leader of the NCSE rafting expeditions through the Grand Canyon — reprises his 1998 examination of "bibliolatry" in books about the Grand Canyon. In *RNCSE* 18 (4), Elders examined Steve Austin's book *Grand Canyon: Monument to Catastrophe*. Here, he applies the same geologist's critical eye to Tom Vail's *Grand Canyon: A Different View*. Vail's book caused considerable controversy late in 2003 when the Grand Canyon gift shop offered this creationist book in its Science section (it has since been moved to the Inspirational Reading section). Readers will also find a news item by NCSE Deputy Director Glenn Branch and several short items relating to Vail's book throughout the issue. And post-doctoral scholar Alan Gishlick invites members to the 2005 NCSE "Two-Models" Grand Canyon excursion.

Bill Parkinson has provided us with an overview of "flood geology". Although many of us have heard the claims and criticism for years, Bill provides a fresh review and perspective to help us see "flood geology" in general terms for what it is — an attempt to twist scientific evidence, laws, and theories into a strict, literal reading of biblical narratives. Following Bill's article are a number of shorter pieces that explore specific claims about or geological requirements for a world-wide flood capable of producing all the earth's geophysical features in about one year only a few thousand years ago.

IN THE NEWS

As this issue goes to press, there are attacks on evolution education throughout the country. Some of these are in state legislatures, and others are in state or local school boards. The biggest news for this issue comes out of Ohio where the Ohio Board of Education let stand a model lesson plan that included misrepresentations of scientific method, scientific data, and scientific analysis that derive from the Discovery Institute's "teach the controversy" strategy. Among other problems, the controversies lesson models "scientific debate" as the process for the class to resolve these disagreements — which many supporters of science education have pointed out violates another state science education standard that calls for educators to help students understand the practice of science.

Patricia Princehouse of Ohio Citizens for Science provides us with an overview of the Ohio situation. We also have a report from Richard Hoppe about repercussions of the Ohio curriculum debate at the local level. Kim Bilica and Gerald Skoog report briefly on their research to understand the impact of this debate on teachers and curriculum, and Scott Moody graciously allowed us to reprint his open letter to the Ohio Board of Education and Ohio Governor Taft about what is wrong with the proposed lessons.

BOOK REVIEWS

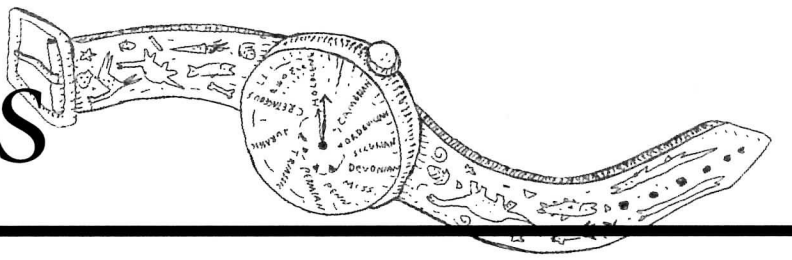
As usual, our book reviewers have been very busy. NCSE President Kevin Padian reviews *The Seashell on the Mountaintop,* which tells the story of Niels Stensen, a Renaissance scholar who contributed much to our understanding of sedimentary rock. Jon Alston reviews Jay Hosler's *Sandwalk Adventures*, and Stanley Rice reviews Alston's *The Scientific Case Against Scientific Creationism*.

INTRODUCING ...

With this issue, we welcome several new "faces". Michael Buratovich joins *RNCSE* as the Associate Editor for Cell and Molecular Biology. Barbara Forrest joins the NCSE Board of Directors, and we welcome Keith Miller, Bill Nye, and Richard Stucky as NCSE Supporters. Look for more information about these new faces in future issues.

RNCSE 24.1 was printed in June 2004.

NEWS



Flood Geology in the Grand Canyon

Glenn Branch
NCSE Deputy Director

During his historic exploration of the Grand Canyon, John Wesley Powell wrote in his diary, "The thought grew in my mind that the canyons of this region would be a Book of Revelations in the rock-leaved bible of geology." Today, geologists know that the Canyon began to be eroded 4 million years ago: what the strata thus exposed reveal is a 1.75-billion-year span of the earth's history. Yet visitors to the official bookstores in Grand Canyon National Park are now treated to a different view — the view of creationists who believe that these rocks were deposited and the Canyon was carved in a twinkling during Noah's Flood.

At issue is *Grand Canyon: A Different View*, compiled by Tom Vail, a Colorado River guide. With its lavish color photographs of the Canyon and its low list price of $16.99, it is the sort of book that you might want to take home as a souvenir. Unless you open it, and happen to notice that it was published by Master Books, the publishing arm of the Institute for Creation Research, or that its list of contributors is a virtual who's who of "creation science", or that "all contributions have been peer-reviewed to ensure a consistent and biblical perspective."

"Flood geology" — according to which Noah's Flood, as described in Genesis, was a historical worldwide event responsible for the distinctive features of the earth's geology — is nothing new. It was pioneered by self-educated geologist George McCready Price in the first half of the 20th century, and revived by John C Whitcomb and Henry M Morris in their 1961 book *The Genesis Flood*.The theory continues to be influential in fundamentalist circles, where adherence to a literal reading of the Bible is frequently thought to demand rejection of evolution as well as acceptance of flood geology.

To the uninitiated, it is hard to imagine that flood geologists regard the Grand Canyon, with its thousands of feet of layers of sedimentary rock deposited over the eons, as a suitable icon. In the 1920s, a colleague of Price's urged him to explain the formation of the Grand Canyon in these words: "Let's have the worst before us when we're dealing with the enemy, and if we perish, we perish!" Yet today's creation scientists are confident that it is, in the words of the title of one of their books, a monument to catastrophe, despite the overwhelming dismissal of their view by the scientific community as absurd.

A Different View claims, for example, that the Canyon was rapidly cut when the sediment was still soft. But it offers no explanation of how the supposedly soft sediment remained standing in high vertical walls instead of slumping, of why the layers alternate between chemically produced sedimentary rocks such as limestone and mechanically produced sedimentary rocks such as sandstone and shale, or of why the canyon's river channels are not the sort of wide deep channels that are characteristic of canyons carved by floods. Similarly, although the Grand Canyon's fossils are confidently described as casualties of the biblical flood, there is no explanation — beyond a vague reference to hydrodynamics — of how they managed to sort themselves in the chronological order so thoroughly documented by paleontologists.

Not surprisingly, then, Wilfred Elders, a professor of geology at the University of California, Riverside, was dismayed to learn that *A Different View* was on the shelves in the bookstores in Grand Canyon National Park. The bookstores are operated by a non-profit organization, the Grand Canyon Association, under the supervision of the National Park Service. According to a spokesman for the NPS, the book was unanimously approved for sale by a panel of park and gift shop personnel. In his review of the book for *Eos*, the weekly newsletter of the American Geophysical Union, Elders lamented, "Allowing the sale of this book within the national park was an unfortunate decision." (See p 33 for a longer version of Elders's review.) In his opinion, *A Different View* is not a work of science; it is religious proselytizing.

The scientific community concurred. The presidents of the American Paleontological Society, the American Geophysical Union, the National Association of Geoscience Teachers, the Association of American State Geologists, the Society for Vertebrate Paleontology, the American Geological Institute, and the Geological Society of America signed a joint letter to the NPS, urging that *A Different View* be removed "from shelves where buyers are given the impression that the book is about earth science and its content endorsed by the National Park Service" (see p 21). The American Institute of Biological Sciences — the umbrella organization of professional biology societies — followed suit.

Meanwhile, Public Employees for Environmental Responsibility, a non-profit organization that promotes environmental ethics and government accountability, was also taking notice. In a press release dated December 22, 2003, PEER cited the sale of *A Different View*, along with the NPS's recent about-face on the removal of plaques bearing biblical verses

from the South Rim of the Canyon and its decision to edit images of gay rights and abortion rights demonstrations from a videotape that airs at the Lincoln Memorial in Washington DC, as evidence that the Bush administration is attempting to institute a program of "faith-based" parks.

The issue finally arrived on the national stage with a story published in the *Los Angeles Times* (2004 Jan 7), citing both the joint letter from the geoscience organizations and the PEER press release. According to the *Times* story, following protests from the park's interpretive staff, *A Different View* was relocated from the natural sciences section of the bookstores to the Inspirational Reading section — a reasonable category for a book that is explicitly founded on the premise that "the Bible, in its original form, is the inerrant Word of God." The recategorization of *A Different View* complies with the geoscientists' recommendation that "if it remains available in Grand Canyon bookstores, it be clearly separated from books and materials that do discuss our scientific understanding of Grand Canyon geology."

To No A-Vail? GC Bookstore Makes the News

As the protest grew about the inclusion of Tom Vail's *Grand Canyon: A Different View* in the book shop at the Grand Canyon National park, news outlets and advocacy groups around the country followed the story. Here is a sampling.

"Bible-based history of park stirs debate" (National Public Radio): <http://www.npr.org/rundowns/rundown.php?prgDate=17-Jan-2004&prgId=7>.

"Protests hit Grand Canyon book with creation science essays" (Southern Baptist News): <http://www.sbcbaptistpress.org/bpnews.asp?ID=17427>.

"Sale of book at park ignites debate over Grand Canyon's age" (*Salt Lake Tribune*): <http://www.sltrib.com/2004/Jan/01172004/saturday/129896.asp>.

[*Thanks to Paul Heinrich for alerting us to these resources.*]

But the story is not over. The superintendent of the park is seeking further guidance from the legal department of the NPS headquarters in Washington. Predictably, creationists are up in arms. Answers in Genesis — a large creationist ministry based in Florence, Kentucky — promptly called upon its supporters to lobby the NPS and Secretary of the Interior Gale Norton, not to permit what it called "censorship and book banning". As of January 12, AiG reports, over 125 of its supporters have communicated with the NPS, complaining of what AiG characterizes as "an incredible attack on free speech". The complaint of censorship is, of course, bogus; the First Amendment confers no right to have books purchased and resold by the government or (as here) by a non-profit organization overseen by a government agency.

Creationists were also unhappy with the relegation of *A Different View* to the Inspirational Reading section of the park bookstores, touting the scientific credentials, publications, and memberships of the contributors in order to emphasize the supposedly scientific basis of the book. The Institute for Creation Research, for example, boasts that "Many of the contributing authors to the book are also active members of the societies represented in the letter of protest." But the NPS management policies clearly state that factual information presented in interpretive and educational programs is to be based on current scholarship and science; it is hardly unreasonable to expect the bookstores overseen by the NPS to reach the same standard by refusing to countenance a counterfeit of science on their shelves.

And legal sabers are now rattling on behalf of "creation science". The Alliance Defense Fund — a Scottsdale, Arizona, organization that describes itself as engaged in "the legal defense and advocacy of religious freedom, the sanctity of human life, and traditional family values" — reportedly threatened to sue if *A Different View* is removed from the bookstores or even if it is relegated to their Inspirational Reading sections, describing such actions as patently unconstitutional. Standing in the way of such a suit, of course, is the formidable obstacle of the Supreme Court's ruling (in the 1987 case *Edwards v Aguillard*) that "creation science" is intrinsically a religious view.

For the time being, *A Different View* remains on the shelves. David Barna, a spokesperson for the NPS, told the Associated Press (2004 Jan 7) that NPS headquarters was likely to tell Grand Canyon National Park's administrators not to restock the book. But Barna then told *The New York Times* (2004 Jan 18) that NPS headquarters decided that "the book can remain on sale as an alternative theory to the Grand Canyon history — but one that the Park Service does not necessarily support." The Baptist Press news service reported (2004 Jan 27) that the bookstores ordered over 300 additional copies of the book; Elaine Sevy, a spokesperson for the NPS, commented, "Now that the book has become quite popular, we don't want to remove it."

For his part, Professor Elders, whose concern about the presence of *A Different View* in the park's bookstores helped to spark the controversy, offers suitably scriptural advice: "speak to the earth, and it shall teach thee" (Job 12:8).

Acknowledgments
I wish to thank Alan Gishlick and Wilfred Elders for helpful comments.

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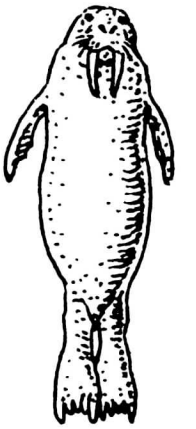

Ohio Rides Again

Patricia Princehouse
Ohio Citizens for Science

Did you think they would just pack up and go home? Although "intelligent design" creationism suffered a heavy blow in Ohio in 2002 (*see* RNCSE *2002 Sep/Oct; 22 [5]: 4-6*), we knew the creationists would not give up.

They came back with an attack on the Ohio Model Curriculum. Five lesson plans proposed for use by teachers in the Buckeye State meet standards for neither good science nor good pedagogy, presenting misinformation on biology, geology, astronomy, physics, and the fundamental methods of science.

In 2002, the board stood up to the well-funded, religiously-motivated, out-of-state influences of Seattle's Discovery Institute, Kansas's IDNet, and others who tried to co-opt Ohio's democratic processes. In a series of open meetings, representatives of anti-evolutionist and sectarian religious organizations attempted to insert "intelligent design" into Ohio's science standards, but were rebuffed by the Ohio Board of Education (OBE), which unanimously rejected creationism and adopted standards calling for quality teaching of good science only. The standards specifically exclude "intelligent design" creationism from the Ohio Graduation Test (still under development).

OBE members Michael Cochran and Deborah Owens-Fink (who has been trying to inject ID creationism into Ohio's curriculum for four years) were most sympathetic to the appeals of creationists. After the vote of intent to adopt the standards, Cochran commented: "I ... in no way for the record believe that this at all advocates for the teaching of creationism in school or intelligent design. ...The standards are clearly limited to scientific controversy." His remarks were echoed by Ohio Superintendent of Public Instruction Susan Tave Zelman in her address to a joint session of the Ohio House and Senate Education Committees on November 13, 2002. Regarding the model curriculum, Zelman explained, "we hope to be able to give teachers ideas on how to present these in an intellectually honest way, and that evolution is very much a part of science."

Unfortunately, neither Zelman nor the Cochran-led standards committee followed the OBE mandate. Instead, a secret process was used to build the model curriculum in 2003, incorporating creationist mischaracterization not only of the content, but also of the process of science itself. Accessing the curriculum required 3 Freedom of Information Act requests from the Ohio Academy of Science. Ohio neo-creationist leader Robert Lattimer bragged to an Intelligent Design Network conference in November 2003: "The debate this year has been very quiet, it's not been in the news, and that's good. That's good, and hopefully it'll stay out of the news ..." He explained how they manipulated the process:

> This is basically a political struggle ... Science will have very little to do with the arguments on what science standards will look like. Education will have little to do with it. It's basically how the politics works in a particular state. ... That does not mean that all members of the State Board of Education supported our viewpoint. Actually, only 5 supported our viewpoint. ... Most politicians do not care about this issue. ... But they do react to public opinion because that's what keeps them in office ... And the Governor was twisting some arms. He appoints 8 of those members, but he has pretty much influence on the whole board.

The model curriculum includes a lesson plan modeled closely on the "intelligent design" book *Icons of Evolution* by Jonathan Wells, a leading proponent of the "intelligent design" creationist movement. Like *Icons*, this lesson plan appears cleverly designed to mock the very enterprise of science and of honest intellectual inquiry. They call it a "Critical Analysis of Evolution". But this lesson plan does not involve critical analysis. Rather, it presents lies about science pulled from the creationist literature. Of course, scientists do not object to true critical analysis; it's their stock-in-trade. Scientist opposing critical analysis would be as nonsensical as Chiquita opposing bananas.

The Wells-inspired lesson plan's scientific inaccuracies are stunning. It begins with false statements about the role of scientific anomalies in critical analysis and builds the whole lesson around a misunderstanding of the scientific process. Its suggested "controversies" — homology, fossil record, antibiotic resistance, peppered moths, and endosymbiosis — are egregious shams, extracted with all the falsehoods intact from *Icons of Evolution* and Michael Behe's *Darwin's Black Box*.

The proposed activities have no basis in current science as "science" is defined in the standards: "science is a systematic method of continuing investigation, based on observation, hypothesis testing, measurement, experimentation, and theory building, which leads to more adequate explanations of natural phenomena."

Along with the bogus content, the lesson plan promotes the creationist vision of how they want to change the process and methods of science. Since the 1960s, creationists have tried to intimidate, cajole, and otherwise induce scientists to engage in an atypical practice — namely replacing careful consideration of evidence with staged public debate, an approach that directly conflicts with OBE directives in the standards. This debate structure would deceive Ohio's students, instilling in them a false template for how science is conducted and thereby damaging Ohio's efforts to develop a scientifically literate work force.

Ohio Citizens for Science and many other organizations and private citizens in Ohio appealed to the OBE to drop the corrupted "lessons" and to substitute lessons based on peer-reviewed, scientific literature. Four were quietly abandoned. However, in its final vote on March 9, 2004, the OBE approved the Wells-inspired lesson that promotes scientific illiteracy among Ohio's public-school students. Law professor Steven Gey says that this attempt to sneak creationism in under the radar is "not just bad science, it's illegal." The ACLU is considering whether to litigate. The next best hope for the future of science education in Ohio's public schools is to develop a graduation test that focuses on good contemporary scientific practice.

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ID Check in Ohio

Richard B Hoppe

On December 10, 2002, after a year of work, the Ohio State Board of Education adopted new state science education standards (*see* RNCSE *2002 Sep/Oct; 22 [5]: 4-6*). While the biology standards emphasized good science and explicitly noted that they do not mandate the teaching of "intelligent design", nevertheless some opponents of evolutionary theory interpreted the standards as sanctioning their position. For example, Jody Sjogren, Manager of Intelligent Design Network (IDNet) of Ohio, claimed:

> From our perspective, this amendment [stating that teaching ID is not mandated] has some positive aspects and no real negative aspects. First, the amendment does not weaken the "teach the controversy" intent of the indicator/benchmark, and this is good. Second, the amendment does not prohibit the teaching of alternative theories, it only states that teaching of ID is not mandated and students will not be tested on ID. At the same time, this implies a permissive attitude toward the teaching of ID, so that teachers who want to and feel able to teach alternative theories should be able to do so. Thirdly, by mentioning intelligent design specifically, the amendment gives ID some legitimacy (<http://www.intelligentdesignnetwork.org/SjogrenReport121102.htm>).

That interpretation, especially the second point, suggested that efforts to inject "intelligent design" creationism into local districts' science programs would follow.

While it is not clear that it was directly due to IDNet's interpretation of the new standards, one of the first attempts to alter a local Ohio district's science curriculum to include creationist and/or IDist views was in Mount Vernon, Ohio. Mount Vernon is the county seat of Knox County, a mostly rural county 50 miles northeast of Columbus. It has a large number of evangelical and fundamentalist churches and has a district office of the Seventh Day Adventist Church. Mount Vernon Nazarene University and Kenyon College are in Knox County.

In late March 2003, John Freshwater, a middle school science teacher in the Mount Vernon City School District, proposed to the district's Science Curriculum Committee that it adopt IDNet's recommended "Objective Origins Science Policy" verbatim (<http://www.intelligentdesignnetwork.org/SchoolPolicy.htm>).

The core sentence of that policy is "... it is necessary and desirable that science which seeks to explain the origins of life and its diversity (origins science), be conducted and taught objectively and without religious, naturalistic, or philosophic bias or assumption." In other words, in "origins science" anything goes!

The principal documents Freshwater provided in support of his proposal were Jonathan Wells's "Survival of the fakest" article from *The American Spectator* (<http://www.discovery.org/articleFiles/PDFs/SurvivalOfTheFakest.pdf>) and Wells's "10 questions to ask your biology teacher" (http://www.iconsofevolution.com/tools/questions.php3>), though the copies that Freshwater distributed did not identify the author of the "10 questions". Freshwater's stated reason for proposing the policy was to obtain guidance from the Committee concerning what material is appropriate to use when criticizing Darwinian evolutionary theory.

After considerable discussion, the Science Curriculum Committee, composed of science teachers and a couple of administrators including the district's curriculum director, unanimously rejected Freshwater's proposal. Freshwater then changed hats from teacher to parent of children in the district and brought his proposal to the 5-member district Board of Education at its April 8, 2003, meeting. There was a large audience at the meeting, mostly supporters of the proposal. During the public comment session, 10 people spoke regarding the proposal, 7 supporting it and 3 opposing.

The support offered for the proposal was fairly diffuse. Some speakers invoked religious reasons (one referred to teaching God's design — a clear tactical mistake) and were duly rewarded with "Amens" from the audience. (Speakers opposing the proposal did not get any "Amens".) Others mentioned various anti-evolution arguments familiar to readers of *RNCSE*. One or two used the "teach the controversy" slogan.

The opposing speakers, one a professional evolutionary biologist and former editor of a professional journal in biology, focused on the undesirability of weakening science education and on the anti-science core of the proposed policy. The evolutionary biologist noted that in his years as a journal editor he had never received a creationist or "intelligent design" submission, indicating their absence from the professional literature of biology.

The curriculum director reported to the Board of Education that after lengthy consideration, the Science Curriculum Committee had unanimously rejected the proposal. The board took the proposal under advisement in order to seek more information from the Science Curriculum Committee regarding its rejection.

During the month between the April and May board meetings, there was a spate of letters to the editor of the local newspaper supporting and opposing the proposal. There were also several articles in the newspaper. A local radio talk show had an old-time creationist (a retired engineer) spouting the usual young-earth creationist (YEC) arguments about the absence of transitional fossils, the improbability of spontaneous assembly of a DNA molecule, and so on.

In addition, there was a fair amount of behind-the-scenes activity. Supporters of the proposal talked to teachers who were members of the Science Curriculum

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Richard B Hoppe is an Affiliated Scholar in Biology at Kenyon College and a Lieutenant on the College Township Volunteer Fire Department. He is married to a special education teacher in the Mount Vernon (Ohio) City Schools.

Committee, attempting to get them to reconsider and recommend adoption of the policy. Opponents of the proposal also talked with committee members, bolstering them in their rejection, and prepared appropriate materials supporting the committee's rejection for board members.

At the May 12, 2003, board meeting, there was a large crowd, again mostly supporters of the proposal. The first speaker in the public comment session identified himself as the president of the county ministerial association and as Freshwater's pastor. The main burden of his remarks was to caution other speakers supporting the proposal, "especially my fellow evangelicals," to avoid references to religion. In contrast to some of the comments at the first board meeting, the proposal's supporters adhered scrupulously to his admonition at this meeting. He asked for a show of hands in support of the proposal. About 80% of the audience raised their hands. Many were from Freshwater's church. Most wore dark blue fish-shaped ribbons, signifying support of the proposal, made by a member of that church. (I declined the offer of a ribbon, eliciting a pitying look from the gentleman who proffered it.)

The speakers in support of the proposal took several approaches, though some choreography was apparent. One spent a few minutes on Haeckel's embryos, with his material coming directly from Wells's "Survival of the fakest." He also characterized Wells as a "responsible authority" because Wells had participated in a panel discussion for the Ohio State Board of Education in 2002. A microbiologist from Mount Vernon Nazarene University said something about how presuppositions can affect interpretations of evidence, adding that she favored academic freedom. One speaker stressed "critical thinking" about evolutionary theory, with the clear implication that thinking critically implies accepting Wells's critique. Another speaker argued for "equal time," though he was not specific about what the equal time should be given to.

Another speaker referred to evolutionary biology as "an old boys' club" and described the

Open Letter to the Ohio Board of Education and Governor Robert Taft

Scott M Moody
Ohio University

[On March 7, 2004, Scott M Moody wrote to the Ohio Board of Education (BoE) and Governor Robert Taft to outline several problems with draft lesson plans under consideration by the Board and their potential effects on science education in the state. We reprint his comments with his permission. Ed.]

TO: Members of the Ohio Board of Education
Governor Robert Taft

FROM: Scott M Moody, Associate Professor of Biological Science
Ohio University

I have been a biologist for as long as I can remember, beginning with an escape from the backyard as a toddler, together with my constant dog companions, to explore and examine the world of nature (fields and woodlands, ponds and streams, snakes and frogs, birds and bees) on a farm in Nebraska. As I grew as a student and naturalist, my father, who strongly supported my inquiries, would always challenge my hypotheses and ideas with the declaration "show me." You see, he had grown up in Missouri and by nature had a healthy sense of skepticism, rarely believing what he had read or heard until he had seen it with his own eyes.

Scientists also must be skeptical of new hypotheses and explanations, and we require considerable evidence through tests of observation and experimentation before a new idea is accepted as being most likely true (not proven in the strict sense but unlikely to be disproved). All scientists critically analyze hypotheses and evidence for and against the hypotheses on a daily basis; this is by definition what a good scientist does, and we try to teach our students in classes of biology or geology or chemistry or physics or astronomy or medicine these intellectual tools of the trade.

Therefore, it is very suspicious to find that among the dozens of lesson plans proposed for adoption by the BoE for the various disciplines of life and physical science to be taught in the secondary schools, only *one* has a lesson plan devoted to "critical analysis". That particular lesson plan happens to focus on the "Theory [not a hypothesis] of Evolution in Biology" that was first formally proposed by Charles Darwin and Alfred Wallace in 1858. For the past 146 years this theory has been tested and tested by thousands of scientists who faithfully followed the skeptical mantra of "show me" and along the way revealed substantial evidence in support of evolution and a conspicuous absence of evidence for alternative notions such as intelligent design creationism.

One of the areas in which I teach and conduct research is "forensic biology": the field of collecting, analyzing, and interpreting biological trace evidence from crime scenes (finger prints, hair, blood, body fluids, and so on). Certainly we want our detectives and crime scene investigators to be highly trained in "critical analysis" of evidence so that hypotheses of "who dunnit" are robust and that innocent folks are not incarcerated. From critical analysis of trace evidence, one can reconstruct a crime and scientifically and accurately

identify who committed the crime at that scene even though nobody actually witnessed the heinous act.

Why do I discuss forensic investigation? Because there are many persons who have claimed erroneously over the past several weeks in letters to newspaper editors, in interviews with newspaper reporters, and in e-mails responding to concerned scientists that "intelligent design" creationism is *not* part of Lesson 10-H23 (Critical Analysis of Evolution — Grade 10).

While it may be true that the phrase "intelligent design" is not explicitly written in the lesson plan, and while it is true that one citation (Wells's *Icons of Evolution*) was removed by vote of the BoE at its last meeting, there is an overwhelming amount of trace evidence that does remain in this lesson plan. Forensic analysis of the proposed plan reveals clearly, beyond a shadow of a doubt, the outline of "intelligent design" creationism, not only in the nature of the questions being asked but also in directing the student to "evidence" at many religious websites rather than only to scientific websites.

As a scientist and as a religious person, I am both befuddled and incensed that the BoE has allowed one particular brand of religion to creep into a lesson plan that should be covering only science. My extended family and I are an "amalgam" of several religious faiths (United Methodist, Presbyterian, Congregational, Roman Catholic, Jewish, and Unitarian), and all of these churches have formally declared that there is no conflict between religious belief and pursuit of higher truths and the scientific explanation of evolution of life.

As Galileo said at his inquisition in Rome, "I do not feel obliged to believe that the same God who has endowed us with sense, reason, and intellect has intended us to forgo their use." And back in the 1950s, when Galileo was posthumously forgiven by the Vatican, the Pope declared: "The Bible doesn't tell Man how the heavens go round, but instead tells Man how to go to heaven." Pursuit of religious truth and pursuit of scientific truth are very separate endeavors that do not need to be in conflict, and most theologians recognize this difference.

I have a son and a daughter in high school and I sincerely expect (no, I demand) that when they are in science class that they will be learning only science and not some brand of religion that does not have my approval and that of my family and all my good United Methodist, Presbyterian, Congregationalist, Catholic, Unitarian, Quaker and Jewish friends.

If the BoE persists on endorsing, indirectly or implicitly, the narrow-minded brand of religion espoused by those supporting Lesson 10-H23 as currently written, then I certainly shall seek legal action to protect my children from being forced to learn a religious viewpoint that is counter to my family's religious beliefs. This is precisely why the US Constitution has always maintained separation of church and state; I hope that Congress will continue this separation.

Please either delete Lesson 10-H23 (Critical Analysis of Evolution — Grade 10) or replace it with a lesson plan that is scientific in both design and intent.

Thank you very much for your kind attention.

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NCSE as "an outside political intimidation organization." He also claimed that the term "intelligent design" did not appear in the proposal. After he finished, the board president pointed out that "intelligent design" appeared in much of the supporting material supplied to the board by proponents.

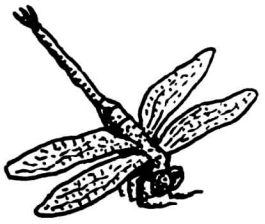
Several people spoke against the proposal, including a microbiologist from Kenyon College who argued (as I understood her) that evolution and science were not necessarily anti-religious. Another was a Christian who spoke in opposition to the proposal. He said, "I don't need science to prove my faith in Jesus Christ. If you need science to support your faith you're barking up the wrong tree."

Finally, a man I had not met before spoke. He was very effective. He argued that science is defined by what scientists do and that what should go in the public schools was defined by mainstream science, not by public attendance at school board meetings. He spoke against the "equal time" argument raised earlier and against the "anything goes" stance of the proposed policy. Then, in an echo of the preacher who spoke first, he said it was clear that the proposal had strong religious overtones, and asked everyone who had raised their hands in support earlier, who were also atheists, to now raise their hands. No hands were raised, of course. That was gutsy (or possibly an expression of a latent death wish!).

The proposal's supporters repeatedly emphasized: "All we want to do is promote critical thinking. This has nothing to do with creationism, religion, or intelligent design." When I made my remarks I reiterated that science thrives on *informed* criticism, that Wells does not represent informed criticism, that real science is full of critical thinking, and that no one is arguing to suppress critical thinking, least of all scientists. The issue is good science — the critical examination of scientific models and theories based on real scientific information and not on the disinformation provided by ID proponents.

After the proposal was officially moved, the Superintendent of Schools gave his recommendation.

UPDATES



Alabama: On February 17, 2004, Senate Bill 336 — entitled the "Academic Freedom Act" — was introduced in the Alabama state Senate and referred to the Senate Education Committee. If enacted, SB 336 would provide teachers and instructors at public institutions "the affirmative right and freedom to present scientific, historical, theoretical, or evidentiary information pertaining to alternative theories or points of view on the subject of biological or physical origins," and protection from penalties for teaching alternatives. The bill would also provide a student the right "to a particular position on biological or physical origins, so long as he or she demonstrates acceptable understanding of course materials." Section 5 of the bill stipulates that the "rights and privileges contained in this act do not apply unless the subject of biological or physical origins is raised in the context of approved curricula material." (House Bill 391, introduced five days earlier, contains similar provisions; see below.) Senator Wendell Mitchell (D-Luverne) told the *Montgomery Advertiser*, "This bill will level the playing field because it allows a teacher to bring forward the biblical creation story of humankind" (2004 Feb 18; available on-line at <http://www.montgomeryadvertiser.com/NEWS/StoryAlabamaevolution18w.htm>). On March 10, SB 336 was passed by the Senate Education Committee by a vote of 7-0. During the committee hearing, the question of whether the bill would open the door to religious ideas about origins such as those of Hinduism was broached; a motion to amend the bill to refer specifically to creationism was rejected, one senator citing the likelihood of a lawsuit as a reason not to do so. On April 8, the Senate passed the bill 28-0.

Alabama: On February 12, 2004, House Bill 391 was introduced in the Alabama House of Representatives and referred to the House Education Committee. If enacted, HB 391 would provide teachers and instructors at public institutions "the affirmative right and freedom to present scientific, historical, theoretical, or evidentiary information pertaining to alternative theories or points of view on the subject of origins," and protection from penalties for teaching alternatives. The bill would also provide a student the right not to be penalized for holding "a particular position on origins, so long as the student demonstrates acceptable understanding of course materials." (Senate Bill 336, introduced five days later, contains similar provisions; see above.) HB 391 was passed by the House Education Committee by a vote of 10-2 (with one abstention) on March 3. One of the legislators on the committee cited the likelihood of litigation over the bill as part of her reason to vote against it (see the *Montgomery Advertiser* 2004 Mar 4; available on-line at <http://www.montgomeryadvertiser.com/NEWS/StoryAlabamaGODBILLS04W.htm>).

California, Malibu: The playwright Jerome Lawrence died on February 29, 2004, at the age of 88, according to his obituary in *The New York Times* (2004 Mar 2). With his collaborator Robert E Lee, who died in 1994, Lawrence wrote 39 plays, including *Auntie Mame*, *The Night Thoreau Spent in Jail*, and, of course, *Inherit the Wind*, which premiered in 1955. Loosely based on the 1925 trial of John Thomas Scopes for violating Tennessee's Butler Act by teaching evolution, *Inherit the Wind* was not intended as a documentary.

After a long, thoughtful, and careful statement (some of it adapted from material I had supplied), he recommended against adoption. (Afterward, when I complimented him on his remarks, he told me he figured that he had written his professional obituary in this town. I sincerely hope not!)

Then the board members made individual remarks. The member who had moved the proposal said, "The theory of evolution is a theory. Our children have to be able to look at that theory as if I were saying 'there's blood dripping from the ceiling out there' and go look to see if there is." I still cannot figure out how the two sentences are supposed to go together.

He also said that "the theory of evolution has been put on a pedestal for 140 years, and it's time we're allowed to tear it apart." He also said the present policies allow what he wants, so the proposal is "a little redundant but maybe necessary," a perplexing remark. He acknowledged that the wording could be changed.

Three members spoke against the proposal, saying it was unnecessary, brought religion into the science classroom, and unacceptably weakened science teaching. One member commented that he had gone to the Intelligent Design Network's web site and saw that it described the issue as a "war". "Mount Vernon is not going to be their battlefield," he vowed.

The board then rejected the proposal, 4-1, with only the member who moved the proposal voting in the affirmative. Immediately following the vote, one of the four who voted against the proposal offered an alternative policy for teaching evolution in biology. Her motion (after some after-the-fact editing) was to confine teaching of evolution in middle school to "microevolution" (which she defined as "things like antibiotic immunity in bacteria") and defer teaching "macroevolution" (which she defined as the origin of new species and the origin of life) to high school. The board took the motion under advisement for a month to seek advice from the Science Curriculum Committee.

After a good deal of drafting, calling, talking, meeting, arguing, cajoling, and plain politicking over the next month, the Science Curriculum Committee recommended against the alternative policy at the June 3, 2003, board meeting, and the board followed that recommendation, rejecting the motion by 3-1 (one member, the one who

Rather, as Tony Randall, who starred in the original Broadway production, explained, "Like *The Crucible*, *Inherit the Wind* was a response to and a product of McCarthyism. In each case, the authors looked to American history for a parallel" (quoted in Edward J Larson, *Summer for the Gods*, Cambridge [MA]: Harvard University Press, 1997, p 240). But for good or for ill, the public perception of the creationism/evolution controversy continues to be largely shaped by Lawrence and Lee's play.

California, Roseville: Science teachers in the Roseville Joint Union High School District have told the district that they do not want to add anti-evolutionist materials to the district science curriculum, according to the *Sacramento Bee* (2003 Dec 28; available on-line at <http://www.sacbee.com/content/community_news/roseville/story/8017943p-8954158c.html>). The materials, recommended by Larry Caldwell, a local parent, and Cornelius Hunter, author of *Darwin's God* (Grand Rapids [MI]: Brazos Press, 2002) and *Darwin's Proof* (Grand Rapids [MI]: Brazos Press, 2003), included the videotape *Icons of Evolution*. The teachers' decision was based on their own assessment of the materials as well as critiques from scientists at the University of California, Davis, California State University, Sacramento, and Brigham Young University. In a statement to district officials, the teachers wrote, "We recommend that the suggested supplemental materials not be used to augment the concepts presented in the Holt biology book," adding, "We will continue to meet our obligation to respect students' viewpoints while helping them understand scientific theories." Although Roseville Assistant Superintendent Steven Lawrence told the *Bee* that the debate over evolution education in Roseville's schools was now over, Caldwell expressed a desire for the decision to be reconsidered. A subsequent story in the *Bee* (2004 Feb 26; available on-line at <http://www.sacbee.com/content/news/education/story/8338988p-9268902c.html>) mentioned in passing that Caldwell has filed a complaint about the district's textbook selection process. (For background, see *RNCSE* 2003 May–Aug; [3–4]: 5–10 and 2003 Sep–Dec; 23 [5–6]: 13–7.)

Georgia, Cobb County: The lawsuit challenging the constitutionality of the evolution disclaimer used in Cobb County, Georgia, took a step forward, when a federal judge ruled that the suit could proceed to trial. The disclaimer, which is affixed inside the books used in Cobb County's public schools, reads, "This textbook contains material on evolution. Evolution is a theory, not a fact, regarding the origin of living things. This material should be approached with an open mind, studied carefully and critically considered." The lawsuit, filed on behalf of Jeffrey Selman and five other local parents in August 2002, contends that the disclaimer inhibits the teaching of evolution and encourages the teaching of faith-based alternatives to it such as creationism. (For background, see *RNCSE* 2002 Sep/Oct; 22 [5]: 9–11.) The defendants asked to have the suit dismissed. But in an order issued on March 31, 2004, US District Judge Clarence Cooper denied the request. In his prima facie assessment of the disclaimer's constitutionality, Cooper decided that although the purpose of the disclaimer was arguably secular, it could have the effect of advancing religion, adding that "the practical effect of students' being encouraged to consider and discuss alternatives to evolution could implicate excessive entanglement concerns" (quoted in the *Atlanta Journal-Constitution* 2004 Apr 5). The trial is expected to begin later in 2004.

Michigan, Grand Blanc: A petition requesting equal time in the science curriculum for "the Christian idea of creation, as stated

had moved the first proposal, was absent). The only affirmative vote was the member who made this proposal. Only a few members of the public spoke at the meeting, and the crowd was considerably smaller than at earlier meetings. Two women who spoke in support ignored the pastor's earlier admonition to avoid religious references and made the religious motivation for the proposals explicit. "Teach God's truth in our schools," one (a home schooler) said.

So the net result of three board meetings, numerous letters to the editor, much calling and talking and writing, and two board votes, was to restore the *status quo ante* in which the Science Curriculum Committee, composed primarily of science educators, is responsible for the materials and content of science courses in the Mount Vernon District. From my point of view that was an excellent outcome.

Finally, after that last board meeting in June, I overheard supporters of the original proposal in the parking lot already beginning to plan for the November election, when two of the members who voted to reject both proposals would be up for re-election. On November 4, both were re-elected with 3–2 majorities over a creationist whose candidacy was supported from the pulpit in several local churches. A third candidate, the woman who offered the watered-down micro/macro motion, was also re-elected. That's not troubling; overall she is a good and hard-working board member.

We learned a number of lessons from the Mount Vernon experience and are sharing those lessons via NCSE. The web resources of the NCSE and the real-time advice of NCSE staffers, particularly Glenn Branch and Skip Evans, were invaluable in preparing materials for the Science Curriculum Committee and the Board of Education and for generating remarks for board meetings. Other knowledgeable people around the country in NCSE's networks also provided counsel, and unnamed though they regretfully are in these notes, we appreciate all of their help.

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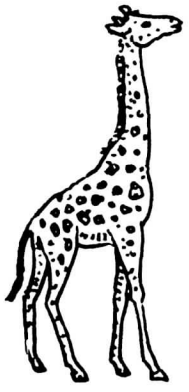


in the Bible," signed by about 85 high school students, was submitted to the Grand Blanc School Board in early February 2004, which received it with thanks. Kelly Edwards, the high school junior who organized the petition, explained that she wanted teachers to present "[j]ust the basics — God created the heavens and the earth ...There's a lot of things that just don't make sense about evolution, things that are missing, things that can't be explained" (*The Flint Journal* 2004 Feb 9). Superintendent Gary Lipe expressed uncertainty about the proposal: "I'm sitting here saying, How much evidence is there [for creationism], and how do you go about doing that, and is there enough to justify equal treatment?" A spokeswoman for the American Civil Liberties Union of Michigan commented, "The teaching of creationism is an issue that the ACLU watches very carefully, and we hope that the school board will act wisely."

Minnesota: On February 5, 2004, Senate File 1714 was introduced in the Minnesota Senate and referred to the Education Committee; on February 12, House File 2003 was introduced in the House of Representatives and referred to the Education Policy Committee. These identical bills, if enacted, would provide that:

> Notwithstanding any rule or law to the contrary, when science academic standards are taught that may generate controversy, including biological evolution, the curriculum must help students to understand the full range of scientific views that exist, why such topics may generate controversy, and how scientific discoveries can profoundly affect society. A quality science education should prepare students to distinguish the data and testable theories of science from religious or philosophical claims that are made in the name of science.

The language is borrowed from the so-called Santorum Amendment. See *RNCSE* 2002 May/Jun; 22 (3): 4–5 or Glenn Branch and Eugenie C Scott's "The antievolution law that wasn't" (*The American Biology Teacher* 2003 March; 65 [30]: 165–6) for background. Both bills are still in committee.

Mississippi: On March 9, 2004, House Bill 1288 died in the Education Committee of the Mississippi House of Representatives. If enacted, the bill would have required that any textbook discussing evolution have a disclaimer inserted inside the front cover, describing evolution as "a controversial theory some scientists present as an explanation for the origin of living things" and as an "unproven belief that random, undirected forces produced living things." The proposed disclaimer also states that "any statement about life's origin should be considered a theory" and mentions several "unanswered questions about the origin of life that are not mentioned in your textbook," including the Cambrian explosion and the supposed lack of transitional forms in the fossil record. Most of the wording of HB1288's disclaimer was derived from the textbook disclaimer formerly in use in Alabama. (For the complete text of HB1288 in PDF format, see <http://billstatus.ls.state.ms.us/documents/2004/pdf/HB/1200-1299/HB1288IN.pdf>.) The bill, introduced by Representative Carmel Wells-Smith and cosponsored by 19 other legislators, died after it failed to meet a deadline to be reported out of committee. Wells-Smith has a record of introducing unsuccessful anti-evolution legislation; see *RNCSE* 2003 Jan/Feb; 23 (1): 6–7 and 2002 May/Jun; 22 (3): 8–11.

Missouri: On December 19, 2003, House Bill 911 was introduced (by prefiling) in the Missouri House of Representatives. Entitled the "Missouri Standard Science Act", HB 911 would, if enacted, require that "If scientific theory concerning biological origin is taught, biological evolution and biological intelligent design shall be taught and given equal treatment." This bill prescribes definitions for the teaching of "standard science" in public elementary and secondary schools by distinguishing the differences between scientific law, scientific theory, and hypothesis and by requiring the equal treatment of viewpoints in written and orally presented material. The bill prescribes seven major criteria for the presentation of information in course materials and instruction. Textbook publishers must certify that their books meet the requirements of the bill, and the commissioner must post a list of suitable textbooks by January 1, 2006. Textbooks purchased after January 1, 2006, must meet the requirements of the bill, and all textbooks in use after January 1, 2016, must meet the requirements. The Commissioner of Education is required to appoint a committee of no fewer than five supporters of "intelligent design" who are knowledgeable about science to develop supplemental materials for interim use by September 1, 2005. Willful neglect of the requirements of the bill is cause for termination of a teaching contract. Finally, state-controlled testing must conform with the bill, and a copy of the bill must be posted in each 8th- through 12th-grade public school classroom in which only science is taught. The full text of the bill is available on-line at <http://www.house.state.mo.us/bills041/biltxt/intro/HB0911I.htm>. On February 12, 2004, more than 250 Missouri scientists and educators issued a statement opposing HB 911; the statement and a list of signatories, as well as a statement opposing HB 911 from the Science Teachers of Missouri, is available on-line at <http://web.missouri.edu/~esiwww/evolution.html>. A long article in the *Springfield News-Leader* (2004 Mar 12; available on-line at <http://www.news-leader.com/today/0314-Intelligen-38724.html>) about HB 911 and its sponsor, Representative Wayne Cooper, noted that the bill was not received enthusiastically by the legislature; the Speaker of the House said that she would not refer it to committee until about May 1, only two weeks before the current legislative session ends. Cooper told the *News-Leader* that, in deference to the views of supporters who disapprove of legislatively mandating instruction in "intelligent design", he is not actively promoting HB 911. Cooper introduced the bill at the behest of Joe White, a resident of St

Evolution, Religion, and Education: A Workshop for Science Teachers

For nearly a century, evolution has been a controversial subject in our schools. Many Americans oppose the teaching of evolution, while many others believe that good science teaching demands that evolution be taught. What are the historical and cultural roots of this controversy? What points of view do Americans hold concerning the relationship between science and religion? What should science teachers know about this controversy, in order to be better teachers of their subjects and to understand their students better?

With financial support from the John Templeton Foundation (<http://www.templeton.org>), Messiah College is sponsoring a workshop for educators and clergy on these very topics. The workshop is designed:

> To acquaint teachers with important aspects of the history of the controversy about evolution, creation, and public education, including the Scopes trial and the "intelligent design" movement
>
> To help teachers meet the expectations of the new Pennsylvania Science & Technology standards, especially those related to the Nature of Science, Inquiry and Design, Biological Sciences, and Physical Science, Chemistry, and Physics
>
> To help teachers meet the expectations of the new Pennsylvania Environment & Ecology standards, especially those related to Ecosystems and their Interactions
>
> To provide teachers with a basic understanding of biological evolution and the "big bang" theory
>
> To help teachers understand the diversity of religious views that Americans hold concerning evolution and the "big bang" theory

Details: The workshop will be held on the campus of Messiah College in Grantham, Pennsylvania, during the week of June 28–July 2, 2004. Sessions will run from 8:30 AM until 4:00 PM, with a 90-minute lunch period and regular breaks. Precise campus location TBA. For additional details about the specific subject content of the workshop, go to <http://www.messiah.edu/godandscience/workshop.shtml>.

Audience: The intended audience is high school science teachers, including teachers from private schools. Clergy of all faiths are also encouraged to attend. Others with an interest in the subject, including college faculty and members of the general public, will be admitted as space allows.

Registration: A non-refundable registration fee of $65 (reduced to $50 for early registrants) will be charged. Tuition, books, and lunches for participants are covered by the grant. For a printable registration form, go to <http://www.messiah.edu/godandscience/workshop.shtml>. On the first day of the course, each participant will receive two books: Edward J Larson, *Summer for the Gods: The Scopes Trial and America's Continuing Debate Over Science and Religion* (1997), winner of the Pulitzer Prize in History, and Karl W Giberson and Donald A Yerxa, *Species of Origins: America's Search for a Creation Story* (2002).

For further information, contact Ted Davis: tdavis@messiah.edu, 717-766-2511, ext 6840 (voice/messages), 717-691-6002 (fax).

Charles, Missouri, and a member of the Missouri Association for Creation.

Montana, Helena: Roxanne Cleasby, a parent in Helena, Montana, attempted to have a book about horses (Juliet Clutton-Brock's *Horse*) removed from her local elementary school library because it devotes two pages to discussing equine evolution. Her complaint "calls for either the removal of the entire book from the school's library or the removal of two pages — eight and nine — in the book that describe the evolutionary process." She told the *Helena Independent Record* (2004 Feb 25; available on-line at <http://www.helenair.com/articles/2004/02/25/helena/a01022504_05.txt>) that she filed the complaint in order to draw attention to the creationism/evolution controversy, saying, "There's been lots of great scientific research done on creation that needs to be considered." Nearly 100 people attended the February 28 public hearing on Cleasby's complaint; almost all of those who spoke — including a native of Afghanistan, who said that the complaint reminded him of the Taliban — opposed the proposal to remove the book from the library or the offending pages from the book (*Helena Independent Record* 2004 Feb 29; available on-line at <http://www.helenair.com/articles/2004/02/29/helena_top/a01022904_02.txt>). The review committee appointed to consider Cleasby's complaint and the superintendent of schools have recommended to the school board that the book be retained. It is open to Cleasby to appeal the recommendation; additionally, according to the *Independent Record*, she "has discussed with school district administrators the possibility that children's books presenting the theory of divine creation be included in the collection" (*Helena Independent Record* 2004 Mar 27; available on-line at <http://www.helenair.com/articles/2004/03/27/helena/a09032704_01.txt>).

Oklahoma: On February 24,

2004, House Bill 2194 was passed by the Oklahoma House of Representatives by a vote of 96–0. As originally introduced on February 2, HB 2194 required textbook publishers to furnish the State Textbook Committee with electronic files for the production of Braille versions of textbooks in conformance with US Department of Education standards. On February 23, the bill was amended to include a new section that requires all textbooks that discuss evolution to include a long disclaimer, virtually identical to one previously proposed in Oklahoma in 2001 and 2003 and in use in Alabama from 1996 to 2001. The proposed disclaimer describes evolution as "a controversial theory which some scientists present as scientific explanation for the origin of living things" and "the unproven belief that random, undirected forces produced a world of living things." It also states, "No one was present when life first appeared on earth. Therefore, any statement about life's origins should be considered as theory, not fact." Bill Graves (R–Oklahoma City), who proposed the disclaimer amendment to HB 2194, was quoted in the *Claremore Daily Progress* (2004 Feb 24) as objecting to textbooks that portray evolution as a scientific fact: "If [children] just believe that they came from some slime in a swamp that's a whole lot different from being created in the image of God." The bill proceeded to the Senate and was referred to the Education Committee, which removed the section of the bill discussing the disclaimer before passing it out of committee at the end of March.

Pennsylvania, Perkasie: In 2001, Joe Baker, then a student in Pennridge High School, distributed anti-evolution flyers on school grounds without obtaining permission in advance, contrary to the district's policy. Although he was allowed to distribute the flyers after they were reviewed, he filed suit with the aid of the Rutherford Institute, a conservative group. Most of Baker's suit was eventually dismissed, and the parties agreed to settle what remained of the suit in August 2003, with the district paying reasonable costs and attorney fees for Baker. (For details, see *RNCSE* 2003 May–Aug; 23 [3–4]: 5–10.) The *Allentown Morning Call* (2004 Feb 10) reports that although the Rutherford Institute requested $57 000 for attorney fees, a federal judge reduced the amount to $14 436. The cost will be borne by the district's insurance company, but the district incurred over $16 000 in legal expenses. The policy itself remains in effect; the district agreed to review the policy, but was not obliged to modify it either by the court or by the terms of the settlement agreement.

Tennessee, Knoxville: On March 23, 2004, Robert Gentry's lawsuit against the operators of the arXiv preprint server — a forum for advance publication of papers in physics, mathematics, non-linear science, and computer science — was dismissed by a Tennessee court, according to a report in *Nature* (2004 Apr 1; 428: 458). Gentry, a Seventh-Day Adventist young-earth creationist known for his work on polonium halos as expounded in his *Creation's Tiny Mystery* (Knoxville [TN]: Earth Science Associates, 1992 [third edition]), complained that arXiv refused a series of 10 of his papers (collectively entitled "Flaws in the Big Bang point to GENESIS") because of their religious content (see *RNCSE* 2003 Jan/Feb; 23 [1]: 6–7 and *Nature* 2002 Dec 12; 420: 597). The court dismissed Gentry's case on the grounds that he failed to show that arXiv or its operators were sufficiently active in Tennessee for it to be a proper venue. Although unsuccessful, Gentry's suit provoked a change in arXiv's submissions policy: on January 17, 2004, arXiv began to phase in a system (described at <http://arxiv.org/help/endorsement>) whereby new submitters will have to secure a referral from a current user.

Texas: Just as the Texas Board of Education was to vote on the eleven biology textbooks under consideration for use in the state (see *RNCSE* 2003 Sep–Dec; 23 [5–6]: 4–7), it found itself embroiled in a different textbook controversy. On October 30, 2003, Trial Lawyers for Public Justice, a national public interest law firm, filed suit against 5 past and present members of the board — Geraldine Miller (only in her capacity as chair of the board), David Bradley, Don McLeroy, Cynthia Thornton, and Grace Shore (who is no longer on the board) — for rejecting Daniel D Chiras's textbook *Environmental Science: Creating a Sustainable Future*, sixth edition (Sudbury [MA]: Jones and Bartlett, 2001). The suit was filed on behalf of Chiras and two students in the Advanced Placement environmental science course at the Dallas Independent School District's Gifted and Talented Magnet High School. Chiras's textbook was recommended by the Texas Commissioner of Education and was passed by the official review panel. But according to TLPJ's press release (available on-line at <http://www.tlpj.org/pr/texas_103003.htm>):

> On November 9, 2001, the Board voted to reject Dr Chiras' book in a 10–5 vote held just one day after public hearings where TPPF and CSE [Texas Public Policy Foundation and Citizens for a Sound Economy, two Texas conservative policy organizations] attacked the book as anti-Christian, anti-free enterprise, and anti-American. For example, TPPF charged that Dr Chiras' book was not acceptable for classroom use because of its allegedly "heavy bias toward radical politics." Indeed, TPPF's spokesperson portrayed the text as unpatriotic based on Dr Chiras' favorable view of the marketability of solar energy sources. Although the board did not name any grounds for rejecting Dr Chiras' book, individual board members' statements show the influence of TPPF and CSE. In short, the board improperly rejected Dr Chiras' book because the author's viewpoint did not echo their own political and religious views.

David Bradley, one of the board members named in the suit, dismissed the complaint as "silly and frivolous," telling the *Galveston County Daily News*, "I am confi-

dent that the attorney general will get it thrown out for its total lack of merit" (2003 Nov 2). The same newspaper's editor, however, opined, "When people use political positions to keep legitimate, scholarly information out of textbooks used in public schools, that's censorship. We really wish we could say this lawsuit was baseless and silly. But it's not" (2003 Nov 2). For the text of TLPJ's complaint filed in the US District Court for the Northern District of Texas, see <http://www.tlpj.org/briefs/TLPJ_DC;64359;1.pdf>.

Texas, Dublin: On July 30, 2002, the Dublin Independent School Board of Education adopted a resolution calling on the Texas Board of Education to include "intelligent design" in the science curriculum and requiring that "when discussions of the origin of life are presented, no single theory shall be presented without the discussion of alternative theories." Following the extended controversy over biology textbook adoption in Texas (see *RNCSE* 2003 Sep-Dec; 23 [5-6]: 4-7), the two-year-old resolution was topical again during a board meeting on January 20, 2004, according to the *Stephenville Empire Tribune* (2004 Jan 22), due to disagreement about whether it requires teachers to include "alternative theories" as part of the curriculum or only when they discuss the origin of life. Superintendent Roy Neff opined, "I think teachers are staying away from the discussion entirely because they don't want the controversy." At the board meeting on March 23, Trustee Garron House proposed a resolution that would explicitly require that a variety of theories of the origin of life be included; the proposal was defeated 4-2 (*Stephenville Empire Tribune* 2004 Mar 25). A proposal to rescind the original 2002 proposal failed to receive a second. Dublin is a town of about 4000, about 85 miles southwest of Fort Worth.

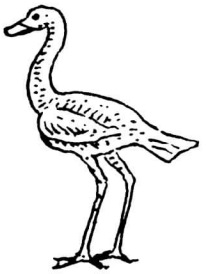
Texas, Waco: Francis J Beckwith was recently appointed as Associate Professor of Church-State Studies and Associate Director of the JM Dawson Institute of Church-State Studies at Baylor University. On September 11, 2003, 29 members of the Dawson family wrote to Baylor's president Robert Sloan to protest Beckwith's appointment to the latter post on the grounds that his association with the Discovery Institute's Center for Science and Culture contravenes the principle of separation of church and state for which JM Dawson (a Baylor graduate, Baptist minister, and staunch separationist) stood. They wrote, in part:

> The Discovery Institute works to get the concept called "intelligent design" into the science curriculum of public school textbooks, claiming that "intelligent design" is a scientific, not a religious, concept. In our judgment and in the judgment of the scientific community, this is a ruse for getting a religious notion into the public schools — clearly a violation of the separation of church and state ...

adding that "[t]he vast majority of scientists view 'intelligent design' as the latest version of creationist theory, though the Discovery Institute works tirelessly to refute this fact" (*Baptist Standard* 2003 Sep 19; available on-line at <http://www.baptiststandard.com/postnuke/index.php?module=htmlpages&func=display&pid=680>). Baylor's Provost David Jeffrey defended Beckwith's appointment, saying that he topped the list of candidates for the post. Beckwith's colleague Barry Hankins also defended him, saying that his "views on the constitutionality of teaching intelligent design in public schools, however debatable, are scholarly and reasonable," and denying rumors that he was forced on the department by the administration. Beckwith's *Law, Darwinism, and Public Education* (Lanham [MD]: Rowman and Littlefield, 2003), argues that it is not unconstitutional to teach "intelligent design" in the public schools; Beckwith himself was active on the Discovery Institute's side in the recent controversy over Texas biology textbooks (see *RNCSE* 2003 Sep-Dec; 23 [5-6]: 4-7).

Wyoming, Worland: According to a story on the American Family Association's web site credited to AgapePress (2003 Nov 5; <http://headlines.agapepress.org/archive/11/afa/52003f.asp>), the school board of Washakie County School District Nr 1 voted 5-2 against a proposal to recommend the adoption of a policy to teach "Darwin's theory of origins" as "only a theory and not a fact". The board previously voted 5-2 in favor of the proposal (see *RNCSE* 2003 Sep-Dec; 23 [5-6]: 4-7). Board member Tom Ball, who supported the proposal, blamed its defeat on "misinformation from teachers" and "outside intimidation". Ball claimed that he was assured, however, that the board would allow other theories of origin to be taught provided they are supported by scientific evidence — "which means intelligent design."

[*NCSE thanks Bob Collins, Victor Hutchison, and John Schweinsberg for information used in this article.*]



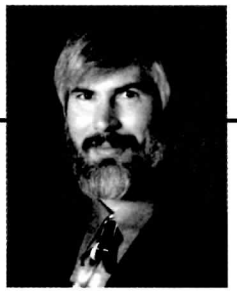
Wasn't That a Mighty Storm?

According to Answers in Genesis, Noah's flood may have extended to the whole solar system. In a piece on AiG's web site (<http://answersingenesis.org/docs2/4412news12-6-2000.asp>), Russell Humphries remarks:

> I've checked out the NASA websites directly about [claims of water on Mars]. The Mars Global Surveyor has photographed sedimentary rock layers on Mars which are just like the layers here on earth formed by the Genesis flood. It is the latest in a long series of space probe evidence (accumulating since the 1970s) for a global flood on Mars. Many creationist scientists, including myself, think the Genesis flood on earth was part of a catastrophe which affected the *whole solar system* (emphasis added).

[*Contributed by Stephen C Meyers.*]

NCSE NEWS



Wesley Elsberry

Nicholas Matzke

Elsberry and Matzke Join NCSE Staff

Glenn Branch, NCSE Deputy Director

We at NCSE are pleased to announce that Wesley R Elsberry is now working for NCSE as the Information Project Director, a position in which he will be using his technical computer skills, his knowledge of biology, and his vast experience in defending the teaching of evolution in the public schools. Elsberry comes to NCSE from Texas A&M University, where he earned his PhD in Fisheries and Wildlife Science in 2003. His dissertation and his current scientific research involve dolphin biosonar sound production and bioenergetics; he received the Society for Marine Mammalogy's Fairfield Memorial Award for Innovation in Marine Mammal Research in 2001.

Elsberry's involvement with activism in opposing anti-evolutionism began in 1986, after he attended a young-earth creationist lecture and read Henry Morris's *The Scientific Case for Creation*. He became involved in on-line discussions, eventually establishing and moderating the FidoNet Evolution Echo (1992–1997). A regular participant on the Usenet talk.origins newsgroup, he also contributed several articles to the TalkOrigins Archive web site (<http://www.talkorigins.org>), including the article on punctuated equilibria. He coordinates the TalkOrigins Archive and hosts its sister site devoted to critiques of "intelligent design", TalkDesign.org (<http://www.talkdesign.org>). And his Antievolution web site (<http://www.antievolution.org>), established in 2002, is now a widely used resource. Elsberry's activism was not solely electronic; in 1996 and 1997, he worked to resist anti-evolutionist attempts to influence the textbook selection process in Texas, where he then lived.

Elsberry is also known for his scholarly investigations of the "intelligent design" movement, having delivered papers at the 1997 conference on "Naturalism, theism, and the scientific enterprise", the 2001 CTNS/AAAS conference on "Interpreting evolution", and the 2002 CSICOP Fourth World Skeptics Conference, and having published (with John Wilkins) a detailed critique of William Dembski's "explanatory filter" ("The advantages of theft over toil: The design inference and arguing from ignorance", *Biology and Philosophy* 2001 Nov; 16 [5]: 709–22) as well as reviews of William Dembski's *The Design Inference* (*RNCSE* 1999 Mar/Apr; 19 [2]: 32–5) and Robert T Pennock's *Tower of Babel* (*Friends Journal* 1999 Nov; 45 [11]: 34). He received NCSE's "Friend of Darwin" award in 2003.

We are also pleased to announce that Nicholas J Matzke has joined the NCSE staff as a Public Information Project Specialist on a one-year appointment. He comes to NCSE from the University of California, Santa Barbara, where he completed his MS in geography in 2003, after graduating from Valparaiso University with degrees in biology and chemistry. In his spare time, he produced critiques of "intelligent design", notably a critique of Jonathan Wells's *Icons of Evolution* for the Talk.Origins web site ("Icons of obfuscation", available on-line at <http://www.talkorigins.org/faqs/wells/iconob.html>) and a review article suggesting a plausible evolutionary scenario for the development of bacterial flagella ("Evolution in (Brownian) space: a model for the origin of the bacterial flagellum", available on-line at <http://www.talkdesign.org/faqs/flagellum.html>). At NCSE he will be assisting local activists in defending the teaching of evolution in their communities and working on rebuttals to specific anti-evolutionist claims about the evolution of biological complexity. His research interests concern evolution in a spatial context, particularly issues surrounding dispersal and convergence; after his stint at NCSE, he intends to enter a PhD program to work on the integration of bioinformatics and biogeography.

Please join us in welcoming these valued new members of our staff! Elsberry's e-mail address here is elsberry@ncseweb.org; Matzke's is matzke@ncseweb.org.

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

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!

Jon P Alston's *The Scientific Case Against Scientific Creationism* (Lincoln [NE]: iUniverse, 2003) appeared (see review by Stanley Rice on p 39). The publisher writes, "Few persons have read so closely the writings of scientific creationists to show how anti-scientific anti-evolutionists become when they criticize the fact of evolution. Creationists are forced to develop 'just-so' stories to defend their literal interpretations of biblical scripture." Alston, who is Professor of Sociology at Texas A&M University, also contributed "Creationism in the comics" — a study of anti-evolutionism in Jack T Chick's tracts — to *RNCSE* (2001 Sep–Dec; 21 [5–6]:

41-3). His review of **Jay Hosler**'s *The Sandwalk Adventures* appears on p 38.

On October 23, 2003, **Brian Alters**, Associate Professor of Education at McGill University, was awarded a Principal's Prize for Excellence in Teaching at McGill University. This university-wide award follows Alters's receipt in May 2003 of the College of Education's highest teaching award, the Distinguished Teaching Award. Heather Munroe-Blum, the Principal of McGill University, said about Alters, "[his] dramatic illustrations in the classroom never fail to enthrall his audience. This is especially important given that the demonstrated science principles in the Department of Integrated Studies in Education influence students who themselves are evolving into teachers. His contributions are outstanding as a 'teacher of teachers'." Alters is also the associate editor for education of *RNCSE* and the coauthor, with his wife Sandra Alters, of *Defending Evolution in the Classroom* (Sudbury [MA]: Jones and Bartlett, 2001).

William D Anderson Jr's review of Massimo Pigliucci's *Denying Evolution: Creationism, Scientism, and the Nature of Science* (Sunderland [MA]: Sinauer Associates, 2002) appeared in *Copeia* (2003 Sep 5; 3: 675-7). "A review of the volume on the evolution/creationism controversy might seem out of place in a journal dedicated to ichthyology and herpetology," Anderson writes, "but it is appropriate, I feel, because a very large percentage of the readers of *Copeia* are involved in some manner with education." He concludes by describing *Denying Evolution* as "informative, interesting, and here and there entertaining." Anderson is on the resident faculty of the Grice Marine Biological Laboratory at the College of Charleston.

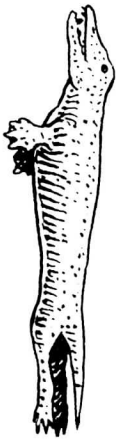
Marshall Berman contributed a guest editorial — "Intelligent design creationism: A threat to society — not just biology" — to *The American Biology Teacher* (2003 Nov/Dec; 65 [9]: 646-8). Quoting extensively from the so-called Wedge document describing the goals of the "intelligent design" movement (<http://www.antievolution.org/features/wedge.html>), Berman argues that "[e]volution is only the initial target of the Wedge's edge, to be followed by an attack on all of science, and ultimately by profound changes in our society, culture, and government." He also describes the tactics commonly employed by proponents of "intelligent design":

- Place ID advocates on school boards and science standards writing committees.
- Go as public as possible in print and visual media.
- Make the inclusion of ID in science classes seem like a free-speech and academic freedom issue.
- Make scientists seem like the dogmatists.
- Claim that "Darwinism" is a religion, but ID is science.
- Claim that "others" are biased, and that teaching ID is only fair.
- Cite popular poll results and ignore the scientific consensus.
- Refer to ID in scientific-sounding rather than religious language.
- Redefine science to allow supernatural causes for natural phenomena.
- Settle for any change or modification in their goals, and declare anything as a victory.
- Create loopholes in state science standards, using innocuous-sounding language, to allow the presentation of so-called "evidence against evolution".

Berman is of course familiar with these tactics from his experience in defending evolution education in New Mexico; see his "The history of the New Mexico science standards" (coauthored with **M Kim Johnson** and **David E Thomas**) in *RNCSE* 2003 Sep-Dec; 23 (5-6): 9-13.

A letter from NCSE Deputy Director **Glenn Branch** to the editor of *Science and Theology News* (formerly *Research News and Opportunities in Science and Theology*) was published (2004 Jan; 4 [5]: 4-5), responding to Jeffrey Addicott's op-ed "ID and anthropic principle are constitutional", which appeared in the November 2003 issue of the newsletter. Branch remarked that Addicott used "Darwinism" equivocally, applying the term from everything from phyletic gradualism to atheism, and disputed his clams that evolution is controversial within the scientific community and that "intelligent design" is a viable scientific alternative to evolution.

John R Cole contributed a piece with the unlikely title "An attack by an amphibious motorcycle gang on ISU archaeologists results in an empirical test of the financial value of graduate degrees" to the *Journal of the Iowa Archeological Society* (2003; 50: 63-8), a special issue entitled "Always on the edge (in the prairie-plains): Essays in honor of David Mayer Gradwohl". Gradwohl, now Professor Emeritus of Anthropology at Iowa State University, and Cole worked together on an archaeological survey in Iowa in 1968, during which they were assaulted by members of a local motorcycle gang. Cole's article humorously relates the incident, noting that "Gradwohl had a PhD, and I did not, yet. Gradwohl's attacker was fined $50, suspended, while mine was fined $25, suspended." Cole is a member of NCSE's board of directors.



A recent issue of *Skeptic* (2003; 10 [3]) featured articles on evolution and creationism, including **Raymond A Eve**'s "Wiccans v creationists: An empirical study of how two systems of belief differ" (70-83), **Tom McIver**'s "Who made it? The Isaac Newton orrery story: Another mythic tale misused by creationists" (84-93), and **Donald Prothero**'s "Inevitable humans? Or hidden agendas?", a review of Simon Conway Morris's *Life's Solution* (54-7). Of interest in the same issue are Richard Dawkins's "A devil's chaplain" (38-40, excerpted from his recent essay collection of the same name), Simon Conway Morris's "Toward a theology of evolution" (42-53, excerpted from *Life's Solution*), Peter A Corning's review of David Sloan Wilson's *Darwin's Cathedral* (58-60), Joe Cuchiara's review of Harold J Morowitz's *The Emergence of Everything* (62-3), L Kirk Hagen's "Creationism's expanding universe", which warns of creationist attempts to infiltrate curricula in the humanities, linguistics, and the social sciences (64-9),

and David Eller's "Macroevolution and microcreationism", which argues against "intelligent design" (70-4).

Reacting to Deborah Owens-Fink's comment in the *Columbus Dispatch* (2003 Dec 4) that as a member of the Ohio Board of Education she "would have preferred that we include in the lessons and the state benchmarks that some scientists are doing work in 'intelligent design'", **Richard B Hoppe** trenchantly replied, "If scientists are doing professional work in 'intelligent design', they hide it well. The 'intelligent-design' movement's leading lights — Michael Behe, Jonathan Wells, William A. Dembski, Stephen C Meyer, Phillip Johnson, etc. — have published no research on 'intelligent design' in the professional literature of biology. Their 'work' consists mainly of scanning the research of real biologists, looking for quotes to mine out of context and writing popularizations aimed at the public to influence the political process, not at producing professional research aimed at scientists." His letter was published in the *Dispatch* on December 17. Hoppe's article on attempts to compromise evolution education in Mount Vernon, Ohio, appears on p 7.

A letter from **Andrew O Lutes** appeared in the Mansfield, Ohio, *News Journal* (2003 Nov 19), responding to a previous letter that complained of "bigotry" against anti-evolutionists. Noting that evolution is "as well established as any principle in science," Lutes argued that "any would-be teacher who denies evolution is as unqualified as a teacher who denies gravity."

Jane Maienschein's *Whose View of Life? Embryos, Cloning, and Stem Cells* was published by Harvard University Press in November 2003. The publisher writes, "Saving lives versus taking lives: These are the stark terms in which the public regards human embryo research — a battleground of extremes, a war between science and ethics. Such a simplistic dichotomy, encouraged by vociferous opponents of abortion and proponents of medical research, is precisely what Jane Maienschein seeks to counter with this book. *Whose View of Life?* brings the current debates into sharper focus by examining developments in stem cell research, cloning, and embryology in historical and philosophical context and by exploring legal, social, and ethical issues at the heart of what has become a political controversy." Maienschein is Regents' Professor of Biology and Society and Director of the Center for Biology and Society at Arizona State University.

In October 2003, **Molleen Matsumura** — NCSE's first Network Project Director and enduring friend — was elected to the Board of Trustees of Americans United for Separation of Church and State. With over 75 000 members, Americans United is the only national organization devoted exclusively to defending freedom of religion and conscience as defined in the First Amendment. Matsumura told *RNCSE*, "Besides belonging to Americans United for many years, I often worked closely with its staff while I was at NCSE. As a trustee, I look forward to working against a wide range of efforts to force religion into public education, as well as many other religious liberty issues. I will make a point of getting regular briefings on creationist efforts from my old friends at NCSE." (NCSE's executive director **Eugenie C Scott** serves on the National Advisory Council of Americans United.)

The new "Lifelines" feature in *Nature* is devoted to interviews of prominent scientists, among them **Kevin Padian** (2003 Nov 20; 426 [6964]: 233). Padian's answers to his interviewer displayed his trademark humor (asked "What book currently resides on your bedside table?" he replied, "If there's only one book, I'm turning in too early") as well as his enthusiasm for his work (asked "What's just around the corner?" he replied, "Even more amazing revelations in evolutionary developmental biology that will connect genetics, paleontology, and ontogeny ... It's an incredibly exciting time that I've waited for since I was a graduate student"). In addition to serving as president of NCSE's board of directors, Padian is Professor of Integrative Biology at the University of California, Berkeley.

Robert T Pennock's review article "Creationism and intelligent design" was published in the *Annual Review of Genomics and Human Genetics* 2003 (4): 143-63. The abstract of his article:

> Creationism, the rejection of evolution in favor of supernatural design, comes in many varieties besides the common young-earth Genesis version. Creationist attacks on science education have been evolving in the last few years through the alliance of different varieties. Instead of calls to teach "creation science", one now finds lobbying for "intelligent design" (ID). Guided by the Discovery Institute's "Wedge strategy", the ID movement aims to overturn evolution and what it sees as a pernicious materialist worldview and to renew a theistic foundation to Western culture, in which human beings are recognized as being created in the image of God. Common ID arguments involving scientific naturalism, "irreducible complexity", "complex specified information", and "icons of evolution", have been thoroughly examined and refuted. Nevertheless, from Kansas to Ohio to the US Congress, ID continues lobbying to teach the controversy, and scientists need to be ready to defend good evolution education.

Pennock is Associate Professor of Philosophy at Michigan State University, the author of *Tower of Babel: The Case Against the New Creationism* (Cambridge [MA]: MIT Press, 1999), and the editor of *Intelligent Design Creationism and its Critics* (Cambridge [MA]: MIT Press, 2001).

Robert T Pennock was also the recipient of New Mexicans for Science and Reason's "The best characterization of creationism from a southwestern perspective" award for his remark during the September 2003 hearings before the Texas Board of Education (see *RNCSE* 2003 Sep-Dec; 23 [5-6]: 4-7) that "When it comes to science, the 'intelligent design' movement is all hat and no cattle." Pennock's award was one in NMSR's list of humorous "Best and worst for 2003" awards, available on-line at <http://www.nmsr.org/nmsrbest.htm>. Also of interest were the "Well done" award, which

continued on page 23

Seven Geoscience Organizations Oppose *A Different View*

December 16, 2003

Mr Joseph Alston, Superintendent
Grand Canyon National Park
PO Box 129
Grand Canyon, Arizona 86023

Dear Mr Alston:

It has come to our attention that a book espousing a particular religious interpretation of the Grand Canyon is being sold in bookstores within the Grand Canyon National Park under the guise of a being a scientific explanation for the origin of the canyon. The book, *Grand Canyon: A Different View* (compiled by Vail, 2003), makes claims about the age of the rocks and the formation of the canyon that are at odds with the well-documented scientific understanding of earth history. The book is not about geology but, rather, advances a narrow religious view about the earth. We urge you to remove the book from shelves where buyers are given the impression that the book is about earth science and its content endorsed by the National Park Service.

The National Park Service should be extremely careful about giving the impression that it approves of the anti-science movement known as young-earth creationism or endorses the advancement of religious tenets as science. The book aggressively attacks modern science and broadly accepted interpretations of the geologic history of the Grand Canyon. As such, any implied approval or endorsement by the NPS for the book and others like it undermines efforts to educate the public about the scientific understanding of Grand Canyon geology.

Grand Canyon: A Different View is not about science and we strongly urge that, if it remains available in Grand Canyon bookstores, it be clearly separated from books and materials that do discuss our scientific understanding of Grand Canyon geology. As you know, the Grand Canyon provides a remarkable and unique opportunity to educate the public about Earth science. In fairness to the millions of park visitors, we must clearly distinguish religious tenets from scientific knowledge.

We appreciate your prompt attention to this matter.

Sincerely yours,

William I Ausich, President, Paleontological Society
Robert E Dickinson, President, American Geophysical Union
Cathryn A Manduca, President, National Association of Geoscience Teachers
John C Steinmetz, President, Association of American State Geologists
Hans-Dieter Sues, President, Society for Vertebrate Paleontology
Barbara J Tewksbury, President, American Geological Institute
Robert van der Voo, President, Geological Society of America

CC: The Honorable Fran Mainella, Director, National Park Service
Dr Michael Soukup, NPS Associate Director, Natural Resource Stewardship and Science
Mr Loran Fraser, Chief, NPS Office of Policy

[*The preceding letter is reprinted with permission.*]

Après le déluge

With all the attention recently devoted to *Grand Canyon: A Different View* and to flood geology in general, it is time to turn, perhaps with a sigh of relief, to scientifically accurate and historically informed literature on such topics. For your reading pleasure, we present books in three categories: on the Grand Canyon itself, featuring both scholarly and popular titles about the geology and the history of the Canyon; on the discovery of "deep time" — the vast temporal expanse that young-earth creationism struggles to deny; and on the roots of flood geology in the Genesis tale of Noah and the Flood. Check out the following books, all of which are now available through the NCSE web site: <http://www.ncseweb.org/bookstore.asp> — look in the "In the latest *RNCSE*" section. And remember, every purchase through the web site benefits NCSE!

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

About the Grand Canyon

Hiking the Grand Canyon's Geology
by Lon Abbott and Terri Cook
For the Hiking Geology series of The Mountaineers Books, Lon Abbott and Terri Cook have produced a hiker's guide to the Grand Canyon that explains the geology in loving expert detail, literally step by step. Eighteen excursions are detailed, ranging — as the publisher writes — "from the most popular rim-to-river trails (Havasu Canyon Trail) to gentle, half-day rim walks (Red Butte Trail) to rugged and remote multi-day backpack trips (Lava Falls Route)" and including useful information on permits, lodging and camping, and mule rides. The authors both teach at Prescott College, where they lead hiking trips to study geology in the field.

Grand Canyon Geology, second edition
edited by Stanley S Beus and Michael Morales
From the publisher: "This second edition of the leading book on Grand Canyon geology contains the most recent discoveries and interpretations of the origin and history of the canyon. It includes two entirely new chapters: one on debris flow in the Canyon and one on Holocene deposits in the canyon. All chapters have been updated where necessary and all photographs have been replaced or re-screened for better resolution. Written by acknowledged experts in stratigraphy, paleontology, structural geology, geomorphology, volcanism, and seismology, this book offers a wealth of information for students, geologists, and general readers interested in acquiring an understanding of the geological history of this great natural wonder."

An Introduction to Grand Canyon Geology
by L Greer Price
Geologist L Greer Price worked for the National Park Service for ten years, mainly in Grand Canyon National Park, and his experience in explaining the geology of the Canyon to the park's visitors is evident on every page of his brief (64-page) introduction, enlivened with dozens of photographs. Basic geological principles, including plate tectonics, structural features and their significance, and the role of erosion, are introduced and emphasized throughout; a glossary and a full index enhance the book's usefulness. Proceeds from the sale of the book benefit the educational programs of Grand Canyon National Park.

How the Canyon Became Grand: A Short History
by Stephen J Pyne
From the publisher: "Exploring more than four hundred years of human contact with the Grand Canyon, Stephen J Pyne chronicles the creation of one of America's greatest icons. The Canyon was discovered in 1540 by Spanish explorers, but dismissed as worthless and immediately forgotten; three centuries passed before it came to be recognized by Westerners for the natural wonder that it is. Merging environmental, social, intellectual, and political history, Pyne takes us on a wondrous journey of discovery. He recounts the achievements of explorers, geologists, artists, and writers, from John Wesley Powell to Wallace Stenger, who transformed the Canyon from a natural phenomenon into a symbol of America."

About deep time

The Age of the Earth
by G Brent Dalrymple
The Age of the Earth begins with a plain answer: "Four and one-half billion years." But keep reading! Dalrymple's comprehensive,

authoritative, and altogether magisterial account of the methods used to determine the age of the earth is, according to the reviewer for *The Quarterly Review of Biology*, "an enormously important book written by an expert for the general scientific public. It is must reading for all interested in the antiquity of nature." Dalrymple, a Supporter of NCSE, is Professor Emeritus in the College of Oceanic and Atmospheric Sciences at Oregon State University.

Measuring Eternity: The Search for the Beginning of Time
by Martin Gorst
In *Measuring Eternity*, Martin Gorst provides a readable and engaging account of attempts to ascertain the age of the world. Ranging from the time of Ussher, La Peyrère, and Burnet all the way to the Hubble Space Telescope, the book provides delightful glimpses of a variety of eccentric characters devoted to the development of a scientific chronology. "The world has not only existed much longer than was once believed," Gorst writes toward the end of *Measuring Eternity*: "we now know that it is larger and more varied, richer and more complex, than Ussher and his contemporaries could ever have imagined."

Time's Arrow/Time's Cycle
by Stephen Jay Gould
In *Time's Arrow/Time's Cycle*, Stephen Jay Gould reconsiders the discovery of deep time by focusing on "the three cardinal actors on the British geological stage — the primary villain and the two standard heroes," that is, Thomas Burnet, James Hutton, and Charles Lyell. Challenging textbook orthodoxies and Whiggish triumphalism in the history of geology, *Time's Arrow/Time's Cycle* was praised by the reviewer for the *Times Higher Education Supplement* as carrying "an enthusiasm, intelligence and sense of purpose that render it a worthy follower to Gould's earlier work." Gould was a supporter of NCSE until his death in 2002.

The Dating Game: One Man's Search for the Age of the Earth
by Cherry Lewis
"It is perhaps a little indelicate to ask of our mother Earth her age, but Science acknowledges no shame." So quipped Arthur Holmes, one of the major figures in the history of attempts to determine the age of the earth, and the subject of Cherry Lewis's lively biography, *The Dating Game*. The reviewer for *Earth Sciences History* writes, "it is always a pleasure — and alas, not a common pleasure — to read a really well-written geological biography. Cherry Lewis is to be congratulated not only in producing one such biography, but also in setting forth with commendable lucidity the evolving scientific concepts by which the earth's dating was achieved."

About Flood Geology

Noah's Flood: The Genesis Story in Western Thought
by Norman Cohn
With the aid of 75 illustrations, including 20 color plates, the distinguished medieval historian Norman Cohn explores the origins, development, and variety of interpretations of the familiar tale of the Noachian deluge. Writing in *Nature*, the historian of geology Martin Rudwick described *Noah's Flood* as "[a]n attractive brief survey of the fortunes and uses of the Flood story, ranging from ancient Mesopotamia to the equally alien territory of twentieth-century American creationism ..." and commended it to "anyone with an interest in the historical roots of modern scientific study of the earth." The author is the Astor-Wolfson Professor Emeritus of History at the University of Sussex.

Genesis and Geology
by Charles Coulston Gillispie
Subtitled "A study in the relations of scientific thought, natural theology, and social opinion in Great Britain, 1790–1850", *Genesis and Geology* "proposed to give an account of the immediate background of the pattern of scientific disagreement which culminated in disputes about Darwin's book and to attempt to analyze the causes of that disagreement." Originally published in 1951, *Genesis and Geology* was reprinted by Harvard University Press in 1996, with a new introduction by the historian of geology Nicolaas Rupke re-evaluating the book in light of the subsequent 45 years of historical scholarship.

The Creationists
by Ronald L Numbers
Published in 1992, Ronald L Numbers's monumental study remains the pre-eminent work on the history of creationism — and on the history of flood geology. "There is, of course, no simple answer to the question 'Why Flood geology?'" Numbers explains toward the end of the book. "But the testimony of countless converts suggests that the lion's share of credit — or blame — for the popularity of flood geology must go to John C Whitcomb Jr and Henry M Morris, who in *The Genesis Flood* gave George McCready Price's Adventist flood theory a proper fundamentalist baptism and then skillfully promoted it as biblical orthodoxy."

When the Great Abyss Opened: Classic and Contemporary Readings of Noah's Flood
by J David Pleins
In his lively, ambitious, and engaging study, Pleins — Professor of Religious Studies at Santa Clara University — investigates the cultural significance of the story of Noah's flood, discussing the connections and conflicts among geology, archeology, myth, literature, the Bible, and popular culture. (A chapter is devoted to "Fundamentalist literalism and 'creation science'".) Michael Ruse writes, "This fascinating book opens up a completely new light on a topic about which we all think we know something and about which we learn we knew very little. One of the great myths of Western culture is seen in a completely fresh light, thanks to the labors of J David Pleins."

NCSE on the Road

A Calendar of Special Events, Presentations, and Lectures

Date June 6, 2004
City Philadelphia PA
Presenter Andrew J Petto
Title Beyond the Ivory Tower — Bringing Science and Religion to Your Community
Event Annual Metanexus Conference
Time 4:00 PM
Location University of Pennsylvania
Contact Julia Loving, conference2004@metanexus.net

Date June 25, 2004
City Long Beach CA
Presenter Eugenie C Scott
Title What's Intelligent About "Intelligent Design"?
Event The Unitarian Universalist General Assembly
Time 11:00 AM and 1:30 PM
Location Long Beach Convention Center
Contact David E Schafer, DavidESchafer@cs.com

Date July 31, 2004
City Snowbird UT
Presenter Eugenie C Scott
Title Just When You Thought It Was Safe To Teach Evolution
Event Botany 2004 Forum Keynote Address
Time TBA
Location TBA
Contact Jeffrey M Osborn, josborn@truman.edu

Date August 14, 2004
City Scottsdale AZ
Presenter Eugenie C Scott
Title The Unreasonableness of Anti-evolutionism
Event Humanicon Southwest Conference
Time 2:00 PM
Location Chaparral Suites Hotel
Contact Susan Sackett, susansackett@earthlink.net

Date October 15, 2004
City San Jose CA
Presenter Eugenie C Scott
Title Body Plans and Adaptive Radiation
Event California Science Education Conference
Time 8:00 AM
Location Marriott Hotel
Contact Judy Scotchmoor, jscotch@berkeley.edu

Date October 23, 2004
City Gainesville FL
Presenter Eugenie C Scott
Title Anti-evolutionism and Museums
Event Enhancing Natural History Museum Visitors Understanding of Evolution Conference — Keynote Address
Time TBA
Location TBA
Contact Bruce J McFadden, bmacfadd@flmnh.ufl.edu

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

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Membership in NCSE brings you:

- 6 issues of *Reports of the National Center for Science Education*
- Participation in NCSE's efforts to promote and defend integrity in science education

Membership Information

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City State Zip

e-mail ( ) Telephone ( ) Fax

Occupation (Optional)

☐ Check here if you do not want NCSE to share your name and address with other organizations

☐ Check here if NCSE may share your name with activists in your state

☐ Check (US dollars) ☐ Charge to: ☐ VISA ☐ Master Card ☐ AmEx

Credit card number Exp. Date

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went to NCSE for Project Steve (see *RNCSE* 2003 Sep-Dec; 23 [5-6]: 50-2), several awards ("Polyanna", "You have a candor problem", and "Hey, news means new info") for anti-evolutionist organizations in New Mexico (see *RNCSE* 2003 Sep-Dec; 23 [5-6]: 9-13), and the "Finally, some candor" award, which went to Phillip Johnson for his explanation that "What's at stake isn't just the first chapter of Genesis, but the whole Bible from beginning to end, and whether or not nature really is all there is" (*World* 2003 Dec 13; 18 [48]; available on-line at <http://www.worldmag.com/world/issue/12-13-03/cover_1.asp>).

Margaret Towne's *Honest to Genesis: A Biblical and Scientific Challenge to Creationism* was published (Frederick [MD]: PublishAmerica, 2003). The publisher writes, "*Honest to Genesis* integrates the biblical creation accounts with modern evolutionary theory. It targets a broad audience, covering both the scientific as well as the theological dimensions of this subject[,] which continues to erupt in the culture from courtroom to classroom to living room. ...The very good news is that conflict need not exist between these often seemingly opposing disciplines if the biblical and scientific records, both written by the same divine Author, are appropriately interpreted."The book will be reviewed in a future issue of *RNCSE*. Towne teaches in both the philosophy department and the biology department at the University of Nevada, Las Vegas; she is also coeditor of the *Newsletter of the American Scientific Affiliation & Canadian Scientific & Christian Affiliation*.

Charles F Urbanowicz, Professor of Anthropology at California State University, Chico peoduced 4 short videos about Charles Darwin's life and work available on-line at <http://rce.csuchico.edu/darwin/darwinvideo.htm>. Together running 90 minutes, the videos attempt (in Urbanowicz's words) "not only [to] convey the content of Darwin's work within the context of his times, but also to demonstrate the impact his ideas have for contemporary students." Urbanowicz reports that he is seeking a publisher to release the videos on DVD.

[*Publications, achievements, honors? Tell* RNCSE *so we can pass on the good news to all of our members. Call, write, or e-mail.*]

NCSE Runs the Canyon

Alan Gishlick, NCSE Postdoctoral Scholar

The Grand Canyon is a perfect place to get perspective on the creationism/evolution controversy. There, at the bottom of the canyon, surrounded by the evidence for deep time (or sediments from the Noachian Flood, if you prefer), you can truly appreciate the awesome forces that have shaped the earth's history.

NCSE's third Grand Canyon river run began with all the participants gathered at Marble Canyon Lodge, with the exception of Eugenie Scott and I, who were madly driving our way there after errant flight reservations prevented our arrival in Las Vegas with the rest of the group. Fortunately, Wilfred Elders — a veteran of NCSE's previous trips to the Canyon and a Canyon expert in his own right — was there to shepherd the participants in our absence. We arrived, breathless, in time to embark.

As with all river trips through the canyon, we started at Lee's Ferry at the top of Marble Canyon. From there, we floated past the strata, learning much about creationist geology from Genie and Wilf. The mainstream geological view was provided by Ed Trotter, whose dissertation involved the sedimentology of the Canyon, and me. As usual, the ride was not only informative but also relaxing.

Reminding us all of Noah's Flood was the series of torrential rainstorms that struck the greater Las Vegas area near the end of August. In the canyon, we were treated to rain, wind, hail, flooding, and even 90-meter falls of water and debris over the canyon rim. Even our experienced boatman, Matt, said that it was the biggest storm that he had ever seen.

The trip had its usual highlights: bumping down exciting rapids, hiking down beautiful side canyons, and floating leisurely down the quiet stretches of the river. We saw more wildlife than we did on previous excursions, including great blue herons, bighorn sheep, deer, and a couple of curious wildcats that invaded our camp in search of scraps. And, after weighing all the evidence on both sides of the issue impartially and objectively, everyone decided that the Canyon was indeed about 4 million years old.

NCSE's fourth Grand Canyon river run will be July 30–August 6, 2005. As always, the 8-day motorized trip from Lee's Ferry to Lake Mead is all-inclusive from Las Vegas, with travel between the Canyon and the Las Vegas airport provided by the outfitter. Participants provide their own sleeping bags and tents (or they can be rented from the outfitter).

Now, since this is an NCSE trip, we offer more than just the typically grand float down the Canyon: the spectacular scenery, exciting rapids, delicious meals, and good companionship. This will be a "two-model" raft trip, where we will provide both the creationist view of the Grand Canyon and the evolutionist view (and let you make up your own mind).

We are still finalizing details for what promises to be yet another exciting and informative excursion. For now, mark your calendars, and watch for further information in *RNCSE* and on NCSE's web site <http://www.ncseweb.org>.

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Questioning "Flood Geology": Decisive New Evidence to End an Old Debate

William Parkinson

Especially since the publication of Henry Morris and John Whitcomb's book *The Genesis Flood* (1961), young-earth creationists have claimed a scientific basis for their view that a historic, worldwide flood shaped the major geophysical features of the earth. A key problem for "flood geologists" is the order and sequence of fossil remains in the geological record. In order to construe the bulk of the geologic column as a result of a single global deluge, flood geologists must replace the current scientific explanation of the fossil record as a result of preservation of series of contemporaneous ecological associations of organisms with one that is consistent with the aftermath of a major geologic catastrophe.

Modern taphonomic studies clearly distinguish the patterns of deposition of organic remains after severe modern flooding from those produced by other processes. The fact that the bulk of the fossil record does not show evidence of the sudden, catastrophic deposition expected from a massive flood means that most of the fossiliferous strata were laid down by some other geologic process. Furthermore, contravening the expectations from a large flood, the fossil record records a succession in the history of life consistent with a theory that is based on the emergence of new species via descent with modification from common ancestors.

A critical requirement of the flood model is to provide a reasonable explanation for this observed stratigraphic succession of both flora and fauna — a universal feature of the fossil record. In an attempt to solve this problem, flood model advocates quickly seized upon the fact that ecosystems naturally vary; as one travels from the seashore to the highlands or from the equator to the poles, the characteristic plants and animals that make up ecological communities will also vary. Invoking this well-documented observation, flood model advocates applied the term "ecological zonation" (EZ) to the hypothesis they developed to account for the observed stratigraphic succession of organisms.

In brief, EZ postulates that, as the water of the Flood rose, organisms were buried according to the ecological zones in which they lived. Thus, according to flood model proponents, marine organisms would be buried first, as sediments derived from the breakdown of rocks that formed the land flowed into the continental shelf and farther into the ocean basins. The next layer would be organisms from near-shore terrestrial environments, and as the water continued to rise, organisms from higher elevations would finally fall victim, or so the explanation goes. Thus, EZ is supposed to account for the well-documented biostratigraphic succession from marine organisms to amphibians and on to organisms fully adapted to terrestrial environments. The development of EZ in the first place is a recognition by flood geologists that the fossil record does not look at all like the outcome of a large-scale flood.

Naturally, flood geologists have overlooked a few facts that demonstrate that EZ is untenable. I will review two significant flaws in the EZ hypothesis that also expose the fundamental explanatory failure of the flood model: its inability to explain the distribution of organisms (the biostratigraphic order) and the pattern of the layers of rocks (the lithostratigraphic order) of the geologic column.

EZ DOESN'T DO IT

The first argument rests upon the observations of the geological record for North America, as summarized in the Geological Society of America's Decade of North American Geology (DNAG is a series of books about the physiographic geology of North America issued through the 1980s in commemora-

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tion of the 100th anniversary of GSA, including an authoritative timescale as of 1986). These observations document that in the past, during most of the early Paleozoic Era, most of North America was covered by broad shallow (epeiric) seas. Indeed, geological atlases show that most of the North American continental interior and continental shield (craton) was covered by these shallow seas and was of very low relief — a relatively flat seabed, with no major valleys or mountains. By contrast, the area known as the Canadian Shield — a large region of Proterozoic rock with little in the way of more recent fossil or sedimentary deposits — was apparently not covered by these shallow seas.

Thus, in North America the Cambrian Period (see Table 1), for example, is dominated by strata bearing organisms of marine origin. Similarly, the Ordovician and Silurian periods are also composed almost exclusively of marine deposits. Later, the Devonian and Carboniferous periods are also composed of large amounts of marine strata, except for deposits near the Appalachians and part of what would become the Rocky Mountains. This is because a series of continental collisions that occurred during that time period formed the Appalachians, proto-Rockies, and several other areas of significant relief.

TABLE 1.
NORTH AMERICAN DIVISIONS OF GEOLOGICAL TIME

Eon	Era	Period	Estimated age of boundary (millions of years ago)
PHANEROZOIC	Cenozoic	Quaternary	1.8
		Tertiary	65
	Mesozoic	Cretaceous	144
		Jurassic	206
		Triassic	248
	Paleozoic	Permian	290
		Pennsylvanian	320
		Mississippian	355
		Devonian	415
		Silurian	438
		Ordovician	490
		Cambrian	540
PROTEROZOIC	Late Proterozoic		900
	Middle Proterozoic		1600
	Early Proterozoic		2500
ARCHEAN	Late Archean		3000
	Middle Archean		3400
	Early Archean		3800

Except for the Canadian Shield, the oldest North American deposits in undisturbed strata always contain marine organisms; terrestrial organisms only occur in more recent strata. Evolutionary theory accounts for this by the successive diversification of descendants that colonized the land from ancestors who were solely or chiefly living in the water. There are no undisturbed strata in which organisms from, say, the Phanerozoic are mixed with or appear in strata older than those of the Proterozoic.

This observation is extremely damaging for young-earth creationists promoting EZ during Noah's Flood to explain the distribution of rock layers and organisms in the geologic record. Even the work of John Woodmorappe (who is also known as Jan Peczkis; 1999) that attempts to discredit the geologic column as an artifice built up by loose deductive reasoning inadvertently confirms that the Canadian Shield constituted dry land during the Phanerozoic. It also confirms that the rest of North America was covered with water during the purported "pre-Flood" period. This means that the terrestrial organisms in the sediments throughout North America had to have been transported thousands of kilometers from their habitats on the Canadian Shield to their final deposition locations. To accomplish this, somehow terrestrial vertebrates and plants had to have been uprooted from their original locations, floated into their present positions, and then settled out of the water carrying them to be deposited in a way that preserves the major components of the biocenosis (a natural assemblage of organisms or a living community).

But this raises other serious problems for EZ — and puts this model at odds with another creationist "explanation" for the geologic column, hydrodynamic sorting (HS). Proponents of HS argue that organisms that can float, swim, or even outrun flood waters will be found higher in the geologic column that those that cannot. How is it possible, then, for organisms with such divergent hydrodynamic properties first to be transported together long distances then later to settle to the bottom and be deposited in a manner that preserves local ecological communities? EZ fails to explain how (younger) rocks of the Mesozoic and the Cenozoic eras have come to have fossil terrestrial organisms situated in their proper ecological context, rather than as mixed assemblages of fossil organisms whose ecological relationships with other organisms have been disrupted by the violent waters of the Flood.

One of the biggest challenges for EZ is the "dinosaur freeway" documented by Martin Lockley.

Furthermore, how can transport and burial of nearly all terrestrial flora and fauna come to mimic the order that evolutionary theory would require (for example, assemblages of marine organisms in earlier deposits, with near-shore amphibians, then reptiles, and then birds and mammals, each associated with its own particular flora in successively later deposits)? Flood model advocates embrace EZ to explain this succession, but with almost all of North America covered by epeiric seas *prior* to the onset of the Flood, as even Woodmorappe's study (1999) shows, they are forced to accept that the only place where EZ could operate as envisioned for terrestrial organisms is in the area of the Canadian Shield, from where the organisms would be transported by the Flood waters over the rest of North America.

One of the biggest challenges for EZ is the "dinosaur freeway" documented by Martin Lockley (Lockley and others 1992). For example, the

Caririchnium ichnofacies (a rock unit characterized by a distinctive suite of trace fossils) is a megatrackway consisting of the footprints of sauropods and theropods (plant-eating and meat-eating dinosaurs, respectively) can be found over an area of 80 000 square kilometers. Of course, the *Caririchnium* ichnofacies and numerous other similar ichnofacies were formed by the actions of many dinosaurs walking on dry land.

But on the flood model, the terrestrial animals responsible for these tracks must have been transported by water from terrestrial habitats far removed from the areas where the trackways were produced. To make that journey, these animals had to survive long-distance water transport, touch down over a wide area on the North American continent, and somehow make tracks on the seabed before they all perished in the Flood. Only wildly ad hoc hypotheses seem capable of explaining the survival of the organisms until they reach the site, or the creation of these tracks, especially given that all of these areas were already under the waters of the epeiric seas prior to the arrival of the organisms (see, for example, "Bibliolatry revisited" by Wilfred Elders, p 33). Of course, the standard — and most rational — conclusion is that the area that was a seabed in the Paleozoic was a terrestrial habitat much later and that the tracks were made by the animals that lived on the land then.

If these soils had to endure transport over thousands of kilometers ... how did they reassemble as distinct layers after being mixed up by the violent ... flood waters?

There are more problems for the transport model when we consider the presence of paleosols (ancient soil horizons preserved in the fossil record). In these cases, the soils are arranged in distinguishable layers, clearly an *in situ* feature. In addition, many paleosols have preserved traces of root systems, including even fine-scale features such as rootlets. Examples of paleosols from the Mesozoic include those of the Triassic Delores Formation documented by Blodgett (1988) and various Cretaceous paleosols studied by Sigleo (1988), to name but a few. If these soils had to endure transport over thousands of kilometers from the Canadian Shield, how did they re-assemble as distinct layers after being mixed up by the violent action of flood waters — including re-assembly of root systems?

So it is easy to see that flood geology is at odds with most of the observations of North American geology. EZ is one model that has been proposed to reconcile these observations with the flood model, but EZ only works if inappropriate ad hoc modifications are made to overcome problems such as those posed by the need to transport ecological communities over large distances and subsequently deposit them mostly intact.

Sedimentary, my dear Watson

Flood geologists have recognized several other problems for the EZ model. For example, one would expect serious erosion and transport of sediment in the worldwide flood. Acknowledging that most present-day sediment cover is found on the cratons of the continents and that the surrounding ocean basins have very little sediment contained within them, Kurt Wise and others (1994) concede that, if the Flood had occurred, the continental rock should have been eroded and subsequently deposited as sediments in the ocean basins — which is clearly not the case. They are forced to postulate that all the sediments and rocks that now cover the continents came from the area of the ocean basins and continental shelves. The mechanism they propose is complex and beyond the scope of this article, but clearly the creationist model requires that virtually all of the sediment that now is contained in sedimentary rock on all the continents was transported over considerable distances to its present location. Taken in conjunction with the earlier observations about geologic deposits in the North American epeiric seas, this means that all the sediments, as well as most of the terrestrial flora and fauna, must have been transported over great distances before being redeposited in an arrangement that resembles their original ecological relationships — and all within a very short time. And time presents the next problem for the flood model.

Readers of *RNCSE* know that young-earth creationists (YECs) are fond of arguing that the many types of isotopic age determination are based on a series of false premises, untenable assumptions, and biased calculations (see Dalrymple 2000; Thomas 2000; York and Dalrymple 2000). However, there is one aspect of geochronology that is incontrovertible even by such creationists: that isotopic age determination yields progressively older dates for progressively lower stratigraphic levels — even though YECs refuse to accept that these methods accurately estimate the ages of these deposits in the millions of years. This consistency among methods for producing older ages in lower strata is thoroughly verified (Dalrymple 1991). From the geological literature, it is clear that the ages of the upper and lower strata are not separated by a few months (as the flood model requires), but by millions of years.

Since this determination of older ages in lower strata is based on a different relative proportion of isotopes of radioactive elements, it is fair to ask how the flood model accounts for this situation. In essence, the flood model requires that the sediment and its component radioactive elements, after being transported quickly and forcefully over great distances, came to rest in a manner that would place radioactive materials that yield the oldest dates in the lowest strata with progressively higher strata showing younger dates by virtue of a smaller proportion of isotopic decay products. There is no known mechanism that could allow for such segregation. After all, hydrodynamic sorting is based on the qualities of density, buoyancy, and displacement, not on isotopic composition, which should have no effect on the placement of these deposits.

Organic change correlates with geologic time

Another significant feature of the stratigraphic record that cannot be explained by transport is the clear

"vector" of biological complexity that runs throughout the geologic column. In recent years some creationists have claimed that organic complexity does not increase from lower (older) to higher (younger) stratigraphic intervals. Although there was never any doubt among paleobiologists about the falsity of this claim, it has, nevertheless, been decisively answered by James Valentine and others (1994) in an article in *Paleobiology* entitled "Morphological complexity increase in metazoans". Valentine and his coworkers demonstrated that organic complexity indeed increases from lower-to-higher stratigraphic intervals.

Taking somatic cell types as their comparative measure of complexity, Valentine and his coworkers noted that at the older end of the scale, the placozoans (which have no tissues, organs, organ systems, heads, or tails) possess only four somatic cell types, while mammals, emerging much later in evolutionary history (represented in their study by hominids), possess over 200 somatic cell types. Plotting times of origin of body plans against cell type numbers, they discovered that complexity, as measured by the number of somatic cell types, increase in the fossil record, at an average rate of about 1 cell type per 3 million years. Clearly, organic complexity does increase throughout geologic time.

Of course, this finding completely contradicts any model according to which the pattern of deposition of fossil organisms was produced by their transportation in a single violent flood into their present positions. What mechanism can flood geologists invoke to explain how organisms naturally subject to simple hydrodynamic principles nevertheless should end up in the fossil record in a manner that mimics the pattern that we would expect to find if organic evolution were true?

Tracks and traces

A further problem for the flood model is the abundance of trace fossils and tracks: there is no significant stratum in the Mesozoic (or even later in the Cenozoic) in which we cannot find either individual prints (ichnites) produced by terrestrial organisms or plentiful terrestrially-produced suites of trace fossils created by ecologically related organisms (ichnocoenoses). This means that at no time in the Mesozoic was the earth so completely flooded that terrestrial organisms could not walk upon the surface. If, in fact, a global flood had covered the earth during the Mesozoic, terrestrial animals hardly could create trace fossils on the surface! Thus at no time during the Mesozoic was the earth entirely covered by water.

The implications of fundamental geologic and paleontologic observations for flood geology are profound. When creationists are forced to realize that the geologic column *cannot* be explained in terms of transport mechanisms, then they are forced to recognize that the geologic column represents the product of natural forces acting over an immense span of time. A corollary of this recognition is that measurable morphological change, so richly documented by the fossil record, is real and indeed, a product of evolution. However, the response typical of YECs is to invent ad hoc modifications of their models in an attempt to make observations consistent with a short-term world-wide flood. In every case, the standard evolutionary and geological models produce satisfactory explanations of the observation that are corroborated by independent research in several scientific fields.

Answers in Genesis Defends *A Different View*

In response to the controversy over the inclusion of *Grand Canyon: A Different View* in the bookstores in Grand Canyon National Park, Answers in Genesis denounced what it refers to as "a book banning effort" on its web site and urged its supporters to lobby the National Park Service to retain the book.

AiG's Michael Matthews commented, "It is difficult to understand why a coffee-table book could spark such a massive response. Perhaps it helps to remember how fearful it is for man to acknowledge the existence of a Creator who has revealed Himself in Scripture. ...The Lord is watching us all, including the men involved in this incident at the Grand Canyon National Park."

For details, visit <http://www.answersingenesis.org/docs2004/0106gc.asp> and <http://www.answersingenesis.org/docs2004/0108gc_book_ban.asp>.

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Ohio Teachers on Teaching Evolution and Counter-Evolutionary Concepts in Biology Classrooms

Kim Bilica, University at Buffalo (SUNY) and Gerald Skoog, Texas Tech University

The Question*

How did the 2002 state curriculum standards debate influence Ohio teachers' decisions to emphasize evolution and counter-evolutionary concepts in biology classrooms?

The Context

From January to December 2002, the debate about the role of biological evolution and alternatives to evolution (specifically, "intelligent design") in Ohio's life science curriculum standards was intense. The controversy surrounding the place of evolutionary theory and alternative "theories" is consequential inasmuch as the science curriculum standards were being revised as part of the state accountability structure under No Child Left Behind (US DOE 2002). These standards would provide the basis for the high-stakes, state-level Ohio Graduation Tests. This debate has occurred in other states as special interest groups and others have argued that evolutionary theory is plagued with weaknesses and that science standards should have a requirement to "teach the controversy".

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The argument against evolution tends to be rejected because evolution is widely accepted by scientists and science educators as a central, unifying theme in science and as the cornerstone of the biological sciences (AAAS 1990, 1993; NRC 1996). Evolutionary theory provides an explanation for the changing patterns and diversity of life on earth. The evidence that life on earth has changed and continues to change is substantial and there is no "controversy" to teach. Furthermore, the tenets of "intelligent design" are not plausible as alternative explanations because they are derived from philosophical and logical arguments rather than cumulated scientific evidence. As such, the design arguments lack explanatory power.

While the resolution to the debate came out — arguably — in favor of evolution (*see* RNCSE *2002 Sep/Oct; 22 [5]: 4-6*), the grades 9 and 10 Life Science curriculum standards included the statement:

> Describe how scientists continue to investigate and critically analyze aspects of evolutionary theory. (The intent of this benchmark does not mandate the teaching or testing of intelligent design.) (Ohio Academic Content Standards 2002, Standard H, p 138)

Because Life Science Standard H includes a parenthetical that mentions "intelligent design", the standard could be construed as an invitation to teach (but not test) "intelligent design", thus formally introducing non-scientific tenets into the public biology classroom. With the ambiguously stated life science standard, and with the March 2004 Ohio State Board of Education's approval of a model lesson plan promoting counter-evolutionary tenets, the decision is now left to the Ohio biology teachers to interpret the Life Science standard and to translate their interpretation into classroom instructional practice.

The Details

In an effort to understand better the effects of the controversy in Ohio biology classrooms, a statewide descriptive survey study was conducted in spring-summer 2003. In April 2003, 900 Ohio biology teachers received a 62-item paper survey that included questions about the classroom emphasis they place on evolution and counter-evolution concepts in the classroom. The instrument also collected information about the teachers' academic preparation, certification status, regional location, school type, and perceptions on the role of evolution in science.

By June 2003, 210 of the surveys were returned (23.3% return rate), and of these 189 were entered into the analysis of data. The teachers were academically well prepared, professionally qualified, and experienced. A majority of the teachers were certified to teach biology in Ohio (94%), and 55.5% had taken a course in biological evolution as part of their academic training. Thirty-one percent (30.6%) of the teachers had obtained a bachelor's degree, and 65.6% earned a master's degree. The teachers were experienced with a median 13 years of teaching experience (mean = 15 years).

Eighty percent (80.2%) of the teachers were teaching in public

schools, and of all responding teachers, 55.1% were located in suburban regions, 30.8% from rural, and 14.1% from urban areas. All were teachers of secondary school science, with 82.8% located in high school, 14.5% in middle school, and 2.7% in both middle and high school. Written comments were made by 81% of the respondents on an optional section of the survey instrument. The large proportion of surveys with written comments was interpreted as evidence that this issue was significant to these teachers.

Data indicated that the responding sample of teachers gave little to no emphasis to counter-evolutionary concepts ("intelligent design" and creationism); whereas they gave moderate to strong emphasis to evolutionary concepts (diversity, human evolution, pace and rate of evolution, evidence for evolution, speciation, descent with modification, and natural selection). With the advent of the new standards for life science, teachers reported that they would not decrease emphasis on evolution (88%), nor would they change the content that they would use to teach evolution (71%). When asked about emphasis on counter-evolution concepts, however, the responding teachers demonstrated less unanimity. Thirty-one percent (31%) of the teachers agreed that they would give some emphasis to "intelligent design" and creationism in their classes, and an additional 11-16% were undecided about their emphasis on anti-evolution content.

The study also demonstrated that certain specific factors influence teachers' emphasis on evolutionary and counter-evolutionary concepts. These factors: professional and academic preparation (certification status, college degree, and having a course in evolution), personal beliefs about evolution in science, and perceptions of support from principal and from the community.

The Bottom Line

Because biology teachers are left to interpret the confusing parenthetical statement about "intelligent design", and as a result of the model lesson for Standard H, the door to the inclusion of non-scientific tenets in the science classroom is now open. The results from the small sample responding to this survey seem to indicate that the teachers will not change the emphasis they place on evolution in their classrooms; however, one third of the teachers intend to include counter-evolutionary concepts in their classroom curriculum. Furthermore, 11-16% of the responding teachers were undecided about their emphasis on counter-evolution concepts, leading to the possibility that one half of the responding teachers could potentially address "intelligent design" and/or creationism in their classrooms.

Who is Affected?

Most proximally, this survey speaks of a select sample of teachers in Ohio; however, as the nationwide debate over "intelligent design" and the perceived need to "teach the controversy" continue to spark flare-ups in other regions, the information provided by Ohio teachers in the context of their state debate may illuminate the actions and activities of educators, administrators, and state policy boards in other states.

Caveats

As with any survey research, the power of the study rests largely in the ability of a small portion of responding individuals to represent the positions of individuals across a larger population. In studies with very large populations, such as all biology teachers across the state of Ohio, achieving a substantial representation becomes very difficult. Because the return rate was substantially lower than anticipated but not entirely unexpected, the researchers, in an abundance of caution, decided that the data in this study were not necessarily representative of all Ohio biology teachers. Instead, the data could only be interpreted from within the responding sample, a group who are likely energized and interested in the Ohio debate. Still, the value of the data rests in the ability to voice the concerns of the teachers who otherwise were not specifically considered in the state curriculum debate.

The Study

This study was conducted by Kim Bilica, State University of New York at Buffalo, and Gerald Skoog, Texas Tech University. A manuscript is currently in progress for potential publication.

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[**The research summary format is based upon an ASCD ResearchBrief (<http://www.ascd.org/cms/index.cfm?TheViewID=887>). Used with permission. The findings of this study were originally presented at the NARST (National Association for Research in Science Teaching) Conference, Vancouver, British Columbia, Canada, April 1-3, 2004.*]

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You Can Say That Again!

"There is something deeply dissatisfying about establishing the *bona fides* of one theory by debunking another. Design simply must put novel predictions of its own on the blackboard."

—Paul Nelson
<http://www.iscid.org/ubb/ultimatebb.php?ubb=get_topic;f=6;t=000175;p=1>

FEATURE

The Amazing Energetics of a World-Wide Flood

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James A Wilson (2002) reported that a majority of entering students in his introductory biology classes believed that a world-wide flood really happened. Scientists generally regard the idea of such a flood to be too absurd to consider, but few consider the actual magnitude of the violation of the laws of physics required. The general public is uninformed on difficulties of a literal interpretation of the Genesis account of the Noachian Flood caused by these natural laws.

If it rained for 40 days and 40 nights and flooded the entire earth to a depth "that all the high mountains under the whole heaven were covered" (Genesis 7:19), what was the temperature of the water when it reached the earth's surface? This question occurred to me during my visit to Turkey in 1982, when the newspaper reported that the Turkish military had just rescued American astronaut James Irwin from the upper slopes of Mt Ararat, where he had been searching for the remains of the Ark.

There is not enough water on our planet to flood us to that depth — even in the "fountains of the great deep" (Genesis 7:11) — and the only logical hypothesis is that a substantial amount would have to come from outer space ("the windows of the heavens"; Genesis 7:11). Although it should be instantly obvious to anyone familiar with physics that the fall of water to earth from outer space would result in heating the water because of the law of conservation of energy, the actual amount of heat is startling. James Irwin had been through re-entry from space and experienced for himself the temporary loss of communications resulting from ionization of the atmosphere around the space capsule, as well as the need to orient the capsule so that the heat shield would erode and carry off the excess heat, yet it evidently never occurred to him that the same heating process would apply to the extraterrestrial source of water for the flood.

It is easy to calculate roughly the energy generated by the water's fall. Escape velocity has been widely publicized as about 40 000 kilometers (25 000 miles) per hour, or 11.1 kilometers (7 miles) per second; re-entry velocity is the same. From Isaac Newton's equations we can calculate the energy generated by the water's falling through the earth's atmosphere: $E = \frac{1}{2}mv^2$, where E is energy, m is mass, and v is velocity. More precise calculations are possible, but the result is not significantly different.

Accordingly, if the water started in outer space at zero velocity and a temperature of zero absolute, each gram would acquire 61.7 kilojoules (14.75 kilocalories) of energy as earth's gravity accelerated it through the atmosphere. This translates to 265 kilocalories per gram-mol of water, enough to tear each water molecule into individual oxygen and hydrogen atoms. The resulting temperature would exceed that of an oxygen-hydrogen welding torch.

If the water fell for 40 days and nights, the rate of energy delivery was 1.28 megatons (1 megaton = 1 000 000 000 000 kilocalories) per square kilometer every minute. Translating to units more familiar to Americans, this is equivalent to a one-megaton thermonuclear bomb for each and every square mile of the entire earth's surface every 18 seconds for 40 days and 40 nights.

Depending on how much of the water had to come from space and how far above the earth it started, this presumed gravitational energy of the water could be diminished somewhat. However, there is no way this gravitational energy can be evaded. Young-earth creationists might argue that the water was in near-earth orbit before it fell, but that would only cut the energy about in half. The point remains nevertheless that if even 1% of the water came from near-earth orbit, the resulting heat would amount to about one megaton per square mile per hour — still plenty to fry the planet's surface.

Then we have to get the water back off the earth, which requires putting all of that energy back in. It is a symmetrical problem.

And finally, despite the energy with which the earth's surface would have been blasted, Genesis 8:14 informs us that the earth was dry and ready to re-inhabit in 1 year and 10 days.

If all of this seems far-fetched, consider the accretion of the earth from dust and small pieces of space debris in the early years of the planet's formation. This process required dissipation of a much greater amount of energy, and the general consensus among planetary scientists is that the formation and cooling of the earth to the point where a continental crust could form required a few hundred million years. (See, for example, Kramers 2001.) Furthermore, it is the gravita-

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Flaws in a Young-Earth Cooling Mechanism

Glenn Morton and George L Murphy

Modern young-earth creationist theories invoke huge quantities of heat — enough to boil most of the oceans and melt the earth's rocks. For instance, John Baumgardner has suggested that rapid subduction of the oceanic plates caused the Flood and accomplished all the continental drift within a few years at most. But he calculates that this process would have generated 10^{28} joules of heat:

> If released near the earth's surface, this amount of energy is sufficient to melt a layer of silicate rock 12 km thick or the boil away a layer of water 25 km deep over the entire earth. It is equivalent to the kinetic energy of 170 000 asteroids, each 10 km in diameter and traveling at 15 km/s. (Baumgardner 1990: 37)

Steve Austin and others (1994a: 612) endorsed this view several years later. In the question-and-answer session after that talk captured on videotape (Austin and others 1994b), Russell Humphreys noted:

> We have always said that one of the major problems was the heat flow — what do we do with the excess heat?

Clearly, such quantities of heat are a huge problem for the young-earth creationist position.

But these processes are not the only source of huge quantities of heat invoked by modern creationist ideas. Institute for Creation Research (ICR) and Creation Research Society (CRS) members have become convinced that large quantities of radioactive decay have taken place on earth (Humphreys 2000: 335; Snelling and others 2000: 398, 455; Vardiman 2000: 3, 15). In 2000, the Radioactivity and the Age of The Earth (RATE) group published a book attempting to explain how the rates of radioactive decay could have increased significantly during the global flood in order to account for the millions-year-old ages given by radioisotope dating methods. But radioactivity gives off heat, and accounting for all the heat produced by the presumed increase in radioactive decay creates another huge heat problem. Larry Vardiman writes:

> For example, if most of the radioactive decay implied by fission tracks or quantities of daughter products occurred over the year of the Flood, the amount of heat generated may have been sufficient to vaporize all the waters of the oceans and melt portions of the earth's crust, given present conditions. (Vardiman 2000: 8)

And Humphreys adds:

> A simple calculation shows that crustal rocks with their present amount of radioactivity would melt many times over if decay rates were accelerated. However, I would like to emphasize here that *all* creationist Creation or Flood models I know of have serious problems with heat disposal. (Baumgardner 1986: 211, cited in Humphreys 2000: 369–70)

Humphreys proposed a mechanism for absorbing the problem heat. Assuming that all particles in the universe are losing energy due to the cosmic expansion, the excess heat generated can be absorbed by these "cooled" particles.

Humphreys outlines his idea this way:

> All relativists think that, while the expansion of space sweeps galaxies apart, the galaxies themselves (and smaller objects) do not change size with the expansion. One explanation (I know of no other) for why that should be so is that the force associated with the

tional energy from condensation of the material for a star that provides the necessary heat to ignite thermonuclear fusion. Both these examples illustrate the amount of energy that can be generated simply by the gravitational attraction of matter.

Science only accounts for things that happen in strict accord with natural processes. In this case, the known natural processes would indeed have destroyed all life on earth, as promised by Genesis, but also would have created serious problems for Noah, his family, and all the surviving animals (not to mention the marine and aquatic organisms that were not aboard the Ark) both during and after the Flood. If any supernatural violation of the laws of physics has ever actually occurred, it is not possible to use the laws of physics to prove it, because there is no way of knowing when normal physics was restored. Scientists assume that the laws of nature are always obeyed, but that assumption is not faith. There is simply no logical way to base rational interpretation of evidence on any other assumption, and trying to accommodate scriptural and other nonscientific accounts in the context of these laws only makes things worse.

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expansion is much smaller than the forces binding together stars in a galaxy (or particles in planets, people and atoms). The expansion is only strong enough to overcome the feeble gravitational forces between galaxies. By that view, the fabric of space between particles bound to each other, whether within stars or atoms, continues to expand, sliding past the particles essentially without friction. The calculations leading to equation (14) were for free particles, because that is easier to calculate ... but a simple *gedanken* experiment suggests the same effect applies to bound particles as well as free ones. Imagine a large box with perfectly reflecting sides. One particle, say a molecule, bounces around in the box in a vacuum. The box itself does not change size, for the reason I offered above, so the molecule does not lose energy to the walls of the box as it bounces off them.

Except for the tiny fraction of time the molecule spends bouncing off the walls, it is perfectly free; during the free part of its flight, it is just like the free particle in empty space, and the molecule imparts some of its energy to the fabric of space. The molecule is bound within the box, and yet it loses energy which does not go into the walls of the box. Now shrink the box to the size of a unit cell in the crystal. Again the molecule loses energy to the fabric of space. In a real crystal, the vibrating ions transfer energy back and forth with their neighboring ions, but as each ion moves, it will also lose some kinetic energy to the fabric of space within which it is moving. From our viewpoint, the energy does not go in any of the three directions we perceive; it simply disappears. (Humphreys 2000: 371–2)

We would make several criticisms of this suggestion. First, one of us has developed a simple classical model for a harmonic oscillator (like a particle oscillating in a crystal), and in this model the particle does not lose energy to the cosmic expansion. While other force terms could be used in the equation of motion to give different results, the one used there seems to be the simplest and most natural generalization of the ordinary linear restoring force. The fact that energy is not lost here suggests that Humphreys's qualitative argument is incorrect. A mathematical model developed by George Murphy that calculates the magnitude of the forces involved is available on request from Glenn Morton.

Second, we would criticize this idea on the basis that it is too slow to be useful to the creationist agenda. Today the expansion of the universe is of the order of 1 part in 10^{10} each year. This is the percentage of expansion of the present size of the universe that occurs each year. As we have shown in calculations elsewhere, doubling the expansion rate, R (Humphreys 2000: 372–3), would decrease the kinetic energy ($mV^2/2$) *of a free particle* by a factor of ¼. But even if this were true for a bound particle (and it is not), the 25% of the thermal energy that would remain would still wreak havoc during a global flood.

Our third criticism of the concept is that there would be visible effects in the spectra of light emitted during the Flood, including that from stars a few thousand light years away in our own galaxy. A change in the energy levels of atoms (which this idea would entail) would change the frequencies at which light is emitted in a fashion that would be observable. The lack of such observations rules out Humphreys's cooling mechanism as a reasonable possibility.

Fourth, we would criticize this concept on theological grounds. In Humphreys's article in the RATE book, he postulates that God performs lots of miracles in order to explain things. God is supposed to have changed the mass of the pion, changed the parameters of gauge bosons to accelerate beta decay, and changed the effective distance of the strong force to alter alpha decay. With all these miracles, why then does God switch to a naturalistic solution to the heat problem — albeit one that requires a rapid cosmic expansion of unexplained origin? All of this raises two serious theological questions. Why does God dance to Humphreys's whim, performing a miracle each time Humphreys requires one? Demanding miracles of God raises certain questions of who is the master and who the servant. And why does Humphreys insist on any naturalistic approach at all, given all the miracles he postulates? Why not simply remove the heat miraculously?

For these reasons, we reject Humphreys's cooling mechanism: because it is wrong, it is ineffective, it is falsified by observational data, and it is theologically flawed.

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Bibliolatry Revisited

Grand Canyon: A Different View

compiled by Tom Vail
Green River (AR): Master Books, 2003. 104 pages.

Reviewed by Wilfred A Elders

On August 10, 1869, Major John Wesley Powell and his party — the first Europeans to explore the length of the Grand Canyon — reached the confluence of the Río Colorado and the Chiquito Colorado (Little Colorado), 71 days after leaving Green River Station, Wyoming. Their frail wooden boats were in need of repair, half of their gear was lost, their dwindling supply of food was thoroughly soaked, and their clothing was in rags. Yet the scenery inspired them with awe. Powell wrote in his diary:

> We are three-quarters of a mile in the depths of the earth and the great river shrinks into insignificance, as it dashes its angry waves against the walls and cliffs, that rise to the world above: they are but puny ripples, and we are but pigmies, running up and down the sands, or lost among boulders. We have an unknown distance yet to run, an unknown river yet to explore. What falls there are, we know not; what rocks beset the channels, we know not; what walls rise over the river, we know not (Powell 1895: 247).

The Canyon's falls, rocks, channels, and walls are now familiar to people around the globe. Each year more than 4 million visitors view its spectacular scenery, and tens of thousands of them hike to the river or raft its rapids. Among them were participants in the National Center for Science Education's (NCSE) third whitewater rafting trip through the Grand Canyon in August 2003.

Powell felt pigmy-like against the immensity of the Canyon. Just as its scale dwarfs our everyday sense of place, its geology dwarfs our human sense of time. Perhaps here, more than anywhere else on the planet, we can experience a sense of "Deep Time". Powell (1895) also wrote, "The thought grew in my mind that the canyons of this region would be a Book of Revelations in the rock-leaved bible of geology." Today we know that the colorful, "rock-leaved bible" exposed in the vertical walls of the Canyon displays a span of 1.8 billion years of earth history (Beus and Morales 2002). But wait! There is a different view! According to a new book about the Grand Canyon, this time span is only 6000 years and the Grand Canyon and its rocks are a record of Noah's Flood and the 6 days of creation (Vail 2003). In asserting that these were the only two significant geological events in the earth's history, this text rejects the whole idea of the geologic column and radioisotope dating, which must surely be among the most robust ideas in science. During my visit to the Grand Canyon in August 2003, I learned that this book, *Grand Canyon: A Different View* (GCDV), was being sold in bookstores within the national park (Elders 2003).

To me GCDV is remarkable; it is the *only* young-earth creationist (YEC) text that I have enjoyed reading. Its author and compiler, Thomas Vail of Canyon Ministries, has been a river guide for many years and knows the Grand Canyon at river-level better than most people. However, it is not his ideas that I found attractive but rather the striking layout and many beautiful photographs of the Grand Canyon that enhance the text. These are largely the work of another river guide, Charly Heavenrich, about whom Vail writes, "Although he does not share the creationist point of view, he is profoundly moved by the canyon and the depth of courage and ability he sees in the people who travel with him" (GCDV, p 104). The book is remarkable in another way: because it has 23 co-authors — a veritable "Who's Who in Creationism" (Steven Austin, John Baumgardner, Ken Cumming, Duane Gish, Werner Gitt, Ken Ham, William Hoesch, Russell Humphreys, Alex Lalomov, John MacArthur, Henry Morris, John Morris, Terry Mortenson, Michael Oard, Gary Parker, Scott Rugg, Andrew Snelling, Keith Swanson, Larry Vardiman, Tasman Walker, John Whitcomb, Carl Wieland, and Kurt Wise). To borrow a line from the classic movie *Casablanca*, Vail must have sent out a call to "round up the usual suspects". For example, Henry Morris and John Whitcomb, the authors of the seminal YEC text, *The Genesis Flood* (Whitcomb and Morris 1961), each contribute a brief introduction.

The format of GCDV has each chapter beginning with an overview by Vail followed by brief comments by other contributors. A note on the contents page lays out the ground rules of such participation: "All contributions have been peer reviewed to ensure a consistent and biblical perspective". This perspective is extreme biblical literalism. Thus, in my opinion, GCDV combines both bad theology and bad science.

[T]his text rejects the whole idea of the geologic column and radioisotope dating.

As a scientist, perhaps it would be inappropriate for me to dwell on GCDV's bad theology. It should be sufficient to remind myself that mainline Christian denominations long ago rejected the idea the earth began on Sunday, October 23, 4004 BCE, at 9:00 in the morning, London time (Nicolson 2003: 149) and that they espouse the findings of evolutionary scientists. (See, for example, published statements on evolution by Pope John Paul II.) On the other hand, the words of Paula Vail (Tom Vail's wife, to whom GCDV is dedicated) epitomize the YEC worldview. She writes, "[T]he Bible has proven correct in every detail to which it speaks." She goes on to state that these details include "the water cycle, the jet stream and movements of the winds, the First and Second Laws of Thermodynamics, atomic structure, oceanography, dinosaurs,

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medicine, and astronomy" (GCDV, p 94).

GCDV complements and builds on the much more detailed YEC text on the geology of the Grand Canyon, *Grand Canyon: Monument to Catastrophe* by Steven Austin of the Institute for Creation Research (Austin 1994). My review of that book in *RNCSE* concluded that Austin had written a contribution to "bibliolatry" (absolute dependence on a group of sacred writings as infallible) rather than to geological sciences (Elders 1998: 14). Austin countered that I was trivializing creationist scholarship and urged me "to come to grips with the fact that creationists have a continuing research program at Grand Canyon" (Austin 1999: 14). My response was that this research fell far short of having the quality and quantity necessary to overthrow the paradigms of science and cause a revolution in geology (Elders 1999). GCDV gives us a bird's-eye view of that continuing "research" program.

Unfortunately GCDV presents YEC ideas as a series of assertions without substantive documentation of evidence. Extraordinary claims require extraordinary evidence, and in this regard GCDV is an extraordinary failure. Just one small example: Vail (GCDV: 32) writes, "... in the creationist's view, the carving of the Canyon would have taken place when the sedimentary layers were still soft, allowing the catastrophic erosion process to quickly and easily cut through the layers". Today the Canyon walls stand 1600 m high in a series of cliffs and benches. These benches form where softer rocks, such as the Bright Angel Shale, have been eroded. The cliffs are formed of harder, more resistant rocks such as the Redwall Limestone. Given that all these rocks formed from muds, clay-rich in the case of the shales and calcium carbonate-rich in the case of the limestones, the onus is on Vail to demonstrate that plastic muds could stand in such enormous cliffs while being catastrophically eroded.

Space considerations prevent discussion here of all the absurdities.

For another example, we can turn to the problem that radioisotope dating presents for young-earth creationists. The words of Henry Morris in GCDV (p 17) nicely encapsulate their problem: "The dating of rocks by the radioactive decay of certain minerals is undoubtedly the main argument today for the dogma [*sic*] of an old earth". Vail's book extends the well-worn, and previously refuted, YEC arguments attacking radiometric dating of igneous rocks in the Grand Canyon (see, for example, Stassen 2003). In GCDV (p 39), Snelling reports new radiometric dates from a Proterozoic intrusion in the Grand Canyon, the Bass Diabase Sill, as follows: K/Ar 841 million years (Ma), Rb/Sr 1055 Ma, U/Pb 1249 Ma, and Sm/Nd 1375 Ma.

However, Snelling's treatment is too brief to discuss potential problems with these samples such as alteration, possible argon loss, the low content of uranium in basaltic rocks, isotopic ratios that may be inherited from source areas, and so on, that are well known to produce avoidable errors in isotopic age estimates. However, he goes on to claim that the spread in the reported ages discredits the whole concept of radiometric dating! His conclusion is, "Indeed, the obvious way to explain the gross disagreements between these dates is that the decay rates have been different in the past than they are today" (GCDV, p 39). Snelling needs to develop this theme, and particularly to explain the thermal consequences to the planet of compressing 4.5 billion years of radioactivity into less than 6000 years and the consequences to the cosmos of changing the fundamental laws of physics.

Space considerations prevent discussion here of all the absurdities propounded by the authors of GCDV. However, the chapter "Fossils in the Grand Canyon" (GCDV, p 48–55) offers some particularly egregious examples. For example, without offering any evidence, Wise (GCDV, p 54) refers to fossils in the Grand Canyon that were the product of "... a continent-sized floating forest". Ham (GCDV, p 55) correctly points out that, "As we look at the Grand Canyon, we see layer upon layer of rock that contains billions of dead things." But he goes on to say, "The evidence from the layers is consistent with their having been laid down catastrophically, by hydrodynamic action of water — exactly as we would expect from the global Flood of Noah." Austin (1994: 147) concurred with this view, stating, "It is not clear whether the order of appearance of organisms in Grand Canyon, or anywhere else on earth, for that matter, is necessarily any different than a random order which a flood might produce."

According to Austin, the time elapsed between the 6 days of creation and Noah's Flood was only 1656 years (Austin 1994: 65). These numbers require that all of the billions of fossils in each of the layers of the Grand Canyon (and, for that matter, all other fossils in so-called "Flood rocks" throughout the world) would have to have lived together during this postulated 1656 years. This situation requires that the carrying capacity of the ecological niches occupied by these organisms in the YEC "pre-flood" world would have to have been many orders of magnitude greater than is possible in the geologist's evolutionary world.

This raises additional problems for the YEC position. According to Genesis 1:1–31, the dry land (rocks?) and plants were created on Day 3 of creation, marine animals and birds on Day 5, and land animals, including humans, on Day 6. The sources of the sediments supposed to have been deposited by Noah's Flood could have been both "created" and "post-creation week" rocks. However, "created" rocks could not be the source of the fossils found in the "Flood" rocks, since all organisms should have been created later and presumably were living in the postulated 1656 years elapsed between creation and flood. According to Austin (1994: 57), the Great Unconformity at the base of Grand Canyon's Paleozoic section marks the onset of Noah's flood. If the sedimentary rocks below this unconformity, the Late Proterozoic Grand Canyon Supergroup, formed during and after Day 3 of creation week, they should carry a record of the abundant life between creation and the flood and should therefore be the among most fossiliferous on earth.

Unfortunately for the YEC position, this is not the case. The only fossils reported from the sediments of the Grand Canyon Supergroup are algal stromatolites and scattered occurrences of obscure micro-organisms (Beus and Morales 2002: 66).

GCDV disagrees with Austin (1994) on where to place the base of Noah's flood in the geological record of the strata of Grand Canyon. Tasman Walker states, "Most creation scientists place the Flood's commencement either within, or at the base of the Grand Canyon Supergroup" (GCDV, p 36–7). But reducing the amount of exposed "pre-Flood" sedimentary rocks compounds the problem. If not in the Grand Canyon, where on earth do "post-creation and pre-Flood" sedimentary rocks occur? We should be able to recognize them easily, as they would have to be much more highly fossiliferous than any "Flood" or "post-

Flood" rock and contain fossils drawn from the whole geologic column. Such occurrences are unknown to science. In spite of Gish's claims to the contrary (GCDV, p 44-5), the so-called Cambrian "explosion" of life, following the world-wide paucity of fossils in the Precambrian, is a major problem for the YEC position.

What were the conditions under which the "flood" rocks of Austin and Walker were laid down? GCDV actually illustrates some excellent evidence about the environment of deposition of some of the Paleozoic rocks, containing (p 48-9) photographs of trace fossils in the Cambrian Bright Angel Shale that Vail calls "fossilized worm tubes". These are the products of marine animals that were filter feeders and deposit feeders that burrowed in the mud of the Cambrian sea; and they were living in place, just as their counterparts do in modern seas today (Beus and Morales 2003: 98). Many other horizons within the strata of the Grand Canyon are replete with examples of bioturbation and animal tracks. A well-known example is the abundance of invertebrate and vertebrate trace fossils in the eolian deposits of the Permian Coconino Sandstone. These dune-bedded desert sands even have well-preserved raindrop impressions (Beus and Morales 2003: 173). These occurrences all indicate that animals lived and died in, or on, the sediments in which we now find their traces, rather than having been transported there by catastrophic flooding, as is repeatedly asserted by GCDV.

Most YEC authors writing about paleontology, such as Gish, limit themselves to criticizing evolution rather than carrying out their own research. One exception to this rule is Austin, a creationist who actually does fieldwork and research. But the bad news is that Austin's religious predilections lead him to make unwarranted conclusions and to appeal to unlikely processes. For a scientist who asserts that the fossils in the strata of the Grand Canyon occur "... in the random order which a flood might produce," Austin has devoted considerable effort in recent years to the study of a decidedly non-random fossil occurrence in the Grand Canyon, the nautiloids near the top of the Whitmore Wash Member, the lowest unit of the Mississippian Redwall Limestone.

These nautiloids were free-floating, chambered cephalopods, similar to the modern nautilus, but they were straight ("orthocone") instead of coiled, and averaged about 45 cm long. They occur in an approximately 2 m thick horizon, overlain by a chert-rich zone of the Thundersprings Member of the Redwall Limestone (Beus and Morales 2003: 115). Austin (GCDV, p 52) writes, "... this fossil bed occupies an area of at least 5700 square miles and contains an average of one fossilized nautiloid per square yard." He interprets this as having been caused by "a catastrophic event of regional extent, resulting in a mass-kill of an entire population of nautiloids," an event caused by "a massive sandy debris flow." In oral presentations (Austin and Wise 1995; Austin and others 1999), Austin described this debris flow as "a hyperconcentrated flow" that he likened to a pyroclastic density current or ignimbrite, moving over a very gentle gradient, and he also stressed the common association of the nautiloids with vertical structures he calls "water-escape pipes". All this he takes as a manifestation of Noah's Flood (GCDV, p 53).

It would take a great deal of space to discuss fully Austin's ideas about this interesting occurrence. Such a discussion would have to consider the following issues: (i) Is the number of nautiloids exaggerated and is extrapolation to such a large area justified? (ii) Is the interpretation of a mass-kill event warranted? (iii) Why are such fossil concentrations usually attributed to accumulation over long intervals during which sedimentation was restricted? (iv) Is the mechanism of a high velocity "hyperconcentrated flow" that moved enormous distances over a low gradient probable, and is it required by the structural and textural nature of the deposit? Austin knows these occurrences better than anyone and should answer these questions.

I have examined these nautiloids in only a few localities within the Grand Canyon National Park, to which he was kind enough to direct me, where I noted that a nautiloid fossil occurred about once every 4 or 5 square meters. From this I infer that either Austin has collected most of the samples from these localities or the abundance of nautiloids claimed is exaggerated. However, unlike Austin, I hesitate to extrapolate from observations at a few isolated localities to a huge area. Furthermore, most of the nautiloid fossils I saw, and that Austin illustrates, were intact. Could they have survived the turbulence that must occur in a fast moving, subaqueous, debris flow? In nature, mass-kill events certainly occur — by red tides, volcanic eruptions, and storm-induced processes flows, for example. However, in order to recognize a mass-kill, we need to understand the population structure of the animals concerned, and to consider factors such as episodic spawning, variable growth rates, the complex diurnal behavior of cephalopods, and so on.

Evidence bearing on the question "Did this nautiloid assemblage accumulate instantaneously or over many generations?" should be present in the deposit itself. Do the dolomitization and the prominent chert horizon overlying the nautiloid bed represent diagenesis during a hiatus in deposition? Similarly, are Austin's "water escape tubes" actually poorly preserved animal burrows (*Skolithos*)? High concentrations of fossil nautiloids occur elsewhere, for example, in Morocco and in the Czech Republic. Ferretti and Kríz (1995) describe several such examples in the Silurian of the Prague Basin and attribute them to the effects of surface currents or re-deposition in shallower environments by storm events during broad scale fluctuations in sea level. Why not the same in the Grand Canyon?

[A]uthors in GCDV adopt two contradictory philosophical positions.

Different creationist authors in GCDV adopt two contradictory philosophical positions: (1) their interpretation of sacred texts is all that is necessary to interpret the geology of the Grand Canyon; and (2) their interpretation of the geology confirms the sacred texts. As an example of the first position, we can cite Walker who writes, "Before we can properly understand geology, we need to know the earth's history. Unlike secular geologists, creationists don't need to speculate about history because we accept the eyewitness accounts of past events, preserved in a reliable written record — the Bible" (GCDV, p 36). On the other hand, Gary Parker states, "When biblical creationists/flood geologists offer explanations for the rock layers in the Grand Canyon, they appeal neither to biblical authority (the Bible doesn't mention the Grand Canyon!) nor to mystical or supernatural processes. They appeal, instead, directly to the evidence we can see, touch, and measure" (GCDV, p 25).

Thus Walker appears to promote starting from biblical authority whereas Parker appears to operate from a position that Walker would call "secu-

lar geology". But is that the case? According to his brief biography (GCDV, p 101), Parker "has published a number of books from both a secular and creationist point of view". Only one of them is referenced in GCDV (p 103), but from that book (Parker 1985) we can follow a trail that illustrates where his self-professed "secular" approach has led. In the 1985 edition of that book (the version available to me), he writes, "Grand Canyon seems to be part of a crack in the earth's crust. It starts in Mexico and runs underground all the way up to Yellowstone Park" (Parker 1985: 53). He continues:

> Grand Canyon started as a sort of earthquake fault. ... The floodwaters poured down into the crack from all directions in great abundance. The soft sediments washed away quickly too before they turned into rock. And that would make the canyon form very fast. And of course further erosion has sharpened the features of the canyon over the past several thousand years since the Flood (Parker 1985: 54).

If Parker has evidence of a crack running from Mexico to Yellowstone that he can "see, touch, or measure," I urge him to publish his findings, for this tectonic feature is totally unknown in the peer-reviewed scientific literature. Similarly, although there are several faults that cut across the Grand Canyon, one of the remarkable features of the region is that the course of the Colorado River seems to be so little controlled by faulting (Beus and Morales 2003, Figure 14.4).

In another attempt to "come to grips with the creationists' continuing research program at Grand Canyon," as Austin advised me to do, I consulted another of the references cited in GCDV (p 103). Vardiman (1999) offers an even more startling insight into creationists' geological thinking in discussing the occurrence of animal tracks in the Coconino Sandstone, just below the rim of the Canyon:

> Another fascinating mystery is why there were animals leaving footprints so late in the flood. ... Dinosaur tracks, which are often found in the Morrison formation, are located at even higher levels in the geologic strata. It would appear that some animals were able to escape the water until later in the flood. Many were strong swimmers but they may have migrated to higher ground or clung to floating vegetation and were killed later as the waters finally reached them. Dr John Baumgardner, a research scientist at Los Alamos National Laboratory, has suggested that circulating water inundating the continents may have formed giant whirlpools with dry floors near the center until late in the flood. This may have allowed animals near the center of the continents to initially escape the flood waters but were then overwhelmed when the events of the flood reached their zenith (Vardiman 1999: 17).

The Morrison Formation occurs approximately 3000 m above the Precambrian crystalline basement rocks. Since fossils of these dinosaurs are absent from the intervening strata, apparently all of them possessed the necessary agility to escape. This is surprising, because a simple calculation of the centripetal force necessary to sustain a whirlpool 3 km deep and with a radius of 3 km reveals that the water at its base would have to rotate at a linear velocity of more than 30 000 km per hour! Bigger whirlpools require bigger velocities. We see footprints of fast-moving dinosaurs, but where are the footprints of these supersonic whirlpools?

What is the intended readership of GCDV? Vail takes as his text a question from the Book of Joshua 4:6, "What mean ye by these stones?" It seems appropriate to direct him in return to Job 12:8, "Or, speak to the earth and it shall teach thee". Mortenson writes, "The Scriptural geologists of today find that the evidence in the Grand Canyon confirms the Word of God. Many use the Canyon as 'Exhibit A' in their defense of the authority of Scripture against vague forms of theism, atheism, and deism that continue to dent a biblical worldview" (GCDV, p 35). *Grand Canyon: A Different View* is not a geological treatise. It is "Exhibit A" of a new, slick strategy by biblical literalists to proselytize using a beautifully illustrated, multi-authored book about a spectacular and world-famous geological feature. Allowing the sale of this book within the National Park was unfortunate. In the minds of some buyers, this could imply NPS approval of young-earth creationists and their religious proselytizing.

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The Seashell on the Mountaintop

by Alan Cutler
New York: Dutton, 2003.
228 pages.

Reviewed by Kevin Padian, NCSE President

Every year about this time, gardeners and farmers reckon that the ground has thawed enough to put in the new year's crop. And, just as surely, there will be new stones to toss away from beneath the discs of plows and rototillers. Didn't we toss away all those stones last year? And the year before?

You could swear, if you did not know better, that the stones must grow all winter in the ground like potatoes, or that they fall from the sky when no one is looking, maybe during the new moon. But how do you know better? Today geologists tell us that much of Long Island is just a mound of glacial debris, so we should expect to keep turning up stones as we sift the soil. But there were no accepted theories of the earth or its properties until the 1800s, and it was not until the 1970s that plate tectonics was sufficiently accepted to be included in textbooks. During the Renaissance and well into the Enlightenment, it was just as reasonable to accept that stones grew or fell to earth. Confirmation by experimentation was admired, but seldom practiced.

For a scientific idea to be accepted, three conditions must obtain. The idea has to be cogently argued, supported by evidence, and convincing in its cultural context. Later generations may judge that ideas that were "ahead of their time" meet the first two criteria, but the third is knotty — and not because the cultures in question are backward or benighted. When evidence is incomplete (it almost always is), doubts can arise for good reason. That is why so few scientific ideas are really new; they are just waiting to satisfy all the conditions. So we have to be cautious when we try to acknowledge historical precursors of ideas that make sense to us today.

Niels Stensen (1638–86) — Nicolaus Stenonius in Latin, or Steno for short — was a brilliant Danish scholar of anatomy who traveled widely in Europe and made his mark in the Florentine court of a Medici grand duke, Ferdinand II. Steno learned early to trust his own dissections, not declarations of philosophers who reasoned about body structures from first principles. He discovered the salivary duct, which still bears his name. But even more original were his investigations of the structure of sedimentary rocks.

Steno is ubiquitous in the first chapters of books on historical geology because he is said to have demonstrated three important principles. First is the "principle of superposition", which states that in a sequence of rock strata the oldest rocks are on the bottom. This may seem obvious now, but in his day most people thought that all rocks were formed at once (at the Creation or during the Flood) if they thought about it at all. Second, water is the source of all sedimentary rocks, so these rocks must have been originally laid down parallel to the surface, no matter how tilted they are today. Third, these water-generated sediments must spread out to the edges of their basins, so if we find abrupt lateral edges, the real borders must be farther afield.

So much for the textbook portrait. Alan Cutler, a geologist and writer affiliated with the Smithsonian, shows in *The Seashell on the Mountaintop*, a slim and accessibly written book, that Steno was a far more complex man, living in complex times. Steno's dissections revealed features and allowed inferences that falsified cherished notions and brought jealous claims of priority from other anatomists; his ideas about the earth reached uncharted waters and could have provoked charges of heresy. He and his contemporaries were mindful of Galileo's fate, and Cutler nicely describes how hypotheses were argued with one eye on observable facts and the other on Scripture. Both lines of evidence had to be credible, but neither was complete or beyond argumentation. Steno, like many others, walked a thin line, but his piety never got in the way of his empiricism; it just made him work that much harder.

One of Steno's great realizations was that shells found on mountain heights were not sports of nature but organic remains. He argued that they had not been formed in place, and that they were not being formed like that today. The shells were often eroded, but never distorted like tree roots that grow in hard soil. They were perfectly formed, not irregular like crystals. And in places where they were broken, the separated pieces fit together. These arguments were ingenious, the first coherent theory of fossilization; but they were not accepted during his lifetime.

Steno was raised a Lutheran in Denmark, but as an expatriate he struggled with the absolutes of faith and rational knowledge. At base he was a pious man who eventually gave up his investigations to devote himself to the Roman Catholic Church (at the time of his death he was a bishop). His conversion seems to have been a logical step in a long journey of inquiry and doubt. He was wrestling with anatomy, the study of what it meant to be a living being, and with geology, which tried to explain the earth itself. He was also trying to reconcile different explanations of these material structures with what he had been taught to believe. In the end, doubting even doubt, Steno took solace in belief, and subjugated his body and mind to his faith, without losing his reason. But his vow of poverty, as strange in Europe then as it would be now, ravaged his health and brought an early death.

Cutler's book is marvelous for making one think about what qualifies as an explanation, and for exploring the endless debates that mix strands of partial knowledge with the need to reconcile religious testaments. And it is timely. Nearly half the people in our country today don't accept evolution. Predictably, they have trouble with concepts of the age and structure of the earth, the generation and sequence of its fossil remains, and cosmology itself. For these people, the dialog between religion and science has not changed much since the 1600s. So both the pious and the impious should find much to ponder in Cutler's account of Steno's times and the fate of his ideas.

As for me, I'm thinking it is time to do controlled experiments. I will measure and mark some stones and rebury them over the winter, so I can see if they've grown by next spring. And I'll be stretching a net over the garden when the moon is new.

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The Sandwalk Adventures: An Adventure in Evolution Told in Five Chapters

by Jay Hosler
Columbus (OH): Active Synapse, 2003. 160 pages.

Reviewed by Jon P Alston, Texas A&M University

Is evolution a laughing matter? Jay Hosler's *The Sandwalk Adventures* presents an outline of evolutionary principles in comic book form, and much can be learned from the work. The first part deals with a creation myth. Such myths are entertaining and exciting, and they do not rely on facts. Nevertheless, myths are difficult to reject. Compared to the story of evolution, creation myths are much more entertaining and dramatic.

The scene shifts to Darwin's eyebrow, where mites living in his eyebrow follicles tell each other creation stories. Then one mite discovers that it and Darwin can hear each other. It takes a number of panels for Darwin to decide he is not hearing voices and for the mite to realize Darwin is not its god and creator. Then the two discuss why mites exist and how were they created, if not by Darwin. Darwin discusses his early scientific interests, his voyage on the *Beagle*, and the theory of evolution. Periodically, the mite makes the chapters on evolution into epic myths to make them more entertaining to its relatives. It is rebuked each time by Darwin, who finally asks, "Why do you feel compelled to drape the elegant wonders of nature in a gaudy gown of mumbo-jumbo ...?"

As Darwin takes his daily constitutional on his sandwalk path, he explains to the mite the principles of evolution. During each discussion, Darwin rebuts possible criticisms of his theory, such as how wings could evolve when a partial wing may not offer any advantage for flight. Darwin explains in this case that a partial wing must have offered some advantage, such as the possibility of gliding away from predators. Meanwhile, the mite's relatives find the story of evolution boring compared to their own myths. The mite finally leaves its family to establish its own family, but whether it is completely convinced the story of evolution is better than a myth is unclear.

Hosler covers the main points and criticisms of evolution in 128 pages. He discusses the principle of natural selection, heredity, adaptation, the struggle for survival, and speciation. He also discusses the limits of the evolutionary knowledge and its gaps. In all, there is a remarkable amount of information interspersed with humor and biographical information.

The last part of the book, about 25 pages long, contains a short bibliography and an annotation notebook. The notebook contains explanations of the illustrations and background information on concepts and persons only hinted at in the main body, including biographies of Charles Lyell, Thomas Huxley, Alfred Wallace, Joseph Hooker, and Richard Owen. The endnotes repeat the basic evolutionary principles in clear form, and explain such concepts as survival of the fittest, selective pressure, and the types of creationism. The process of fossilization is explained, as well as punctuated equilibria.

How does the tremendous amount of information given in primarily a cartoon format compare with other attempts? Evolution has attracted a large number of authors wishing to explain evolution to the general public in clear, simple terms. For example, Morton Jenkins (2000) presents 101 evolutionary concepts in alphabetical form. These mini-essays are also clear and avoid technicalities. Evans and Selina (2001) use a partial comic book format where large drawings dominate the pages. The information in this work is also impressive and more sophisticated, though the comic book form encourages rapid jumps in topics. In the same manner, David Bourne's work (2003) contains many illustrations and short descriptions of evolutionary topics. Both the works of Bourne and of Evans and Selina offer a good introduction to evolution, but without any nuances.

The authors of all these works want to teach about evolution and convince the reader that the evolutionary model is correct, of course. The tone tends to be on the serious side and fairly preaches to the reader. By contrast, creationists dealing with evolution try more to entertain and reinforce rather than convince. Creationists also select the information they wish to present because their task is simplified by the requirement to conform to scripture, while evolutionists are forced to present more complex, nuanced explanations. Creationists seem to be talking to the converted, of course, making their attacks on evolution easier.

It is probably impossible to compete with creationists on the comic book level, though much can be learned from their simplified and humorous presentations of evolution. Unfortunately, the topic does not fit the comic format as well as creationism. The paragon of the use of comics to oppose evolution is Jack T Chick, whose multi-colored comics *Primal Man?*, *The Ark*, and the smaller *Big Daddy?* embody the type of engaging and entertaining story-telling that Hosler's mites found easier to accept than the less exciting evolutionary explanations provided by Darwin. Works for children by John Morris and Ken Ham (1990) and by Ham alone (2001) are entertaining vehicles from which to learn the creationist, anti-evolution message. In Dooley's *The True Story of Noah's Ark* (2003), creationists are even better at presenting their case in simplified form, as shown by an illustration of a mammoth carrying timber to help build the ark. Jay Hosler was correct to begin his work with a discussion of the attractiveness of myths and the difficulty of rejecting them in favor of evidence and facts — and to use this format to make the story of evolution more attractive and accessible to a wider audience.

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Jon P Alston is Professor of Sociology at Texas A&M University and the author of The Scientific Case Against Scientific Creationism *(Lincoln [NE]: iUniverse, 2003).*

The Scientific Case Against Scientific Creationism

by Jon P Alston
Lincoln (NE): iUniverse, 2003.
177 pages.

Reviewed by Stanley Rice, Southeastern Oklahoma State University

This concise book does an adequate job of exposing the scientific errors of creationist attacks on evolution, both from the old-line creationists and the modern "intelligent design theorists". I consider the books by Niles Eldredge *(The Triumph of Evolution and the Failure of Creationism),* Tim Berra *(Evolution and the Myth of Creationism),* and Massimo Pigliucci *(Denying Evolution: Creationism, Scientism, and the Nature of Science)* all to be better at both presenting the positive scientific evidence *for* evolution as well as arguing *against* the overall approach of creationism. However, there is something in this book that is superior to the others. The author of this book, sociologist Jon P Alston, has actually taken the time to investigate the creationist literature that most of the world does not see.

Most evolutionary scientists and educators do not bother with investigating, much less answering, the arguments that creationists publish in their own literature. We choose to spend our time on positive scientific education. For example, my *Encyclopedia of Evolution*, scheduled to appear in 2006, will have only a few pages about creationism. But somebody has to do it, and Alston did. How many other people would take the time actually to read creationist John Woodmorappe's treatise on the feasibility of Noah's Ark and summarize its flaws into two pages? Alston misses a few creationist developments — for example, he did not mention that the creationists have invented a "new science" they call "baraminology". Nevertheless, this book is an interesting behind-the-scenes look at creationism that will provide important and informative to most readers.

In the process, Alston's book reveals some disquieting things about many creationists. First, within their own circle, many creationists are satisfied with wild flights of unsupported speculation. Examples include Henry Morris's claims that the theory of evolution was invented by Satan on top of the Tower of Babel. Some creationists claim that a pre-Flood vapor canopy created an environment in which people grew to the size of giants; others claim that the Flood waters came from giant underground reservoirs and that these reservoirs may still be there; that Noah's Ark is still on Mt Ararat but God is hiding it from our secular eyes and satellites. One of them even said that the Ark had so much room that there was a whole deck free for shuffleboard and badminton! And these are the same people who think that their brand of "science" would help to make America's youth better educated, critical thinkers?

Second, many creationists will resort to any degree of special pleading to avoid having to admit they are ever wrong about anything. This is not the way we want to educate future scientists, nor the image we want to give the public about science — and, therefore, "creation science" will not improve American science education. True scientists are not like this; within evolutionary theory, for example, we have admitted that Darwin was wrong about gemmules, that DeVries was wrong about saltation, that Kelvin was wrong about the age of the earth. Evolutionary science, unlike creationism, allows disagreement (such as the controversies over sociobiology and adaptationism) and change. Creationism goes through the most convoluted antics to avoid change, and Alston's book gives some good examples of this.

Third, Alston's book reveals that some creationists claim that God intervened to move things around — God put the fossils into an evolutionary order in the sediments, and moved a whole bunch of marsupials to Australia — to make it look like evolution, in order to test our faith. This view depicts God as a Cosmic Trickster, which is, incidentally, not the way the Bible portrays God. In this and in other ways, the creationists are making God and belief in God look ridiculous. Alston does not quite go far enough in drawing this conclusion, but again he provides some good examples.

I think Alston could have made an even stronger scientific case. He does not clearly point out that the fossil record cannot both be a record of the sudden appearances of species over time *and* deposits from a flood. Either the strata represent geological time or they do not. He also does not present the truly convincing evidence that interspecific comparisons of non-coding DNA produce nearly the same web of relationships as do the comparisons of anatomy. The only way creationists could explain this would be to say that God created non-coding DNA with evolutionary patterns hidden in it — once again to trick us.

In some other cases, Alston did not quite carry his conclusions far enough. He correctly points out that a single pair of animals on the Ark could not have contained all of the genetic variability in a single species, much less (as many creationists claim) an entire genus or family. He should go further and point out that if creationists were in charge of saving the biodiversity of the world, something few of them seem interested in doing, they would think that saving a single pair of animals in a single zoo would be adequate. Creationist conservation biology, therefore, would be a disaster.

The book would be clearer if it had some illustrations, and the proofreading was not adequate before going to press. But overall, this is a valuable book for what it shows us about the hidden side of creationist science.

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Creationism and Scriptural Geology

John M Lynch of Arizona State University edited *Creationism and Scriptural Geology, 1817-1857* (Bristol:Thoemmes Press, 2002), a multi-volume set of source material from the pre-Darwinian debate over Genesis and geology. His useful introduction is available on-line at <http://www.thoemmes.com/science/creationism_intro.htm>.

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