



REPORTS

OF
THE
NATIONAL CENTER FOR SCIENCE EDUCATION

DEFENDING THE TEACHING OF EVOLUTION IN THE PUBLIC SCHOOLS

Volume 29, Number 5

SEP-OCT, 2009

CONTINUES NCSE REPORTS & CREATION/EVOLUTION



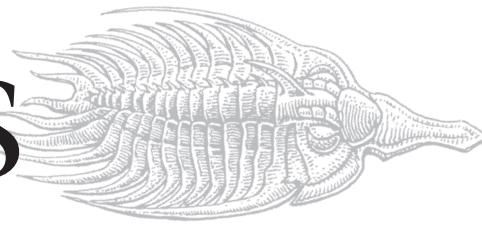
Creationist
Museums:
Why Do
They Bother?

Dutch
Creationists
Target
Flanders

People & Places
of Evolution:
Creation Evidence
Museum

Books Section:
Evolution
and Ecology
of Birds

CONTENTS



NEWS

- 4** A Nobelist Misrepresented in Texas
Joshua Rosenau
When the creationists on the Texas state board of education trotted out a Nobel Prize winner as having doubts about evolution, it turns out (of course) that they were using erroneous, second-hand information.
- 6** “Ask Darwin”: An Interactive Exhibit
Two Pittsburgh-area professors have teamed with a multimedia center to produce an interactive exhibit, allowing visitors to hear Darwin in his own words, and to hear from modern scientists about how evolutionary science has grown.
- 7** Exporting Creationism: Dutch Creationist Leaflet Now to be Distributed in Belgium
Stefaan Blancke
After a campaign that drew public and media attention, creationists in the Netherlands are targeting Dutch-speaking areas of Belgium with the remainder of their leaflets — or are they?
- 8** Updates
News from Arizona, California, Florida, Iowa, Kentucky, Ohio, Texas, the United Kingdom, and the world.

NCSE NEWS

- 14** News from the Membership
What our members are doing to support evolution and oppose pseudoscience wherever the need arises.

ARTICLES

- 17** Credibility, Profitability, and Irrefutability: Why Creationists are Building Museums
Julie Duncan
Why would creationist organizations invest so much money and effort into museums when they reject the basic scientific foundations of our modern understanding of the history of life and the universe?
- 21** Missionary Lizards: What the Creation Museum Reveals About Natural History Exhibits
Katherine E Schroer
Everybody loves dinosaurs. But the different ways they are displayed in natural history museums and the Creation Museum speaks volumes.

SPECIAL FEATURE

PEOPLE & PLACES

- 34** Creation Evidence Museum
Randy Moore
A close-up view of one of the best-known of the creationist museums.

FEATURES

- 31** Reflections on a Visit to the Creation Museum
Raymond A Eve
It is difficult not to be impressed by the sheer assault on the senses and the carefully designed exhibits. But a closer look reveals an anxiety about control of cultural ideas and norms.
- 36** Edward Blyth: Creationist or Just Another Misinterpreted Scientist?
James K Willmot
Blyth is one scientist whose early dedication to creationism is misrepresented to imply that he rejected descent with modification by natural selection.
- 38** Yes, Noah’s Flood May Have Happened, But Not Over the Whole World
Lorence G Collins
In the type of major flood that almost certainly occurred in the ancient Middle East, what would make people think that it covered “the whole world”?

MEMBERS’ PAGES

- 23** Understanding Creationism
An adaptation of a recent NCSE brochure that explores the basics of creation science.
- 24** For the Birds
These books explore the biology, ecology, and evolution of birds.
- 26** NCSE *On the Road*
Check the calendar here for NCSE speakers.

BOOK REVIEWS

- 41** *Reframing Scopes: Journalists, Scientists, and Lost Photographs from the Trial of the Century*
by Marcel Chotkowski LaFollette
Reviewed by Charles A Israel
- 42** *The Darwin Myth: The Life and Lies of Charles Darwin*
by Benjamin Wiker
Reviewed by Sander Gliboff
- 43** *Why the Universe Is the Way It Is*
by Hugh Ross
Reviewed by David Koerner
- 45** *The Bible, Rocks, and Time*
by Davis A Young and Ralph F Stearley
Reviewed by Steven Newton
- 46** *More Than a Theory: Revealing a Testable Model for Creation*
by Hugh Ross
Reviewed by Graham Oppy

VOLUME 29, NR 5, SEP-OCT 2009
ISSN 1064-2358

©2009 by the National Center for Science Education, Inc, a not-for-profit 501(c)(3) organization under US law. *Reports of the National Center for Science Education* is published by NCSE to promote the understanding of evolutionary science.

EDITOR

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

EDITORIAL ASSISTANT

LaKisha Barrett

BOOK REVIEWS EDITOR

Glenn Branch

EDITORIAL BOARD

Contributing Editor

John R Cole

Associate Editors

Education

Brian Alters, McGill U

Cell and Molecular Biology

Michael Buratovich, Spring Arbor U

Educational Technology

Leslie Chan, U Toronto

Physics and Astronomy

Taner Edis, Truman State U

Geosciences

John W Geissman, U New Mexico

Mathematics and Statistics

Rob Kusner, UMass - Amherst

Paleontology and Evolutionary Theory

Kevin Padian, U California - Berkeley

Philosophy of Science

Barbara Forrest, Southeastern Louisiana U

Glenn Branch, *Production & Circulation*

Debra Turner, *Design*

Eugenie C Scott, *Publisher*

National Center for Science Education

PO Box 9477

Berkeley CA 94709-0477

(510) 601-7203

fax: (510) 601-7204

e-mail: ncse@ncseweb.org

http://www.ncseweb.org

Views expressed are those of their authors and do not necessarily reflect the views of NCSE. *RNCSE* is published 6 times a year.

Address editorial correspondence to the editor. Style guidelines can be found at <<http://ncseweb.org/media/authors-information>>. Write to the publisher regarding address changes, missing issues, purchases of back issues, reprint rights, and related issues.

Cover: Invitation at the entry to the Creation Evidence Museum
Photo by Randy Moore

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

Everybody loves dinosaurs. As Katherine Schroer points out in one of our featured articles, the two most reliable draws to a natural history museum are dinosaurs and human ancestors. So, how do the handful of creationist "natural history" museums handle these materials?

How do they present the skeletal material, the ecological and geological contexts, the inferences about the tree of life that naturalists draw from the evidence? As one of Arte Johnson's characters on the old *Laugh In* show would say, "Very carefully!"

We present several items about natural history museums operated by creationists. Julie Duncan and Katherine Schroer both did senior theses that compared creationist museums to mainstream institutions. Duncan focused on historic and cultural influences that shape these facilities. Schroer examines the presentation of the scientific evidence in a variety of natural history museums and draws contrasts among facilities with regional, national, and international clientele.

Two other long-time students of the creationism/evolution dispute also examine creationist museums. Raymond Eve reports on his visit to the Answers in Genesis Creation Museum. He finds that one of the chief goals is to assert control over the cultural construction of knowledge of the world. The science is secondary.

And in his regular column on the people and places of evolution, Randy Moore visits the Creation Evidence Museum — one of the facilities examined in Julie Duncan's thesis. He explores for us the history of this facility and its role in the evolution of the "creation science" of the 1960s.

We also feature two other items on classic creationist themes: Noah's Flood and the identification of prominent 19th-century scientists as "creationists". Lorence Collins examines the geology of the Middle East and how a massive flood could have made it appear that the "whole world" was covered in water. And Jim Willmot examines the quote-mined work of Edward Blyth, whom an Answers in Genesis staffer claimed in a letter to the editor was a creationist who had the idea of natural selection before Darwin.



IN THE NEWS

Texas still features prominently in the news. Joshua Rosenau completes our analysis of the Texas State Board of Education hearings. The support for challenging evolution that state board of education members claimed from

a Nobel laureate evaporates on close inspection. What a shock!

In Europe, the Dutch creationists that printed and distributed hundreds of thousands of anti-evolution pamphlets are turning their sights to Flanders — the Dutch-speaking region of Belgium. There appears to be some confusion or disagreement among creationist sponsors of the campaign about when and how many pamphlets will be distributed in Belgium, but it is clear that they are targeting Flanders very soon. We get details from Stefaan Blancke.

In our Updates section, readers can follow stories that appeared earlier in *RNCSE*. We have brief reports on the legal actions in the John Freshwater, Chris Comer, and James Corbett cases, and an update on federal actions against Dinosaur Adventure Land and Creation Science Evangelism — both entities subject to seizure by the government. There is also no shortage of politicians and candidates saying silly things about the history of the universe and of life.

An international survey shows that large majorities are aware of Darwin and his role in the development of evolutionary science, but there is a wide range of proportions of those who agree that scientific evidence supports the theory. The United States is ninth among ten countries in this measure.

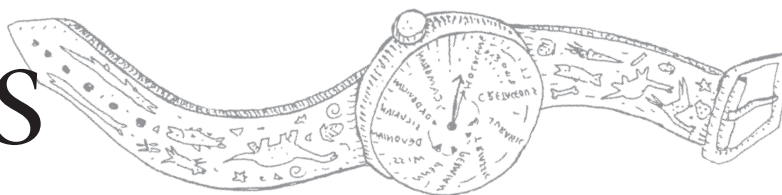
BOOK REVIEWS

Our book reviewers look at anti-evolutionist books that claim to present a scientific perspective. These books all fall short of the mark for many reasons, but the biggest one is that they simply fail to apply the process of scientific inquiry as it is practiced in the 21st century. We also have a review of a new perspective on the Scopes trial based on documents and photographs that have not been previously seen.

RNCSE 29(5) was printed in November 2009.

VOL 29, NR 5 2009

REPORTS



A Nobelist Misrepresented in Texas

Joshua Rosenau

Creationists on the Texas State Board of Education (SBOE) went to great lengths to defend outdated and inaccurate requirements that students learn the “strengths and weaknesses” of scientific theories. In 2003, that language was central to an attempt to force creationism into textbooks. In the course of defending that language in 2008 (see *RNCSE* 2009 May/June; 29 [3]: 4–6), opponents of evolution simultaneously flaunted their ties to young-earth creationism and misrepresented the views of many scientists, including Werner Arber, who won the 1978 Nobel Prize in Physiology or Medicine for his work on restriction enzymes.

The board held the first of three public hearings about new science standards in November 2008. Testimony lasted over six hours, ending near 11:00 PM, and almost all of it focused on “strengths and weaknesses”, with many people supporting a replacement drafted by scientists and teachers appointed by the board to revise the standards. Tempers in Austin were flaring as dinner time came and went.

Witnesses opposed to the “strengths and weaknesses” language constantly asked what the supposed “weaknesses” were, but got no satisfaction. Finally, conservative board member Cynthia Dunbar gave her explanation. Replying to teacher Anita Gordon’s observation that the community of scientists regards evolution as fundamentally strong, Dunbar replied,

“science is not something that’s determined by majority vote, there is a scientific method. I would like to have someone of the magnitude of Dr Werner Arber [*sic*] here. I don’t know if you know who he is. Are you familiar with him?”

Gordon was not, so Dunbar continued:

He is a Nobel laureate. He spent his life doing studies in evolution and genetics. I don’t think we could get him here, I think he’s in Switzerland. But his, his years and years and years and years of research in genetics and evolution are very, very credible, and his end result recently, I think it was in September, was that the genetic code, and genetic mutations are actually built in to a limitation that they can only go so far, which is contrary to the ultimate result of natural selection and all of that. But that would not be someone outside of the scientific community.

Dunbar again referred to Arber when college student Garrett Mize challenged her on the issue of “weaknesses” of evolution. “Where’s the data for that?” he asked. “It’s my understanding that the entire scientific community doesn’t believe that they exist.”

Dunbar’s reply followed a familiar course: “First of all,” she repeated, “science is not based on majority rule, and there’s lots of data. Do you know who Werner Arber is? He’s a PhD and a Nobel laureate.” The student was not familiar with Arber, and Dunbar urged:

Go Google him. Because he spent his life on evolution and genetics. So there is data out there [on the weaknesses of evolution], we don’t want that squelched. We want to be able to discuss it. ... His documentation, if you

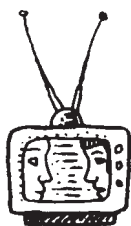
go read it, I mean it’s very clear as to the geneticists and the documentation of the mutations and all that. I mean it’s not anything that fails, it’s testable, it’s observable, it’s right there. But those are the types of the things that we want the students to be able to discuss.

WORKING IN THE QUOTE MINE

I took to heart Dunbar’s wish to hear Arber’s views. Taking her advice, I searched the internet for his writings. Looking for the paper in which he supposedly published “his end result recently, I think it was in September,” I came up short. He did not publish anything in September 2008, but that same month, an article by Jerry Bergman — “Werner Arber: Nobel laureate, Darwin skeptic” (*Acts & Facts* 2008 Sep; 37 [9]: 10) — was published about him in that month’s newsletter from the young-earth creationist Institute for Creation Research.

I was disturbed, but not shocked, to see Dunbar citing a young-earth creationist newsletter as scientific evidence in support of her preferred public policy. Dunbar made headlines before the November election when she declared that a terrorist attack in the first months of an Obama administration “will be a planned effort by those with whom Obama truly sympathizes to take down ... America.” In her book *One Nation under God* (Oviedo [FL]: HigherLife Development Services, 2008), Dunbar called public education “tyrannical”.

Nor was she alone in drawing on creationist sources. In January 2009, chair Don McLeroy, a dentist himself, stated that “the latest article” on the evolution of teeth was titled “Tooth evolution theory lacks bite”. A quick web search traced that article to a young-earth creationist website (<<http://www.creationsafaris.com>>).



Jerry Bergman's claim that Arber was skeptical of evolution and supported "intelligent design" creationism was based largely on an interview from the early 1990s, published in a collection *Cosmos, Bios, Theos*, edited by Henry Morgenthau and Roy Abraham Varghese (Peru [IL]: Open Court, 1992). Varghese was recently in the news over charges that, as co-author of philosopher Antony Flew's apologia for switching from atheism to deism (*There is a God: How the World's Most Notorious Atheist Changed His Mind* [New York: Harper One, 2007]), he overstated Flew's opinion of Christianity (see, for example, Mark Oppenheimer's "The turning of an atheist," *The New York Times Magazine* 2007 Nov 4).

Arber's interview with Varghese does not support the claim that he favors "intelligent design" creationism. Arber responds to a question about human evolution by stating: "I do not have problems understanding the origin of *Homo sapiens*. Biologically, man is just a living organism as any other. ... [T]here is no good scientific evidence to assume that *H sapiens* is an independent creation" (p 142). Asked about the origin of life, Arber confesses it is "a mystery to me," and finds "[t]he possibility of the existence of a Creator, of God ... a satisfactory solution to this problem" (p 142). Nothing distinguishes this from a view like theistic evolution, which contrasts strongly with "intelligent design" creationism's rejection of natural explanations for the origin of life.

While Arber did not publish in September 2008, he had been busy. Shortly before the Texas state board of education hearings in November 2008, Arber had been the co-organizer of a conference on evolution for the Pontifical Academy of Sciences (see box, p 6). In his paper, "From microbial genetics to molecular Darwinism and beyond," he firmly stated his support for evolution as science and discussed "consistencies between the acquired scientific knowledge and traditional wisdom such as that reflected in the Old Testament." In this regard, his views align with Pope John Paul II's and with NCSE Supporter Ken Miller's take in *Finding Darwin's*

STATEMENT ON MY VIEW ON BIOLOGICAL EVOLUTION

To whom it may concern:

I recently became aware of an article entitled "Werner Arber: Nobel laureate, Darwin skeptic" that was published in September 2008 by the Institute for Creation Research and that is authored by Jerry Bergman. This article completely misinterprets my general conclusions that I base on several decades of studies in microbial genetics. A number of citations are taken out of their original context[s] and surrounded by comments and misinterpretations by the author of the article.

The truth is that I have contributed to advance scientific knowledge on biological evolution by studying molecular mechanisms of genetic variation. Genetic variation is clearly the driving force of biological evolution. A number of different specific molecular mechanisms contribute to spontaneous genetic variation. Together with non-genetic elements specific gene products are thereby involved as variation generators and as modulators of the rates of genetic variation. These are established facts that are based on experimental evidences and that are valid for the course of biological evolution as it works today in living organisms. Theoretically, one can extrapolate into the past history of life development on earth. One can, for example, postulate how the genes involved in biological evolution may have become fine-tuned to ensure to living organisms a comfortable genetic stability and at the same time to the populations of living organisms an evolutionary development, including adaptability to changing living conditions and an expansion of biodiversity. In contrast, there is, so far, neither satisfactory scientific knowledge nor theory on the origin and early evolution of life on our planet.

On solid scientific grounds one cannot expect to discover if a Creator as defined by religious beliefs and sometimes referred to as "intelligent design" or God's Will, could be responsible for the origin and subsequent evolution of life. Serious scientific investigations can neither prove nor disprove the existence of God or a possible impact of God on evolutionary processes. In our civilization, both scientific knowledge and religious beliefs contribute essentially to our orientating knowledge, but these two sources of our worldview should not be intermingled.

In conclusion, I am neither a "Darwin skeptic" nor an "intelligent design supporter" as it is claimed in Bergman's article. I stand fully behind the neo-Darwinian theory of biological evolution and I contributed to confirm and expand this theory at the molecular level so that it can now be called molecular Darwinism.

Werner Arber
Professor Emeritus of Molecular Microbiology,
University of Basel
Nobel Laureate in Physiology or Medicine, 1978

God (San Francisco: Cliff Street Books, 1999).

Nor does his research show signs of doubts about evolution. He has published with such luminaries of evolutionary biology as Richard Lenski and Peter Raven, and his Nobel-prize-winning work on restriction enzymes has been powerfully useful to evolutionary biology.

IN HIS OWN WORDS

Certain that ICR had misrepresented Arber, and happy to fulfill Dunbar's desire to hear Arber's own views, I got in touch with some of his professional col-

leagues for help alerting him to ICR's erroneous article and Dunbar's mangled repetition of it. One colleague replied, "That certainly seems to me to be a misrepresentation of Professor Arber's views on the matter, and quite amazing."

I also wrote to Arber himself. He wrote back, with thanks for alerting him to the problem. He included a statement he had sent to ICR refuting the article and Dunbar's interpretation of it (see his reply above), adding that I was "welcome to make use of this statement in relevant situations." He also pointed out a common prob-

lem in dealing with creationists: “I slowly learn to write my papers by taking care to reduce the chance of misinterpretation, but this is not easy.” Given creationists’ propensity for quoting inaccurately or without adequate context, it is indeed difficult to prevent such misinterpretation.

Arber’s response to the ICR is unequivocal. Had he been at the hearings, as Dunbar wished, he would surely have denied that evolution is riddled with weaknesses. Indeed, in his statement he affirms, “I am neither a ‘Darwin skeptic’ nor an ‘intelligent design supporter’ as it is claimed in Bergman’s article. I stand fully behind the neo-Darwinian theory of biological evolution and I contributed to confirm and expand this theory at the molecular level so that it can now be called molecular Darwinism.”

NCSE executive director Eugenie C. Scott presented Arber’s letter to the board at its hearing in January 2009, noting “this is only one of many examples of false and misleading information that emanates from creationist sources.” Taken aback, Dunbar seized on Arber’s uncertainty about the origin of life. Scott replied, “That is irrelevant to the conversation today that we’re having, because the conversation that we’re having today is whether we should teach students, without qualification, the point of view of the scientific community, which is that living things have common ancestors. That’s what evolution is.” Scott concluded her comments by observing: “The high school classroom is no place to fight the culture wars, and this unfortunately is what is happening in Texas, and in Louisiana and in many other states, where this issue has disproportionately affected education.” Arber was not mentioned again.

Dunbar relied on a single erroneous creationist source to contradict the testimony and guidance not only of her own committee of experts, but also of Texan Nobel Prize winners and of scores of scientific societies that urged the board to drop the language about “strengths and weaknesses” (see *RNCSE* 2009 May/June; 29 [3]: 13). This rejection of expertise was a theme throughout the hearings. As

Jeremy Mohn showed in *RNCSE* (2009 May/June; 29 [3]: 7–9), McLeroy quote-mined many scientists to garner support for creationist amendments in January. In March 2009, McLeroy rejected outright any scientific testimony he disagreed with, declaring, “Someone’s got to stand up to experts!” He later explained his support for an amendment questioning the existence of climate change, telling the *Austin American-Statesman* (2009 Mar 28), “Conservatives like me think the evidence (for human contributions to global warming) is a bunch of hooey.”

Educational policy should never be based on any source that relies solely on political or religious ideology. This is doubly so for sources which make demonstrably false statements, as *Acts & Facts* did about Werner Arber. NCSE is working hard to prevent the erroneous standards passed in Texas from weakening textbooks used across the country. In the longer term, we must all work to ensure that public policy is built on solid foundations, not on creationist falsehoods.

AUTHOR’S ADDRESS

Joshua Rosenau
NCSE
PO Box 9477
Berkeley CA 94709-0477
rosenau@ncseweb.org

“Ask Darwin”: An Interactive Exhibit

Two professors at Duquesne University, John Pollock and Dave Lampe, have teamed with the Entertainment Technology Center (ETC) at Carnegie Mellon University to provide visitors to Carnegie Science Center an opportunity for a chat with Charles Darwin, as a part of the Center’s Darwin Celebration 2009. The ETC’s “synthetic interview technology allows visitors to ask Darwin about his adventures, his ideas about evolution, reaction to his theory, and a number of other topics. The “ghost of Darwin” is portrayed by Pittsburgh actor Randy Kovitz.

Pollock, an executive producer of Darwin Celebration 2009, notes that the exhibit provides an insight that most people do not experience: “Darwin the man is almost completely unknown to the general public. We are working to demystify Darwin as a human being by giving everyone a chance to ask him questions. In doing so, we will reveal the philosophical roots and ramifications of his thoughts.”

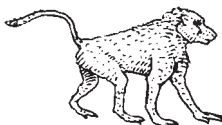
The opportunity to interact virtually with Darwin promises to help people better appreciate both the man and his scientific insights, said Pollock. Of course, a lot has happened in evolutionary science since Darwin’s death in 1882, so videotaped answers on modern science also are available from modern-day experts.

Work on the Darwin Synthetic Interview began in 2007 with questions developed from over 1000 interviews with students in schools and with adults throughout Pittsburgh. Lampe, also an executive producer of Darwin Celebration 2009, assembled responses to almost 200 questions, composed using excerpts from Darwin’s published research, autobiography, letters. As a result, visitors are able to ask Darwin about more than just his scientific work, but can learn about many aspects of his life — childhood, marriage and family; travels and science; religion and philosophy.

“The main goal is to humanize Darwin, and show him to people as a human being,” Lampe said. “There is a lot of biographical information in this display. Secondly, we hope people learn a little history and, of course, understand evolution better.”

ARBER ON EVOLUTION

The proceedings of “Scientific Insights into the Evolution of the Universe and of Life,” the plenary session of the Pontifical Academy of Sciences that Werner Arber chaired in 2008, are now freely available on-line in PDF format via <http://www.vatican.va/roman_curia/pontifical_academies/acdscien/documents/rc_pa_acdscien_doc_20020103_index_general_en.html>.



Exporting Creationism: Dutch Creationist Leaflet Now to be Distributed in Belgium

Stefaan Blancke

A previous issue of *RNCSE* (Anonymous 2009; Brummer 2009) reported that Dutch young-earth creationists reacted to the Darwin year festivities by distributing an eight-page leaflet to six million households in the Netherlands. Although the creationists met with some opposition from both outside and within mainstream Protestant circles, the activist creationists considered this campaign a huge success. Measured by the media attention they drew, this was not an unreasonable evaluation. The leaders of the campaign were repeatedly interviewed in newspapers and invited to television and radio shows — an ideal forum to express their anti-evolutionary sentiments. Creationism had most certainly made its way back into the Dutch public arena.

Inspired by this response, the Dutch creationists are now taking their campaign across the border to Flanders, the Dutch-speaking part of Belgium (the small country of Belgium consists of two main regions: Flanders, in the north, near Holland, where people speak Dutch, and Wallonia, in the south, near France, where French is the common language). News of the expansion of the campaign into Flanders came on July 28, 2009, when articles appeared in Flemish newspapers, informing the public that “[t]he creationists are coming” (<<http://www.standaard.be/Artikel/Detail.aspx?artikelId=9B2D3SHQ&word=creationisten>>).

Stefaan Blancke is a PhD researcher at the Department for Philosophy and Moral Sciences at Ghent University, Belgium. He also contributes to the website <<http://www.evolutietheorie.be>>, which promotes the education and outreach of evolutionary theory in Flanders.

Although Belgian creationist groups had been involved with the campaign from its beginning in November 2008, the news still came as a surprise for two reasons. First, there is the financial aspect. For the leaflet campaign in Holland alone the creationists had to raise 400 000 euros (well over 500 000 US dollars). In December 2008, Kees van Helden, who acted as spokesperson for the leaflet campaign, declared in an interview that the campaign would only be expanded into Belgium if sufficient money were raised (see also Anonymous 2009). Today, they are still more than 70 000 euros short of breaking even for the Dutch campaign (see <<http://www.creatie.info>>, accessed on August 28, 2009). It makes one wonder how they managed to fund this new effort while the previous campaign is not yet been paid for.

Second, creationism has never been a big issue in Flanders (or Belgium, for that matter). The Netherlands have a long tradition of orthodox Protestantism that turned out to be a fertile soil for the young-earth creationism imported by the Institute for Creation Research (ICR) and other US creationist organizations during the 1970s (Knevel 2007). Even today, this American influence leaves its distinct mark on Dutch creationism. One of the organizations behind the leaflet campaign, Mediagroep in Genesis (<<http://www.scheppingofevolutive.nl>>), is a Dutch spin-off of Answers in Genesis.

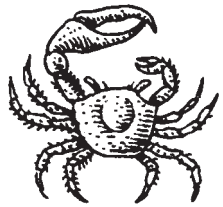
Furthermore, the content of the leaflet is most certainly inspired by North-American creationist literature (Brummer 2009). For instance, the reference to the supposed “abuse” of Ernst Haeckel’s drawings of embryos in textbooks can be traced back to *Icons of Evolution* by Jonathan Wells, a leading member of the Discovery Institute’s Center for Science and Culture (Wells 2000: 81–109). The leaflet also takes the two-model approach, a theme that is highly popular in North American creationist propaganda (Pennock 1999).

Unlike predominantly Protestant Holland, Roman Catholicism is the most influential denomination in Flanders. Roman Catholicism traditionally allows for a more

relaxed reading of the Bible and has usually taken a rather lenient attitude towards evolution and evolutionary theory. Therefore, it offers less opportunity for creationist ideas to spread. In 1996, Pope John Paul II declared that evolutionary theory is “more than a hypothesis” and in March this year, the Vatican itself organized a conference to discuss evolutionary theory. In editorials of Flemish Catholic magazines that commented on the Darwin year, evolutionary theory is generally endorsed and appeals are made for a “rational dialog” between science and religion. In the same breath, the authors explicitly distance themselves from the Protestant fundamentalists in the US and Holland, and from the “ideological” interpretations of evolutionary theory that turn “Darwinism” into “a kind of religion” (De Volder 2009; Henau 2009). Along with this Roman Catholic tradition, Flemish culture and society are highly secularized, leaving little room for Christian fundamentalists.

Of course, this does not mean that the Flemish wholeheartedly embrace evolutionary theory. There are Flemish young-earth creationist organizations, but these groups remain small and do not pose a serious threat to Flemish science education. The larger danger is that sometimes “intelligent design” is not recognized as a religious anti-evolutionary movement, but mistaken for a bridge between science and religion; and occasionally, prominent members of the Belgian Catholic Church or of the Flemish Christian Democratic Party say things that sound drawn from or sympathetic to ID positions. However, nowhere — and this, again, in contrast with the Netherlands — can we find a well-formulated defense of “intelligent design” by a prominent Christian.

Of more relevance perhaps is the presence of Islamic creationism. As a result of immigration waves between 1950 and 1970, when Belgian factories and mines were looking abroad for cheap labor, Belgium today has significant Turkish and Moroccan communities, especially in the cities. Exact figures are hard to come by, but approximately 5% of the Belgian



UPDATES

Arizona: During a June 25, 2009, meeting of the Arizona Senate's Retirement and Rural Development Committee, state senator Sylvia Allen (R-District 5) said, "[The earth] has been here 6000 years, long before anybody had environmental laws, and somehow it hasn't been done away with." A video of her remark, which suggests that she accepts a young-earth creationist estimate of the age of the earth, was posted to YouTube by the *Arizona Guardian* (available on-line at <<http://www.youtube.com/watch?v=PtzJhTfQiMA>>), and as the *Arizona Republic* (2009 Jul 10) noted, "the snippet had been viewed nearly 115 000 times, and had garnered notice everywhere from Comedy Central to *Discover Magazine* and lefty blog *Think Progress*." Allen also won the dubious accolade of "Worst Person in the World" from MS-NBC's Keith

Olbermann, who commented on his July 9, 2009, show,

Look, if you want to believe the earth is 6000 years old ... go to town, have fun ... But don't pretend it's a fact. And especially don't make yourself look like the stupidest person on the planet by stating it as fact during a hearing about digging up uranium. The way we know the earth is actually billions of years old is because of the speed at which we can measure the radioactive decay of uranium. *Of uranium.*

Olbermann then revealed himself to be almost as poorly informed about isotopic dating methods by adding, "Carbon dating" — which, of course, is not used to measure dates more than about 50 000 years before present. Allen herself told the *Republic*, "I just totally

have ignored this. It's just ridiculous," adding, "I think people are welcome to believe whatever they want about how old the earth is."

California, Mission Viejo: Continuing news from *CF et al v Capistrano Unified School District et al*, the 2009 case in which a teacher's description of creationism as "superstitious nonsense" was ruled to violate the Establishment Clause of the First Amendment (see *RNCSE* 2009 May/June; 29 [3]: 15-22, 27-9). The *Orange County Register* (2009 Jul 13) reported that the plaintiff, "Chad Farnan, a 17-year-old senior at Capistrano Valley High School, had sought a court injunction against" the defendant, "Advanced Placement European history teacher James Corbett, to bar the 20-year educator from 'expressing any disapproval of religion while acting in his official capacity as a public school employee.'" At a July



population is Muslim. How many Muslims are creationists is even harder to tell, but some events and surveys indicate that within Muslim communities, creationism is a respectable position. In February 2008, an imam proclaimed on national television that "we [Muslims] do not accept evolutionary theory, because it is an ideological system that one uses to combat religion. The theory only functions as a scientific cover-up." (see <<http://www.youtube.com/watch?v=4MMpxIN-TdQ>>) He said the deficit of the theory was convincingly demonstrated by "scientists" like Harun Yahya, the leader of the influential Turkish creationist movement that actively seeks converts in Europe (see Sayit and Kence 1999; Edis 1999). Surveys conducted in Antwerp and Brussels show that Muslim high-school students feel far more reluctant than their Christian and atheist colleagues to accept evolutionary theory, making them an easy target for Islamic creationists (Bogaert 2005; Perbal 2005).

In addition to Islamic creationism, there is also some anti-evolutionary sentiment among orthodox Jews (<<http://www.standaard.be/Artikel/Detail.aspx?artikelId=R11G5BVQ&word=creationisme+joods>>) and in anthroposophy circles (anthroposophy is a Christian cult, instigated by the Austrian philosopher Rudolph Steiner) (Blancke 2004). However, creationism in Belgium is not very visible, organized, or active. Nevertheless, Bert Dorenbos, president of the anti-abortion organization Schreeuw om Leven ("Cry for life") who also acts as a spokesperson for the leaflet campaign, feels confident that the leaflet will find a hearing in Flanders. In a Flemish newspaper, Dorenbos said:

I know of many groups in Belgium that reject evolutionary theory, but they haven't come to the surface yet. When these people see our leaflet, they just might come out of the closet. There

is big potential for creationism here and that is exactly what we are digging for. We want to initiate the debate. (<<http://www.standaard.be/Artikel/Detail.aspx?artikelId=9B2D3SHQ&word=creationisten>>)

Perhaps, Dorenbos is right. After all, a study by Miller, Scott and Okamoto reported that 20% of Belgians do not accept the evolution of humans out of "earlier species of animals" (Miller and others 2006). Whether this percentage can be translated directly into support for young-earth creationism remains very doubtful.

And what about the money problem? According to Dorenbos, there isn't any:

Some sympathizers give 10 Euros, others a 100, or even much, much more. That's how today we have almost paid for the 6.6 million leaflets in the Netherlands. In Belgium, we can count on

13, 2009, hearing, Farnan's attorney argued that if Farnan wished to take AP European history or AP art history in the 2009–2010 school year, he would have to do so with Corbett, the only teacher at the school who teaches those classes. "We have nothing of record to support that he has contemplated or intends to pursue any classes," US District Court Judge James Selna responded. "Without that fact, it's too speculative to warrant an injunction." At the same hearing, according to the *Register*, Selna "declined a motion from Corbett's attorney seeking to shield the teacher from financial liability under a qualified immunity defense" but indicated that he was doing so on a technicality and expressed his willingness to reconsider the motion if refiled. Fees and damages in the case have not yet been determined.

Florida: According to a WorldNetDaily "exclusive" article (2009 May 20; available on-line at <<http://worldnetdaily.com/index.php?fa=PAGE.view&pageId=98681>>), the Florida Virtual School, one of the largest on-line

schools in the country, allowed a parent to opt her child "out of lessons on evolution, sex education and teaching that goes against her Christian beliefs — and her tax dollars pay for it all." Although evolution is specifically required in Florida's Sunshine State Standards, and although Florida regulations limit opting out only for lessons involving dissection and disease, the article quoted the parent as asserting that in terms of curriculum, she was "totally in control of everything. It is far better than regular school systems."

It turns out that the WorldNetDaily article was wholly inaccurate. When NCSE contacted the Florida Virtual School, Chief Learning Officer Pam Birtolo explained that "the student cited in that article completed the evolution assignment in question and received an appropriate grade for her work. She simply attached a statement at the beginning of the assignment stating that she didn't believe in evolution." The WorldNetDaily article incorrectly conflated the student's submission of the statement with a wholesale

opting out of evolution. NCSE is now assisting Florida Virtual School to ensure the best science education possible by integrating evolution throughout the biology curriculum.

Florida, Pensacola: Dinosaur Adventure Land, Kent Hovind's creationist theme park in Pensacola, Florida, is to be seized by the federal government, the *Pensacola News Journal* (2009 Jul 31) reported. In November 2006, a federal jury found Hovind guilty of 58 charges, including failing to pay payroll taxes for his employees, structuring financial transactions to avoid reporting requirements, and "corruptly endeavor[ing] to obstruct and impede the due administration of the internal revenue laws." Hovind was subsequently sentenced to ten years in prison and to pay over \$600 000 in restitution (see *RNCSE* 2006 Jul/Aug; 26 [4]: 12–3).

After the judge presiding over the case ordered that two bank accounts and ten real properties located in Pensacola be forfeited to satisfy the financial judgment against Hovind, two claimants filed separate objections. Eric Hovind —

the same kind of support, I suppose.

Indeed, the creationists seem to be quite sure they will collect the necessary funding as they cherish even bigger plans. Dorenbos explains:

For now, the leaflet is only in Dutch. But there is some interest to translate it into French. But we'll see. First we have to look into how we are going to get the campaign in Flanders organized. After that, we might expand the campaign into the rest of Europe.

However, there seems to be confusion among the activists. One day later, a small article appeared on the website of the *Reformatorisch Dagblad*, an orthodox Christian newspaper, in which L Van Bochove of Johannes Media, another cooperating organization in the campaign, said that the news that the leaflets are going to be distributed on a massive scale in Flanders

was a misunderstanding. According to Van Bochove, sympathizing churches in Flanders are only handing out the leaflets that were left over from the Dutch campaign. It remains unclear how many leaflets will be imported into Flanders.

REFERENCES

- [Anonymous]. 2009. Updates. *Reports of the National Center for Science Education* 29 (2): 14–20.
- Blancke S. 2004. Wetenschap naar antroposofisch geloven: de mens dan toch het doel van de evolutie? De evolutie volgens Jos Verhulst. *Wonder en is geen Wonder. Tijdschrift voor Wetenschap en Rede* 3: 29–32.
- Bogaert A. 2005. *De ontkenning van de evolutietheorie door de Islam* [master's thesis]. Lessius Hogeschool Antwerpen.
- Brummer C. 2009. Darwin year in the Netherlands: A time to reflect. *Reports of the National Center for Science Education* 29 (4): 4–5.
- De Volder J. 2009. Darwinisme tussen wetenschap en geloof. *Tertio* 471: 3.
- Edis T. 1999. Cloning creationism in Turkey. *Reports of the National Center for Science Education* 19 (6): 30–5.

Henau E. 2009. Dialoog. *Het teken* 10 (May 2009): 289.

Knevel A. 2007. *Avonduren. Dagboek van een bewogen jaar*. Baarn: Ten Have.

Miller JD, Scott EC, Okamoto S. 2006. Public acceptance of evolution. *Science* 313 (5788): 765–6.

Pennock RT. 1999. *Tower of Babel: The Evidence against the New Creationism*. Cambridge (MA): MIT Press.

Perbal L. 2005. *Evaluation de l'opinion des étudiants de l'enseignement secondaire et supérieur de Bruxelles vis-à-vis des concepts d'évolution (humaine)* [master's thesis]. Université Libre de Bruxelles.

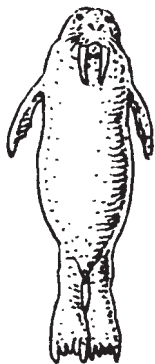
Sayit Ü, Kence A. 1999. Islamic scientific creationism. *Reports of the National Center for Science Education* 19 (6): 18–20, 25–9.

Wells J. 2000. *Icons of Evolution. Science or Myth? Why Much of What We Teach about Evolution is Wrong*. Washington (DC): Regnery Publishing.

AUTHOR'S ADDRESS

Stefaan Blancke
Department for Philosophy
and Moral Sciences
Ghent University
Blandijnberg 2
9000 Ghent
Belgium
stefaan.blancke@ugent.be





who is running Creation Science Evangelism while his father is incarcerated — claimed ownership of a single property, in which he lives, while Glen Stoll — who was hired by Hovind to restructure his ministry so its assets would be managed through supposedly tax-exempt trusts — claimed ownership of the remaining nine as well as one of the bank accounts.

Eric Hovind's claim was upheld by the court in its July 29, 2009, order, which noted that the conveyance of the title to his home was not part of Stoll's plan for restructuring the ministry. But Stoll's claim was not: the court noted:

Stoll has not shown he played anything more than a titular role in the trusts he created, and the court finds he was a nominee title holder for Kent and Jo Hovind. ...As such, Stoll has no legal interest in any forfeited substitute property and lacks standing to challenge the court's June 28, 2007, and October 8, 2008, forfeiture orders.

(The decision is available on-line at <http://ncseweb.org/webfm_send/1130>; the quotation is from p 12.)

Among the properties forfeited appears to be Dinosaur Adventure Land, which describes itself as "a theme park and science museum that gives God the glory for His creation." Reporting on his visit there in the November 2004 *Skeptical Inquirer* (28 [6]: 47-51; available on-line at <<http://www.csicop.org/si/2004-11/hovind.html>>), Greg Martinez concluded, "Dinosaur Adventure Land is just a playground tricked out with dinosaur dressage to attract an audience that can then be enticed, seduced, and eventually duped into accepting superstitions, pseudoscience, and plain nonsense passed off with a patina of both scientific and religious authority."

Iowa, Spencer: A proposed "religious liberties" policy for the schools of Spencer, Iowa — a town of about 12 000 in the northwest of the state — contains a proposal to offer an elective course, "Criticism of Darwinism, a scientific approach," which would "provide a balanced review of evidence for and against the theory of evolu-

tion, using texts which include *Darwin's Black Box* by M Behe". According to the *Des Moines Register* (2009 Jul 8), "School officials say they want to set clear rules for religious expression without discouraging students, for example, from writing 'Merry Christmas' on holiday cards in class." Ben Stone of the ACLU of Iowa countered, "Where's the evidence that students in that district are having their religious freedoms curtailed by the government?" and added, "Because if that's happening, call us. They don't need to adopt a written policy." An editorial in the *Register* (2009 Jul 9) commented:

Its plans for "Religion in the Curriculum" do give us pause because the only proposed electives are a Bible course and a headlong confrontation of Darwinism. If the goal of its proposal is to accommodate any and all expressions of faith and to promote understanding of all religions, fine. If the goal is to endorse or advance one religious belief, then it will surely fail legal challenge. And it should.

The Spencer board of education is currently studying the policy.

Kentucky: The former creationism of a candidate for the post of Education Commissioner of the state of Kentucky was in the news recently. Dennis W Cheek, a senior fellow at the Ewing Marion Kauffman Foundation, was one of the four finalists for the post. A blogger, Richard Day of Kentucky School News and Commentary, discovered that in 1981, Cheek published "The creationist and Neo-Darwinian view concerning the origin of the order primates compared and contrasted: A preliminary analysis" in *Creation Research Society Quarterly* (18 [2]: 93-110). (For Day's posts about Cheek, visit <<http://theprincipal.blogspot.com/search/label/Dennis%20Cheek>>.) The *Louisville Courier-Journal* (2009 Jul 8) subsequently reported:

Although [Cheek] still accepts the "concept of creation" as a Christian, he said

he recognizes that "we have plenty of evidence of evolution", and he does not believe that creationism or intelligent design should be taught in schools. Further, he said, he doesn't believe in "young-earth creationism", which holds that the earth is just thousands of years old. "My view is that we should never think about introducing material into a science class until the scientific community has embraced it," said Cheek.

Cheek also told the *Lexington Herald-Leader* (2009 Jul 9) that he wholeheartedly endorses the decision in *Kitzmiller v Dover*: "What should be taught in school is exactly what the judge in the Dover case said. He was quite clear ... and I concur 100 percent with the decision that was made." In the end, a different candidate, Terry Holliday, was selected as commissioner.

Kentucky, Petersburg: Paleontologists took a trip to Answers in Genesis's Creation "Museum" — and were dismayed, unsurprisingly, by what they saw. The Ninth North American Paleontological Convention was held June 21-26, 2009, at the University of Cincinnati, attracting several hundred paleontologists from around the world to present their latest research, as well as to attend a plenary session on evolution and society featuring NCSE's executive director Eugenie C Scott. The organizers of the convention also offered a side trip to the nearby Creation "Museum," explaining that "it is essential for professional paleontologists to become better aware of how their work and their roles in society are portrayed by creationists, themes that are conveyed vividly at the museum" (quoted from <<http://www.napc2009.org/creationmuseum>>).

Reporters accompanied the bemused paleontologists on their excursion, with stories subsequently appearing in the *Cincinnati Enquirer* (2009 Jun 24), *The New York Times* (2009 Jun 30), and *Agence France-Presse* (2009 Jun 30). A few representative reactions from those stories: "I'm not offended, just annoyed" (Julia Sankey of

California State University, Stanislaus); “I think they should rename the museum — not the Creation Museum, but the Confusion Museum” (Lisa Park of the University of Akron); “This bothers me as a scientist and as a Christian, because it’s just as much a distortion and misrepresentation of Christianity as it is of science” (Daryl Domning of Howard University).

Scientific criticism of the Creation “Museum” is nothing new. When it opened in 2007, over 800 scientists in the three states surrounding it — Kentucky, Indiana, and Ohio — signed a statement (available on-line at <<http://ncseweb.org/taking-action/aig-creation-museum>>) sponsored by NCSE expressing concern about the effect of the scientific inaccuracies of its exhibits on local students. Shortly thereafter, the Society for Vertebrate Paleontology issued a press release (available on-line at <<http://vertpaleo.org/news/index.cfm?mode=viewEntry&id=09647CC3-A12B-5FD2-C6DA5855160D5FFC>>) contending that “the museum presents visitors with a view of earth history that has been scientifically disproven for over a century” and accusing it of “undermining the basic principles of science, eroding the public’s confidence in science, and causing a general weakening of science education in the country.”

Ohio, Mount Vernon: A partial settlement was reportedly reached in *Doe v Mount Vernon Board of Education et al*, the case in which a Mount Vernon, Ohio, teacher, was accused of inappropriate religious activity in the classroom — including displaying posters with the Ten Commandments and Bible verses, branding crosses into the arms of his students with a high-voltage electrical device, and teaching creationism. The *Mount Vernon News* (2009 Aug 27) reported that “the board’s insurance company has agreed to pay \$115 500 toward the plaintiffs’ legal fees, \$5500 to one of the plaintiffs as compensation and the sum of \$1 each to two other individuals.” The board, superintendent, and principal of the middle school admit no liability in the agreement, which will have to be approved by a court.

Not covered by the settlement agreement is the teacher himself, John Freshwater. Shortly after the filing of the case, the board voted to initiate proceedings to terminate Freshwater’s employment in the district. Freshwater appealed the decision, and administrative hearings have been proceeding intermittently since October 2008. Detailed reports on the hearings by Richard B Hoppe are available on The Panda’s Thumb blog (search for “Freshwater”). Complicating the legal situation, Freshwater filed a counterclaim in *Doe v Mount Vernon* in 2008 and his own lawsuit, *Freshwater v Mount Vernon City School District Board of Education et al*, against the board and a number of district administrators in 2009, alleging religious discrimination, defamation, conspiracy, and breach of contract.

According to the *Mount Vernon News*, the school board also agreed to “[p]rohibit staff from discussing the John Freshwater case with or in the presence of students during the school day and at school activities; [p]rovide training to board members and administrators concerning religion and the school, and provide training to teachers on the same topic ... [and] [m]ake a public statement at the conclusion of the Freshwater administrative hearing.”

A statement released by the board explained, “The resolution of the lawsuit against the board, superintendent and middle school principal has no impact or bearing on the pending administrative hearing with respect to the middle school teacher’s employment. Due to pending litigation, the board will not be commenting further.” (For background, see *RNCSE* 2008 Mar/Apr; 28 [2]: 16–8; 2008 May/June; 28 [3]: 5–10; 2008 Jul/Aug 28 [4]: 11–4; and 2009 Jul/Aug; 29 [4]: 6–8.)

Texas: Chris Comer, whose lawsuit challenging the Texas Education Agency’s policy of requiring neutrality about evolution and creationism was dismissed on March 31, 2009, is now appealing the decision. Formerly the director of science at the TEA, Comer was forced to resign in November 2007 after she forwarded a note announcing a talk by Barbara Forrest in Austin; accord-

ing to a memorandum recommending her dismissal, “the TEA requires, as agency policy, neutrality when talking about evolution and creationism.” (See *RNCSE* 2008 Jan/Feb; 28 [1]: 4–7.)

In June 2008, Comer filed suit in federal court in the Western District of Texas, arguing that the policy violates the Establishment Clause of the First Amendment: “By professing ‘neutrality,’ the Agency credits creationism as a valid scientific theory.” The judge ruled otherwise, however, writing, “As a matter of law, the Agency’s neutrality policy, if it advances religion at all, only does so incidentally. Further, a reasonable observer of the neutrality policy would not believe the Agency endorses religion through the policy.” (See *RNCSE* 2008 Jul/Aug; 28 [4]: 11–4.)

In her appellate brief, submitted to the United States Court of Appeals for the Fifth Circuit, Comer asked the court to “review the record *de novo* and reverse and vacate the district court’s decision. Specifically, it should grant Comer’s motion for summary judgment, and vacate the grant of summary judgment for defendants, as well as the dismissal of plaintiff’s complaint.”

NCSE’s collection of documents from the case is available on-line at <<http://ncseweb.org/creationism/legal/chris-comer-docs>>. A brief video about the Comer case is available on NCSE’s YouTube channel (available on-line via <<http://www.youtube.com/user/NatCen4ScienceEd>>).

National: “Nearly all scientists (97%) say humans and other living things have evolved over time,” while only 61% of the public agrees, according to a new report (available on-line at <<http://people-press.org/reports/pdf/528.pdf>>, p 37) from the Pew Research Center for the People & the Press. Asked which comes closer to their view, “Humans and other living things have evolved over time” or “Humans and other living things have existed in their present form since the beginning of time,” 97% of scientists responding chose the former option, as opposed to only 2% choosing the latter option; 61% of the public responding chose the former option, as opposed to 31% choosing the latter option.



Those who chose the former option were also asked whether they preferred “Humans and other living things have evolved due to natural processes such as natural selection” or “A supreme being guided the evolution of living things for the purpose of creating humans and other life in the form it exists today.” Among scientists, 87% preferred the former option and 8% preferred the latter option; among the public, 32% preferred the former option and 22% preferred the latter option. Members of the public were also asked whether scientists generally agree that humans evolved over time; 60% said yes, 28% said no.

“Views on evolution vary substantially within the general public,” the report observed (p 38), “particularly by religion and attendance at religious services.” For example, among white evangelical Protestants responding, 57% agreed that humans existed in their present form since the beginning of time, and among those respondents attending religious services weekly or more often, 49% agreed. In contrast, among the religiously unaffiliated responding, 60% agreed that humans evolved due to natural processes. Also correlated with acceptance of evolution were youth and education.

The questions about evolution were part of a larger project, conducted by the Pew Research Center and the American Association for the Advancement of Science, investigating the public’s attitude toward science and comparing it to the attitude of scientists. The report relied on three surveys, two conducted by telephone among members of the general public in the United States in April, May, and June 2009, and one conducted on-line among members of the AAAS in May and June 2009. The broader significance of the project’s results are summarized in the Pew Research Center’s overview report, issued on July 9, 2009 (available on-line at <<http://people-press.org/report/528/>>).

Nigeria: The BBC (2009 Jul 28) reported that a group of Islamic radicals in Nigeria — dubbed the Nigerian Taliban or Boko Haram, meaning “Western education is a sin” — takes issue with science

education. The group’s leader Mohammed Yusuf explained:

There are prominent Islamic preachers who have seen and understood that the present Western-style education is mixed with issues that run contrary to our beliefs in Islam ... Like rain. We believe it is a creation of God rather than an evaporation caused by the sun that condenses and becomes rain. Like saying the world is a sphere. If it runs contrary to the teachings of Allah, we reject it. We also reject the theory of Darwinism.

The group emerged around 2004 and is responsible for violent attacks across northern Nigeria aimed at overthrowing the government and imposing strict Islamic law. The Associated Press (2009 Jul 31) reported that Yusuf was captured during a major offensive by Nigerian police and military forces; he was shot and killed while in police custody. “Though his followers in the Boko Haram sect may be in disarray — some lieutenants fled and others were arrested — the grievances that caused followers to flock to his cause remain,” the AP added.

United Kingdom: A question mentioning creationism on a national test raised hackles in Britain, according to the *Telegraph* (2009 Jul 6), which reported that in a standardized test administered on June 22, 2009:

Pupils were presented with four “theories of how new species of plants and animals have developed”. These included creationism, which is commonly known as the belief that the earth and its species were created suddenly by God within the last 10 000 years, and intelligent design, its more recent off-shoot. Pupils were also presented with Darwinism and Lamarckism, the theory of organic evolution advanced by the French naturalist Lamarck.

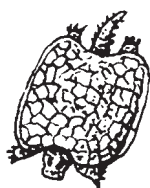
A spokesperson for the Assessment and Qualifications Alliance, which prepared the test, told the newspaper, “Merely asking a question about creationism and intelligent

design does not imply support for these ideas. Neither idea is included in our specification and AQA does not support the teaching of these ideas as scientific.” But James Williams, a lecturer in science education at the University of Sussex, observed, “This gives an unwarranted high profile to creationism and intelligent design as ideas of equal status with tested scientific theories.” The AQA’s spokesperson conceded, “we accept that in the context of a science examination this could be misleading and we will be addressing this issue for any future questions.”

United Kingdom: A group of scientists — including both Richard Dawkins, the popular expositor of both evolution and atheism, and Michael Reiss, the biologist and priest who lost his post with the Royal Society over his misconstrued remarks about creationism (see *RNCSE* 2009 Mar/Apr; 29 [2]: 8–9) — are protesting the exclusion of evolution from a proposed revision of the primary school curriculum. In a July 27, 2009, letter to Ed Balls, the Secretary of State for Children, Schools, and Families, the scientists wrote:

We find it extraordinary that evolution and natural selection find no place in the section “Science — life and living things” The theory of evolution is one of the most important ideas underlying biological science. It is a key concept that children should be introduced to at an early stage so as to ensure a firmer scientific understanding when they study it in more detail later on. The wealth of new resources on evolution available for children of primary school age clearly demonstrates their ability to grasp its central concepts. We consider its inclusion vital.

Signed by twenty-six of Britain’s top scientists and science educators, including three Nobel laureates, the letter (available on-line at <<http://www.humanism.org.uk/uploads/documents/BHA-Scientists-letter-to-DCSF-FINAL.pdf>>) was organized by the British Humanist Association. A spokesperson for the BHA added, in a July 27, 2009, press release



(available on-line at <<http://www.humanism.org.uk/news/view/327>>), “The curriculum currently being drafted will apply for years to come so it is vital that this long-standing omission of evolution is corrected now.”

United Kingdom: “Examinations for an Evangelical Christian curriculum in which pupils have been taught that the Loch Ness monster disproves evolution and racial segregation is beneficial have been ruled equivalent to international A-levels by a UK government agency,” reported the *Times Educational Supplement* (2009 Jul 31). The curriculum at issue is the Accelerated Christian Education (ACE) program, developed in Texas in the 1970s and used by hundreds of students in about fifty private religious schools in Britain; students who complete it may receive the International Certificate of Christian Education. The ACE program was found to be comparable to certificates from Cambridge International by the National Recognition Information Centre, a governmental agency responsible for advising universities and employers about the status of certification programs. Jonny Scaramanga, who attended a school using the ACE program as a child, protested to NARIC, citing various bizarre claims from the ACE science and history textbooks, including:

Are dinosaurs alive today? Scientists are becoming more convinced of their existence.

Have you heard of the “Loch Ness Monster” in Scotland? “Nessie,” for short has been recorded on sonar from a small submarine, described by eyewitnesses, and photographed by others. Nessie appears to be a plesiosaur.

Could a fish have developed into a dinosaur? As astonishing as it may seem, many evolutionists theorize that fish evolved into amphibians and amphibians into reptiles. This gradual change from fish to reptiles has no scientific basis. No transitional fossils have been or ever will be discovered because God created each type of fish, amphibian,

and reptile as separate, unique animals. Any similarities that exist among them are due to the fact that one Master Craftsman fashioned them all.

A spokesperson for NARIC told the *Times Educational Supplement* that evaluating the content of the curriculum was beyond its responsibility; the chief executive officer of the ICCE in the United Kingdom said that its teachers considered the textbooks useful, but sometimes found it necessary to register disagreement with particular claims.

International: A recent international survey conducted by the British Council investigated awareness of Darwin, acceptance of evolution, and attitudes toward evolution and faith. In a June 30, 2009, press release (available on-line at <<http://www.britishcouncil.org/darwinnow-survey-global.pdf>>), Fern Elsdon-Baker, the head of the British Council’s Darwin Now program, commented:

The international Darwin survey has thrown up some very interesting results, especially as it includes data from countries not previously covered The most encouraging aspect of the survey shows that whilst there are diverse views on Darwin’s theory of evolution, there appears to be a broad acceptance that science and faith do not have to be in conflict. Whilst the results show that there is some way to go in communicating the evidence of evolutionary theory to wider audiences, it is evident that there is clear space for dialogue on this sometimes complex area of debate.

The survey was conducted in April and May 2009 in ten countries: Argentina, China, Egypt, Great Britain, India, Mexico, Russia, South Africa, Spain, and the United States. For the question “Have you heard of Charles Darwin?” Russia led the list with 93% of respondents saying yes, with Great Britain and Mexico tied for second at 90%, and China a close third at 90%; the United States was fifth at 84%.

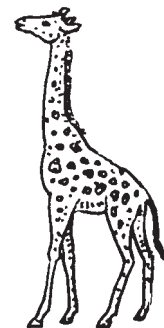
For the question “To what extent do you agree or disagree that it is possible to believe in a God and still hold the view that life

on earth, including human life, evolved over time as a result of natural selection?” India led the list with 85% of respondents agreeing, with Mexico second at 65% and Argentina third at 62%; the United States was seventh at 53%, just behind Great Britain, Russia, and South Africa, which were in a three-way tie for fourth at 54%.

For the question “To what extent do you agree or disagree that enough scientific evidence exists to support Charles Darwin’s Theory of Evolution [*sic*]?” — posed to respondents who had heard of Charles Darwin and knew something about the theory of evolution — India led the list with 77% of respondents agreeing, with China second at 72% and Mexico second at 65%. The United States was ninth at 41%, just behind South Africa at 42% and well ahead of Egypt at 25%.

In keeping with reports on previous international surveys on public attitudes toward evolution, such as Miller, Scott, and Okamoto’s article in *Science* in 2006, the United States was also conspicuous for the level of disagreement with the theory of evolution: 30%, second only to Egypt’s 63%. Only 29% of respondents in the United States indicated that they neither agreed nor disagreed or did not know.

Respondents were also asked which of the following was closest to their own view: “life on earth, including human life, evolved over time as a result of natural selection, in which no God played a part”; “life on earth, including human life, evolved over time in a process guided by a God”; and “life on earth, including human life, was created by a God and has always existed in its current form.” (Respondents were also offered the response, “I have another view on the origins of species and development of life on earth, which is not included in this list.”) The first view was preferred in China by 67% of the respondents, in Mexico, Great Britain, and Spain by 38%, in Argentina by 37%, and in Russia by 32%; the third was preferred in Egypt by 50% of the respondents, and in India, South Africa, and the United States by 43%. In no country was the second view held by a plurality of respondents.



NCSE NEWS

News from the Membership

Glenn Branch

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!

Tim Berra gave the keynote address at the bicentennial celebration of the birthday of Charles Darwin at a very special venue: Charles Darwin University in Darwin, Australia. (He also spoke at Flinders University in Adelaide.) In advance of his trip he contributed “Charles, my hero” to the university’s magazine *Origins* (2009; 1: 10); it is available on-line at <http://www.cdu.edu.au/newsroom/origins/Origins-Issue-1-2009-page10.pdf>. His trip is supported by a Fulbright Senior Specialist grant; it is Berra’s third visit to Australia on a Fulbright award, and he quipped, in a July 20, 2009, press release from the Ohio State University, Mansfield, “I have made a career out of studying strange Australian fishes, and it’s all due to the Fulbright program.” Professor emeritus of evolution, ecology, and organismal biology at the Ohio State University, Mansfield, Berra is the author of *Charles Darwin: The Concise Story of an Extraordinary Man* (Baltimore [MD]: Johns Hopkins University Press, 2009) as well as *Evolution and the Myth of Creationism* (Stanford [CA]: Stanford University Press, 1990).

Ann Bovbjerg saw a column in her local newspaper, the *Iowa City Press-Citizen*, which advocated the teaching of a “full range” of evolution views. She responded with a concise letter to the editor, “Science must be only about science,” published on July 8, 2009. Her letter explained how scientific knowledge differs from non-scientific perspectives. It also pointed out that teachers are legally constrained from “teaching that a personal, non-scientific or anti-scientific view is valid science.”

NCSE’s deputy director **Glenn Branch**’s review of the updated edition of *But Is It Science? The Philosophical Question in the Creation/Evolution Controversy* (Amherst [NY]: Prometheus Books, 2009) appeared in *eSkeptic* (available on-line at <http://www.skeptic.com/eskeptic/09-08-12#feature>) for August 12, 2009. The review concluded:

But Is It Science? is evidently intended as a sourcebook for university classes in philosophy, the history of science, science and religion, and so forth, and as such it succeeds admirably. But it is, or ought to be, appealing to the general public at large. The creationism/evolution controversy is a perennial feature of life in the United States, with attempts to remove, balance, or compromise the teaching of evolution recurring from the Scopes era to the present day. Even if public interest in intelligent design dwindles after *Kitzmiller*, as public interest in creation science dwindled after *McLean* and *Edwards*, the profound yet misguided discomfort with evolution that actuates such assaults on evolution is bound to remain. Also bound to remain are philosophical controversies over creationism, which — as the *Kitzmiller* case illustrated so vividly — have the potential to affect the quality of science education across the country and indeed around the world. Pennock and Ruse conclude their preface by writing, “We hope that you enjoy this collection and learn from it.” I think that you will. And they add, “We hope sincerely that in twenty years it will not be necessary to bring out a third edition.” I do, too. But if so, it will be

due, despite Mencken’s jab, in large part to the philosophers — Pennock, Ruse, and Forrest, to be sure, but also Philip Kitcher, Sahotra Sarkar, Elliott Sober, and a host of their colleagues — who have worked tirelessly to expose the philosophical flaws of creationism.

The editors of the book, philosophers **Michael Ruse** and **Robert T. Pennock**, testified in *McLean* and *Kitzmiller*, respectively, and Ruse is additionally a Supporter of NCSE. Branch’s review will be published in a forthcoming issue of *Skeptic*.

NCSE Supporter **Sean B. Carroll** was awarded the Viktor Hamburger Outstanding Educator Prize for 2009 from the Society for Developmental Biology, at the society’s 68th annual meeting, held July 23–27, 2009, in San Francisco. Carroll, Professor of Molecular Biology, Genetics, and Medical Genetics and Howard Hughes Medical Institute Investigator at the University of Wisconsin, Madison, was honored “in recognition of his pioneering role in elucidating the genetic and molecular basis of morphological evolution, and for his exceptional contributions to making scientific advances in this field accessible to both students and the general public.” After summarizing Carroll’s scientific achievements, the SDB’s citation (available on-line at <http://www.sdbonline.org/Awards/Carroll-Hamburger09.pdf>) notes that he “has also led a second life, equally successful, as a public educator in the realm of evolution,” listing his books *From DNA to Diversity: Molecular Genetics and the Evolution of Animal Design*, *Endless Forms Most Beautiful*, *The Making of the Fittest*, *Into the Jungle*, and *Remarkable Creatures*. “Indeed,” the citation continued, “the philosopher Michael Ruse has opined that if Charles Darwin were alive today,



there would be no scientist that he would rather spend an evening with than Sean Carroll.” The prize, established in honor of Viktor Hamburger, a preeminent embryologist and developmental neuroscientist of his era, recognizes individuals who have made outstanding contributions to developmental biology education. Previous recipients include Robert DeHaan, NCSE Supporter **Bruce Alberts**, Leon Browder, Lewis Wolpert, **Scott Gilbert**, and, in 2007, NCSE’s executive director **Eugenie C Scott**. Founded in 1939, the Society for Developmental Biology seeks to promote the field of developmental biology and to advance our understanding of developmental biology at all levels.

Barbara Forrest, a member of NCSE’s board of directors, was honored by the American Humanist Association with its Humanist Pioneer Award for 2009, at its 68th annual conference, held in Phoenix, Arizona, June 5–7, 2009. Also honored were **PZ Myers**, who received the Humanist of the Year award; **Barry Lynn** of Americans United for Separation of Church and State, who received the Religious Liberty Award; and NCSE Supporter **Neil deGrasse Tyson**, who received the Isaac Asimov Science Award. While in Phoenix, Forrest and Tyson were both interviewed for the Humanist News Network’s podcast, available on-line at <<http://www.americanhumanist.org/HNN/details/2009-07-humanist-network-news-podcast-40-popularizing-science>>.

Science Under Siege: Defending Science, Exposing Pseudoscience (Amherst [NY]: Prometheus Books, 2009), edited by **Kendrick Frazier**, includes articles by two NCSE members. **Barbara Forrest**, a member of NCSE’s board of directors, contributed “The ‘vise strategy’ undone: *Kitzmiller et al v Dover Area School District*” (99–112), and NCSE Supporter **David Morrison** contributed “Only a theory? Framing the evolution/creation issue” (124–9). Also of interest in the collection are excerpts from Judge John E Jones III’s opinion in the *Kitzmiller* case (91–8), Charles Sullivan and Cameron McPherson Smith’s “Four

common myths about evolution” (113–23), and Massimo Pigliucci’s “Is intelligent design creationism?” (130–2).

John Lynch explained “Why Ben Stein is wrong about science and history” to the Humanist Society of Greater Phoenix on August 23, 2009. Slides of his presentation debunking the creationist propaganda film *Expelled* are available on-line at <<http://www.slideshare.net/jmlynch/why-ben-stein-is-wrong-about-history-science>>. A zoologist and historian of science, Lynch is Honors Faculty Fellow at Barrett, the Honors College at Arizona State University.

Former NCSE staffer **Nick Matzke** found a source for a spurious Darwin quotation — and won a prize for it! The passage in question — “It is not the strongest of the species that survives, nor the most intelligent that survives. It is the one that is most adaptable to change” — is due not to Darwin but apparently to Leon C Megginson, Professor of Management and Marketing at Louisiana State University at Baton Rouge, who offered substantially similar statements, intended as paraphrases of Darwin, in two articles published in the 1960s. The Darwin Correspondence Project comments, “At some stage Megginson’s paraphrase of Darwin, slightly recast, was turned into an actual quotation from *Origin*. That part of the story remains to be told, and we look forward to Nick finding out more” (see <<http://www.darwinproject.ac.uk/content/view/164/30/>>).

Discussing his search for the source of the spurious quotation at The Panda’s Thumb blog (<<http://pandasthumb.org/archives/2009/09/survival-of-the-1.html>>), Matzke explained, “The quote appears to start as a paraphrase; there is no evidence that Megginson initially intended this to be taken as an exact quote; rather, at some later stage, someone copied down the phrase (perhaps in lecture notes, for example), and then later assumed it was an actual quote of Darwin.” He added, “The quote has apparently evolved over time to become shorter and pithier. I suspect that quotes that are shorter and more pithy have an ‘adaptive

advantage’ in collections of inspirational quotes, motivational seminars, and similar venues which seem to be common habitats for the quote in the business world. I hereby dub this process ‘pithification.’”

Matzke, who worked for NCSE from 2004 to 2007 and is currently a graduate student in the Department of Integrative Biology at the University of California, Berkeley, will receive a copy of volume 16 of *The Correspondence of Charles Darwin*. The search for the source of two other spurious Darwin quotations — “In the struggle for survival, the fittest win out at the expense of their rivals because they succeed in adapting themselves best to their environment” and “In the long history of humankind (and animal kind, too) those who learned to collaborate and improvise most effectively have prevailed” — is still continuing (see <<http://www.darwinproject.ac.uk/content/view/157/1/>>). And anyone who is able to find a closer and earlier match for the “It is not the strongest of the species” quotation will still be eligible to win a prize from the Darwin Correspondence Project.

Gordon Maupin, the executive director of The Wilderness Center in Wilmot, Ohio, and his colleagues are offering “Wild Ideas” — a weekly science-based podcast about conservation biology, available on-line at <<http://www.wildernesscenter.org/podcasts/>>. Maupin writes, “We (a naturalist, a science educator, and a conservation biologist) mostly talk about conservation biology. Our format is to take everyday observations and put them in perspective. ... We do not shy away from using the ‘e’ word throughout the podcast as we discuss concepts related to conservation biology, nature, natural history, or physical sciences.”

Brian Myres celebrated the 200th anniversary of the birth of Charles Darwin and Abraham Lincoln with a letter to his local newspaper, the *Loveland Reporter-Herald*. “Lincoln and Darwin dramatically changed the world,” he wrote. “Lincoln ended slavery and saved the union from splitting into two or more separate countries, eliminating the possibility of dire



consequences for later world developments. Darwin's natural selection led the sciences out of the darkness of supernatural explanations of nature, opening the door to scientific advancements that would not otherwise have been possible." His letter was published on February 11, 2009, the day before the anniversary.

Kevin Padian was in the news for coauthoring "First record of a pterosaur landing trackway," forthcoming in *Proceedings of the Royal Society B*. The *San Francisco Chronicle* (2009 Aug 20) explained:

For the first time, a team of scientists, including a noted UC Berkeley paleontologist, has discovered the tracks that one small pterosaur made as it landed on the muddy shore of an ancient sea sometime between 150 million and 115 million years ago. ... "These tracks," Padian said, "tell us that this animal must have flapped its wings with its body upright, stalled in the air like many waterbirds do, and landed feet first just the way flying ducks like mergansers do today. Then, its newfound tracks show this pterosaur took a few short, stuttering steps, turned slightly to its left, and there the tracks stop." ... Although the discovery reveals much about the evolution of flight in the first vertebrate animals to reach the air, the scientists conclude that nothing in the tracks they have studied so far "provides any indication how these animals took off".

Padian is president of NCSE's board of directors and Professor of Integrative Biology at the University of California, Berkeley.

Michael Ruse reviewed **David P Mindell's** *The Evolving World* (Cambridge [MA]: Harvard University Press, 2006) for *Isis* (2009; 100 [2]: 385). The book, Ruse wrote, is "directed primarily at the general reader, but I think that those interested in more technical topics could well use the book as a guide and that younger people would find much of it very interesting and informative." He concluded, "This is a friendly book,

not without humor, and nicely balanced. Nothing is terribly deep, but then that is not really the intent. Many people could learn much from it. It deserves to be widely read." Ruse is Professor of Philosophy at Florida State University and a Supporter of NCSE. Ruse also contributed "Gaia in the light of modern science" to the *Chronicle of Higher Education* (2009 Jul 20), a review of John Gribbin and Mary Gribbin's *James Lovelock: In Search of Gaia* (Princeton [NJ]: Princeton University Press, 2009).

The journal *Nature* (2009; 460: 574-7) asked a number of scientists — including NCSE's **Eugenie C Scott** — for recommendations for summer reading. Scott picked Mark Pallen's *The Rough Guide to Evolution* (London: Rough Guides, 2009), writing that Pallen "provides a concise summary of what you need to know: a brief history of the idea that all living things share common ancestry, a complete survey of the mechanisms of evolution and a solid summary of how life originated and then adapted through time to a changing planet. He livens up the story with literary, musical and cultural references so that you never feel you are being told to eat your vegetables." She added, "Alas, it is not only non-specialists who don't have a firm grasp of the strength of theory and data supporting the modern understanding of evolution — many scientists outside the field of evolutionary biology struggle too. This entertaining handbook will bring anyone up to date."

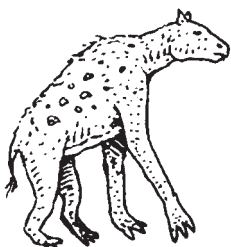
NCSE's executive director **Eugenie C Scott** was interviewed by *Science News* (2009; 176 [3]: 32; available on-line at <http://www.sciencenews.org/view/generic/id/45594/title/Accept_it_Talk_about_evolution_needs_to_evolve_by_Eugenie_Scott>) about the need for scientists to watch their language when talking about evolution and the nature of science. "What your audience hears is more important than what you say," she observed, recommending, for example, that scientists describe themselves as "accepting" rather than as "believing in" evolution. Answering the question "What should scientists and peo-

ple who care about science do?" Scott replied, "I'm calling on scientists to be citizens. American education is decentralized. Which means it's politicized. To make a change ... you have to be a citizen who pays attention to local elections and votes [for] the right people. You can't just sit back and expect that the magnificence of science will reveal itself and everybody will ... accept the science."

NCSE Supporter **Elliott Sober's** *Evidence and Evolution: The Logic Behind the Science* (Cambridge: Cambridge University Press, 2008) received high praise from the reviewer for *Notre Dame Philosophical Reviews* (2009 Jul 18; available on-line at <<http://ndpr.nd.edu/review.cfm?id=16705>>), who wrote, "Sober has once again provided a carefully argued and stimulating book. It is clearly written, though it is not necessarily an easy read, especially for those unfamiliar with the issues discussed. The effort required, though, is heavily outweighed by the potential insight gained into these topics."

Lorne Trottier contributed "EMF and Health: A Growing Hysteria" to the September/October issue of *Skeptical Inquirer* (2009; 33 [5]: 36-7). A member of NCSE's board of directors, Trottier is a co-founder of Matrox, a corporation that specializes in computer graphics.

Robert "Mac" West, a paleontologist and museum consultant who serves on NCSE's board of directors, presented "Something fishy about you" at the Cedar Lane Unitarian Universalist Church in Bethesda, Maryland, on July 19, 2009. The description of his talk from the church bulletin: "Creationists (people who want the [B]ible taught in science classes beside evolution) say that evolution has errors because we do not have all of the 'transitional species' evidence from single cells to us. Mac has worked on and directed some of the projects that fill the gaps. He has been a professor, a museum director and an active member and current officer of the primary organization (National Center for Science Education) that fights putting religion into science classes."





Credibility, Profitability, and Irrefutability: Why Creationists are Building Museums

Julie Duncan

I was a junior in high school when I first read that Answers in Genesis was planning to build a \$27-million-dollar creationist museum just minutes from my home. The creationism/evolution “debate” had long been an interest of mine, and when my like-minded father left a clipped newspaper article about the museum on my desk with the words “uh oh!” scrawled across the top, I was dismayed to read that my town would soon be embroiled in evangelical fervor.

The museum seemed to mark a new direction for the creationist movement — and, I worried, seemed poised to bring creationist thought into the mainstream. When the museum opened in 2007, I was immediately struck by its technological and aesthetic sophistication. I had known, of course, that there were going to be animatronic dinosaurs, but I was blown away by what I saw. Everything — the displays, the labels, the movies, even the landscaping — was even more impressive than I had imagined.

Timothy Heaton (2007) and Daniel Phelps (2008) have already provided detailed descriptions of the museum’s interior, so I will refer readers to those accounts of the facility. However, what I saw that day — and what over 714,000 others had seen by June of 2009 (Leichman 2009) — convinced me that there was something more to this museum than just a scientific façade. Creationists had been appropriating scientific language since at least the 1960s; that was nothing new. What *was* new was the museum itself. Why, I wondered, had creationists suddenly decided to build this museum instead of, say, a new megachurch or a Bible school? What is it about a museum that makes it particularly well suited to creationists’ purposes?

THREE FOR THE ROAD

It is this question that I have worked to answer over the past year and a half. To do so, I investigated not only the Answers in Genesis Creation Museum but also three other creationist museums in other parts of the country. I analyzed their displays, interviewed their founders and employees, made note of the items

for sale in their gift shops, and tried to determine just what each museum’s purpose was.

The first of these was the Creation Evidence Museum in Glen Rose, Texas, founded in 1984 by Carl Baugh — perhaps best known as host of Trinity Broadcasting Network’s “Creationism in the 21st Century”. The museum has three main attractions: Baugh’s *Creation in Symphony* video, a Bible-based reconstruction of the phases through which the earth has passed or will pass “from Genesis to Revelation”; a 20-meter-long “hyperbaric biosphere,” inside which Baugh claims to have simulated the conditions of the pre-Flood world in “controlled, scientific experiment[s]” (Baugh 1997); and a number of fossilized footprints he insists were made by humans. These footprints are Baugh’s most treasured pieces of evidence, as he believes they prove that dinosaurs and humans lived contemporaneously — and therefore that the evolutionary time scale is flawed. Accordingly, Baugh built his museum along the road leaving Dinosaur Valley State Park — a place famous for its well-preserved dinosaur footprints — in the hope that it “would cause people to question the state park’s version of prehistory” (Henry 1996).

My second visit was to Pensacola’s Dinosaur Adventure Land (DAL), billed as the place “where dinosaurs and the Bible meet” (Hovind nd-a). DAL was founded by and constructed in the backyard of Kent Hovind. In 1989, Hovind had founded Creation Science Evangelism (CSE), a creationist ministry, and it was under the auspices of this organization — located on the same property — that DAL was built (DAL staff nd). According to Hovind, CSE’s mission is to demonstrate “the perfect harmony of the Biblical record with factual science and history” as well as “the fallacies and deceptions of modern evolutionary thinking” (Hovind nd-b). With numerous outdoor, hands-on activities — each with “a science lesson to make you smarter, a physical challenge to make you tired, and a Bible lesson to bring you closer to the Lord” — Dinosaur Adventure Land’s message is clearly directed toward children. As Hovind explains on his *Ideas for Starting a Creation Ministry* CD (2006), this dinosaur theme is a particularly valuable tool “to draw the kids in, to be able to talk to them.”

Finally, I visited the Museum of Creation and Earth History (MCEH) in Santee, California. From 1992 to 2008, this museum belonged to the Institute for Creation Research, an organization that has been called “the intellectual center of the creationist movement” (Schudel 2006). During that time the museum

Julie Duncan is a native of Burlington, Kentucky, and a 2009 graduate of Harvard College, where she majored in history and science. This article is adapted from her senior thesis, “Faith Displayed as Science: The Role of the ‘Creation Museum’ in the Modern American Creationist Movement”, which was awarded Harvard’s Thomas T. Hoopes Prize. She recently began her first year at Yale Law School, where she plans to study constitutional law.

offered free admission and received, according to then-curator Cindy Carlson, about 15 000 visitors per year (2008). The museum's displays closely mirror the contents of founder Henry Morris's book *The Genesis Flood* (Whitcomb and Morris 1961), and they serve much the same purpose: in Carlson's words, to help believers "integrate the creationist worldview with science" (2008). Indeed, much more than any of the other three museums I visited, the MCEH portrays creationism as a no-nonsense, intellectually tenable *scientific* theory. In 2008, after its move to Dallas, the ICR sold this museum to the Life and Light Foundation, a 501(c)(3) non-profit organization that plans to expand the museum's collections (LLF nd).

WHY BUILD A MUSEUM?

Scientific credibility

There are at least three significant and interrelated reasons for which creationists build these museums. First, museums have a long history as places of both scientific research and of public education. The modern museum's earliest ancestors are the *wunderkammer*, "cabinets of curiosity" that sprung up in the homes of the rich and the royal during the European Renaissance. Though these collections were generally unorganized and served mainly as entertainment and status symbols in polite culture, they did contribute to scientific studies, especially when lists and pictures of their contents were published (Olmi 1985: 6; Crane 2000: 65). In the 18th and early 19th centuries, as the works of Linnaeus and Buffon sparked interest in classification of the natural world, natural history museums — still private institutions — became more focused on expanding and ordering their collections so they might be useful for scientific studies, especially comparative anatomy (Farber 2000: 55). By the end of the 19th century, however, governments and corporations had begun actively supporting the construction of these "cathedrals of science" and making their collections available to the masses (Farber 2000: 88–90). The museums, still accompanied by large, behind-the-scenes research staffs and filled with exotic trophies of empire, enjoyed wide popularity. By the 20th century they had established a reputation as "centers of education and public enlightenment" (Alexander and Alexander 2008: 7), an image still quite popular today. By calling their institutions museums instead of "Bible centers" or "Faith parks," then, creationists automatically appropriate for their institutions this reputation for credibility and education.

It might seem ironic that creationists would be interested in building "cathedrals of science". They do, after all, reject a scientific theory supported by the vast majority of practicing scientists. However, creationists have shown themselves to be just as fond of science as other Americans; they simply believe that creationism *is* science. Both in these museums and in popular creationist literature, they argue that there is a purely *scientific* debate going on over evolution: a disagreement not between religious thinkers and scientists but between scientists who appear to be *equally credentialed*. As historian of science Steven Shapin notes, when experts disagree, the problem becomes "deciding who the scientific experts really

are" (Shapin 2004: 46). At that point, Shapin argues, the layman is forced to perform a sort of "moral evaluation," favoring those experts "whom we can trust ... to do good" (Shapin 2004: 48).

The creation museums exploit this idea, asking their visitors to make a similar moral evaluation when deciding whom to trust. Creationists, of course, are connected to God, the Bible, and the Christian way, encouraging visitors to trust in their morality as well as their scientific expertise. Then, by connecting evolutionists with things like racism, genocide, and communism, the museums' displays suggest that evolutionists are morally bankrupt, greatly diminishing their perceived authority.

Learning (and earning) while entertaining

The second crucial quality of museums is that they provide entertainment, unlike churches or Bible schools (in most cases). This is important for two reasons. First, it is a common belief that people of all ages, and especially children, learn better when they are having fun. Hooper-Greenhill (2007) reports that "teachers saw pleasurable experiences as central to effective learning" and that they saw a trip to the museum as "an opportunity to generate enjoyment" (Hooper-Greenhill 2007: 122). By teaching with a method that is "more 'fun' than using books" (Hooper-Greenhill 2007: 146), then, creation museums make it more likely that visitors will retain the message promoted therein. This is particularly true at Dinosaur Adventure Land, with its child-oriented focus on interactive learning, and at the Answers in Genesis museum, with its entertaining videos, impressive animatronic dinosaurs, and overall pleasant design. As Annalee Ward, a professor at Trinity Christian College, notes, these museums "are becoming major media venues that persuade as they delight" (Ward 2008: 164).

The entertainment value of museums is significant for another reason: revenue. At least since the days of Barnum's American Museum (founded in 1841 by PT Barnum, of circus fame), it has been known that offering crowds a glimpse at the strange or exotic — even if it means blurring the line between fact and fiction — can mean big money. In much the same way, the material on display in creation museums attracts big crowds. In addition to the price of admission, there are concessions, parking, and gift-shop items. According to Ward, that clientele represents a significant potential for revenue: "evangelicals are the primary market for a more than \$4-billion-a-year religious entertainment industry" (Ward 2008: 164).

The Creation Evidence Museum takes in relatively little money — in 2007 Baugh reported just a little over \$400 000 in total revenue and paid himself a salary of just \$71 730 (IRS 2007a: 5). This situation is probably due to the museum's relatively isolated location and rather rudimentary displays. For the most part, the Institute for Creation Research, too, seems to make good on its promise that no employee is in it for the money (Morris nd): in 2007, Institute President John Morris, one of only two paid members of the ten-member board of trustees, made just \$89 049 (IRS 2007b: 22) — a modest salary for the president of a large organization living in expensive San Diego.

For Dinosaur Adventure Land and Answers in



Genesis, however, the story is quite different. The IRS reported that Kent Hovind made bank deposits in excess of \$1 million per year before being jailed for tax fraud, suggesting that Creation Science Evangelism and Dinosaur Adventure Land were performing well (AP 2004). Answers in Genesis reported over \$20 million in assets in 2006 and was paying Ken Ham a salary of \$188 655 (IRS 2006: 18). At least four other employees were earning more than \$100 000 per year (IRS 2006: 18–20) — and this was in 2006, the year *before* the museum opened. It is unclear why Answers in Genesis's 2007 tax returns are still (as of May 2009) unavailable, but considering that the \$27-million museum opened without a penny of debt, the \$20 admission fee (plus \$5 for the planetarium show and more from bookstore and online merchandise sales) multiplied over more than 714 000 visitors has surely resulted in substantial revenue since then.

Unchallenged assertions

The third probable motivation for building a museum — and the one I consider most revealing — is that museums appear to speak directly to “the people” without intervention on the part of mainstream scientists or government officials as would be encountered in legal battles. In other words, museums are a medium in which creationist claims can go unchallenged. This seems to be part of a larger movement by creationists *away* from high-profile court cases over the evolution issue and toward the goal of, as AiG put it, “get[ting] information to the people” and “influenc[ing] the culture” (Ham 2008) from the ground up. Historian of science Ronald Numbers points out that this trend appears to have begun in the late 1980s, after creationists suffered “a string of losses in state assemblies and a series of negative decisions in federal courts” (Numbers 2006: 354). It was then that they “shifted from headline-grabbing legislative battles to quiet persuasion among teachers and school-board members” (Numbers 2006: 354). It seems likely that these museums, especially in the wake of defeat in *Kitzmiller v Dover* (2005), are part of this broader shift from legislative battles — and, perhaps, attempts to *impose* creationist belief — to persuasion on a local or individual level.

Because museums occupy a unique position in our society as places of both education and entertainment, it may be most accurate to think of them as a kind of “middle path” between the truly popular doctrinal media — things like books, DVDs, and Christian music groups, which appeal to a wide variety of believers — and the more academic “intelligent design”, which appeals to a subgroup of believers concerned with their religion’s scientific legitimacy. By incorporating elements of both the popular *and* the scientific — not just animatronic dinosaurs and sing-along musicals, but numbers and graphs, too — museums achieve a much more universal appeal.

REPERCUSSIONS FOR SCIENCE

What makes all of this important are the repercussions these museums are likely to have for science. First, the museums drastically and independently change the definition of science. According to their view of science, appealing to the supernatural to explain

observed phenomena is perfectly acceptable and even desirable. The “presupposition” that the Bible is true is just as legitimate as an *a priori* commitment to naturalism. As historian of science Peter Bowler notes, however, this is not so much a redefinition of science as “an excuse for stopping science in its tracks” (Bowler 2007: 213). In this view, a divine being could be invoked to account for any unexplained natural phenomena, rendering experimental support unnecessary. Furthermore, science as creationists define it would be teleological. That is, the ultimate results of any investigation would be predetermined, as they would have to conform to the Bible. The openness of mainstream science, a discipline whose practitioners have long boasted of its inability to “prove” anything (being capable only of *disproving* a hypothesis) would be eliminated.

Just as important, by setting up a rigid dichotomy between evolution and creationism, these museums suggest that “[e]vidence against one position is support for the other position” (Riddle 2004). Thus, any time scientists disagree or when part of a theory remains unresolved (for example, Does the Oort Cloud really exist? How exactly did life begin?), museum visitors are taught not that these are interesting questions deserving of further study but that they are “fallacies” whose very existence is further evidence *for* creationism.

Mainstream natural history museums, those “cathedrals of science”, are being affected, too. In 2005, *The New York Times* reported that museum docents across the country were struggling to deal with “creationists eager to challenge the museum exhibitions on evolution” (Dean 2005). Answers in Genesis now sells museum, zoo, and aquarium guides that creationists can take with them and use for alternative, biblically correct interpretations of the displays. With those guides in hand, it is probable that creationists will feel even more confident in their questioning.

What is more, companies such as BC Tours — “where we are BC [biblically correct] and not PC” (Jack and Carter 2008) — have begun offering their own tours through mainstream museums on which visitors may learn “biblically correct” science (Rooney and Patria 2009). The Museum of the Earth in Ithaca, New York, is just one of many American museums forced to provide its workers with additional training in evolution in response to an influx of questioning creationists (Dean 2005). Though this influx is not due entirely to the effect creation museums are having on their visitors, it certainly cannot hurt that creationists now have their own impressive museums to contradict the ideas put forward in those of the mainstream.

SIGNIFICANCE FOR CREATIONIST MOVEMENT

With knowledge of these four creation museums, their methods, and their purposes, two important conclusions may be drawn about the state and direction of the modern American creationist movement. First, these museums are just one part of a larger shift in the creationist movement away from high-profile, “top-down” attempts to win recognition and classroom time for creationism. Like books, documentaries, and the internet — all of which have been utilized extensively by the creationist movement — creation muse-



ums have the ability to go “straight to the people.” While court cases require that both sides receive an equal hearing, the museums can and do provide a one-sided view of the creation–evolution “debate”, circumventing any rebuttals from scientific authorities.

Second, creation museums are part of the creationist reaction to the “conflict model” (Russell 1935; White 1876; Draper 1881) so entrenched in Western conceptualizations of the relationship between religion and science, which suggests not only that science and religion are “at war” but also that science has generally prevailed. By insisting that creationism *is* science, however, creation museums have collapsed the distinction between religion and science, fundamentally changing the space for debate; for how can creationism — which is itself a science — be *against* science? The dichotomy they have created is not a battle between religion and science but between two sciences, one moral and one immoral.

If one may judge by the remarkable success of the Answers in Genesis Creation Museum in Kentucky, the largest and most recently constructed of the four, creation museums are no passing trend. Millions of Americans agree with their messages, and hundreds of thousands patronize them each year. It seems very probable that the years to come will see the construction of more museums, most likely in the high-tech style of the Answers in Genesis Creation Museum, which has proven quite lucrative.

REFERENCES

- Alexander P, Alexander M. 2008. *Museums in Motion*. Lanham (MD): AltaMira Press.
- [AP] Associated Press. 2004 Apr 18. Biblical theme park's finances investigated. *St Petersburg Times*. Available on-line at <http://www.sptimes.com/2004/04/18/State/Biblical_theme_park_s.shtml>. Last accessed May 12, 2009.
- Baugh C. 1997. *Family Tour of the Creation Evidence Museum* [DVD]. Carrollton (TX): Take One Video and Post.
- Bowler P. 2007. *Monkey Trials and Gorilla Sermons*. Cambridge (MA): Harvard UP.
- Carlson C. 2008 26 Aug. [Personal interview].
- Crane S. 2000. Curious cabinets and imaginary museums. In: Crane S, editor. *Museums and Memory*. Palo Alto (CA): Stanford University Press. p 60–80.
- DAL staff. nd. About Dinosaur Adventure Land. Available on-line at <<http://drdino.com/articles.php?spec=70>>. Last accessed May 12, 2009.
- Dean C. 2005 Sep 20. Challenged by creationists, museums answer back. *The New York Times*. Available on-line at <http://www.nytimes.com/2005/09/20/science/20doce.html?_r=1>. Last accessed September 14, 2009.
- Draper J. 1881. *History of the Conflict between Religion and Science*. New York: D Appleton and Co.
- Farber P. 2000. *Finding Order in Nature: The Naturalist Tradition from Linnaeus to EO Wilson*. Baltimore (MD): Johns Hopkins University Press.
- Ham K. 2008. Bellevue Baptist Middle School visits Creation Museum. Available on-line at <<http://blogs.answersingenesis.org/aroundtheworld/2008/05/30/bellevue-baptist-middle-school-visits-creation-museum/>>. Last accessed May 20, 2009.
- Heaton T. 2007. A visit to the Creation “Museum”. *Reports of the National Center for Science Education* 27 (1–2): 21–4.
- Henry K. 1996 Dec 12. Footprints of fantasy. *Dallas Observer*. Available on-line at <<http://www.dallasobserver.com/1996-12-12/news/footprints-of-fantasy/4>>. Last accessed September 12, 2009.
- Hooper-Greenhill E. 2007. *Museums and Education: Purpose, Pedagogy, Performance*. New York: Routledge.
- Hovind K. nd-a. *Dinosaur Adventure Land: An exciting science learning and activity center for all ages* [VHS]. Pensacola (FL): Creation Science Evangelism.

Hovind K. nd-b. About Creation Science Evangelism. Available on-line at <<http://www.drdino.com/read-article.php?id=67>>. Last accessed May 11, 2009.

Hovind K. 2006. *Ideas for Starting a Creation Ministry* [audio CD]. Pensacola (FL): Creation Science Evangelism.

Jack B, Carter R. 2008. BC Tours. Available on-line at <<http://bctours.org>>. Last accessed February 12, 2008.

Kitzmiller et al v Dover Area School Board et al. 2005. Available on-line at <<http://www.pamd.uscourts.gov/kitzmiller/decision.htm>>. Last accessed September 13, 2009.

[IRS] Internal Revenue Service (USA). 2006. Return of organization exempt from income tax (IRS Form 990): Answers in Genesis.

[IRS] Internal Revenue Service (USA). 2007a. Return of organization exempt from income tax (IRS Form 990): Creation Evidence Museum.

[IRS] Internal Revenue Service (USA). 2007b. Return of organization exempt from income tax (IRS Form 990): Institute for Creation Research.

Leichman A. 2009 Jun 1. Creation museum still draws crowds, ruffles feathers after 2 years. *Christian Today Australia*. Available on-line at <<http://au.christiantoday.com/article/creation-museum-still-draws-crowds-ruffles-feathers-after-2-years/6363-2.htm>>. Last accessed June 1, 2009.

[LLF] Life and Light Foundation. nd. *Creation & Earth History Museum*. Santee (CA): Life and Light Foundation. Available on-line at <http://www.lifeandlightfoundation.org/documents/museum_ebrochure_000.pdf>. Last accessed November 11, 2009.

Morris H. nd. *Creation and its Critics*. Dallas (TX): The Institute for Creation Research. Available on-line at <http://www.icr.org/home/resources/resources_tracts_caic/>. Last accessed May 12, 2009.

Numbers RL. 2006. *The Creationists: From Scientific Creationism to Intelligent Design*, expanded ed. Cambridge (MA): Harvard University Press.

Olmi G. 1985. Science-honour-metaphor: Italian cabinets of the sixteenth and seventeenth centuries. In: Impey O, MacGregor A, editors. *The Origins of Museums: The Cabinet of Curiosities in Sixteenth- and Seventeenth-Century Europe*. New York: Oxford University Press. p 5–16.

Phelps D. 2008. The Anti-Museum: An overview and review of the Answers in Genesis Creation Museum. Available on-line at <<http://ncseweb.org/creationism/general/anti-museum-overview-review-answers-genesis-creation-museum>>. Last accessed September 13, 2009.

Riddle M. 2004. Astronomy and the Bible [PowerPoint presentation]. Santee (CA): Institute for Creation Research. Available on-line at <<http://www.answersingenesis.org/home/area/overheads/TOC.asp>>. Last accessed December 20, 2008.

Rooney B, Patria M. 2009 Feb 9. “Biblically correct” tour guides. ABC News [broadcast]. Available on-line at <<http://abcnews.go.com/m/screen?id=4467337&pid=574>>. Last accessed June 10, 2009.

Russell B. 1935. *Religion and Science*. New York: Home University Library.

Schudel M. 2006 Mar 1. Henry Morris: Intellectual father of “creation science”. *The Washington Post*. Available on-line at <<http://www.washingtonpost.com/wpdyn/content/article/2006/02/28/AR2006022801716.html>>. Last accessed January 10, 2009.

Shapin S. 2004. The way we trust now: the authority of science and the character of the scientist. In: Bechler R, editor. *Trust Me, I'm a Scientist*. London: British Council. p 42–63.

Ward A. 2008. Faith-Based theme parks and museums. In: Schultze J, Woods R, editors. *Understanding Evangelical Media*. Downers Grove (IL): IVP Academic. p 161–171.

Whitcomb JC Jr, Morris H. 1961. *The Genesis Flood*. Philadelphia: Presbyterian & Reformed.

White A. 1876. *A History of the Warfare of Science with Theology in Christendom*. New York: D Appleton and Company.

AUTHOR'S ADDRESS

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

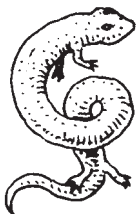




FIGURE 1 A *Utahraptor* reconstruction at the Creation Museum teaches the difference between “Human Reason” and “God’s Word” and how the two “ideologies” perceive fossils.

INTRODUCTION

“Missionary lizards”: that’s how Answers in Genesis refers to dinosaurs. Stegosaurus and triceratopses have become the new mascots for this particular sect of biblical literalists. Visitors to the Creation Museum can witness the interaction of the first man, Adam, with an *Ankylosaurus* in the Garden of Eden, see sauropods among the lineup of Noah’s animals on the ark, and learn about God’s Word from a helpful *Utahraptor* (Figure 1). Dinosaurs, however, are only one of the many scientific motifs utilized by the Creation Museum to promote the stories of Genesis. Visitors to the museum can also learn that trilobites were created on the fifth day with dolphins and other aquatic animals, how Pangaea was split into the modern continents during Noah’s flood, and how a race of modern humans called Neanderthals was dispersed after a fiasco at the Tower of Babel. Meanwhile, hundreds of accompanying textual passages remind visitors that modern scientific theories are inaccurate if they do not conform to biblical stories. Foremost among the museum’s complaints is the theory of evolution, which the museum maintains is both unscientific and immoral.

Many educators have already deplored the museum’s rejection of evolutionary theory (Chang 2009, Kennerly 2009, McMurray 2009, Asma 2008, Young 2008, Asma 2007, Huntington 2007, and Phelps 2008 offer a sampling). However, though the museum may

Missionary Lizards: What the Creation Museum Reveals About Natural History Exhibits

Katherine E Schroer

lack scientific merit, it offers one redeeming factor for science educators: it provides us an excellent opportunity to understand what scientific icons have become important to the American public — so much so that creationists are determined to use scientific icons to validate religious belief. Comparing similar displays at the Creation Museum and traditional natural history museums allows us to answer two basic questions: what motifs are shared by both anti-evolutionary and evolutionary exhibits, and how are these motifs used to teach the public? The results of these comparisons reveal the different pedagogical strategies used in anti-evolutionary and evolutionary exhibits. Surprisingly, such comparisons also show a disparity between evolutionary exhibits at local and national natural history museums.

Since there is no secular institution that is exactly comparable to the Creation Museum, it was necessary to make comparisons on two levels: (1) large natural history museums aiming for a national or even international audience; and (2) regional museums that tend to be less comprehensive in their collections and exhibits or that focus on local features or discoveries. In the first group this study includes three of the largest natural history museums in the US: the Field Museum in Chicago, the American Museum of Natural History (AMNH) in New York City, and the Smithsonian Institution’s National Museum of Natural History (NMNH) in Washington DC. Unlike the Creation Museum, which lies just off I-275 in Petersburg, Kentucky, these museums are located in large cities, attract both public and private funding, and boast exponentially larger collections. Although such a comparison may seem unfair, the Creation Museum’s controversial message and robust attendance have garnered national media attention that invites comparison with more established natural history institutions.

Katherine E Schroer is a graduate student in the Hominid Paleobiology Doctoral Program at the Center for the Advanced Study of Hominid Paleobiology, Department of Anthropology, George Washington University, where she studies the molecular development of primate teeth. She has interned with both the American Museum of Natural History and the National Museum of Natural History.

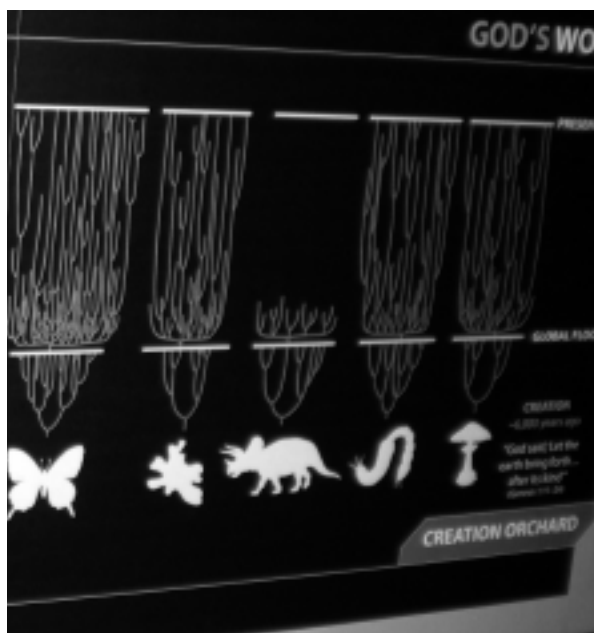


FIGURE 2 This display in the Creation Museum explains the concept of baraminology. According to baraminology, God created “kinds” of organisms. These kinds changed over time through natural selection into several species. A bottleneck event occurred during the flood, when only one male and one female of each “kind” were spared destruction. After this, organisms again rapidly changed into many species through natural selection with special abilities given to them by God.

Many creationists, including Answers in Genesis, even *encourage* such comparisons (Dewitt 2007, McKeever and others 2007). For example, Biblically Correct Tours, a creationist company that provides “alternative” interpretations of exhibits in natural history museums, sees such comparisons as opportunities to test religion against reality (Hendrix 2009).

In addition to natural history museums of national prominence, my sample also includes the Behringer-Crawford Museum and the Cincinnati Museum of Natural History and Science. These two museums are within 25 miles of the Creation Museum and, along with Big Bone Lick State Park, represent the nearest natural history institutions. Though they lack the Creation Museum’s national spotlight, the Behringer-Crawford Museum and the Cincinnati Museum share the regional audience.

The exhibits in these six museums share many motifs, including pictorial models of DNA, imposing skeletons of mammoths, and explanations of the origin of the Grand Canyon. For the sake of brevity, however, I report here on two major icons invoked at the Creation Museum: dinosaurs and human relatives. These two icons represent the “candy” and “crisis” of evolutionary theory: the former draws audiences into exhibits (Asma 2001, Diamond and Scotchmoor 2006) and the latter scares even evolution-espousing members of the public into creationist explanations (Spiegel and others 2006). For readers interested in a more thorough walk-through of the Creation Museum, I recommend Phelps (2008) and Heaton (2007), both available on NCSE’s website.

DINOSAURS

The dinosaurs at the Creation Museum feature prominently in its entrance hall and afterwards reappear sporadically throughout its facility. Dinosaur images frequently accompany biblically inspired dioramas and occur most often in the form of life-sized reconstructions rather than fossil material. Few fossils, or even fossil replicas, are found in the museum. Fossils that are on display are found in randomly associated glass cabinets that invoke the curiosity cabinets of a bygone age. Often, the isolated fossils in these cabinets are haphazardly associated with the fossils of animals “created” on different “days”.

As visitors exit the first two halls of the museum, they encounter an occasional and diminished dinosaur presence. Dinosaurs can be spotted foraging next to Adam in the Garden of Eden, ravenously eating meat as Cain kills his brother Abel, and tractably boarding Noah’s Ark with various other land animals. Visitors walk along this chronological path of biblical stories, ending abruptly in the middle of the 11th chapter of Genesis (there are 39 more chapters to go). At this point, the museum skips most of the Bible and features an abbreviated video of the life of Christ. Upon exiting this video, visitors have the option of visiting either the chapel on the left or the Dinosaur Den to the right.

The Dinosaur Den exhibit represents the only other concentration of dinosaurs within the museum aside from the entrance hall. This exhibit features numerous life-sized dinosaur reconstructions but only one composite fossil specimen. No fossil evidence accompanies any of the dinosaur reconstructions. The dinosaurs are also not grouped according to their biblical “kinds”. Kinds include all animals that look similar (Figure 2), and Answers in Genesis currently recognizes 50 or fewer dinosaur kinds (Purdom and Hodge 2008). However, the Creation Museum does not distinguish between its different kinds of dinosaurs on display. The Dinosaur Den even includes a reconstructed *Archaeopteryx*, which the Creation Museum maintains is a bird, not a dinosaur — a different kind of animal, created on a different day. *Archaeopteryx*’s role in the exhibit is to establish that birds and dinosaurs are different kinds, rejecting a current hypothesis of evolution that birds, possibly including *Archaeopteryx*, are descendants of theropod dinosaurs.

In contrast, natural history museums collect almost all of their dinosaur material within dedicated dinosaurian halls. The major exceptions to this rule are dinosaurs in the entrance halls of the AMNH and Field Museum. However, outside of entrance displays, dinosaur materials are always in close proximity to each other. Rarely does a reconstruction appear without its fossil template appearing nearby. At the AMNH and Field Museum, associations among specimens are illustrated in tree diagrams showing evolutionary relationships (Figure 3). These pictorial representations offer hypotheses as to how common ancestry accounts for why certain dinosaurs share similar features. For example, the inference that modern birds are descendants of dinosaurs is featured extensively in exhibit material at the AMNH, the NMNH, and the

continued on page 27

Creationism and Young-Earth Creationism

*This note is excerpted from material posted on the NCSE website.
To see the original, please visit <<http://ncseweb.org/creationism/>>.*

For more than two decades, the National Center for Science Education has been opposing efforts by creationists to weaken or block the teaching of evolution. The “creationism” section of our website offers articles about anti-evolution creationist movements, critiques of creationist writings, and collections of materials on the leading lawsuits over efforts to teach creationism or to undermine the teaching of evolution in public schools.

Creationism refers to the religious belief in a supernatural deity or force that intervenes, or has intervened, directly in the physical world. Within that broad scope, there are many varieties of creationist belief. Some forms of creationism hold that natural biological processes cannot account for the history, diversity, and complexity of life on earth. Such “anti-evolution” creationists have been leading opposition to the teaching of evolution since the 1920s.

The term “creationism” will be used here to refer to anti-evolution creationism with claims to *scientific* status for ideas about the history and diversity of life that are primarily derived from religious perspectives. NCSE’s critique of these perspectives is that they are not scientific and should never be presented as such. There are also critiques of these perspectives from religious, philosophical, and historical scholars. Readers interested in these perspectives might find Peter Hess’s detailed analysis helpful (<<http://ncseweb.org/religion/>>).

The institutions discussed in this issue are mainly run by “young-earth” creationists (YEC) — which is probably what most people think of when they hear the word “creationism”. Young-earth creationists adopt a method of biblical interpretation that requires that the earth be no more than 10 000 years old, and that the six days of creation described in Genesis each lasted for 24 hours of 60 minutes each. YECs believe that the origin of the earth, the universe, and various forms of life, and so on, are all instances of special creation. The doctrine of special creation involves direct divine intervention, suspending the laws of nature to achieve a given result. This doctrine contrasts with a view common among theistic evolutionists that God can work through natural laws.

Young-earth creationists are among the more organized creationist movements. Two of the largest groups, Answers in Genesis and the Institute for Creation Research, produce magazines, websites, books, and videos for general audiences as well as publish journals which report on so-called creation science. In May 2007, Answers in Genesis opened its multi-million dollar

Creation Museum in Kentucky, aimed at attracting a wide public audience. The Institute for Creation Research was founded by Henry Morris in 1970 and opened the Museum of Creation and Earth History in Santee, California, in 1992. ICR operated the museum until its move to Dallas in 2008.

YEC writings tend to focus on attempting to explain why much of modern science cannot be correct. For example, YECs spend considerable effort trying to explain why the earth cannot be 4.5 billion years old. They also make arguments for the feasibility of Noah’s ark and for the occurrence of a single worldwide flood within the last 5000 years. A major YEC endeavor is to explain how the 15 million or more species alive today could have evolved from a much smaller number of “kinds” which they believe were created in Genesis. This project is sometimes referred to as baraminology — derived from a compound Hebrew word understood to mean “created kind” as it appears in Biblical passages like “Let the earth bring forth the living creature after its kind, cattle, and creeping thing, and beast of the earth after its kind.” A central tenet of young-earth creationism is that evolution is possible only within these created kinds — a form of evolution they call microevolution — while it is not possible between kinds — a process they distinguish as macroevolution. Of course, this is not the way those terms are used by the scientific community.

Attempts to force YEC teachings into public schools were rejected by a federal court in *McLean v Arkansas* in 1982, and again by the Supreme Court in *Edwards v Aguillard* in 1987.

FURTHER READING

NCSE’s Eugenie C Scott describes the place of YEC within the Creation–Evolution Continuum:
<<http://ncseweb.org/creationism/general/creationevolution-continuum/>>.

Daniel J Phelps and Timothy H Heaton recount their visits to Answers in Genesis’s Creation Museum:
<<http://ncseweb.org/creationism/general/anti-museum-overview-review-answers-genesis-creation-museum/>>
<<http://ncseweb.org/rncse/27/1-2/visit-to-new-creation-museum/>>

William Thwaites provides a concise history of creationism through the ages:
<<http://ncseweb.org/creationism/general/creationism-past-present/>>

FOR THE BIRDS

"Did the MIRACLE OF FLIGHT come from frayed, loosely hanging FISH SCALES? Did the myriads of birds EVOLVE from ungainly, hulking caymans and crocodiles? Evolutionists say they did. Reason, logic, common sense, TRUE science and the Great Creator God say they DIDN'T! Here's the PROOF!" That, capitalization and all, is how a creationist tract from the early 1970s begins (Garner Ted Armstrong and Paul W Kroll, "A theory for the birds," Pasadena [CA]: Ambassador College Press, 1971) — and there has been little in the way of progress since, judging from the latest ornithological effusions of Answers in Genesis and the Institute for Creation Research. On the other hand, evolution and ornithology continue to be birds of a feather, providing mutual support and enlightenment, as studies ranging from the Galápagos islands and their iconic finches to the fossil beds of China and Mongolia and their feathered dinosaurs illustrate. The following books are available through the NCSE website: <<http://ncseweb.org/store>> — look in the "In the latest RNCSE" section. And remember, every purchase benefits NCSE!



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

ORNITHOLOGY AND ORNITHOLOGISTS

Ornithology, third edition
by Frank B Gill

The leading textbook in its field, now in its third edition, *Ornithology* begins, appropriately, with a section on origins, discussing the diversity of birds, their evolutionary history, and their systematics. "The power of evolution by natural selection is the central theme of this book," Gill explains. "The adaptations of birds ranging from morphology and physiology to migration and mating systems are testimony to the pervasive role of Darwinian evolution in action through the millennia." The author is a former president of the American Ornithologists' Union and a former Senior Vice President and Director of Science for the National Audubon Society.

Ornithology, Evolution, and Philosophy: The Life and Science of Ernst Mayr 1904-2005
by Jürgen Haffer

As Jürgen Haffer's title suggests, the late Ernst Mayr — a member of NCSE — was a towering figure in several fields, including ornithology. (He coauthored a book on the birds of northern Melanesia in 2001 — at the age of 97!) Reviewing *Ornithology, Evolution,*

and Philosophy in a recent issue of *Evolution: Education and Outreach*, Ulrich Kutschera wrote, "After reading Haffer's comprehensive biography, we have to conclude that Ernst Mayr may be regarded as the 'Einstein of the modern life sciences.' This first biography ... will certainly open a series of books on Ernst Mayr and his outstanding scientific achievements."

The Speciation and Biogeography of Birds
by Ian Newton

"This book is about the formation and diversity of bird species, their geographical distributions and their migration patterns," Ian Newton explains in his introduction. "It is an attempt at a fresh synthesis which draws from recent developments in the biological sciences, as well as in the earth sciences of geology and climatology." The reviewer for *Trends in Ecology and Evolution* described the book as "a readable, balanced and comprehensive review that will become a standard textbook for courses in avian biogeography," adding, "I believe that this book will be warmly welcomed by bird biologists and enthusiasts alike."

Speciation in Birds
by Trevor Price

Peter R Grant writes, "Trevor Price takes up the challenge to explain how birds speciate, and succeeds magnificently. It is a comprehensive review of all the major ideas, beautifully illustrated with pictures of birds. More than 1300 works are cited, but more impressive is the range of subjects, from genetics to biogeography, from the reconstruction of phylogeny to ecology and the causes of reproductive isolation, all discussed with admirable clarity. If they were alive today Ernst Mayr would bestow patrician approval on this work of scholarship, and Theodosius Dobzhansky would applaud from the sidelines." The author is Professor of Biology at the University of Chicago.

DARWIN'S FINCHES

Ecology and Evolution of Darwin's Finches
by Peter R Grant

Originally published in 1986, Peter R Grant's classic study of natural selection in action among Darwin's finches, based on over a decade's worth of detailed observations in the field, was immediately hailed by the reviewer for *The Auk* as "a classic that deserves to be in everyone's library." The



1999 reissue contains a new foreword by Jonathan Weiner, whose *The Beak of the Finch* won a Pulitzer Prize, as well as a new preface and afterword by the author and a thoroughly updated bibliography. Grant and his wife Rosemary Grant were awarded the Linnean Society's Darwin-Wallace medal in 2008 and the Kyoto Prize in 2009.

*How and Why Species Multiply:
The Radiation of Darwin's
Finches*

by Peter R Grant and B Rosemary Grant

The culmination of over thirty years of research on Darwin's finches by two leading evolutionary biologists, *How and Why Species Multiply* uses geography, ecology, behavior, and genetics to trace the evolutionary history of fourteen different finch species as they diverge from a common ancestor about three million years ago. David B Wake writes, "What really distinguishes the book, of course, is the authority of the authors, who have lived with these birds for many years and have unparalleled familiarity with them. Readers will benefit enormously from the scholarship in this book." "[E]xciting and lucid reading," wrote the reviewer for *Science*.

*Pilgrim on the Great Bird
Continent*

by Lyanda Lynn Haupt

Pilgrim on the Great Bird Continent interweaves a biographical sketch of Darwin that emphasizes his ornithological work together with extensive personal details from Haupt's own experience in the field, with birds, and in the conservation movement. Reviewing the book for *RNCSE*, Paul Lawrence Farber wrote, "Darwin's humanity, humility, and observational acuity emerge in [Haupt's] telling of his life seen through the lens of his interest in birds. This is an ideal book to give to a birdwatcher acquaintance who thinks Darwin was some sort of modern devil, out to destroy religion and to dehumanize our picture of nature."

The Beak of the Finch

by Jonathan Weiner

From the publisher: "On a desert island in the heart of the Galápagos archipelago, where Darwin received his first inklings of the theory of evolution, two scientists, Peter and Rosemary Grant, have spent twenty years proving that Darwin did not know the strength of his own theory. For among the finches of Daphne Major, natural selection is neither rare nor slow; it is taking place by the hour, and we can watch." Praised by the *Washington Post Book World* for its "[e]vocative writing, exhaustive research, and Weiner's memorable portrait of the engaging Grants," *The Beak of the Finch* won the Pulitzer Prize for General Non-Fiction in 1995.

DINOSAURS AND BIRDS

Glorified Dinosaurs:

*The Origin and Early
Evolution of Birds*

by Luis M Chiappe

Glorified Dinosaurs presents a comprehensive summary of the exciting paleontological discoveries that provide evidence for the dinosaurian ancestry of birds. The reviewer for *Natural History* wrote, "In this handsome book, whose brilliant illustrations and magisterial breadth beg comparison with Bert Hölldobler and Edward O Wilson's classic monograph, *The Ants*, Chiappe lays out the evidence and presents the case with a flourish ... a book that dinosaur lovers and bird fanciers alike will want to make part of their permanent collections." The author is the director of the Dinosaur Institute at the Natural History Museum of Los Angeles County.

The Bone Museum:

*Travels in the Lost Worlds of
Dinosaurs and Birds*

by Wayne Grady

In *The Bone Museum*, science journalist Wayne Grady wittily and insightfully chronicles his travels around the world with the paleontologist Philip J Currie as he continues to investigate the

evolutionary connections between dinosaurs and birds. "Pluck the feathers off a bird," Currie tells Grady, "and you've got a dinosaur." Wrote the reviewer for *Publishers Weekly*, "Whether he's musing over the migratory patterns of birds or where to buy winter gloves in Patagonia, Grady's intelligent, seasoned, witty writing makes for a pleasurable and thought-provoking read." Grady is also the author of *The Dinosaur Project: The Story of the Greatest Dinosaur Expedition Ever Mounted*.

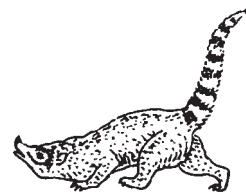
*Taking Wing: Archaeopteryx
and the Evolution of Bird Flight*
by Pat Shipman

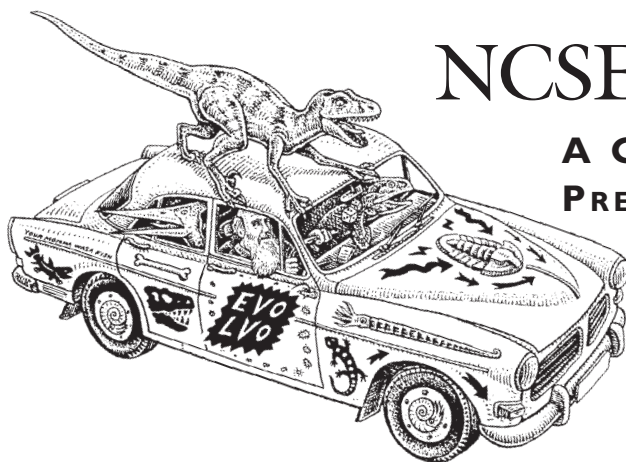
From the publisher: "In 1861, just a few years after the publication of Charles Darwin's *On the Origin of Species*, a scientist named Hermann von Meyer made an amazing discovery. Hidden in the Bavarian region of Germany was a fossil skeleton so exquisitely preserved that its wings and feathers were as obvious as its reptilian jaws and tail. This transitional creature offered tangible proof of Darwin's theory of evolution. Hailed as the First Bird, *Archaeopteryx* has remained the subject of heated debates for the last 140 years. Are birds actually living dinosaurs? Where does the fossil record really lead? Did flight originate from the 'ground up' or 'trees down'?"

Feathered Dinosaurs

by Christopher Sloan

Aimed at readers in middle school, *Feathered Dinosaurs* offers a scientifically accurate and lavishly illustrated introduction to the evidence for the dinosaurian ancestry of birds. The reviewer for *Booklist* writes, "Sloan puts all the facts together in a way that is engaging, accessible, and intriguing enough to get readers hooked on nonfiction." "The feathered and nearly feathered dinosaurs are among the most exciting animals to be discovered in the fossil record for decades," Kevin Padian proclaims. "In this book Christopher Sloan gives you a first look at them and tells you why they provide even more evidence that birds evolved from dinosaurs."





NCSE on the Road

**A CALENDAR OF SPECIAL EVENTS,
PRESENTATIONS, AND LECTURES**

VISIT THE GRAND CANYON WITH SCOTT AND GISH!

FEATURING NCSE's executive director, Eugenie C Scott
and Alan D Gishlick

DATES July 1, 2010 - July 9, 2010

Twenty-four lucky NCSE members will raft the full length of the canyon from Marble Canyon to South Cove, experiencing one of the most beautiful and majestic natural features on the planet.

Of course, as Eugenie C Scott, NCSE's executive director, will inform the rafters, the whole Colorado plateau was laid down by the receding waters of Noah's Flood about 4300 years ago, and the Grand Canyon itself was gouged catastrophically in a matter of days. Geologist Alan "Gish" Gishlick will present the standard geological history of Grand Canyon to the rafters — and they can make up their own minds"

NCSE's "Creation/Evolution Grand Canyon Raft Trip" is a wonderful way to learn about the creationism/evolution controversy in a fabulous natural setting.

**THE 2009 TRIP SOLD OUT EARLY.
MAKE RESERVATIONS NOW FOR 2010!**

DATE December 2, 2009
CITY Fresno CA
PRESENTER Eugenie C Scott
TITLE Why All the Fuss about Evolution?
EVENT Public lecture
TIME 7:30 PM
LOCATION Fresno State University,
Satellite Student Union Auditorium
CONTACT Madhusudan Katti, mkatti@csufresno.edu

DATE January 25, 2010
CITY Fort Collins CO
PRESENTER Eugenie C Scott
TITLE Not Over After Dover: What We Learned from
Kitzmiller v Dover
EVENT Colorado State University
Colloquium in the Life Sciences series
TIME TBA
LOCATION TBA
CONTACT Leon van Eck,
CAS_colloquium@mail.colostate.edu

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

JOIN US AT THE NATIONAL CENTER FOR SCIENCE EDUCATION

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

Name _____
Address _____
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) ☐ Discover ☐ VISA ☐ MasterCard ☐ AmEx

NCSE MEMBERSHIP

☐ One Year US: \$30 Foreign Air: \$39
☐ Lifetime \$600

Tax Deductible Contribution to NCSE

TOTAL

Credit card number _____ Expiration Date _____

Name as it appears on card _____ Signature _____

Field Museum. These museums also update their exhibits frequently.

Although they date fossils in millions of years, neither the Behringer-Crawford Museum nor the Cincinnati Museum of Natural History and Science explicitly promote evolution in their permanent displays. In fact, their natural history exhibits generally lack the word “evolution.” The only exception is in two temporary exhibits at the Cincinnati Museum: one that discusses dinosaur evolution and the other emphasizing Charles Darwin’s contributions to modern science. Conversely, national natural history museums use dinosaurs as a vehicle to teach evolutionary themes.

HUMANS AND THEIR RELATIVES

Hominin material is rare at the Creation Museum, although it is planning a new exhibit to address human origins through a creationist lens (Leichman 2009). Currently, the museum contains only three mentions of hominin ancestors. The first is in the “Who’s Who” exhibit of the entrance hall, where a reconstruction of the Lucy fossil appears in a lineup of important evolutionary icons, and where she is labeled as an ape. She is also singled out in diagrams comparing a scientific understanding of human origins (which includes Lucy’s relationship to human ancestors) and the creationist model (in which apes, including Lucy, are created separately from humans) (Figure 4). The museum also mentions *Homo erectus*, Neanderthals, and Cro-Magnon people, which the museum claims are races of modern humans that no longer exist. According to the museum, these races were scattered with the rest of humanity after humans defied God by building the Tower of Babel.

The fossils of the Creation Museum’s early halls usher visitors into several rooms void of natural history elements. Two of these exhibits — Graffiti Alley and Culture in Crisis — single out the theory of evolution for attack. Several walls of plastered newspaper clippings visually connect stories of teaching evolution with euthanasia, abortion, racism, suicide, school-shootings, homosexuality, and parents’ spending less time with their children (Figure 5). Talking-head videos show individuals caught up in illegal drug use, teen pregnancy, and divorce, while nearby, a diorama features a wrecking ball labeled “Millions of Years” crashing into a church. The relationship between these exhibits and natural history displays before and after them remains unclear.

Although the amount of hominin material at the Creation Museum is small, it boasts more hominin material than the secular natural history museums in this region. Neither the Cincinnati Museum of Natural History and Science nor the Behringer-Crawford Museum contains exhibits addressing human evolution. The AMNH, the NMNH, and the Field Museum, however, all have exhibit space devoted to the topic. These museums vary in their presentation of human relatives, though their exhibits all feature multiple fossil samples and anatomical comparisons of fossil evidence with modern humans. At the AMNH, human fossils have their own dedicated hall that includes a large section devoted to under-

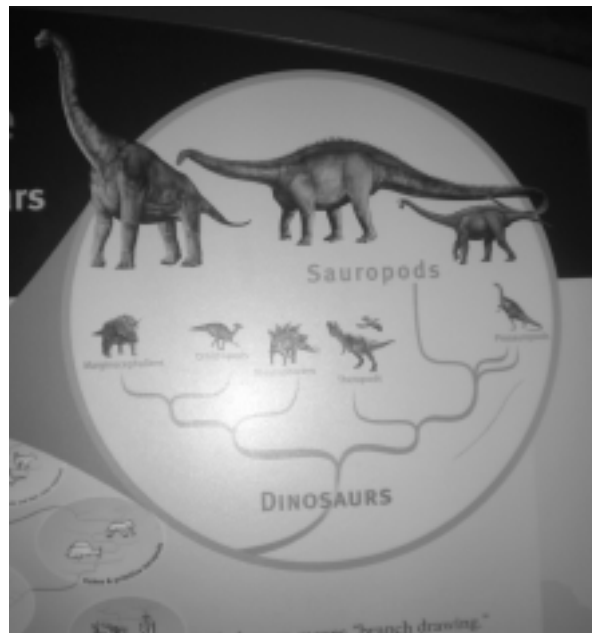


FIGURE 3 An evolutionary tree in the *Evolving Planet* exhibit at the Field Museum offers one hypothesis about how the dinosaurs in the display might be evolutionarily related to other dinosaurs. The diagrams throughout the exhibit invite the audience to notice the anatomical evidence on the specimens that supports such groupings.

standing the lines of evidence (genetic and paleontological) that suggest these fossils demonstrate human evolution. Another section discusses cultural characteristics of humans, such as art, and their relative uniqueness compared to other animals. This portion of the exhibit also includes a display describing how scientists often reconcile their religious beliefs and scientific theories. The fossils and fossil replicas in the exhibit are numerous and the human relatives are arranged non-linearly, with an associated cladogram to help visitors understand the evolutionary relationships among the fossils on display. The fossils are sometimes accompanied by life-sized dioramas showing diverse hominin behaviors in ecological context and providing paleontological evidence supporting these portrayals.

Unlike the AMNH, the NMNH and the Field Museum’s human evolution exhibits appear as smaller parts of larger fossil halls. The NMNH’s former human evolution exhibit existed as part of their hall on ice age mammals, though the exhibit recognized that many human relatives existed long before the last ice age. The exhibit included a number of isolated fossil replicas, mostly skulls, and arranged them in a linear model of descent. Its most prominent display was a reconstruction of a Neanderthal burial, which, at the time, was revolutionary in its portrayal of Neanderthals (Figure 6). After several decades, the NMNH’s human evolution exhibit was outdated and featured several corrections to its displays. The exhibit is now closed as the NMNH prepares to open a new permanent human evolution exhibition. In the Field Museum, the exhibit on human evolution likewise exists as a small part of a much larger exhibit. In this

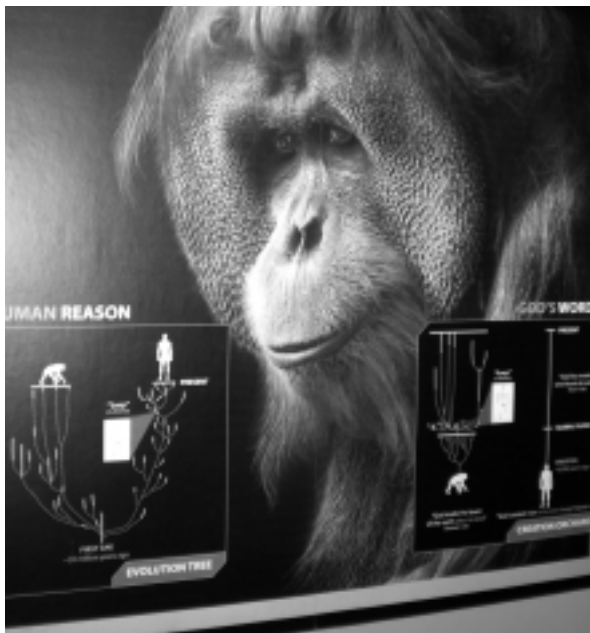


FIGURE 4 A poster in the Creation Museum demonstrates the belief that the australopithecine Lucy (represented by a white rectangle) is more similar to modern apes than humans. On the left, an inaccurate evolutionary diagram entitled the “Evolution Tree” shows apes and humans diverging from a common ancestor. Lucy is vaguely included on the human side of this diagram. On the right side, the creationist view, called the “Creation Orchard,” shows Lucy and all modern apes originating from a generic “ape-kind” created by God. Humans, in this diagram, never change from their created kind.

case, the exhibit is embedded within a series of displays devoted to the evolution of different mammal groups, and these exhibits are further embedded within the massive Evolving Planet exhibition that also includes the museum’s dinosaurs. Although it includes fewer representative species than the AMNH, the Field Museum likewise displays skeletons of human relatives and discusses their evolutionary relationships to humans and other primates through anatomical and genetic comparisons.

DIFFERENCES BETWEEN THE CREATION MUSEUM AND NATURAL HISTORY MUSEUMS

Comparisons of dinosaur and hominin exhibits reveal critical differences both between the Creation Museum and natural history museums, and within natural history museums. At the Creation Museum, the structure of its exhibits challenges its claim that it offers a valid scientific alternative to natural history museums. Although the Creation Museum claims it has the “same facts, [but] different conclusions” as natural history museums, even a superficial comparison shows that the Creation Museum does not start with the same facts.

Rather than base its exhibits on material evidence, the Creation Museum marginalizes its fossil specimens. It is essentially a collection of biblically-inspired posters with videos and animatronics in between. What fossils do appear are not grouped systematically; animals of

similar “kinds” appear disassociated and sometimes with animals not created on the same “day”. Conversely, natural history museums favor interpretations based foremost on material evidence. In the case of the Field Museum, for instance, about 90% of its exhibits are real fossils (as in the Evolving Planet exhibit). The displays of the Behringer-Crawford Museum show that even small natural history museums will rely on actual fossils for their displays. Natural history museums group their material in systematic way, providing their audiences opportunities for comparative reasoning. They apply a consistent epistemology (the scientific method) to their interpretations of material evidence, even presenting multiple viewpoints when there is more than one competing scientific explanation.

The Creation Museum’s material is epistemologically inconsistent, as is the museum’s message. Though the museum attempts to inject science into the book of Genesis, the museum simultaneously argues that acceptance of scientific theories such as evolution will produce public immorality. The displays of the Creation Museum use exclusionary dialog to ostracize mainstream scientists, non-Christians, political liberals, divorcees, homosexuals, and many others (Figure 5). Natural history museums prefer the use of inclusionary dialog, and commentary on public morality is usually in the context of the evolution of cooperation in human groups. Natural history museums specifically restrict political commentary to the issues of reconciling religion and science (AMNH), supporting environmental conservation (AMNH, NMNH, Field Museum, and Cincinnati Museum), and celebrating human diversity (AMNH, NMNH, Field Museum, and Cincinnati Museum).

The subject of human diversity reveals a particular disparity in the Creation Museum’s exhibit logic. The Creation Museum maintains that God created all humans equally and argues that evolutionists are responsible for social Darwinism and racism. In its haste, the museum ignores the role of some Christians in perpetuating racism in the United States, ignores the role of evolutionists in establishing that all humans are one species, and ignores the many passages of the Bible which permit slavery based on ancestry (Genesis 9: 25–27 is an example). Like its presentation of science, the Creation Museum rejects historical interpretations which do not conform to its ideology. Conversely, natural history museums offer corrections to their exhibits, present multiple explanations and opinions concerning both their scientific and historic material, and refrain from attacking other ideologies. Natural history museums, unlike the Creation Museum, are opportunities for intellectual introspection.

The Creation Museum’s exhibit design also demonstrates that their exhibits are intended as part of a sermon, rather than an opportunity for discussion. The museum’s exhibits feature little audience involvement. First, the museum’s text relies on declarative statements rather than the inquiry-based learning promoted by most museums. The Creation Museum features few questions, and those which do appear can generally be characterized as “existential”. For instance, a large display in an early exhibit reads, “Why am I here?” Similar questions ask, “Am I alone? Why do

I suffer? Why do I have to die?" The Creation Museum also lacks interactives. The museum features two opportunities for engagement: a triceratops statue with a saddle for visitors and a nine-piece puzzle of Noah's ark for youngsters. This is a stark contrast to the many different types of interactive material available at natural history museums. Even small museums include play areas, question blocks, scavenger hunts, and opportunities for the audience to record their own opinions. Most natural history museums, including the Cincinnati Museum, also feature glass-walled labs that invite the audience to participate in the scientific process.

WHAT THE CREATION MUSEUM DOES WELL

The Creation Museum is a useful tool for science educators; it clearly highlights gaps in the public's current understanding of evolutionary theory. For example, many people connect dinosaurs with science, but in the public mind, all dinosaurs belong together. This includes dinosaurs separated by geography, taxonomic affiliation, and millions of years; hence, the Dinosaur Den exhibit at the Creation Museum. Most members of the public are also familiar with the evolutionary inference that apes and humans are related, and many recognize similarities between humans and apes. However, many also mistakenly assume that humans evolved *from* modern apes, rather than understand that both groups shared a recent common ancestor. The Creation Museum itself misunderstands this aspect of evolutionary science when it describes australopithecines as a group of modern apes. Most of the public also accepts that species are adapted to fill ecological niches; they accept the principle of natural selection. However, they do not necessarily grasp the concept that natural selection, over time and during periods of isolation, can produce descendant species different from their ancestral populations. The Creation Museum appropriates this evolutionary disconnect in its new "Natural Selection is Not Evolution" exhibit to argue that, while natural selection happens, evolution does not.

The Creation Museum also helps to illuminate how the public approaches science itself. Answers in Genesis differentiates between "origins sciences" (such as evolution) and "operational sciences" (such as medicine and genetics) (McKeever and others 2007). While the operational types of science are testable and useful, Answers in Genesis maintains that "origins sciences" have no evidence to support them. In other words, Answers in Genesis appreciates science only in terms of narrowly defined "proofs" instead of an intellectual, communal, and testable process of inquiry (that is, the scientific method in practice). They are interested in the science's products rather than its process. The Creation Museum's lack of interactive dialog and repeated disparaging of "gaps" in evolutionary theory likewise dissuade the public from participating in the scientific process. Members of the public subscribed to the museum's rhetoric interpret science as only results and perceive evolution as a theory in confusion rather than a theory in motion.



FIGURE 5 A portion of Graffiti Alley at the Creation Museum, where headlines describing evolution, violence, and liberal politics are grouped together in a large mural.

DIFFERENCES AMONG NATURAL HISTORY MUSEUMS

Comparison with the Creation Museum also reveals educational differences between local and national natural history museums. Although national museums contain whole exhibits devoted to evolution, the museums nearest the Creation Museum do not even emphasize the word "evolution" in their permanent displays. Both the Behringer-Crawford Museum and the Cincinnati Museum of Natural History date their fossils in millions of years, but neither uses its exhibits to explain the concept of evolutionary change to the public. The Cincinnati Museum has begun to change this, hosting the *Dinosaurs Unearthed* evolution exhibit and building a small Darwin exhibit in honor of his bicentennial. However, evolution remains largely an afterthought to these museums' permanent displays. Human evolution is noticeably absent from the local stage.

Though they lack major evolutionary exhibits, these local museums excel at displaying regional fossils, especially marine invertebrate fossils like trilobites and the bones of mammoths and mastodons. Unlike the national museums, these fossils do not compete with dinosaurs and hominins for the public's attention; instead, the local museums are able to spotlight the rich paleontological history of their regions. Local fossils may thus provide an excellent and easy means for small museums to place greater emphasis on evolutionary theory; these fossils allow evolution to become part of the audience's everyday experience. The use of local fossils in teaching evolution lags behind dinosaur and hominin images. It took the Creation Museum more than two years after opening to include a mastodon skeleton in its displays, despite the presence of Big Bone Lick, a major, evolution-espousing paleontological site, only four miles away.



FIGURE 6 The NMNH's display of a Neanderthal burial was revolutionary at its time for its portrayal of Neanderthals. The diorama highlights the sophisticated culture of Neanderthals and their many similarities to modern humans.

The museum's sluggishness reflects the tiny role that local fossils currently play in teaching evolution.

This review of evolutionary icons at the Creation Museum, national natural history museums, and local natural history museums demonstrates that presentations of evolution are by no means uniform. Each museum uses these icons to promote educational agendas that may be anti-evolutionary, evolution-espousing, or evolution-neutral. Although the material within the exhibits might be similar, the pedagogical strategies and supporting materials can lead visitors to markedly different conclusions about the scientific processes that shape our world. Natural history museums, especially those serving local audiences, must diligently, scientifically, and confidently consider an increased emphasis on teaching the process of evolution, not just displaying its results. Otherwise, the Creation Museum will continue to succeed in its perversion of science, using it as a source of proof rather than an intellectual process. Now is an excellent opportunity for natural history museums to emulate the Creation Museum in one crucial factor: use novel presentations to change fossils from icons to eye-openers to an entire worldview.

ACKNOWLEDGMENTS

Many individuals have contributed to this ongoing research: Bruce Hardy, Kimmie Murphy, Sam Pack, and David Suggs (Kenyon College), Robert Meier (Indiana University), Robin Bernstein and Bernard Wood (George Washington University), Alison Brooks (George Washington University and NMNH), Briana Pobiner (NMNH), Matthew Sanger (AMNH), Matthew Borths (Stony Brook University), Peter W. Case, and Lena DeBaz (University of Rochester). Thank you all for your advice and reviews. Funding was provided by Kenyon College's Office of the Provost and Department of Anthropology and NSF-IGERT DGE-0801634.

REFERENCES

- Asma ST. 2001. *Stuffed Animals and Pickled Heads: The Culture and Evolution of Natural History Museums*. Oxford: Oxford University Press.
- Asma ST. 2007 May 18. Dinosaurs on the Ark: The Creation Museum. *The Chronicle of Higher Education* 53 (37): B10.
- Asma ST. 2008 Jan 17. Trapped in the Creation Museum: Evangelical curators challenge Darwinism with what some might call unnatural selection. *Chicago Tribune*.
- Chang K. 2009 Jun 29. Paleontology and creationism meet but don't mesh. *The New York Times*.
- Diamond J, Scotchmoor J. 2006. Exhibiting evolution. *Museums & Social Issues* 1 (1): 21–48.
- DeWitt DA. 2007. A tale of two museums. Available on-line at <<http://www.answersingenesis.org/articles/2007/09/10/tale-of-two-museums>>. Last accessed November 11, 2009.
- Heaton TH. 2007. A visit to the new Creation "Museum". *Reports of the National Center for Science Education* 27 (1–2): 21–4. Available on-line at <<http://ncseweb.org/rncse/27/1-2/visit-to-new-creation-museum>>. Last accessed September 13, 2009.
- Hendrix S. 2009 Mar 11. The genesis of a debate. *Washington Post* A1.
- Huntington D. 2007 Apr 27. Protests planned for grand opening of Creation Museum. *The Christian Post*.
- Kennerly B. 2009 Jun 30. Paleontologists brought to tears, laughter by the Creation Museum. Agence France Press.
- Leichman AJ. 2009 Jun 1. Creation museum still draws crowds, ruffles feathers after 2 years. *Christian Today Australia*.
- McKeever S, editor. 2007. *Museum Guide: A Bible-Based Handbook to Natural History Museums*. Hebron (KY): Answers in Genesis – USA.
- McMurray J. 2009. Jun 26 Scientists study foes' ways at Creation Museum. MSNBC.
- Phelps D. 2008. The Anti-Museum: An overview and review of the Answers in Genesis Creation Museum. Available on-line at <<http://ncseweb.org/creationism/general/anti-museum-overview-review-answers-genesis-creation-museum>>. Last accessed September 13, 2009.
- Purdom G, Hodge B. 2008. Zonkeys, ligers, and wolphins, oh my! Available on-line at <<http://www.answersingenesis.org/articles/aid/v3/n1/zonkeys-ligers-wholphins>>. Last accessed November 11, 2009.
- Spiegel AN, Evans M, Gram W, Diamond J. 2006. Visitors' understanding of evolution. *Museums & Social Issues* 1 (1): 69–86.
- Young E. 2008. Hundreds of complaints force zoo to break ties with Creation Museum. *The Christian Post* 3 December.

AUTHOR'S ADDRESS

Katherine E Schroer
Department of Anthropology
George Washington University
2110 G St NW
Washington DC 20052
schroer@gwmail.gwu.edu



FIGURE 7 The opening salvo of the Field Museum's *Evolving Planet* exhibition includes this panel discussing the origin of organic compounds on earth. The display provides evidence for two conflicting theories and notes that scientists have not yet determined which better explains the origin of life.

Reflections on a Visit to the Creation Museum

Raymond A Eve

I recently made my way through the Answers in Genesis Creation Museum on a Sunday morning. Driving to the museum, I was inclined to give AiG the benefit of the doubt — I supposed they were well-meaning and devout, but just did not have a good grasp of the basic science involved. Now, I am less sure about the innocence of their motives, and much more inclined to believe that this is a pretty cynical effort to separate the gullible from some coin of the realm, and to build membership for a social movement (which, not coincidentally, is probably good for their acquisition of even more coins).

At the entrance, I was surprised to find several uniformed police directing traffic (complete with imposingly decked-out and very military-looking Hummers). The effect was not unlike dealing with post 9-11 airport security and served to create a vague feeling of imminent danger. In contrast, there

was some comfort to be found in the form of a display of a ski boat just outside the main doors, complete with an ad for a local boat dealership. Apparently weekends at the lake with family or beer buddies are an important element of godliness to AiG adherents.

My very first impression was, “Wow, this museum cost cubic money!” (estimates vary, but \$27 million is the most common). I was to decide at the end of my visit that Hollywood and Disney would be proud of the level of presentation. My immediate first impressions were quickly followed by the inevitable theme-park-style photographer who took everyone’s picture so visitors would have the privilege of buying some copies on the way out. Then there was a “4-D” (multimedia, plus fake rainfall) movie that all were encouraged to take in at the very beginning of their visits.

Prominently featured were two “everyman” type of actors. Maybe I should say “everybody” because even though apparently about thirty years of age, they cast an ambience of white-hot sarcasm towards the teachers and professors who were depicted in the presentation as hopelessly dogmatic ignoramus intent on foisting off the great lie of evolution. But these guys were clearly too smart for them, and intended to demonstrate it in the extreme. Strange, but I rather suspect that even for the believers in the audience these two must have come off as overgrown juvenile delinquents with mannerisms they would prefer to assign to unsocialized nabobs of negativism (as Vice-President Spiro Agnew liked to say) of the followers of the 60s New Left. They seemed to me to come off as some sort of part-time long-

haul truck drivers, on way too much speed, but who just happened to have an in-depth knowledge of evolution, biochemistry, and the like that would be the envy of 99% of the PhDs at work in the relevant academic fields of study. Ultimately, what it all reminded me of is the recent emphasis by the creationist “intelligent design” supporters on having believers in the classroom confront their professors as militantly as possible — with disrespect as the tool with which to prosecute their case. I found myself wondering what kind of a world this would all lead to if we were all to become so intensely proud of our materially unsupportable viewpoints?

I really began to feel as if I had fallen down the Alice-in-Wonderland rabbit hole where facts are no longer a problem for the construction of reality. I felt seriously unnerved as I saw how the fairly large number of patrons in the museum were buying into the “see, creationism is really scientific” aspect. Funny, but the same people did not seem to notice that about half of the “scientific displays” were merely scenes from the Bible — most of which told an obvious morality tale. But this aspect of the place was actually the touching part. It was so clear that so many of those present felt adrift, if not outright lost, in the current world. Many seemed to me to suffer from a sense of being trapped in a world of moral normlessness — at least as seen from their own viewpoint. They seemed desperately to want to believe that a recommitment to biblical literalism would bring a “return” to a world with less anomie and less suffering.

My own work on creationism

Raymond A Eve is Professor of Sociology and Head of the Sociology Program at the University of Texas at Arlington. He has studied the sociology and social psychology of creationism versus evolution for thirty years. Among his books are The Creationist Movement in Modern America (Boston: Twayne, 1992), which he coauthored with Francis B Harrold, Cult Archaeology and Creationism: Understanding Pseudoscientific Beliefs about the Past (expanded edition, Iowa City [IA]: University of Iowa Press, 1995), which he coedited with Harrold, and Chaos, Complexity, and Sociology: Myths, Models, and Theories (Thousand Oaks [CA]: Sage, 1997), which he coedited with Sara Horsfall and Mary E Lee. He has written extensively on creationism and “intelligent design”.

and “intelligent design” stresses how much of the controversy is really not driven by science at all, but instead represents “a struggle for the means of cultural reproduction” (see Eve and Harrold 1992, especially chapter 6). With this latter in mind, I could not help but notice that there were *no* minority persons (at least not any readily identifiable ones) in attendance among a fairly large number of viewers. Indeed, there were not many people in their 30s through their 50s.

What I *did* see was a lot of white folks with gray hair, and gray-haired folks taking their grandchildren through (most without their parents). This latter might be related to the fact that I found more than one book in the bookshop that stressed the belief that the current generation of parents is already “lost to the Lord.” And without intervention by the grandparents, presumably, the grandchil-

dren would naturally follow the errant road of their parents.

CREATIONIST PERSPECTIVES

So I left with three powerful impressions clanking around in my skull. One was outrage that such lurid disinformation could be so sincerely presented. That led to the second clanging thought: most attendees were indeed going to buy the pseudoscience as totally legit because of their own lack of understanding of even basic science. Certainly the museum had used a plethora of elaborate iconography of science, *albeit* where the symbols were disconnected from their actual referents — enough so to make any post-modernist proud.

This striking array of scientific evidence “in favor of” creationism perhaps reflects the ambivalent attitude of creationists toward the new “great legitimator” (religious

doctrine is the old one, science the newer one). Many anti-evolution organizations are quick to embrace “scientific” creationism and “intelligent design” as “proof” that their religious positions are correct: “look at all this *scientific* evidence that supports us.” (Of course, there are some real fringe groups, such as Jehovah’s Witnesses who would typically just flatly say “God said it, I believe it. Who cares what scientists think?”).

It is important to note, however, that the current conflict is not always one between science and religion, but often between an older form of science and the more recent form. In some ways the controversy may be more a matter of the differences between 19th-century science (Baconian inductivism) and contemporary deductivist science. We need to remember that most scientists of the 19th century were themselves creationists — and as such felt their only job would be to collect enough data to show how the divine plan had worked. For most such scientists it came as a rude shock when they found that some of the data did not “fit” Scripture. Most contemporary creationists still fit into this category. That is to say that they are not really so anti-science that they will not happily appeal to scientific authority when they find what they believe to be science that supports Scripture.

By contrast, the AiG museum seems fully prepared to be outright disingenuous in its presentation of scientific evidence. At least my own feeling was that the museum was prepared at any cost to say whatever needed to be said to convince the groundlings of scientific support for creationism. If the truth was to be a frequent casualty in such an effort then surely the ends must justify the ends. Machiavelli’s Prince would be proud indeed of the displays presented throughout. Besides, such an approach would (excuse me for returning to an earlier theme) surely lead to more coins in the coffer.

I was really saddened by the third strong impression I formed during my visit. It seemed to me that so many were visiting the museum because they feel so unfulfilled and saddened by the

CREATIONIST DINOSAUR MUSEUM OPENS IN MONTANA

The Glendive Dinosaur and Fossil Museum opened in Glendive, Montana (near the North Dakota border), in May 2009. A blogger writing on the Daily Kos blog (<<http://www.dailykos.com/story/2009/7/15/753816/-Creationist-Dinosaur-Museum-Opens-in-Montana>>) noted: “[The museum] had authentic dinosaur exhibits, but everything had a creationist tint ([for example,] the earth is only 5000–6000 years old).” The museum appears to be a ministry of an organization calling itself Foundation Advancing Creation Truth (FACT). The blogger quoted from two issues of the museum’s on-line newsletter:

Just last week we were notified that the Montana Dakota Utilities Foundation approved a grant for 80% of the funds needed to purchase the full-scale T-rex head and neck cast, which will be the first exhibit seen when touring the museum. (<http://www.creationtruth.org/newsletters/2009-01_Newsletter.pdf>)

Finally, the truly big news we want to share with you is that the Gianforte Family Foundation has graciously provided FACT with a gift of \$220 000! This gift was given to specifically purchase the main exhibit — the Tyrannosaurus rex and the Acrocanthosarus [*sic*] — two of the most spectacular and terrible of the “terrible lizards” that ever lived. This wonderful gift from the Gianforte Family Foundation covers two-thirds of our needs in reaching the goal of being able to open the museum. (<<http://www.creationtruth.org/documents/FACT%20Special%20Newsletter%20-%20Praise%20Report%20-%20August%2030%202008.pdf>>)

Both the Gianforte Charitable Trust and the scientifically accurate Museum of the Rockies are located in Bozeman, Montana — about five hours’ drive along Interstate 94 from Glendive.

wider world as they perceive it. It is well-known in the sociology of religion that people tend to join cults after they decide that a search for answers within mainstream contemporary institutions (the family, the local church, the local psychiatrists, and so on) have failed to give them what they need. This certainly seemed to be a paradigm that fit well on many of those I saw. The difference, however, is that this is not a movement of the “new religions”; instead, it is a “revitalization movement”. The latter term refers to movements intended to restore a *formerly* dominant set of persons and cultural practices after they have been displaced by something new. In the revitalization movement the constituents, the now displaced, seek to return things to the “normal” way they used to be.

This is part of the struggle for the means of cultural reproduction mentioned above. What I like to call cultural traditionalism has in recent decades been replaced by cultural modernism and postmodernism. The cultural traditionalists (a high percentage of whom are creationist “intelligent design” supporters) seek to return to a time when they were the dominant cultural aggregate. The fist-fight over evolution is really all about conflicting heuristic rules for knowing the truth. Cultural traditionalists use tradition, faith, authority, and revelation as the acid tests for assessing any given truth claim. (“God said it. I believe it. That settles it”). Modernists tend to use rational, empirical data for hypothesis testing to arrive at their truths. Postmodernists have no use for any of this, preferring to believe that truth is short-term, situational, and internal to the person (“it feels right to me, dude”).

This is why the conflict over origins has no easy end. The different cultural traditions have not agreed on the rules for assessing the truth. By their own standards, each type feels that its own truth claims are well supported and refuses to accept any other method of assessing the relevant evidence. All this also helps to explain why the battle is most frequently in the school room, the courtroom, or the legislatures. These are precisely the places

that the factions mentioned above struggle to try to control just which one of the ways of knowing, and associated “facts,” will be passed on the next generation as legitimate. Hence the term “struggle for the means of cultural reproduction.”

THE CHALLENGE FOR SCIENCE

Creationists are deeply alienated from the “Official Reality” propagated by mainstream institutions. This is a trend with a long history in the US. In some of my published studies and papers (such as Eve and others 1995), I examined a fairly recent sample of creationists who had attended a “Creationism Fair” in Glen Rose, Texas. (The event was put together by Carl Baugh, progenitor and curator of the first creationism museum — the one in Glen Rose just outside Dinosaur State Park, which is the alleged home of the famous Paluxy River “mantracks”. Baugh’s terminal degree is from a small wooden building in Dallas, but that’s another story for another day.) I compared these creationism supporters to a sample of Wiccans from a “Magical Arts Convention” just outside of Austin, Texas.

The two populations were diametrical opposites on nearly every question of fact and attitude — with two exceptions. One was that both samples scored very high on alienation from big government, big industry, and even mainstream religion. The other thing they agreed on was that for their own (very different) worldviews and moral judgments there was “plenty of scientific evidence in support” of their respective views. So, one thing we all need to be doing is figuring out just what they think science actually is ... and whether there is a better way to teach a larger number of people valid science.

I do not think many creationists will ever change their views simply because someone tells them they are wrong. Instead, they must somehow come to know enough current scientific method to understand for themselves why they are wrong. The task seems hopeless in the short run. But I would point out that in the long run more Americans *are* scientifically capable today than ever, and



most who are so schooled are increasingly disinclined to accept creationism. So the real field of action needs to be the high school and college classrooms.

In closing, let me just say that it is easy to get wrapped up in the *science* debate as one goes through the museum, but it is also important to keep one’s eye out for how much of that debate is really driven by the social dynamics described above. For my own part, I found myself wishing I knew how to stand out in the parking lot as the folks left and then divide up the loaves and fishes and lay my hand on their heads and relieve all that anomie and mental anguish of contemporary life and the future. But, I could not. Indeed, I wondered who or what could?

REFERENCES

- Eve RA, Harrold FB. 1990. *The Creationist Movement in Modern America*. Twayne Press.
- Eve RA, Taylor J, Harrold FB. 1995. Why creationists don’t go to psychic fairs. *Skeptical Inquirer* 19 (6): 23–8.

DINOSAUR ADVENTURE LAND ON THE COLBERT REPORT

Humorist Stephen Colbert examined the fate of Kent Hovind’s Dinosaur Adventure Land in late August, when the news broke that the federal government had moved to seize the theme park to settle its claims against Hovind’s Creation Science Evangelism ministry. Visit <http://www.colbertnation.com/the-colbert-report-videos/240802/august-06-2009/yahweh-or-no-way-dinosaur-adventure-land-black-market-kidneys>.



Creation Evidence Museum

People driving along Highway 205 on their way to Dinosaur Valley State Park just outside of scenic Glen Rose, Texas, are often surprised to encounter the Creation Evidence Museum, located just a few hundred yards before the park's entrance (Figures 1, 2). The popu-

lar museum consists of a small group of trailers and a larger building that advertises itself as a "scientifically chartered museum." The museum's founder is Carl Baugh, a Baptist preacher, archaeologist, and Trinity Broadcasting Network personality who uses the museum to discredit evolution by claiming that people lived contemporaneously with dinosaurs. Baugh began his excavations along the nearby Paluxy River on March 15, 1982, and two days later announced discoveries of human and dinosaur tracks having "unparalleled historical significance".



FIGURE 1 The Creation Evidence Museum is an evangelical organization that claims to have discovered more than 100 human footprints alongside dinosaur footprints in the Paluxy Riverbed at Glen Rose, Texas. (All photos by Randy Moore)

FIGURE 2 (on cover) Roadside sign urges passersby to visit the Creation Evidence Museum to see evidence that allegedly refutes evolution.

lar museum consists of a small group of trailers and a larger building that advertises itself as a "scientifically chartered museum." The museum's founder is Carl Baugh, a Baptist preacher, archaeologist, and Trinity Broadcasting Network personality who uses the museum to discredit evolution by claiming that people lived contemporaneously with dinosaurs. Baugh began his excavations along the nearby Paluxy River on March 15, 1982, and two days later announced discoveries of human and dinosaur tracks having "unparalleled historical significance".

In the museum, visitors watch a 40-minute *Creation in Symphony* video in which Baugh describes

his story of creation that includes water's being sprayed 70 miles into the air and God's stretching the "space fabric" to a point where faraway stars exploded. Baugh, a young-earth creationist, claims that evolution offers no explanation for our existence. Baugh's creationism, on the other hand, provides

hope and a happier ending. The museum, which was established in 1984, supports a variety of research programs, including expeditions that claim to have found living pterodactyls in New Guinea.

Museum officials claim that the fossilized human footprints displayed in the Museum were made in what people have been "educated" to believe are 113-million-year-old deposits of limestone in nearby Dinosaur Valley State Park. Baugh claims to have excavated almost 100 footprints and 475 dinosaur footprints. Researchers in nearby Dinosaur Valley State Park have found thousands of dinosaur tracks, but no contemporaneous human footprints.

One of the largest footprints on display at the Creation Evidence Museum — the 14" (36 cm)-long "Burdick Track" — was found by the energetic Clifford Burdick (1894-1992), a founder of the Deluge Society, one of America's first creationist groups. Burdick went to Glen Rose (about 50 miles southwest of Fort Worth) late in 1949, and in 1950 published an article titled "When giants roamed the earth" in the Seventh-Day Adventist magazine *Signs of the Times*. In that article, Burdick proclaimed that the Paluxy tracks were made by humans and that they therefore refute evolution. Burdick's article used out-of-context quotes to suggest that famed fossil-hunter Roland Bird (who went to Glen Rose in 1938 to investigate the tracks) had excavated the tracks and believed that they were made by humans.

Footprints from the Paluxy site were subsequently featured in *The Genesis Flood*, a book by Henry Morris and John Whitcomb Jr, that in 1961 launched the modern "creation science" movement in the United States. The tracks were promoted by numerous books (such as AE Wilder-Smith's *Man's Origin, Man's Destiny* in 1965) and films (Baptist minister Stanley Taylor's *Footprints in Stone*, produced with the help of Henry Morris in 1972). However, all of the tracks allegedly made by humans have been discredited by numerous studies.

The "Burdick Track" was not Burdick's only major discovery; in 1966, Burdick described his alleged discovery of pollen from conifers in Precambrian rocks as "science-shaking original-pioneering work." However, this discovery — like the "Burdick Track" — was later discredited by scientists; and even some creationists began to distance themselves from Burdick's claims. For example, young-earth creation-



FIGURE 4 These dinosaurs, which today are displayed at Dinosaur Valley State Park in Glen Rose, Texas (only a few hundred yards from the Creation Evidence Museum), were part of Sinclair Oil's "Dinoland" exhibit at the New York World's Fair in 1964–1965 that produced a wave of dinosaur-mania in the United States.

ist Walter Lammerts (1904–1996) — whose work was also cited in *The Genesis Flood* — criticized Burdick as someone who was “weak”, “slow”, and who “has not kept up with his reading”. Unlike many creationists of his era, Lammerts supported civil rights and conservation, abhorred far-right extremists, and rejected the claim that communism was based on evolution. Lammerts’s approach to the evolution controversy was simple: “If a man is such a stupid fool he can’t see that evolution is wrong, I’m not going to try to convince him.”

The Creation Evidence Museum also includes a large magenta-windowed “hyperbaric biosphere” in which Baugh claims to have recreated “earth’s original pre-flood environment” (Figure 3). According to Baugh, the biosphere — which is connected to an oscilloscope — increases organisms’ life-spans by 300%; it also detoxifies copperheads’ venom. Near the biosphere is an aquarium in which Baugh grows “vegetarian piranhas.” Baugh believes his discoveries support the vast life-spans of biblical patriarchs such as Adam (who allegedly lived to be 930), and the

harmonious environment (that is, no carnivores or death) before Eve introduced sin into the world. Baugh hopes to grow dinosaurs in the biosphere. On the museum’s walls, visitors can view paintings in which pre-flood children play with a baby *Apatosaurus* in the nearby Paluxy River. Visitors can purchase these replicas, as well as books, posters, and other materials such as certificates honoring recipients as “visionaries” for “supporting truth in education.”

The dinosaur tracks in Glen Rose are from the lower Cretaceous; some of these tracks that were studied by Roland Bird are also displayed at the American Museum of Natural History. The 1500-acre Dinosaur Valley State Park — a National Natural Landmark — includes models of a 70’ (21 m) *Apatosaurus* and a 45’ (14 m) *Tyrannosaurus rex* commissioned by the Sinclair Oil Company for the New York World’s Fair in 1964–1965 (Figure 4).

Randy Moore is coauthor of *More Than Darwin* (Berkeley [CA]: University of California Press, 2009) and of *Chronology of the Evolution-Creationism Controversy* (Westport [CT]: Greenwood Press, forthcoming in 2010).



FIGURE 3 The “hyperbaric biosphere” in which Carl Baugh claims to have recreated “earth’s original pre-flood environment.”



Edward Blyth: Creationist or Just Another Misinterpreted Scientist?

James K Willmot

In early December 2007, my hometown newspaper, the Louisville, Kentucky, *Courier-Journal*, published my opinion piece concerning the newly opened creation museum in northern Kentucky. As a former science teacher with a particular interest in the understanding and advancement of science in society, I expressed my concern that this \$27-million facility dedicated to the rejection of all science that contradicts a literal interpretation of biblical scripture is exceeding attendance expectations and gaining momentum in its mission to cast doubt on evolutionary biology and the multitude of scientific theories that support it.

I went to the museum and toured it twice during its opening weekend in late May of 2007. While no one can argue with the high quality of the facility and its 103 animatronic dinosaurs, the museum, built by the Christian ministry Answers in Genesis (AiG) erroneously claims its biblical interpretations of creation are backed up by scientific facts. What is most disconcerting to me (and the reason I wrote the article) is that the museum has become a *de facto* science center for the growing Christian home-school movement in the Ohio, Indiana, and Kentucky areas, teaching thousands of children that the theory of evolution is incompatible with Christianity and that science can only be valid when viewed through the lens of Christian scripture.

In my opinion piece, I suggested that Christians seek guidance on the subjects of evolution and cosmology from a Christian organization dedicated to the advancement of modern science (there are several). In response, one of the

museum's founders, Chief Communications Officer Mark Looy, wrote to the *Courier-Journal*, suggesting that *had* I visited the museum (which I had), I would have seen that AiG is not anti-science; he charged that I was a member of a cabal of scientists and secularists who have pushed Darwinism on society and stifled dissenting faith-based scientific theories (an oxymoron) on human origins. In addition, he asserted:

Darwin was not the first to fully describe natural selection; it was a creationist, Edward Blyth, 24 years before *Origin of Species*. Darwin just popularized an already existing idea and tagged it onto his belief about origins.

Looy also said that AiG is not anti-science and that I "conveniently" failed to mention that AiG has seven PhD scientists on staff. Despite AiG's claims of being a legitimate science organization, it does not practice science since it accepts no scientific evidence that contradicts its core tenets of a six-day creation and a young earth. AiG is practicing religious fundamentalism masquerading as science (<<http://www.answersingenesis.org/about/faith>>).

WHAT ABOUT BLYTH?

One of the tactics that creationists use to cast doubt on evolution is to suggest that Darwin undeservedly received the credit for the theory of natural selection and misappropriated the idea from the work of other scientists (see for example <<http://www.uncommondescent.com/intelligent-design/was-blyth-the-true-scientist-and-darwin-merely-a-plagiarist-and-charlatan/>>). This claim is as false as the "science" of creationism itself. As any student of science and history knows, new discoveries in science seldom emerge from a single source. Many

of the advancements of science occur when new knowledge, derived from a variety of sources, is blended together to form new theories. Credit for scientific discovery is often a messy business and this was certainly the case with Darwin.

Contrary to Looy's claim, natural selection was first described not by Blyth (or Darwin for that matter), but by the ancient Greek philosophers Empedocles and Aristotle in the third and fourth centuries BCE. Many scientists and philosophers in the centuries that followed contributed to the understanding of the adaptation of species due to environmental and competition pressures: al-Jahith, Harvey, Paley, Linnaeus, Buffon, Malthus, Lamarck, and Darwin's grandfather, Erasmus Darwin, to name a few (see <http://evolution.berkeley.edu/evolibrary/article/0_0_0/history_index_01>). Blyth contributed to the pool of knowledge with his insightful observations of bird species (specifically the birds of India) and his analysis of selective breeding practices of domesticated animals in a series of articles in *The Magazine of Natural History* from 1835 to 1837.

It is true that in his younger years Blyth believed in an "eternal and ever-glorious Being which willed matter into existence" (1837a: 140), as did most of the naturalists of his day. He held that while animal populations changed due to the influences of environmental conditions over geologic time, the human species was created by God as is. He reasoned that because modern humans are able to shape the environment to suit our purposes, we are exempt from the forces of natural selection.

Does not, then, all this intimate that, even as a mundane being, man is no component of that reciprocal system to



which all other species appertain? a system which for countless epochs prevailed ere the human race was summoned into being. (1837b: 83)

While Blyth's writings clearly disagree with young-earth creationists on the age of the earth ("It is needless to add, that a prodigious lapse of time is required here; and, to judge from data which past history of the globe abundantly furnishes, in legible records, wherever we turn our eyes..." [1837a: 140]), he was firmly in their camp when it came to human origins. He wrote the humans were created as "the last act of creation upon this world" by God (1837a: 140). However, there is evidence that Blyth's thinking on human origins changed, possibly due to the influence of his good friend Charles Darwin.

In 1867, thirty years after Blyth's articles first appeared in *The Magazine of Natural History*, a very different Edward Blyth emerged in correspondence with Darwin. Blyth wrote Darwin at least 57 letters between 1855 and 1869. I have read all of Blyth's known letters to Darwin (some of these are posted at <<http://www.darwinproject.ac.uk/>> and others are located at the Darwin Collection at Cambridge University). In a letter dated February 19, 1867, Blyth suggested to Darwin that humans descended from primates similar to gibbons (1867). Part of this letter follows:

The marked resemblance in facial expression of the Orang-utan to the human Malay of its native region, as that of the Gorilla to the Negro, is most striking, & what does this mean? Unless a divergence of the anthropoid type prior to the specialization of the human peculiarities, which however would imply a parallel series of at least two primary lines of human descent which seems hardly probable; & moreover we must bear in mind the singular facial resemblance of the *Lagothrix Humboldtii* (a *platyrrhine* form) to the negro, wherein the resemblance can hardly be other than accidental. The accompanying diagram will illustrate what I suggest

(rather than *maintain*); & about *Hylobates* or Gibbons, I am not sure that I place it right, for, upon the whole, the Gibbons approximate Chimpanzee more than they do the Orang-utan, notwithstanding *geographical position*. *Aryan* I believe to be improved *Turanian* or *Mongol* —

Blyth's beliefs on human origins were obviously influenced by the widespread racism of mid-19th-century Western culture. But this particular letter shows clearly that Blyth has accepted an evolutionary relationship between humans and other primates that would clearly be unacceptable to Answers in Genesis — or most young-earth creationists. If AiG is going to claim Blyth as a "creation" scientist robbed of credit for the theory of natural selection because he was creationist, they should also inform their devotees that Blyth changed his thinking in later years and suggested that all humans evolved from primate ancestors. Something tells me Chief Communications Officer Looy will not be jumping up and down to put this on AiG's website.

Why did Blyth's thinking on human origins change? Judging from his published articles and his letters to Darwin, one can only conclude that his exposure to 30 years of scientific inquiry and evidence lead him to reshape his perspective on human origins (he was never a young-earth creationist) into one that recognized that transmutation of species was the logical extension of the theory of natural selection. In fact, it is this theory, descent with modification over "countless epochs", creating totally different species, including mankind, that Darwin originated and popularized, with the already described theory of natural selection gaining additional acceptance due to Darwin's brilliant insights and writings.

AiG's Looy states, "Blyth, though, did not believe that natural selection could be a mechanism to produce new genetic information in creatures that could, over time, turn molecules into men." Of course not; "genetic information" would have made no sense as a biological concept to Blyth or any of his con-

temporaries (and it is a muddled pseudoscientific concept promoted by anti-evolutionists like Looy to make it seem as though genetic change is a barrier to, rather than the engine for, evolutionary change). However, Blyth's own writing, in his later years, clearly shows that he accepts that humans emerged from primate ancestors.

A fellow Louisvillian, Muhammed Ali, once said, "The man who views the world at 50 the same as he did at 20 has wasted 30 years of his life." Were he alive today, Edward Blyth would probably agree with Ali, and tell AiG and other evolution obstructionists to quit quote-mining his earliest works to claim he opposed evolution. Unfortunately, Blyth is unable to prevent his considerable body of work from being misused by AiG.

What is particularly insidious is that creationists' chief tool for supporting their absolutist doctrine is to misinterpret the enormous collection of evidence supporting evolution and mislead their audiences. It is a practice that I am sure would be appalling to Edward Blyth, a credible scientist whose thinking "evolved" over the years due to Darwin's great idea. I suggest that Edward Blyth would have strongly supported the advancement of science and reason in society and firmly condemned the pseudoscience promoted by institutions such as the Answers in Genesis museum.



REFERENCES

- Blyth E. 1837a. Psychological distinctions between man and other animals — part 4. *The Magazine of Natural History* 10: 131-41.
- Blyth E. 1837b. Psychological distinctions between man and other animals — part 3. *The Magazine of Natural History* 10: 77-85.
- Blyth E. 1867. Letter 5405 — Blyth, Edward to Darwin, CR, 19 Feb, 1867, Darwin Correspondence Project, Cambridge University. Available on-line at <<http://www.darwinproject.ac.uk/darwinletters/calendar/entry-5405.html>>. Last accessed November 11, 2009.

AUTHOR'S ADDRESS

James K Willmot
7249 Fox Harbor Rd
Prospect KY 40059
jimwillmot@bellsouth.net

[A version of this article previously appeared on-line on May 19, 2008, at <<http://www.butterfliesandbees.com/articleprint.php?num=326>>.]



Yes, Noah's Flood May Have Happened, But Not Over the Whole Earth

Lorence G Collins

INTRODUCTION

The Bible (Genesis 6–9) describes a worldwide flood (the Noachian Flood) covering even the highest mountains of the earth and the construction of a huge boat (a rectangular box-like craft) that transported animals, at least two of a kind of all land animals on the earth. The Qur'an (Suras 11 and 71) has almost a duplicate story with a similar huge boat that transported animals and a worldwide flood. In addition two older stories exist in ancient Babylonian epics that describe a huge flood. One is the Epic of Gilgamesh, describing a flood on the Euphrates River (Academy of Ancient Texts nd). The other is the Epic of Atrahasis, which has a huge flood on the Tigris River (Byers nd).

In the Epic of Gilgamesh, Gilgamesh is warned that a god plans to destroy all humanity and is told to build a ship to save himself, his family, friends, and cattle. In the Epic of Atrahasis, a tribal chief survived with his family by floating in a boat down to the Persian Gulf. After the flood subsided, the chief got out on dry land and erected an altar and sacrificed to a water god so that such a flood would not happen again (Anonymous nd-a). Noah also built an altar when he got off the Ark and offered sacrifices (Genesis 8:20). Because these stories all describe an ancient huge flood in Mesopotamia, it is extremely likely that a huge flood could have occurred. However, the next question is: "Did the Noachian Flood cover the whole earth?"

Lorence G Collins is a retired professor of geology at California State University, Northridge, who has written extensively to promote general knowledge about geology and to counter arguments by anti-evolutionists, including three other articles for RNCSE. For details, visit <<http://www.csun.edu/~vcgeo005/creation.html>>.

SCIENTIFIC EVIDENCE AGAINST A WHOLE-EARTH FLOOD

The Bible says that the rains that created the Noachian Flood lasted for 40 days (Genesis 7:17), that the waters prevailed on the earth for 150 days (Genesis 7:24), and after these 150 days the waters gradually receded from the earth so that by the seventh month and the seventeenth day, Noah's Ark came to rest upon the mountains of Ararat (Genesis 8:4). A year plus two months and twenty-seven days later the earth was dry enough so that Noah, his family, and the load of animals could disembark from the Ark (Genesis 8:14).

Because this flood was intended by God to destroy all flesh on earth (Genesis 6:13) and because sedimentary rocks on all continents contain fossils that supposedly represent the "destroyed flesh of all life," it might be thought that the Bible story, describing a whole-earth flood, was true. However, interlayered with these fossil-bearing sedimentary rocks on all continents are layers of evaporite rock salt (sodium chloride), gypsum (hydrated calcium sulfate), anhydrite (calcium sulfate), and various potash and magnesium salts, which are associated with red beds (shales) containing fossilized mud cracks (Schreiber and others 2007).

Many of these mineral compounds and red beds have combined thicknesses on different continents of more than one kilometer (~3,281 feet) (Collins 2006). The red beds are red because they con-

tain red hematite (iron oxide) which formed from magnetite grains that were oxidized while the muds were exposed to oxygen in open air. The mud cracks can form only under drying conditions that cause the mud to shrink and form polygonal cracks. The evaporite mineral compounds in the layers are deposited in the correct chemical order predicted by the solubility of each kind of ion in these compounds and whose increasing concentrations during the evaporation of water would cause them to precipitate in a predictable depositional sequence as the water volume decreased. Such evaporite deposits would be expected to occur where a marine sea was once present and to disappear when the sea became completely dry. Therefore, one could expect these evaporites to be at the top of the supposed Noachian Flood deposits when the water supposedly receded and the land dried out, but certainly not in different levels in between older and younger fossiliferous "Flood deposits".

We read in the Bible that there is only one time in which the Flood waters are said to recede and leave the earth dry. That is, no multiple worldwide climatic conditions are described in which flooding, then drying to a dry earth, more flooding, more drying to a dry earth, in repeated cycles that occur over and over again in that Flood year. On that basis, it is logical that all the kinds of evaporite deposits and red beds in many different levels in the supposed Noachian Flood deposits could form only in local climates with desert drying-conditions and could *not* possibly have formed all at the same time — a time when a flood covered the *whole* earth for more than one year (Collins 2006). On that basis, the Noachian Flood story cannot describe a whole-earth flood, but it could only represent a large regional flood.

REGIONAL EVIDENCE FOR THE NOACHIAN AND SIMILAR FLOODS

Two rivers, the Euphrates and Tigris flow through Mesopotamia, which is now the country of Iraq (Figure 1). There are several layers in exposed rocks near these two rivers in southeastern Mesopotamia (Iraq) that are likely flood deposits. Most are about a foot (0.3 m) thick, but one is as much as 3 meters thick (MacDonald 1988). Flood debris from this same thick deposit along the Euphrates River near the ancient Sumerian city of Shuruppak about 200 km southeast of Baghdad has been dated by the C^{14} method, giving an age of 2900 BCE (Best nd). Flood deposits 2.4 meters thick are also reported by MacDonald (1988) as far northeast as the ancient Babylonian city of Kish (120 km south of Baghdad). At any rate, the many flood-deposit layers show that flooding in southeastern Mesopotamia was not unusual in ancient times.

Similar large local floods are common throughout history around the world. For example, monsoon storms in Bangladesh frequently produce much rain over the country and in the Himalaya Mountains, which rise in the northern part of the country (Anonymous nd-b). Runoff of water from the rain and melting snow during such storms create great floods in four rivers that converge to the Wang River, which then drains into a huge delta in the Bay of Bengal (Anonymous nd-b). Thousands of people have been drowned in this delta region by many such floods during the last century. Almost every culture through history has a flood story to tell, as would the people in Bangladesh, but in each of these times and places, the floods would have been local and not worldwide.

Many creationists have pointed out that the Bible indicates that God promised not to cause another huge flood to occur and, therefore, there cannot be any floods that are similar to the Noachian Flood (Genesis 9:13–15). Therefore, the geological record should show at least one unique flood event that is different from all the large regional

floods for which there is geological evidence.

WHY WAS THE LOCAL LARGE FLOOD POSSIBLE?

Storms that occur in Mesopotamia usually come from the Mediterranean Sea, cross the mountains in Syria, Turkey, and western Iran, move southeasterly over Mesopotamia to the Persian Gulf, and then exit in the Gulf of Oman. The Euphrates and Tigris Rivers that would transport water from these storms leave higher land in northern Mesopotamia and enter a nearly flat area about 130 km north of Baghdad. In this 130-km interval the gradients of these rivers are small, with the elevation dropping about 3 m per km along the course of the rivers. Both the Euphrates and Tigris Rivers near Baghdad have elevations of about

30 m above sea level, and at the city of As Samawah (280 km south of Baghdad), the Euphrates River has an elevation of 9 m (a drop in elevation of 21 m) (NOAA nd). A similar 21-meter drop occurs along the Tigris River. On that basis, the gradients of the two rivers in these intervals are 0.075 m per km. In the additional 360 km to the Persian Gulf (sea level) the gradients are only about 0.025 m per km. Therefore, in both southeastern and central Mesopotamia the gradients are so low that the rivers barely flow downhill, and frequent flooding could be common.

A large river has natural levees. During a big storm, water rushing down the channel carries abundant sedimentary debris. If the water in the channel overflows its banks onto the adjacent flood plain, the velocity immediately slows because of friction with the

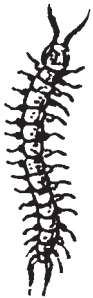


FIGURE 1. Map of Mesopotamia (Iraq).

FIGURE 2. Map showing elevation contours around the Euphrates and Tigris Rivers that extend NW-SE through Mesopotamia.



flat land, and the water at lower speed cannot carry its entire load of sediment. Heavier coarser particles are deposited abruptly on tops of the banks adjacent to the river while finer silts and clay particles are transported onto the flood plain. When such overflowing floods are repeated year after year, the coarser sediments deposited adjacent to the river build up natural levees on both sides of the channel. Natural levees along the Euphrates and Tigris Rivers rise up to 4 to 5 meters above the river channels, and the surface of these levees slope gently away from the rivers for 5 to 8 km toward lower, adjacent, nearly-flat flood plains that are up to 105 km wide (Tactical Pilotage Chart TPC G-4C, H-6A, and H-6B). The people living in Mesopotamia in biblical times would have had their villages on the natural levees because the flood plains would have been swampy.



WHAT HAPPENED DURING THE FLOOD?

The watershed for the Euphrates and Tigris Rivers on which the flood could have occurred extends for more than 1600 km from the Persian Gulf through Mesopotamia into Syria and Turkey and laterally for about 1000 km from eastern Saudi Arabia to southwestern Iran — an area of more than 1.6 million square kilometers. On that basis, if abundant rain fell, not only in the mountains of Syria and Turkey, but also in Saudi Arabia and Iran, the tributary streams from these countries would all contribute their volumes of water to the flood plains of the Tigris and Euphrates Rivers (Figure 2).

Normally, in lesser storms most water runoff would have come primarily from the mountains in Syria and Turkey and not also from Saudi Arabia and Iran. During the flood, upstream where water first accumulates, the depth of water on the flood plains may be barely over the tops of the natural levees, but downstream the water “piles up” because it does not flow very fast downhill on a nearly flat surface. Therefore, downstream water depths could reach 32 m or more above the tops of the levees.

This increase in depth would be

intensified where the two flood plains with a width of 275 km in the northern section would be squeezed into a 220-km width in the lower part of the drainage system where the two rivers join. The joining of the two rivers would also increase the volume of the water in the flood plains, thereby increasing the depth. At any rate, all higher land on the natural levees where the people in the villages were present would be completely submerged. Thus, it would be possible for a flood to have occurred in mid-Mesopotamia, perhaps about 2900 BCE, as evidenced by the scientifically dated flood deposits.

REMNANT EVIDENCE OF THE FLOOD

When the huge storm ceased that caused the flood, there would have been huge lakes, and it could have taken months to drain the water in these lakes into the gulf — which could easily explain why the Noachian Flood took so long to recede (as much as one year, according to Genesis 8:14). Evidence for this poor drainage can be seen in the present-day lakes in the flood plains. Lake Hawr al Hammar is 32 km wide and more than 80 km long, lies on the flood plain of the Euphrates River west of Basra, and several other large lakes are on flood plains adjacent to the Tigris River (for example, Hawr as Sa'diya and Hawr as Saniyalt). The poor drainage would be caused by the fact that the water covering the flood plains would have no channel through which to flow, would not flow uphill over the sloping natural levees to re-enter the river channels, and the slopes of the bottoms of the lakes would have been nearly flat with gradients toward the gulf of 0.025 to 0.075 meters per kilometer.

EFFECTS OF THE CURVATURE OF THE EARTH

Because of the curvature of the earth, the horizon drops from where the viewer is standing. However, the drop is proportional to the square of the distance between the viewer and an object on the horizon (Young nd). From these relationships, it can be seen that a tribal chief (or Noah) stand-

ing on the deck of a large boat (Ark), perhaps 7.8 meters above the water, would not be able to see the tops of any hills as high as 15 m from as little as 24 km away across flood plains covered with water because the curvature of the earth prevents it (See the Appendix for examples of calculations). Most hills in this region that are as much as 15 m high are more than 95 km away from the river levees. Therefore, the survivors of the Flood could see *only water in all directions* while they were floating down the Tigris River and over the flood plains. Many of these hills would also be partly covered with water which would make their tops project less above the water level, and therefore, the curvature of the earth would make them disappear from the line of sight in even a shorter distance than 24 km.

Northeast and southwest of the nearly flat surface that contains the two rivers, the topography rises to more than 455 m in Saudi Arabia and in Iran. Calculations show that elevations of 455 m high cannot be seen beyond 86 km away, and these places are more than 160 km from the Euphrates or Tigris Rivers. Therefore, none of the high country in Saudi Arabia or Iran would be visible to a tribal chief (or Noah). On that basis, the “whole world” would definitely appear to be covered with water during the Flood, and that was the “whole world” for the people in this part of southeastern Mesopotamia at that time.

CONCLUSIONS

If the 3.4-meter-thick layer of flood deposits in southeastern Mesopotamia (MacDonald 1988) represents a huge flood of ancient times, and if it is the remnants of the one described in the early Babylonian epics, then the authors of these epics were likely survivors who lived in a village on natural levees on the lower parts of either the Euphrates or Tigris Rivers where the flood waters covered their village, natural levees, and adjacent flood plains for distances of 160 to 320 kilometers so that no land could be seen, and their “whole world” would have been under water.

ACKNOWLEDGMENTS

I wish to thank Kevin Collins, Fred Tonsing, Eugene Fritsche, Warren Hunt, Jarvis Streeter, Steve Peralta, and Barbara Collins for helpful comments that greatly improved the manuscript.

REFERENCES

Academy for Ancient Texts. nd. Epic of Gilgamesh. Available on-line at <<http://www.ancienttexts.org/library/mesopotamian/gilgamesh>>. Last accessed February 16, 2009.

[Anonymous]. nd-a. Atra-Hasis. Available on-line at <<http://www.absoluteastronomy.com/topics/Atra-Hasis>>. Last accessed February 16, 2009.

[Anonymous]. nd-b. Floods in Bangladesh. Available on-line at: <http://en.wikipedia.org/wiki/Floods_in_Bangladesh>. Last accessed February 17, 2009.

Best RM. nd. Noah's Ark: A lost legend about Ziusudra, King of Sumer. Available on-line at <<http://www.noahs-ark-flood.com/>>. Last accessed February 16, 2009.

Byers G. nd. Great discoveries in Biblical archaeology: The Atra-Hasis epic. Available on-line at <<http://www.biblearchaeology.org/post/2006/10/Atra-Hasis-Epic.aspx>>. Last accessed February 16, 2009.

Collins LG. 2006. Time to accumulate chloride ions in the world's oceans — More than 3.6 billion years: Creationism's young earth not supported. *Reports of the National Center for Science Education* 26 (5): 16–8, 23–4.

MacDonald D. 1988. The Flood: Mesopotamian archaeological evidence. *Creation/Evolution* 8 (2): 14–20.

NOAA [National Oceanic and Atmospheric Administration]. nd. Climate of Iraq. US National Climatic Data Center. Available on-line at <<http://www.ncdc.noaa.gov/oa/climate/afghan/iraq-narrative.html>>. Last accessed February 23, 2009.

Schreiber BC, Lugli S, Babel B. 2007. *Evaporites Through Space and Time*. Cambridge: GSL Publishing Associates Limited.

Young AT. nd. Distance to the horizon. Available on-line at <http://mintaka.sdsu.edu/GF/explain/atmos_refr/horizon.html>. Last accessed October 22, 2009.

APPENDIX

The drop in the horizon (curvature) does not vary linearly but with the square of altitude. The formula is:

$$\sqrt{(2rh+h^2)},$$

where r is the radius of the earth and h is the altitude above the earth's surface (Young nd). The radius of the earth varies a little at different locations on the surface, but is on average 6378 km. A simpler calculation derived from this formula is 3.57 km times the square root of the height of the eye in meters.

For a person who is 1.8 meters (6 feet) tall, the eye level is about 1.75 meters above the ground. If we place that person on the deck of an ark that is 30 cubits (13.6 meters) high and that is floating so that 2/3 of its height is above the surface

BOOKREVIEWS

REFRAMING SCOPES: JOURNALISTS, SCIENTISTS, AND LOST PHOTOGRAPHS FROM THE TRIAL OF THE CENTURY

by Marcel Chotkowski LaFollette
Lawrence (KS): University Press of
Kansas, 2008. 196 pages

Reviewed by Charles A Israel

How many readers of this journal, if asked to think of images of the Scopes trial, find mental pictures of Spencer Tracy, Fredric Marsh, and other actors from *Inherit the Wind*? Sure, we know the film and play it was based on was really a McCarthy-era allegory, but the Hollywood image has proven quite sticky indeed. The real Scopes trial, held in Dayton, Tennessee, in the summer of 1925, was carried on WGN radio and covered by colorful print journalists of the era like HL Mencken and Joseph Wood Krutch, and their word-pictures have proven highly influential. Some contemporary photographs and more editorial cartoons have survived, but for many the real Dayton has been overtaken by the fictional Hillsboro. Now there is a possible cure for this condition.

In 2005, eighty years after the trial of high school teacher John Thomas Scopes, historian Marcel Chotkowski LaFollette discovered an amazing collection of photographs in an only partly processed collection at the Smithsonian Institution Archives. In this short volume, she has intelligently blended the restored photographs with pictures from other collections for a total of fifty-one images. Attached to each is an informative caption, and from the assemblage she draws attention to themes and interpretations of the trial lost from view in other accounts. We see the expected cast: defendant Scopes, guest prosecutor William Jennings Bryan, and defense attorney Clarence Darrow. More valuable, perhaps, are the images of the defense team of lawyers, scientist-witnesses, and interested supporters assembled on the steps of their trial headquarters. While most contemporary and historical attention from the trial has centered on the high-

of the water, then the total for h will be $1.75 + 6.06 = 7.81$ meters.

Thus, we calculate the distance to the horizon:

$$(3.57\text{km})(\sqrt{(7.81)}) = 9.98 \text{ km.}$$

Similarly, we can use this calculation to compute how far away a hilltop has to be before it disappears below the horizon. If the hills were 15 meters tall, as occurs in high ground between the two river systems south of Baghdad, these hills are below the horizon at:

$$(3.57\text{km})(\sqrt{(15)}) = 14 \text{ km.}$$

If we add the additional 9.98 km that Noah would gain by standing on the deck of the ark, the hilltops would be invisible from any distance greater than about 24 km. Since these hills are more than 95 km from the river levees, they would be invisible from the Ark.

If the elevations were 455 meters high, as occurs in eastern Saudi Arabia and on the steep slopes of the Zogras Mountains in southwestern Iran, the calculations are

$$(3.57 \text{ km})(\sqrt{(455)}) = 76.15 \text{ km.}$$

So a person standing on the ark could see these mountaintops at about 86 km away. Since these elevations are more than 320 km away from the Euphrates River and more than 160 km away from the Tigris River, they would also be invisible from the ark.

AUTHOR'S ADDRESS

Lorence G Collins
c/o NCSE
PO Box 9477
Berkeley CA 94709-0477
ncseoffice@ncseweb.org



profile attorneys arguing the case, LaFollette's pictures and text showcase zoologist Maynard M Metcalf, the only scientist who actually testified on the stand in Dayton; Howard Gale Byrd, a minister of the Methodist Episcopal Church who was forced to resign his pulpit in Dayton in the midst of the church in a controversy surrounding the discussion of evolution in the church; E Haldeman-Julius, an advocate of science and reason who published radical tracts and drove to Dayton from Kansas with his wife Marcet; and an assembly of worshippers gathered for a baptism in a stream nearby during the trial.

Even though they have a certain behind-the-scenes quality, most of the images are clearly posed, but this is not surprising given their source: the bulk of the photographs in the book were snapped by Watson Davis, who in 1925 was in Dayton to cover the trial as a journalist along with Frank Thone, a biologist with a PhD from the University of Chicago and an interest in popularizing science. Without Davis and Thone there would be no book here, and it is their presence and mission in Dayton that provide what is most unique in LaFollette's approach to this much covered media and legal event. Watson was in Dayton as managing editor of the Science Service, an organization endowed by publisher EW Scripps and cooperating with scientists and journalists. Science Service had a difficult mission: to provide the public both interesting and accurate stories of contemporary science and technology. The circus atmosphere of the Scopes trial would provide both a wonderful opportunity for the young organization to demonstrate its utility but also a large challenge to overcome all the sensationalist

Charles A Israel is an associate professor in and chair of the Department of History at Auburn University. His research concerns religion and social reform in the South, including a book on evangelicals, education, and evolution, Before Scopes: Evangelicals, Education, and Evolution in Tennessee, 1875-1925 (Athens [GA]: University of Georgia Press, 2004).

press issued by partisans on both sides of the affair.

LaFollette is well equipped to investigate and assess the role of Davis, Thone, and the Science Service in the Scopes Trial. In her previous books, she has explored the public images of science in the first half of the twentieth century as well as the history of plagiarism and scholarly misconduct among scientists. She is complimentary of, even thankful for, Davis's and Thone's efforts to document the trial and publicize its scientific issues in the 1920s and in preserving their records for posterity. But she also takes a critical approach to the two scientific journalists' position in the trial: not content to be just observers, the two were active participants in the defense team efforts. Even while distributing stories on the scientific aspects of the trial, they assisted in recruiting scientists to testify for the defense. Their close affiliation with the defense may have given the lie to any quaint notion of journalistic objectivity, but it did allow them to acquire the many great images reprinted in the book. And it led to another of their legacies from the trial: Davis and Thone led the effort to fund defendant John T Scopes's graduate education at the University of Chicago. Impressed by his lack of desire to take the spotlight in the trial or afterword, the two scientist-journalists helped to protect his privacy after the trial.

LaFollette does a fine job of using the pictures to open up many different stories of the trial. Scholars in many fields will be both interested to see what she pulls from the images and frustrated that she did not pursue the themes more. But she intelligently introduces many issues — journalistic objectivity, the religious preferences of the scientists, the objectifying gaze of the journalists on the local holiness religious practices, and the failed aspirations for economic rebirth in Dayton — without getting too far from the images or losing general readers.

AUTHOR'S ADDRESS

Charles A Israel
Department of History
310 Thach Hall
Auburn University AL 36849
cisrael@auburn.edu

THE DARWIN MYTH: THE LIFE AND LIES OF CHARLES DARWIN

by Benjamin Wiker
Washington DC:
Regnery Publishing, 2009.
196 pages.

Reviewed by Sander Gliboff

Using that "life and lies" formula in the subtitle of this anti-Darwin book was not a wise move by Discovery Institute Senior Fellow Benjamin Wiker. It invites unfavorable comparison to a similarly titled book about a similarly celebrated white-bearded English sage with an ugly nose. I mean, of course, *The Life and Lies of Albus Dumbledore*, by Rita Skeeter, a book within a book in the Harry Potter series.

For the uninitiated: Skeeter is an unscrupulous witch of an investigative reporter. She takes Dumbledore's own remarks and other peoples' recollections out of context and makes him seem guilty of everything from racial prejudice, elitism, claiming credit for the accomplishments of others, and manipulating friends, family, and the public, to valuing the greater good over individual rights, inspiring a militaristic and eugenical ideology, and fomenting world war.

In a spooky case of life's imitating art, Wiker makes essentially the same accusations against Darwin, using Skeeter's exact methods. Those methods do not require "facts" to be conjured out of thin air, although both authors are quite capable of doing it. The real trick is to select, isolate, and exaggerate the facts you like, while making the ones you do not like vanish. Wiker's favorite way to get rid of these is to wave his hands and pass them off as lies.

Having led one of the best-documented lives in the history of science, Darwin provides a good vari-

Sander Gliboff is Associate Professor of the History and Philosophy of Science at Indiana University, and the author of HG Bronn, Ernst Haeckel, and the Origins of German Darwinism: A Study in Translation and Transformation (Cambridge [MA]: MIT Press, 2008).

ety of facts and quotes for Wiker to select from. For example, on the subject of religion: Darwin once described himself as having been a biblical literalist, once signed an oath of Anglican orthodoxy required of Cambridge students, studied to be a clergyman, sometimes called himself an agnostic, sometimes a materialist, and sometimes a theist (but never an atheist). He took pride in his friendship and collaboration with his Anglican minister as well in his family heritage of Unitarianism and freethought.

When serious biographers piece together Darwin's life story out of such a confusing historical record, they look at the chronological progression and the changing circumstances, and they see a developing individual. Mythical figures and epic heroes do not need to develop, but humans do, and character development is what makes our current picture of Darwin realistic and interesting. Darwin grew, erred, learned, and only gradually became the venerable "Sage of Down". Along the way, he grappled with difficult questions about God and nature, and left the record of his changing answers in notebooks, letters, publications, and an autobiography.

In contrast, it is Wiker who gives us a mythical Darwin, one who appears constant in his rejection of religion, practically from birth. It makes no difference to Wiker that all of Darwin's recorded doubts date from after his voyage on the *Beagle*, or that Darwin also made favorable, conciliatory, or just plain uncertain statements about religion. Wiker either ignores them or dismisses them as lies.

Wiker occasionally writes nice things about Darwin and pats himself on the back for not demonizing him, but he sure does make him out to be a horrible liar and a cheat. He has Darwin lying about his religious beliefs to get into Cambridge, lying about the motives behind his theorizing, lying about having been led to his theory by evidence, lying about its originality, stealing the credit for it, and plotting to convince people of it as well as of the need to take God out of nature and science. It

gets so ridiculous that the poor guy cannot even tell us he enjoyed music without Wiker's calling it deceptive.

In addition to the life-and-lies business, there is also a long chapter about the *Origin of Species* and the *Descent of Man*, with an emphasis on how those books supposedly undermined the biblical foundations of morality (which, for Wiker, are the only foundations morality can have). Cherry-picked quotations make Darwin appear to have endorsed eugenics and the extermination of inferior races. And natural selection is described as destroying the unfit for the good of the species, sacrificing them, as it were, to a dark creator. Suddenly Darwinism is not atheism, but death worship.

Three short chapters address later historical developments and social ills, for which responsibility is pinned, predictably, on you-know-who. The ills include eugenics, Nazism, abortion, euthanasia, sex education and contraceptives for the poor, cyber-pornography, and cannibalism (by which Wiker means embryonic tissue culture and stem-cell research). Even though Darwin was a kindly gentleman who loved his family and wished none of these things upon us, Wiker argues (remembering to say something nice again, so as not to demonize), they are still his fault because of his general de-Christianizing influence.

Striving for balance between faith and reason, Wiker advises "reasonable Christians," as he calls them, not to overdo the reason part, but to put revelation first. On the other hand, they should leave themselves some room — within strict but unspecified limits — for interpreting Scripture, and they do not have to reject evolution altogether. They just need a non-Darwinian version of it that puts God, morality, and purpose back into nature. This is touted as an astonishing finding.

Indeed the pitch for theistic evolution is astonishing, considering how little credence the book gives to any evidence for species transformation. Aside from that, the book's claims are unsurprising, since they are mostly Discovery Institute talking points that date

back to the mid-1990s and have been rebutted many times since then. The biographical interpretations may be original, though. They also verge on fantasy, so I recommend this book to Harry Potter fans, in case they want to see how a real-life Rita Skeeter operates.

AUTHOR'S ADDRESS

Sander Gliboff
Department of History and
Philosophy of Science
130 Goodbody Hall
1011 E 3rd St
Indiana University
Bloomington IN 47405
sgliboff@indiana.edu

WHY THE UNIVERSE IS THE WAY IT IS

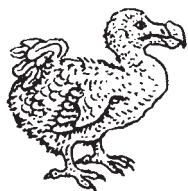
by Hugh Ross
Grand Rapids (MI): Baker Book
House, 2008. 240 pages



Reviewed by David Koerner

Hugh Ross agrees with Leibniz. All's for the best in the best of all possible worlds, and you are living in it. As founder and president of an old-earth creationist ministry, Reasons to Believe, Ross also thinks nature and the Bible are complementary sources of truth. Both are necessary for a complete picture of our cosmic purpose. In his catechetical book *Why the Universe Is the Way It Is*, nature speaks first in the form of a cosmological fine-tuning argument from design. Fundamental properties of the universe and unique features of planet earth are improbably arranged, hence designed solely for our benefit. The remainder of the book cites Bible chapter and verse to dispatch the pesky problem of evil with an eschatological solution. Do you sometimes have difficulty seeing the Designer's purpose in a life-destroying tsuna-

David Koerner is Associate Professor in the Department of Physics and Astronomy at Northern Arizona University, where he studies planet formation in astronomical observations of circumstellar disks around young stars. He coauthored Here Be Dragons: The Scientific Quest for Extraterrestrial Life (New York: Oxford University Press, 2000) with Simon LeVay.



mi, earthquake, or pandemic? All will become clear when the “best possible world” of this age gives way to an even better “perfect” world of the next. But purpose is still discernible in events of this world, including the greatest of tragedies. You must simply look harder. Ross explains that the quest for meaning is like playing “Where’s Waldo?” in the children’s book series of the same name. Why is the universe so big, old, dark, lonely, and in decline (chapters 2–6)? Ross finds the Waldos and points them out. Like Christopher Durang’s Sister Mary Ignatius, he “explains it all for you”.

Ross’s version of the cosmic fine-tuning argument resembles that of several Discovery Institute Fellows, although he parts company with their efforts to promote a non-supernatural designer in public science education. Physicists have understood for quite some time that life as we know it could not exist if any of several cosmic constants deviated from their observed values by one part in 10^{40} or some similarly large number (for example, see Rees 2001). Why is this true? The anthropic principle points out that, were it otherwise, we would not be here to ask the question. But is our existence due to a colossal fluke, some yet-undiscovered natural law(s), divine design, or a rarity made inevitable by membership in a super-huge, random, and mostly sterile set of multiple universes (the “multiverse”)? For Ross, design is the only option worth talking about. To make his case, he recites from an expanding litany of gee-whiz antecedents to existence (chapter 8) and ignores competing explanations.

In the standard design solution to fine-tuning, a Designer is used to explain the narrow range of cosmic parameters that allow us to be here. To use an analogy that Ross does not, material facts of our existence are like cards in a highly improbable hand drawn from a very large deck. Their putative unlikelihood is explained if an Intelligent Dealer picked them out on purpose. There are 2 598 960 possible five-card hands that can be drawn from a deck of only 52 cards. The chances of drawing any

one *in particular* are thus already pretty low. But we are not likely, *a posteriori*, to see a miracle in every hand drawn. What is the prior expectation for a special hand, then, like one that contains two pairs? Since there are 123 552 *different ways* to get two pairs in a five-card hand, the probability is $123\,552/2\,598\,960$ — about 5%. It is somewhat unlikely to get this result in a single deal. If you were dealt 20 hands in succession, however, you would not find it remarkable to get two pairs in at least one of them. Is the special “hand” of our existence vastly more improbable? Ross says yes, but he is still answering after the fact. He does not know the number of ways intelligent life could be arrived at or the number of attempts that have occurred, or even the initial range of possibilities (the “deck”). Despite repeated claims, he has no way to determine if our existence is likely or not.

Fundamental properties of the universe are necessary but insufficient conditions for life in it. So Ross’s Designer works post-Big Bang to make a habitable planet and put life on it as per Genesis 1. *That* was the week that was, says Ross, but it actually lasted several billion years. Incredulous readers are referred to Ross’s other books to connect Genesis to the fossil record. Meanwhile, he expands the fine-tuning argument along the lines of Discovery Institute Fellows Guillermo Gonzalez and Jay Richards. Gonzalez is an “intelligent design” martyr recently beatified in Ben Stein’s movie *Expelled* (see *RNCSE* 2008 Sep–Dec; 28 [5–6]). He and Ross published on this topic as early as 2000 in the religious journal *First Things* (Gonzalez and Ross 2000). At that time, Gonzalez also collaborated with paleontologist Peter Ward and planetary scientist Don Brownlee who argued in *Rare Earth* (2000) that our galaxy is probably not host to much extraterrestrial intelligence (ETI). This boldly marketed conjecture was captured in a groan-inducing parody worthy of a Yoko Ono lawsuit: “Imagine There’s No Spacemen” (*sic*) (<<http://www.astro.washington.edu/rareearth/rareearthsite/rareearth.mp3>>).

Ward and Brownlee contended

that to support complex intelligent life, a planet needs an improbable combination of things like a large moon, plate tectonics, a nearby Jovian planet, and location in a “Galactic Habitable Zone” (GHZ). Gonzalez and Richards went further in *The Privileged Planet* (2004; reviewed in *RNCSE* 2005 Jan–Apr; 25 [1–2]: 47–9) and saw God where the former merely doubted ETI. Earth is not only rare; it’s a miracle! To make the case, they hyped the importance and rarity of each and every condition necessary for life as we know it. Ross follows suit and, for instance, champions a highly restrictive GHZ that is simply not borne out by quantitative modeling. On the basis of numerical simulations that neither Ward, Brownlee, Gonzalez, nor Ross bothered to make, Prantzos (2008) reports that it is currently impossible “to draw any significant conclusions about the extent of the GHZ: it may well be that the entire Milky Way disk is suitable for complex life.”

Exaggerated claims like an extremely limited GHZ surround a more serious central blunder in the rare earth argument from design: discounting the *multi-planet* solution. Design proponents often cite a testability criterion to reject undetected multiple universes in favor of a cosmological Designer who, coincidentally, is also unobserved. In the terrestrial version, however, Ross expressly *ignores* the ongoing discovery of a large population of planets. By Ross’s own calculations, there are of order 10^{21} stellar systems in the observable universe alone. Current observations and theory suggest that nearly all these will contain planets of some kind. But neither Ross nor Gonzalez demonstrates, quantitatively, that a generic planet has less than 1 chance in 10^{21} of ending up with properties that could support complex life. There is therefore no reason to exclude the origin of a habitable “rare earth” solely from natural causes, given the size of the universe and ubiquity of planets.

This is just one more Waldo that vanishes under scrutiny like the face on Mars at high resolution. Sadly for Waldo searchers, it happens time and time again in Ross’s

latest book. In the end, one finds many reasons to doubt but few reasons to believe.

REFERENCES

- Gonzalez G, Ross H. 2000. Home alone in the universe. *First Things* 103: 10–2.
- Gonzales G, Richards JW. *The Privileged Planet: How Our Place in the Cosmos is Designed for Discovery*. Washington (DC): Regnery Publishing, 2004.
- Prantzos N. 2008. On the “Galactic Habitable Zone”. *Space Science Reviews* 135 (1–4): 313–22.
- Rees M. 2001. *Just Six Numbers: The Deep Forces that Shape the Universe*. New York: Basic Books.
- Ward P, Brownlee D. 2000. *Rare Earth: Why Complex Life is Rare in the Universe*. New York: Copernicus Books.

AUTHOR'S ADDRESS

David Koerner
Department of Physics and Astronomy
Northern Arizona University, Box 6010
Flagstaff AZ 86011-6010

THE BIBLE, ROCKS AND TIME

by Davis A Young and
Ralph F Stearley
Downers Grove (IL): IVP
Academic, 2008. 510 pages

Reviewed by Steven Newton

In *The Bible, Rocks and Time*, Calvin College professors of geology Davis Young and Ralph Stearley present a clear, cogent, and detailed explanation of how scientists know the age of the earth. (The book is a “total rewrite” of Young’s *Christianity and the Age of the Earth* [Thousand Oaks (CA): Artisan Press, 1988].) Young and Stearley address the religious implications of the earth’s antiquity and attempt to reconcile scientific and religious perspectives on this important issue. Although Young and Stearley address their book to “Christian pastors, theologians, biblical scholars, students and lay people,” the richness of its scientific and historical information make *The Bible, Rocks and Time* appealing to an even broader audience.

The first section of the book, “Historical Perspectives”, presents a very readable history of the

development of geologic thinking, elucidating the discoveries of scientists such as Steno, Hutton, Smith, and Buffon. We learn how early geologists “began to realize that the strata could not have been produced in a one-year Deluge but had to form over a period of time” (p 79). Discarded geologic ideas such as Neptunism — the hypothesis that igneous rocks precipitate from water, just as crystalline salts precipitate from evaporating water — are explained in the context of a developing science that gradually progresses by correcting its errors.

The second portion of the book, “Biblical Perspectives”, presents a history of the attempts to understand the age of the earth through scripture, especially Genesis and Psalms. Young and Stearley clarify how a 6000-year-old young-earth view is only one scriptural interpretation among many, some of which allow for a much older earth. Because the interpretation of the earth as 6000 years old grabs so many headlines, it is easy to overlook the fact that such a view does not represent the range of religious scholarship. Young and Stearley reveal a complicated, nuanced story of many competing ideas, some of which gained larger followings than others.

The third section of the book, “Geological Perspectives”, is a strong critique of young-earth creationist claims that geology is “an artificial construct of geologists designed to mislead the public,” by piecing “together the fossil record, crazy-quilt style, to fit a preconceived notion of organic evolution” in order to promote “a faulty, rationalistic philosophy of science” (p 235).

Young and Stearley demonstrate the sloppiness of creationists; in one memorable example, creationists Henry Morris and John Whitcomb are caught using a flawed description of the fossils of Lincoln County, Wyoming, not from peer-reviewed geologic literature, but from an article in *Compressed Air Magazine*. This brief, error-riddled article formed the basis of their inaccurate, second-hand description of fossils in Lincoln County.

Young and Stearley then delin-

erate the evidence for geologic time in a number of specific locales — Yosemite, the Michigan Basin, Table Mountain, Kilauea. The authors explain how phenomena such as contact metamorphism in Sierra Nevada roof pendants are incompatible with creationist geology. Calculations of deposition rates show that in order for Flood geology to be true, sediment would have to accumulate at a rate of 36 000 feet per year, a rate so far removed from anything observed today that Young and Stearley exclaim, “Do Flood geologists really expect anyone to believe that?” (p 378).

The strongest portions of *The Bible, Rocks and Time* come in two chapters on radiometric dating. Young and Stearley present a very readable explanation of radiometric dating that is substantive, yet basic enough for non-scientists to understand. They start at the beginning, working through the definitions of atoms and isotopes and decay rates, to more advanced concepts such as how different isochron methods address the problem of pre-existing daughter isotopes.

The last section, “Philosophical Perspectives”, examines geologic thinking in regards to the ideas of catastrophism and uniformitarianism. Creationists are philosophically predisposed to think in terms of catastrophism — violent, rapid changes over a very short period of time. Geologists are predisposed to think in terms of uniformitarianism — gradual, small changes affecting earth over a long period of time. Young and Stearley explain that according to some creationists, when geologists “blindly [hold] to a dogma of uniformitarianism, geologists unwittingly misinterpret the geologic evidence pertaining to the antiquity of earth” (p 447).

Young and Stearley trace how geologic thinking developed from the time of Charles Lyell, who believed in uniformitarianism so strictly that he saw even evolution as an affront to this steadiness of the world, to our current time. Modern geologists know that while the idea of uniformitarianism is very useful, there have been punctuations in the earth’s history



Steven Newton is Public Information Project Director at NCSE.

involving processes not seen today, such as the deposition of banded iron formations in response to the first atmospheric free oxygen, massive dolomite deposition under conditions in which dolomite cannot form today, and meteor-induced mass extinctions.

The Bible, Rocks and Time explains how uniformitarianism evolved. Plate tectonics was initially rejected by the geologic community despite Alfred Wegener's convincing evidence. In addition to Wegener's lack of a plausible mechanism, the idea that continents could move relative to each other was so hard to reconcile with uniformitarianism that geologists found the concept difficult to consider seriously.

Geologists were also disinclined to recognize evidence for titanic floods — despite the evidence that such floods had occurred, in eastern Washington for example. In these decidedly non-uniformitarian floods 15–13 000 years ago, the collapse of ice dams holding back lakes formed by melting glaciers unleashed discharges of billions of liters per second over eastern Washington, carving unique structures in the rock and creating what are now known as the Channeled Scablands.

Another challenge came in 1980, with the seminal Alvarez paper on the Cretaceous–Tertiary extinction. Uniformitarianism adapted to this new evidence, changing to a view where processes in the past largely were as they are now, with occasional exceptions, such as big rocks from outer space smacking the planet. Creationists, by contrast, “are unwilling to abandon their young-earth, global-Flood hypothesis even when the evidence shows it to be untenable” (p 472).

Young and Stearley argue that creationism is harmful to faith. They write of the dilemma that occurs when young Christians conclude, “because the geologic evidence is so persuasive, that what they were taught about creation must be incorrect. To them, the Bible now becomes a flawed book” (p 477). But, Young and Stearley argue, it is the creationist young-earth interpretation that is flawed.

The Bible, Rocks and Time is a systematic refutation of creationist geology. On point after point, Young and Stearley demolish the claims of flood geologists and sundry young-earthers in substance and in detail. This book will prove a useful tool for scientists to explain geologic ideas to the public, and to refute the notion that accepting science necessarily means rejecting religion. Moreover, since Young and Stearley's defense of science comes from a specifically religious viewpoint — they argue that “nobody needs to abandon sound science in order to become a Bible-believing follower of Jesus Christ” (p 11) — it will be especially useful in communicating with evangelical Christians.

AUTHOR'S ADDRESS

Steven Newton
NCSE
PO Box 9477
Berkeley CA 94709-0477
newton@ncseweb.org

MORE THAN A THEORY: REVEALING A TESTABLE MODEL FOR CREATION

by Hugh Ross
Grand Rapids (MI): Baker Books,
2009. 298 pages

Reviewed by Graham Oppy

Hugh Ross is the founder of the self-described “science-faith think tank” Reasons to Believe (RTB). The fundamental aim of the “scientists” at RTB is “to demonstrate how God's verbal revelation [in the Christian Bible] proves accurate and wholly consistent with the latest [scientific] discoveries” (<<http://www.reasons.org>>). In the service of this fundamental aim, Ross and his RTB colleagues have produced a long list of books and pamphlets: for example, Rana and Ross 2004, 2005; Ross 1983, 1989, 1993, 1994, 1996, 1998, 2004, 2006, 2008; Ross and

Graham Oppy is Professor of Philosophy at Monash University. His latest book is *Arguing about Gods* (Cambridge: Cambridge University Press, 2006).

others 2002. It is no secret that these previous books have received scathing reviews from both mainstream scientists (see RNCSE 2006 Sep/Oct; 26 [5]: 35–7, 2006 Sep/Oct; 26 [5]: 37–8, and 2007 May-Aug; 27 [3–4]: 45–8 for reviews of Ross 2006, Rana and Ross 2005, and Rana and Ross 2004, respectively) and young-earth creationists.

In his new book, Ross sets out to compare “the RTB model of creation/evolution” with “the three most familiar Western models: naturalistic evolution, young-earth creationism, and theistic evolution” (p 234). Ross claims that, in 2006, RTB published “a set of simple science predictions” from these four “models”, and that the assessment of these “predictions” against subsequently collected data yields the results reproduced in Table 1 (p 244).

Here are four of the “simple science predictions” that Ross attributes to “naturalistic evolution”:

1. New astronomical discoveries will increasingly disprove the current astronomical consensus that the physics of the Big Bang event must be exquisitely fine-tuned for life to be possible in the universe. (p 235–6)
2. New astronomical discoveries will show how unremarkable earth's location in the universe is for habitability and observation. ... Astronomers will soon discover other planetary systems in the Milky Way Galaxy where advanced-life-support planets could exist and where observers could view the universe as easily and thoroughly as astronomers do on earth. (p 236–7)
3. Evidence for fine-tuned long-lasting plate tectonics will weaken as scientists learn more about plate-tectonic phenomena. ... Thin-atmosphered planets (or other bodies) with stable, long-lasting plate-tectonic phenomena will prove relatively common. ... These phenomena will prove less and less crucial to the needs of advanced life ... and their apparent fine-tuning will eventually be seen as vastly overrated. (p 238)



4. As anthropological and genetic research advances, humanity will prove increasingly less distinct from the most recent hominid species. ... Evidence for interventionist miracles to explain humanity's unique characteristics will steadily decline. (p 239)

This is all sublimely silly. Naturalism — the view that there is nothing but natural causation — does not involve a commitment to 1–4. Naturalistic astronomers do not predict, for example, that they will soon find lots of planets with thin atmospheres and stable, long-lasting plate-tectonic phenomena. Moreover, even if the astronomical evidence were to suggest strongly that, in the observable universe, the earth is *unique* in possessing a

new book displays all of the failings that others identified years ago in his previous works — that is, his new book is also replete with errors of fact, errors of reasoning, misunderstandings of science, egregious interpretations of scripture, elementary misunderstandings of Hebrew, uses of scientific terms without consistent explanation or elaboration, unjustified reliance on religious rhetoric, and sundry other kinds of cheap tricks, distortions, and so on — and is no more worthy of a serious readership.

Here is one small example. Ross claims that Hawking and Penrose “proved, within the framework of classical general relativity, that if the universe contains mass and if the equations of general relativity reliably describe the universe’s dynam-

	Naturalism	Young Earth	Theistic Evolution	RTB Creation
Fulfilled	1	3	4	20
Partly Fulfilled	1	0	5	1
Not Yet Fulfilled	1	1	2	1
Partly Falsified	3	1	11	0
Falsified	16	17	0	0

TABLE 1. Predictions of four models, according to Hugh Ross.

thin atmosphere and a stable, long-lasting plate-tectonic structure, that would be no difficulty for naturalism. Setting all other considerations aside, we need only note that we have but lower bounds on the size of the universe proper: we have no good current estimates of the size of the part of the universe that we are unable to observe. So, setting all other considerations aside, naturalists can suppose that the size of the part of the universe that we are unable to observe is sufficient to remove puzzlement at the existence of a planet with a thin atmosphere and a stable, long-lasting plate-tectonic structure.

Ross does say: “I’ve taken the liberty to deduce predictions from each of the four models while attempting to remain as neutral and objective as possible. Should any of these predictions be misstated, I have a genuine desire for correction. Where a range of positions is held within a particular camp, unless otherwise qualified, I’ve attempted to describe the position as held by its most publicly prominent advocates” (p 234). But this is surely just cant. Ross’s

ics, then its space and time dimensions must have had a beginning that coincides with the universe’s origin” (p 96–7). This simply is not so. Hawking and Penrose did prove some theorems that tell us that, under plausible assumptions, there are generic essential singularities in general relativistic space-times: that is, under plausible assumptions, if we suppose that general relativity is true, then we have good reason to suppose that there are singularities in space-time. However, Hawking and Penrose did not prove that, under plausible assumptions, there are generic essential *initial* singularities in general relativistic space-times: that is, they did not prove that, under plausible assumptions, if we suppose that general relativity is true, we have good reason to suppose that space-time has an initial singularity. If there are black holes, then there are singularities in space-time. The Hawking and Penrose results allow that there are general relativistic space-times that contain black holes but that have no *initial* singularities. So Hawking and Penrose certainly did *not* prove that “if the



universe contains mass and if the equations of general relativity reliably describe the universe’s dynamics, then its space and time dimensions must have had a beginning that coincides with the universe’s origin”.

REFERENCES

- Rana F, Ross H. 2004. *Origins of Life: Biblical and Evolutionary Models Face Off*. Colorado Springs (CO): NavPress.
- Rana F, Ross H. 2005. *Who was Adam?* Colorado Springs (CO): NavPress.
- Ross H. 1983. *Genesis One: A Scientific Perspective*. Sierra Madre (CA): Wiseman Productions.
- Ross H. 1989. *The Fingerprint of God*. Orange (CA): Promise Publishing.
- Ross H. 1993. *The Creator and the Cosmos*. Colorado Springs (CO): NavPress.
- Ross H. 1994. *Creation and Time*. Colorado Springs (CO): NavPress.
- Ross H. 1996. *Beyond the Cosmos*. Colorado Springs (CO): NavPress.
- Ross H. 1998. *The Genesis Question*. Colorado Springs (CO): NavPress.
- Ross H. 2004. *A Matter of Days*. Colorado Springs (CO): NavPress.
- Ross H. 2006. *Creation as Science*. Colorado Springs (CO): NavPress.
- Ross H. 2008. *Why the Universe is the Way it is*. Grand Rapids (MI): Baker, 2008.
- Ross H, Samples KR, Clark M. 2002. *Lights in the Sky and Little Green Men* Colorado Springs (CO): NavPress.

AUTHOR’S ADDRESS

Graham Oppy
School of Philosophy and Bioethics
Monash University VIC 3800
Australia
Graham.Oppy@arts.monash.edu.au

NATIONAL CENTER FOR SCIENCE EDUCATION
PO Box 9477
Berkeley CA 94709-0477

Non-Profit Org.
U.S. Postage
PAID
Permit 1197
Berkeley CA

Change Service Requested

29(5)

EDITOR

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

SUPPORTERS

Bruce Alberts, *UC San Francisco*
Francisco J Ayala, *UC Irvine*
Frederick Borsch, *LTSP*
Stephen G Brush, *U MD*
Sean B Carroll, *U WI*
Johnnetta B Cole, *Bennett College*
Joel Cracraft, *AMNH*
Brent Dalrymple, *OR State U*
James E Darnell Jr, *Rockefeller University*
Richard E Dickerson, *UCLA*
Robert H Dott Jr, *U WI*
Niles Eldredge, *AMNH*
Milton Fingerman, *Tulane*
Douglas J Futuyma, *SUNY Stony Brook*
Alfred G Gilman, *U Texas SMC*
Laurie Godfrey, *U MA*
Donald Hornig, *Harvard*
Duane E Jeffery, *Brigham Young*
Donald Johanson, *Inst Hum Origins*
Patricia Kelley, *UNC Wilmington*
Philip Kitcher, *Columbia*
Richard C Lewontin, *Harvard*
Lynn Margulis, *U MA*
Malcolm McKenna, *AMNH*
Keith B Miller, *Kansas State U*
Kenneth Miller, *Brown*
David Morrison, *NASA Ames*
Bill Nye, *The Science Guy*
Robert L Park, *U MD*
James Randi, *Conjuror*
Michael Ruse, *Florida State U*
James W Skehan, *SJ, Weston Obs*
Elliott Sober, *U WI*
Frank Sonleitner, *U OK*
Richard Stucky, *Denver Mus Nat & Sci*
Neil DeGrasse Tyson, *AMNH*
MarvaLee Wake, *UC Berkeley*
Mary Jane West-Eberhard, *Smithsonian Inst*
Tim D White, *UC Berkeley*

OFFICERS AND DIRECTORS

Kevin Padian, *President*
Elizabeth K Stage, *President-Elect*
Jack B Friedman, *Past President*
Robert M West, *Secretary/Treasurer*
Brian Alters, *Director*
John R Cole, *Director*
Barbara Forrest, *Director*
Martha J Heil, *Director*
Duane E Jeffery, *Director*
Michael McIlwrath, *Director*
Andrew J Petto, *Director*
Frank J Sonleitner, *Director*
Lorne Trotter, *Director*
Bernard Winograd, *Director*

Eugenie C Scott, *Executive Director*
Stanley L Weinberg, *Founder*

NCSE is a nonprofit, tax exempt corporation
affiliated with the American Association
for the Advancement of Science.

Membership in the National Center for Science Education brings you

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

MEMBERSHIP / SUBSCRIPTION / DONATION

Name			
Address	City	State	Zip
Home Phone		Work Phone	
Occupation			
<input type="checkbox"/> Check here if NCSE may share your name with activists in your state			
<input type="checkbox"/> Check here if you object to our sharing your name with other nonprofit organizations			

NCSE MEMBERSHIP		
ONE YEAR	US: \$30 Foreign Air: \$39	
LIFETIME	\$600	\$
TAX DEDUCTIBLE CONTRIBUTION TO NCSE		\$
BACK ISSUES		
NCSE Reports / C/E Newsletter (Vol 1-16, \$3 per issue; \$18 per volume; all 16 vols, \$150) C/E Journal (1-9 copies, \$6 each; 10 or more, \$5 each; full set, nrs 1-39, \$150) RNCSE (Vol 17-28, \$5 per issue; \$24 per volume)		\$
SHIPPING		
\$1.25 for 1 issue, add \$1 for each additional issue; maximum of \$10		\$
TOTAL		
<input type="checkbox"/> Check (US dollars) <input type="checkbox"/> Discover <input type="checkbox"/> VISA <input type="checkbox"/> MasterCard <input type="checkbox"/> AmEx		\$

Credit Card Number	Expiration Date
Name as it appears on card	
Signature	

SUBSCRIBER INFORMATION
Subscriptions are fully tax deductible. NCSE is tax exempt under Federal IRS Code 501(c)(3) and the corresponding provisions of the California law. Amounts paid to NCSE are tax-deductible to the extent permitted by law.

MISSING ISSUES
If your issue fails to arrive or is badly damaged in transit, send us the date of issue and we will rush you a replacement.

Please mail all correspondence about your subscription to NCSE, PO Box 9477, Berkeley, CA 94709-0477 or call (510) 601-7203 or (800) 290-6006 or e-mail us at NCSE@ncseweb.org

MOVING TO A NEW ADDRESS?
Let us know your new address as early as possible and we will update our records of your subscription accordingly. Please allow 4 weeks for an address change.