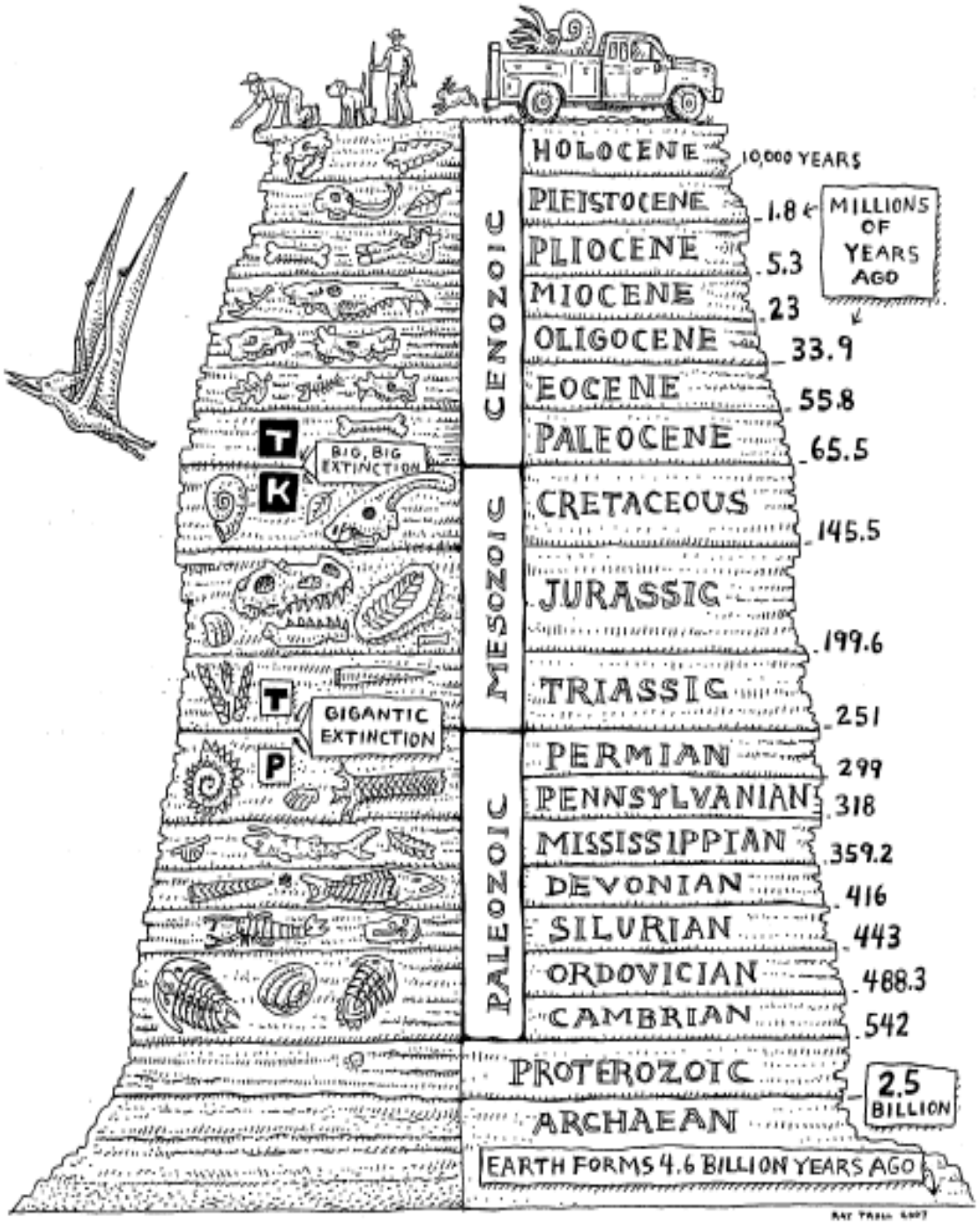
REPORTS OF THE NATIONAL CENTER FOR SCIENCE EDUCATION

DEFENDING THE TEACHING OF EVOLUTION IN THE PUBLIC SCHOOLS

Volume 30, Number 6 **Nov-Dec, 2010**

CONTINUES *NCSE REPORTS & CREATION/EVOLUTION*



CONTENTS

REPORTS OF THE
NATIONAL CENTER FOR SCIENCE EDUCATION
DEFENDING THE TEACHING OF EVOLUTION IN THE PUBLIC SCHOOLS
CONTINUES *NCSE REPORTS* & *CREATION/EVOLUTION*

VOLUME 30, NR 6, NOV-DEC 2010
ISSN 1064-2358

National Center for Science Education
PO Box 9477
Berkeley CA 94709-0477
(510) 601-7203
fax: (510) 601-7204
e-mail: info@ncse.com
http://www.ncse.com

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://ncse.com/media/authors-information>. Write to the publisher regarding address changes, missing issues, purchases of back issues, reprint rights, and related issues.

Cover: *Timeline*, ©Ray Troll, 2007. Ray has generously contributed his artwork to RNCSE since *RNCSE* began. Thank you

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

By now you know that *RNCSE* is poised at the edge of a new transition. This issue will be the last in the series that we began in 1997 when we combined NCSE's two publications — *NCSE Reports* and *Creation/ Evolution* — and expanded the variety of resources that we provided. With the first issue of Volume 31, *RNCSE* will appear in its entirety only on line. Members still receive a print edition with highlights of the content that keep you up to date on the latest trends and issues in the ongoing effort to promote good science education (Members may also request free printed copies of *RNCSE* online content if they are unable to access it easily on line).

Saying goodbye to this format of *RNCSE* also means that this is the last editor's column that I will write. The editor's column was a prominent feature of *Creation/Evolution*, introducing readers to the issue and providing a perspective on the contents. It is a bittersweet farewell. We are still interested in hearing your suggestions on how we can serve you better and help you help us fulfill NCSE's mission.

IN THE ISSUE

There is probably no more relevant (and perhaps ironic) observation than that anti-evolutionism constantly evolves. In this issue two features explore different aspects of that phenomenon. Glenn Branch provides an extensive analysis of anti-evolutionism's search for scientific legitimacy in the form of research publications. In this overview, Glenn focuses on the latest "intelligent design" journal and gives the highlights (lowlights?) of the history of such journals. Perhaps because they seek a real place at the scientific table, these ID journals have been less successful than the publications of the old-school creationist organizations, such as the Institute for Creation Research and Answers in Genesis. The new journal that Glenn reviews — *BIO-Complexity* — is another in a series of ID publications that makes grand claims to being ideologically neutral, while betraying those claims by the membership of its boards of directors and editors and, of course, the source of its funding.

Michael Barton explores another characteristic of anti-evolutionist publications: quote mining involving John Tyndall (1820–1893). Because of his status in biology, Tyndall's apparent lack of support for evolution was big news — even though his original comments conveyed exactly the opposite position. The original quotation was condensed by a reporter after a public lecture in New York.

Once the mangled quotation was in print, it was picked up and spread around. In this case, the reporter apparently was looking for a good angle and was not necessarily trying to undermine evolution or promote creationism; we cannot say the same for the people who have uncritically passed that quote along.

IN THE NEWS

There seems to be a temporary respite in legal challenges to evolution education. Two major court cases — one in California and one in Ohio — appear to be ended. In California, the state university system will continue to decide which high school texts prepare students appropriately for higher education. In Ohio, parents complaining about religious indoctrination and symbolism in a public school classroom prevailed in their case against a high school teacher. Elsewhere, Florida's students will not read about supposed "evidence against evolution", and the Minister of Education in Israel has removed the Ministry's chief scientist after he publically doubted human evolution.

IN REVIEW

Among the reviews in this issue, Jim Lippard and John Lynch review a creationist documentary film on Darwin's historic voyage and his subsequent work on natural selection and evolution. It will surprise no one that the film looks for errors and problems in Darwin's work. Of course, it's the film that is full of errors and problems.

James Lennox explores views of creationism, design in nature, and naturalism in antiquity. The urge to explain "life, the universe, and everything" seems to be an ancient one.

And that is just the beginning!

RNCSE 30(6) was printed in Jan 2011

UPDATES

California: On October 12, 2010, the Supreme Court declined to review *Association of Christian Schools International et al v Roman Stearns et al*, thus bringing the case to a definitive end. The case, originally filed in federal court in Los Angeles on August 25, 2005, centered on the University of California System's policies and statements relevant to evaluating the qualifications of applicants for admission. The plaintiffs — the Association of Christian Schools International, the Calvary Chapel Christian School in Murrieta, California, and a handful of students at the school — charged that the university system violated the constitutional rights of applicants from Christian schools whose high school coursework it deemed inadequate preparation for college.

Creationism was prominent in the case. The plaintiffs objected to the university system's policy of rejecting high school biology courses that use creationist textbooks as "inconsistent with the viewpoints and knowledge generally accepted in the scientific community." Michael Behe, a proponent of "intelligent design" creationism, served as a scientific expert witness for the plaintiffs, although his defense of the creationist biology textbooks was unavailing. Wendell Bird, one of the attorneys for the plaintiffs, is a former employee of the Institute for Creation Research; he defended Louisiana's 1981 "equal time" act all the way to the Supreme Court, where it was ruled to violate the Establishment Clause in the decision in *Edwards v Aguillard* (1987).

Relying in part on the view of defendants' expert witnesses Donald Kennedy and Francisco J Ayala (a Supporter of NCSE) that the creationist textbooks were not appropriate for use in a college preparatory biology course, the trial judge in *ACSI v Stearns* granted the defendants' motion for summary judgment on August 8, 2008. The plaintiffs appealed the decision, but in a January 12, 2010, ruling, the Ninth Circuit Court of Appeals affirmed the district court's decision, which is now reaffirmed by the Supreme Court's decision not to review the case. Documents from the case are available on NCSE's website, in a special section devoted to *ACSI v Stearns* (<http://ncse.com/creationism/legal/acsi-v-stearns>).

California, Modesto: "Last month, a Modesto science teacher announced at a back-to-school night that he would teach the theory of intelligent design alongside evolution," according to the *Modesto Bee* (2010 Sep 26). But a spokesperson for the Modesto City Schools said, "He will not be teaching intelligent design. He has been instructed to teach the state standards and intelligent design is not in the state standards." The teacher in question, Mark Ferrante, a mathematics teacher at Roosevelt Junior High School, but did not return e-mails from the newspaper.

Florida: A sidebar in a marine science textbook recommended for approval in Florida is "packed with good ol' fashioned creationist language," Florida Citizens for Science charged. The text in question, *Life on an Ocean Planet* (Rancho Santa Margarita [CA]: Current Publishing, 2011), was recently recommended for state approval by the state's instructional materials adoption committee on a 7–2 vote, according to the education blog of the *St Petersburg Times* (2010 Sep 22, 2010). But as FCFS's president Joe Wolf wrote to Florida Department of Education Commissioner Eric Smith, the sidebar on "Questions about the Origin and Development of Life" is "simultaneously actively misinforming, at odds with state standards, and ultimately irrelevant to marine science." Smith has the final say in the textbook adoption process, and Wolf recommended that the sidebar "should be removed entirely, as there is so little information that is either correct or useful to make it worth retaining."

The sidebar (available on-line at <http://ncse.com/files/images/LOP_3-14-15.jpg>) makes a variety of historical and scientific errors. For example, it claims that in the *Origin of Species* "Darwin proposed that life arose from nonliving matter"; it equates microevolution with genetic drift; and it contends that selective breeding demonstrates genetic drift. Moreover, although the sidebar acknowledges that "the vast majority of biologists (probably more than 95%)" accept evolution, it also airs, without attempting to debunk, a variety of creationist claims, attributed to unnamed "skeptics". Among these claims: that the fossil record "does not contain the many transitional species one would expect," that "evolution doesn't adequately explain how a complex structure ... could come to exist through infrequent random mutations," that transitional features could not be favored by natural selection, and that "the hypotheses that ... chemicals can lead to abiogenesis are highly debatable."

The *St Petersburg Times*'s education blog cited a Florida Department of Education spokesperson as stating that the committee's vote to recommend *Life on an Ocean Planet* for approval included the provision that the publisher remove two specific pages — presumably the problematic sidebar. But FCFS wasn't so sure about what was recommended, reporting, "Information we have about the committee vote indicates that they voted to approve the textbook overall, and then a second vote was called for to remove the sidebar. That second vote failed but a compromise was reached to 'fix' the sidebar." FCFS added, "Further muddying of the waters comes from there being two versions of the textbook: an electronic one on CD and a print one. It's unclear whether the votes pertain to both versions or just one since it looks like the committee only reviewed the electronic one."

Is There Mutation in Scientific Citations?

A recent observation by Christian G Specht in *The Scientist* described a process of "mutation" of scientific citations. Using models of biologic mutation mechanisms, Specht classifies the citation errors that appear in articles citing one key article that identifies protein products generated by specific genes (Laemmli 1970). Specht located over 200 000 instances in which the original article was cited in research articles. When he searched the "Web of Knowledge" reference databases for the details of the citations, he reported "more than 600 variations" in the details of those citations.

Although there were errors in nearly every element of the citation, Specht reported two findings of interest for evolutionary models. The first was that the distribution of the errors was not random: some occurred at much higher rates that others. For example, it was more likely that the numeral 3 than a numeral 2 would substitute for a numeral 8 in a citation. Among other common errors were transposition of number, particularly in publication dates, so that, for example, 1970 might become 1907. There were also insertions, deletions, and inversions of citation elements.

The second finding of interest was that errors were transmitted to future "generations" of researchers, either because those researchers were trained directly by the researchers who made the original error or because those researchers based their work on research that contained the original error. In both cases, certain errors defined "lineages" of researchers whose work could be traced back to a "common ancestor" where the original error occurred.

Although Specht is not arguing that these citations mutate in precisely the way that genetic sequences do, his analysis suggests that a "descent with modification" approach to the array of errors in scientific citation gives valuable insight into the structure of our systems of knowledge. He concludes:

> citation variants arise through a variety of mechanisms similar to those described by molecular genetics. They are heritable between scientists and offer exciting insights into the transfer of knowledge. The high incidence of wrong citations reflects the fact that the contained information is to a certain extent redundant and may thus tolerate many mutations.

See Specht's analysis and comments by readers on *The Scientist* web site: <http://www.the-scientist.com/news/display/57689/>.

References

Laemmli UK. 1970. Cleavage of structural proteins during the assembly of the head of bacteriophage T4. *Nature* 277: 680–5.

Specht CG. 2010. Mutations of citations: Just like genetic information, citations can accumulate heritable mutations [opinion]. *The Scientist*
Available from <http://www.the-scientist.com/news/display/57689/>. Last accessed Nov 22, 2010.

Shortly thereafter, the *Orlando Sentinel* (2010 Sep 23) also reported that state education officials stated that the publisher agreed to remove the sidebar, and a week later, the newspaper's education blog (2010 Sep 30) quoted excerpts from e-mail correspondence from the publisher to the state department of education confirming that the sidebar would be removed: "We will also review all of the curriculum components and remove any content that refers to the information on these pages."

Eileen Roy, a member of the Alachua County School Board who was on the committee and voted against the textbook's approval, told the *Sentinel*'s blog that she feared that the "very, very egregious ... discussion of evolution" might be reflected in the rest of the textbook. She also said that she worried that, if the textbook were approved, it would be adopted by the Florida county school boards that in 2008 adopted resolutions opposing the proposed improvements to the treatment of evolution in Florida's state science standards.

Subsequently, Dean Allen, the vice president and general manager of Current Publishing, told the *Sentinel*'s education blog (2010 Oct 4) that the sidebar was intended to provide a "critical thinking exercise for students" and not to undermine the teaching of evolution. "Everywhere else in the book we teach evolution," he said, "and we teach it to the Sunshine State standards." He confirmed that the sidebar would be removed from both the printed and the electronic version of the textbook.

Ohio, Mount Vernon: A settlement was reached on Dec 3, 2010, in *Doe v Mount Vernon Board of Education et al*, the case in which John Freshwater, a Mount Vernon, Ohio, middle school science teacher, was accused of inappropriate religious activity in the classroom — including displaying posters with the Ten Commandments and Bible verses, branding crosses on the arms of his students with a high-voltage electrical device, and teaching creationism. The *Mount Vernon News* (2010 Oct 27) reports that the parties have signed the agreement, which still must be approved by a judge:

> The settlement involves a $300 000 payment by Freshwater's insurer to Stephen and Jenifer Dennis [the Does] to compensate them 'for mental pain and other damages suffered.' The insurer, Ohio Casualty, is the school district's liability carriernand is involved because Freshwater was a school district employee at the time the lawsuit was filed. A separate payment of $150 000, over the course of the next 13 years, will be used to purchase an annuity for their minor son, Zach Dennis, on whose behalf the lawsuit was originally filed.

Shortly beforehand, on October 21, 2010, Freshwater filed a notice to dismiss his own lawsuit against the Mount Vernon City School District Board of Education, which he filed in June 2009 after he was dismissed from employment with the district in June 2008. Freshwater claimed that he had been offered a financial settle-

ment, but Sarah Moore, a lawyer representing the school district, denied it, telling the *Columbus Dispatch* (2010 Oct 23),"I can confirm there was no settlement, and we're not expecting any."

Freshwater told the Associated Press (2010 Oct 22) that he abandoned his lawsuit against the board because "it would have interfered with a public airing of his complaint in a different venue" — presumably the administrative hearing on the termination of his employment, which was conducted intermittently from October 2008 to June 2010.The referee presiding over the hearing has yet to release his decision. (Richard B Hoppe's detailed reports on the hearing as well as the two lawsuits are available on The Panda's Thumb blog <http://www.pandasthumb.org>; documents from both cases and the hearing are available on NCSE's website.)

Israel: Gavriel Avital was dismissed from his position as chief scientist in Israel's Ministry of Education due to his denial of evolution and global warming, according to *Haaretz* (2010 Oct 5). In February 2010, Avital's views sparked a furor; *Haaretz* (2010 Feb 21) quoted him as saying, "If textbooks state explicitly that human beings' origins are to be found with monkeys, I would want students to pursue and grapple with other opinions. ... Part of my responsibility, in light of my position with the Education Ministry, is to examine textbooks and curricula." (For background, see *RNCSE* 2010 May–Jun; 30 [3]: 9–10.)

Israeli Minister of Education Gideon Sa'ar told a session of Israel's parliament that Avital's remarks "are not in line with Education Ministry policy and are unacceptable to me," as reported in *Haaretz* (2010 Mar 4). But after Avital promised to follow the ministry's policy on evolution and the environment, the controversy seemed to have subsided. Avital's dismissal now appears to be connected to the expiration of what Ynetnews (2010 Oct 4) described as "a scandal-filled trial period of less than a year."

Avital told Ynetnews that he was fired "because of an interview I gave to the press, not because I didn't do my job well." He added, "In the interview I expressed my opinion on evolution, science and literature — there was no negative response to the interview, only good feedback." Yet the responses to his interview included a protest from ten recipients of the Israel Prize — the country's highest civilian honor — protesting that his remarks "undermine the standing and importance of science and take us centuries backward," as *Haaretz* (2010 Feb 26) reported.

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!

"Dispatches from the Evolution Wars: Shifting Tactics and Expanding Battlefields," a review article by NCSE's **Glenn Branch**, **Eugenie C Scott**, and **Joshua Rosenau**, was published in *Annual Review of Genomics and Human Genetics* (2010; 11: 317–38). The abstract:

> Creationism continues to present a challenge to the teaching of evolution in the United States. With attempts to ban evolution education and to "balance" the teaching of evolution with creationism unavailing, creationists are increasingly favoring the approach of misrepresenting evolution as scientifically controversial. To understand the ongoing challenges facing evolution education in the United States, it is necessary to appreciate creationist actions at the different levels of educational governance — state legislatures, state boards of education, local boards of education, and finally the individual classroom — that serve as the battlegrounds for the evolution education wars. Scientists are in a unique position to defend the teaching of evolution, both by resisting creationist incursions as they occur and by helping to improve the teaching of evolution at both the precollege and college levels.

Complimentary access to a PDF version of the article for personal use is available from *Annual Reviews* (visit <http://ncse.com/news/2010/10/dispatches-from-evolution-wars-006257> for details), but further/multiple distribution, publication, and commercial usage requires permission from the *Annual Reviews* Permission Department. Published annually since 2000, the *Annual Review of Genomics and Human Genetics* covers significant developments in the field of genomics as they apply to human genetics and the human genome; it is widely considered to be a leading journal in genetics and heredity.

A special issue of *Proceedings of the California Academy of Sciences* (2010; series 4, vol 61, supp vol 2) was dedicated to Darwin and the Galápagos. In his introduction, the editor Michael T Ghiselin writes, "The various chapters provide more than just a glimpse of Darwin's life and accomplishment. They represent a

Glenn Branch is NCSE's deputy director

good sample of how his investigations progressed, and of the problems with which he was concerned. Inspired by Darwin's example, scientists have returned again and again to the sites and topics that interested him. Darwin's science is evolving, and will continue to do so for the foreseeable future." Among the articles were **Jere H Lipps**'s "Charles Darwin and HMS *Beagle*: Besides Galapágos" and John E McCosker and **Richard H Rosenblatt**'s "The fishes of the Galápagos Archipelago: An update." Other authors include Edward J Larson, Peter R Grant, sB Rosemary Grant, and Sandra Herbert. All of the papers in the special issue are freely available on-line via <http://research.calacademy.org/scipubs/pubs/1831>.

Matt Lowry attended a talk by a representative of the Discovery Institute and subsequently not only blogged about it but also gave a talk — "ID's next strategy in the evolution/creationism was?" — about it to the North Shore chapter of Americans United for Separation of Church and State, of which he is the president, on September 30, 2010. Announcing the talk, Lowry wrote:

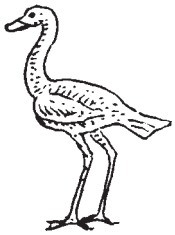
> In the last two decades, creationism has attempted to repackage itself as 'intelligent design,' and the organization behind this effort, the Discovery Institute, has mounted an aggressive PR campaign for years against both evolutionary science and the church–state wall. After their stinging defeat at the *Dover v Kitzmiller* trial in 2005, the Discovery Institute has tried to revise its strategy. I recently had the opportunity to go 'into the lion's den' and attend a talk by none other than Casey Luskin, Fellow of the Discovery Institute. Luskin's talk took place last month at the University Club of Chicago, and was sponsored by the St James Fellowship and *Salvo* Magazine. He had some very interesting things to say, and I think that based upon what I heard at that talk and some follow-up research I did I have a little insight into what the Discovery Institute's next assault against science and the church-state separation wall might be. I will summarize the basic points made by Luskin, why they're wrong, and outline how we in the pro-science & church–state separation community should consider responding. It should make for a good discussion.

For Lowry's blog post and audio of his talk, visit his blog at <http://skepticalteacher.wordpress.com/>.

Writing at the Huffington Post (2010 Aug 26; available on-line at <http://www.huffingtonpost.com/steven-newton/darwin-was-not-wrong—new_b_696132.html>), NCSE's **Steven Newton** debunked the latest round of "Darwin was wrong" sensationalism in the media. A recent paper in *Biology Letters*, Sarda Sahney, Michael Benton, and Paul Ferry's "Links between global taxonomic diversity, ecological diversity and the expansion of vertebrates on land," was widely proclaimed as showing that Darwin was wrong. But Newton commented, "These reporters really should have 1) talked to the authors, 2) read the *Biology Letters* paper, and 3) familiarized themselves with what Darwin wrote. When I talked to lead author Sarda Sahney, of the University of Bristol, she told me unequivocally: 'We are not in any way suggesting Darwin was wrong.'" After briefly describing the real significance of the paper, which represents "a refinement of the details of how evolution happens," Newton lamented the prospect of these misleading reports' fueling creationist efforts to undermine the teaching of evolution: "Once misguided, sensationalist headlines such as these start to spread, this poisonous misinformation — despite all the hard work and research of scientists — becomes a tool for those who reject science."

NCSE's **Steven Newton** was quoted in a *USA Today* story (2010 Sep 24) about a new report on the economic importance of science education. The report, *Rising Above the Gathering Storm, Revisited*, lamented that "in spite of sometimes heroic efforts and occasional very bright spots, our overall public school system — or more accurately 14 000 systems — has shown little sign of improvement, particularly in mathematics and science." Newton commented, "The current economic crisis makes the link between education and employment very clear." In further remarks posted on the newspaper's Science Fair blog (2010 Sep 24), Newton wrote,

> The NCSE welcomes this report, and we hope that the call for improving education — particularly in science, math, and technology fields — is heard by many. … [T]here is a direct link between education and the economy. Educated citizens earn more, and pay more taxes. When states save money by not fixing roads, more drivers get flat tires. But when states try to save money by short-changing public education, they rob kids of their futures and they rob America of its economic growth.



Ronald L Numbers spoke on "Anti-evolutionism in America: From creation science to intelligent design" at Wheaton College on October 7, 2010. A reporter for *Suburban Life Publications* (2010 Oct 17) attended, writing, "Wheaton College did well in selecting Numbers to address this subject. He wrote *The Creationists*, which many have called the definitive historical account of the anti-evolution movement." Robert Bishop of Wheaton College commented, "I selected Ron for this fall's lecture because his work on recent history of evolution and anti-evolutionism is very good work and something that I think the Christian community needs to learn more about." Numbers is the Hilldale Professor of the History of Science and Medicine in the Department of Medical History and Bioethics at the University of Wisconsin, Madison, and the author of *The Creationists: From Scientific Creationism to Intelligent Design*

(Cambridge [MA]: Harvard University Press, 2006).

Robert T Pennock kept busy during the summer of 2010. In June, he organized a workshop and gave a talk at the Society for the Study of Evolution meeting in Portland to help scientists better communicate about evolution to the press and to the general public. In August, he presented two talks at a conference in Dennmark on artificial life. The first was a historical talk about Herbert Simon, artificial intelligence, and evolutionary computation. The second was on a set of experiments demonstrating the evolution of dynamic memory abilities in populations of digital organisms that were evolved in maze environments. To gain resources, organisms evolved to be able to control their movements in response to a sequence of signposts along various food paths. (These experiments were featured in a major article in the August 4, 2010, issue of *New Scientist*.) His article "Selective pressures for accurate altruism targeting: Evidence from digital evolution for difficult-to-test aspects of inclusive fitness theory" (coauthored with his colleagues Jeff Clune, Heather J Goldsby, and Charles Ofria) was accepted by and published on-line in *Proceedings of the Royal Society B.* Pennock is Professor of Philosophy at Michigan State University and coeditor, with **Michael Ruse**, of *But Is It Science? The Philosophical Question in the Creation/Evolution Controversy* (Amherst [NY]: Prometheus Books, 2009).

Stanley A Rice's *Life of Earth: Portrait of a Beautiful, Middle-Aged, Stressed-Out World* (Amherst [NY]: Prometheus, 2010) was published. The publisher writes:

> Unlike most books on earth history, which present the story of life on our planet in terms of one chronological period after another, Rice discusses earth's teeming diversity in terms of pivotal evolutionary developments. ... Rice's eloquent, panoramic perspective is well designed to foster an appreciation for the scope of life on earth and to encourage wise stewardship of the natural world on which our survival depends.

Rice is Professor in the Department of Biological Sciences at Southeastern Oklahoma State University.

Four years after its publication, *Not in Our Classrooms: Why Intelligent Design is Wrong for our Schools* (Boston: Beacon Press, 2006), is still receiving praise from the reviewers. In the latest review, published in the *Journal for the Study of Religion, Nature and Culture* (2010; 4 [3]: 228–250), Mark H Dixon of Ohio Northern University writes:

> The papers in this volume serve to reinforce what those who have had a rigorous science education have long known: there are no real scientific controversies at all about evolution as a process. The evidence is as unequivocal as scientific evidence can be — evolution is a discernible, testable, and verifiable scientific process. All that "intelligent design" proponents can do is to continue to sow confusion. While it is regrettable they are necessary, books like *Not In Our Classrooms* provide an accessible, illuminating, and most welcome perspective on the intelligent design movement.

Edited by NCSE's **Eugenie C Scott** and **Glenn Branch**, *Not in Our Classrooms* contains essays by Scott, **Nicholas J Matzke** and **Paul R Gross**, Martinez Hewlett and Ted Peters, Jay D Wexler, **Brian Alters**, and Branch, as well as a foreword by the Reverend **Barry W Lynn**. **Bill Nye** the Science Guy recommends: "If you're concerned about scientific literacy, read this book."

In Orange County, California, to give a talk at Chapman University, NCSE's executive director **Eugenie C Scott** was interviewed by the *Orange County Register* (2010 Oct 11). She explained why creationism is wrong for the public school science classroom, observing, "The scientists tell us claims of scientific support for special creation are invalid. So why would we deliberately teach students information that the scientific community says is not accurate?" She addressed the creationist strategy *du jour* of presenting evolution but "balancing" it with the teaching of "evidence against evolution" — which, she added, "is really just what they call creationism these days." And asked whether people in Orange County can "just relax and not worry" about the teaching of evolution in the absence of a major local controversy, she warned, "I think it would be a mistake to look at the newspaper and say, 'No creationism today. I can relax.' Because the creationist activity that matters is what's happening at local school districts and pressure on local teachers — which never makes the newspapers."

The *Orange County Register* (2010 Oct 12) devoted a second column to NCSE's executive director **Eugenie C Scott**'s recent talk at Chapman University. "Rumor was," the columnist joked, "some Bible-thumping creationists were going to try and smite down speaker Eugenie C Scott and turn the rest of us into pillars of salt or some such. Didn't happen." Instead, she reviewed the history of the creationism/evolution controversy, from the Scopes trial of 1925 through the *Epperson* and *Edwards* cases to the *Kitzmiller* case of 2005. The latest creationist strategy is to encourage individual teachers to present evolution, as with the so-called Louisiana Science Education Act of 2008. "'Creationists have found that top-down agendas ... get knocked down by courts,' Scott says. The way they get around that is to appeal to individual teachers, some 25–30 percent of whom nationwide are believed to be sympathetic to creationism."

Eugenie C Scott's *Evolution vs Creationism* (second edition: Westport [CT]: Greenwood Press, 2008 and Berkeley [CA]: University of California Press, 2009) was recommended by the International Society for Science and Religion (ISSR) as one of 250 central texts in the field of science and religion. In his essay introducing the book for ISSR, the historian Edward J Larson described it as

> an invaluable resource for those seeking to understand the American controversy

over creationism and evolution from the perspective of an eloquent and knowledgeable partisan. … [It] offers an insightful overview of the American controversy over teaching evolution along with a representative sampling of short excerpts from both creationists and evolutionists. By reading it, teachers, parents, students and the public can be better prepared to answer creationist claims and defend the teaching of evolution.

A November 20, 2007, press release from the ISSR explained

> The ISSR, the world's leading learned society in the field of science and religion, will create a foundational library of central texts in the field. This library will consist of approximately 250 books spanning all important areas and disciplines as well as key international and intercultural voices. Upon selection of constituent titles, Society members will write critical essays on each book and these will be collected into a new, stand-alone companion volume, *The ISSR Companion to Science and Religion*, to be made available through a commercial publisher. ... By the end of this three-year program a basic library in science and religion will exist for the first time. A compact, critical overview will be available in the form of the companion volume, and hundreds of institutions worldwide will provide access for their students, scholars and the general public.

Other books by NCSE members and Supporters in the list include **Francisco Ayala**'s *Darwin's Gift to Science and Religion* (introduced by NCSE's **Peter MJ Hess**), **Sean B Carroll**'s *Endless Forms Most Beautiful*, **Daniel C Dennett**'s *Breaking the Spell* and *Darwin's Dangerous Idea*, **Taner Edis**'s *An Illusion of Harmony*, **Ursula Goodenough**'s *The Sacred Depths of Nature*, **Stephen Jay Gould**'s *Rocks of Ages* and *Time's Arrow, Time's Cycle*, **John F Haught**'s *Deeper than Darwin* and *Is Nature Enough?*, **Ernst Mayr**'s *Toward a New Philosophy of Biology*, **Kenneth R Miller**'s *Finding Darwin's God*, **Ronald L Numbers**'s *The Creationists* and his collection *Galileo Goes to Jail*, **Robert T Pennock**'s *Tower of Babel* and his collection *Intelligent Design Creationism and its Critics*, **Michael Ruse**'s *Can a Darwinian be a Christian?* and *Monad to Man*, and **Elliott Sober**'s *Unto Others* (coauthored with David Sloan Wilson).

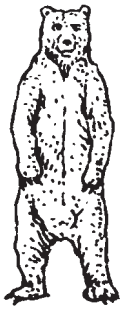
As the 50th anniversary of the film adaptation of *Inherit the Wind* approached, NCSE's executive director **Eugenie C Scott** discussed its enduring relevance with the *Los Angeles Times* (2010 Oct 2). Scott, Edward J Larson (who won a Pulitzer Prize for his book on the Scopes trial, *Summer for the Gods*), and Karen Kramer and Kat Kramer (the widow and daughter of Stanley Kramer, who directed the film adaptation) participated in a panel discussion on *Inherit the Wind* at the Malibu Film Society on October 3, 2010. Karen Kramer, Larson, and Scott all emphasized that *Inherit the Wind* was not intended as a documentary, with Kramer saying, "It is not about the Scopes trial. It's about freedom of thought, freedom of speech," Scott explaining, "I always tell people, 'Don't look at it as a movie reporting on the Scopes trial,'" and Larson adding, "In the 1950s, everybody realized that. ... What happens was that they set up the creationists as strawmen for McCarthy and they didn't think there were any Creationists left. But the strawmen outlived the McCarthyites." Nevertheless, Scott contended, *Inherit the Wind* does capture a very important mood that reflects the anti-evolution movement ... That theme is particularly strong in the movie and is central to the creationist message today: Evolution leads to evil, and evolution means that you can't believe in God and you have no moral rudder." In addition, she suggested that the film retains its appeal simply "because it's a great story. It engages your interest and deals with serious issues. The Scopes character … he does what is right."

NCSE Supporter **Elliott Sober**'s *Did Darwin Write the* Origin *Backwards?* (Amherst [NY]: Prometheus, 2010) was published. The publisher writes, "The main topics that are the focus of the book — common ancestry, group selection, sex ratio, and naturalism — have rarely been discussed in their connection with Darwin in such penetrating detail. ... This insightful collection of essays will be of interest to philosophers, biologists, and laypersons seeking a deeper understanding of one of the most influential scientific theories ever propounded." Sober is Hans Reichenbach Professor and William F Vilas Research Professor in the Philosophy Department at the University of Wisconsin, Madison.

After Daniel Lapin's op-ed "Civilization and the Severed Flower" appeared in the *Jewish Press* (2010 Sep 24), arguing against church/state separation, **Zev Stern** wrote a letter to the editor to protest. Among his points:

> Lapin, in asserting that manners find their roots in the biblical account of God creating humans separately from animals, repeats the tired canard that the modern outlook on human origins encourages people to 'act like animals.' Well, as every pet owner knows, dogs act like dogs and cats act like cats and pigs act like pigs. Why shouldn't humans act like humans? We are highly social primates who for most of our history competed with other larger, stronger and faster species. Social cooperation was the only way to successfully compete, and even today, when we no longer run down big game with primitive weapons, we cannot manage without getting along with one another.

His letter appeared on October 6, 2010.



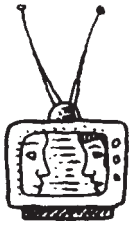
Jason R Wiles, Assistant Professor of Biology in Syracuse University's College of Arts and Sciences, received the 2010 Science and Technology Outreach Award from the Technology

The Latest "Intelligent Design" Journal

Glenn Branch

Enter BIO-Complexity

A new on-line, open-access, peer-reviewed journal with the ungainly name *BIO-Complexity* (ISSN 2151-7444) was announced on April 30, 2010, by its publisher, the Biologic Institute. According to its statement of purpose and scope, *BIO-Complexity* "aims to be the leading forum for testing the scientific merit of the claim that intelligent design (ID) is a credible explanation for life." The journal hopes to publish "studies in all areas of science with clear relevance to its aim, including work focusing on the relative merit of any of the principal alternatives to ID (neo-Darwinism, self-organization, evolutionary developmental biology, etc.)."



Hailing the journal was the Discovery Institute's Jay Wesley Richards, who declared on May 1, 2010 in the *Evolution News and Views* blog) declared,"A new scientific journal, *BIO-Complexity*, is set to accelerate the pace and heighten the tone of the debate over intelligent design," complained that work supporting "intelligent design" is unjustly (if not entirely) excluded from the scientific literature, and added, "Of course, the journal itself is simply a forum for the evidence to be presented, defended, debated, and critiqued — not to be a mouthpiece for ID" (Richards 2010). A look at the publisher, the editorial staff, and the history of "intelligent design" journals suggests otherwise.

The Biologic Institute

The Biologic Institute — as Barbara Forrest noted in her "Understanding the intelligent design creationist movement" — was mentioned in a story in *The New York Times* (Chang 2005) in August 2005, "one month before the *Kitzmiller* trial began, at the time of the ID movement's greatest need to create the appearance of scientific authenticity" (Forrest 2007: 23). Yet it was not incorporated in the state of Washington until October 2005, and its existence was not publicly confirmed until 2006, when Celeste Biever, a reporter for *New Scientist*, visited it in person and received a chilly reception. "The reticence," she reported, "cloaks an unorthodox agenda" (Biever 2006).

George Weber, a director of the Biologic Institute, a retired member of the business faculty at Whitworth University, and the head of the Spokane chapter of the old-earth creationist ministry Reasons to Believe, told Biever, "We are the first ones doing what we might call lab science in intelligent design. ...The objective is to challenge the scientific community on naturalism." After he spoke to *New Scientist*, however, Weber left the board of the Biologic Institute, and Douglas Axe, the lab's senior researcher, told *New Scientist* that Weber "was found to have seriously misunderstood the purpose of Biologic and to have misrepresented it."

Instead, Axe said, the lab only seeks "to show that the design perspective can lead to better science. He also contended that it will nevertheless "contribute substantially to the scientific case for intelligent design." Axe told *New Scientist* that the Biologic Institute was currently conducting research on "the origin of metabolic pathways in bacteria, the evolution of gene order in bacteria, and the evolution of protein folds" as well as research on computational biology, where he claimed "we are nearing completion of a system for exploring

---

Alliance of Central New York (TACNY). Wiles received the award at TACNY's 12th annual Celebration of Technology Banquet on September 20 in Liverpool, New York. The award is presented annually to a resident of central New York who has increased interest in science or technology or expanded opportunities for people with limited access to science or technology. In addition to teaching biology and biology education at Syracuse University, Wiles is also involved in conducting in-service teacher training and in outreach, especially with regard to evolution education, to the community. Wiles's "Overwhelming scientific confidence in evolutionary theory and its centrality in science education — and the public disconnect" — arguing that in light of "a great disconnect between the scientific community and the largely dissenting and apparently underinformed, or misinformed, public," "[l]arge-scale research efforts regarding current practices related to the instruction of evolution, and into more effective methods of teaching evolution, are needed" — was recently published in *The Science Education Review* (2010; 9: 18–27; available at <http://www.scienceeducationreview.com/ open_access/wiles-evolution.pdf>.)

Wade B Worthen contributed "Flying dragons: A colorful experiment in resource partitioning" — in which he explained how to use the fact that common dragonfly species perch at different heights to teach about ecological principles such as niche partitioning and territoriality — to *The American Biology Teacher* (2010; 72 [7]: 432–6). A life member of NCSE, Worthen is Professor of Biology at Furman University.

the evolution of artificial genes that are considerably more life-like than has been the case previously."

A list of selected publications on the Biologic Institute's website cites twenty-eight papers in a variety of fields. But over half were published before the institute was officially formed, and Biologic Institute is listed as the affiliations of the authors on only two (Axe and others 2008, Sternberg 2008); neither mentions "intelligent design". The editor of the journal in which the former article appeared commented:

> There has been some concern about the authors' connection with an intelligent design institute, which understandably creates a perception that the research may be ideologically biased. I did not detect any such bias in this manuscript; nor do the results support intelligent design in any way (Scheffler 2008).

New Scientist reported, "It was Discovery that provided the funding to get the Biologic Institute up and running," but noted that both Axe and a spokesperson for the Discovery Institute insisted that the Biologic Institute is a "separate entity" from the Discovery Institute (Biever 2006). Biologic Institute's tax return for 2006 indicated revenues of $261 000 from "indirect public support" — a category that would include revenue from a tax-exempt parent organization, such as the Discovery Institute. In 2007 and 2008, the Biologic Institute's revenues, of $464 000 and $280 998, respectively, were from direct public support. The source is unclear.

There is also overlap between the personnel of Biologic Institute and of the Discovery Institute's Center for Science and Culture: Guillermo Gonzalez and Jonathan Wells are both listed under "People" at the former and as "Senior Fellows" at the latter. Brendan Dixon, listed under "People" at the Biologic Institute and a coauthor of Axe and others (2008), donated $700 000 to the Discovery Institute's Center for Science and Culture in 2006 through a private family foundation (Bottaro 2007).The same foundation also donated $30 000 to Baylor University to fund a part-time appointment for William Dembski; it was later returned by the university (Bottaro 2007).

Axe himself was named in the Wedge document as the head of the Discovery Institute's Center for Science and Culture biochemistry program, and he was listed as a Fellow of the Discovery Institute's Center for the Renewal of Science and Culture (as it was known then) in 2000; although his name was removed in the same year, his *curriculum vitae* in 2003 listed him as a Senior Fellow from 1999 to the present (Forrest and Gross 2004: 40–1). Axe told Forrest in 2001 that he had not attempted to argue for "intelligent design" in any of his publications (Forrest and Gross 2004: 42), although in 2007 he was quoted as saying that they "add to the case for intelligent design" (Forrest 2007: 24).

The Editorial Staff

BIO-Complexity's editor-in-chief and the thirty people on its editorial board have a variety of connections with the "intelligent design" movement. Five — Michael Behe, Walter Bradley, William Dembski, Scott Minnich, and Jonathan Wells — are Fellows at the Discovery Institute's Center for Science and Culture. Those five, as well as Russell Carlson, James Keener, Matti Leisola, and Jed Macosko, were Fellows of the International Society for Complexity, Information, and Design, which William Dembski cofounded in 2001, with the slogan "retraining the scientific imagination to see purpose in nature". ISCID seems to have become moribund.

The editor-in-chief and twenty-four members of the editorial board of *BIO-Complexity* are signatories to the Discovery Institute's "A Scientific Dissent from Darwinism":

> We are skeptical of the claims for the ability of random mutation and natural selection to account for the complexity of life. Careful examination of the evidence for Darwinian theory should be encouraged. (<http://www.dissentfromdarwin.com>)

The statement, of course, is widely and misleadingly cited by creationists as evidence for the claim that there is a genuine scientific controversy over evolution.

Three members of the editorial board — Behe, Dembski, and Minnich — were slated to testify in *Kitzmiller v Dover*, although only Behe and Minnich did so (Elsberry 2006). Five members of the editorial board— Behe, Carlson, Edward Peltzer, Ralph Seelke, and Wells — testified in Kansas in May 2005 to express their support for the so-called minority report version of the state's science education standards, rewritten with the aid of a local "intelligent design" organization to misrepresent evolution as scientifically controversial. (The standards were adopted in November 2005, only to be rescinded in February 2007, after the balance of power on the state board of education shifted.)

There are also connections with creationism in its traditional forms, starting with the editor-in-chief, Matti Leisola. He is identified by *BIO-Complexity* as "a professor of Bioprocess Engineering at Aalto University (previously Helsinki University of Technology)." Unmentioned, however, is the fact that he is evidently a dyed-in-the-wool creationist, having spoken on his "30 years as a non-evolutionist" at the 8th European Creationist Conference (Anonymous 2003), being described by Creation Ministries International as a biblical creationist (Wieland 2009), and having told a Finnish Christian youth magazine that evolution "is basically a heresy" (Anonymous 2006).

Similarly, Colin Reeves is a Trustee of Biblical Creation Ministries and a contributor to the journal of the Biblical Creation Society (Lynch 2009, Pieret 2009); Stuart Burgess is listed as a speaker on the United Kingdom branch of Answers in Genesis and a contributor to AiG's journal (Lynch 2009, Pieret 2009); Norman Nevin edited and contributed to a book arguing that Christians ought not to accept evolution (Nevin 2009); David

Glenn Branch is NCSE's deputy director

Snoke wrote a book arguing for old-earth creationism (Snoke 2006); and so on. To be sure, none of these activities and affiliations implies that the editorial board members are not competent to evaluate submissions to the journal. But it is hard to imagine such a prevalence of creationists in a journal without any axe to grind.

True, it seems that there were efforts to recruit non-creationists to the editorial board. Loren Haarsma and Scott Turner are both on the board: Haarsma is a physicist at Calvin College who coauthored a book arguing for a reconciliation of evolution and religion —in particular, Christian Reformed doctrine — (Haarsma and Haarsma 2007; see Flietstra 2008), while Turner is a biologist at the State University of New York's College of Environmental Science and Forestry who wrote a book declaring on its first page that it "is not about intelligent design ... ID theory is essentially warmed-over natural theology" and adding, "it is not a critique of Darwinism" (Turner 2007).

Günter Wagner, a biologist at Yale University, was also asked to join the editorial board. He told *RNCSE* that he declined because "the existing evolutionary biology journals are able to handle the necessary research on the evolvability of complex characters." He explained,

> Publishing on this subject in mainstream journals is also better for ... the credibility of the eventual answer to this question, as well as for the integrity of the scientific process in general. There are too many reasons for scientists to distrust a journal with a substantial ID influence, regardless of whether this particular enterprise is biased or not. ... In the current situation any project of this sort will have a hard time to earn the trust of the scientific community.

The History of "Intelligent Design" Journals

The first, and most successful, "intelligent design" journal was *Origins & Design* (ISSN 0748-9919), produced by the Access Research Network, formerly Students for Origins Research, which published *Origins Research*. The stated goal of *Origins & Design* was "(1) to examine theories of origins, their philosophical foundations, and their bearing on culture, and (2) to examine all aspects of the idea of design." The journal received a portion of its funding from the Discovery Institute's Center for the Renewal of Science and Culture (Forrest and Gross 2004: 166, 176). *Origins & Design* apparently ceased publication in 1999, with its last issue identified as volume 19, number 2.

After his plan to establish a base for "intelligent design" at Baylor University failed, Dembski founded the International Society for Complexity, Information, and Design (Forrest and Gross 2004: 207–13). ISCID published the second "intelligent design" journal, *Progress in Complexity, Information, and Design* (ISSN 1555-5089) in an on-line format. Its stated goal was "to advance the science of complexity by assessing the degree to which teleology is relevant (or irrelevant) to the origin, development, and operation of complex systems." *Progress in Complexity, Information, and Design* ceased publication in 2005, with its last issue identified as volume 4, number 1.

The on-line *Journal of Evolutionary Informatics* (no ISSN) was sponsored by the Evolutionary Informatics Lab, a project of Dembski and Robert Marks, a professor of electrical and computer engineering at Baylor University. The "Lab" was controversial because it was originally hosted on a Baylor University server; after Marks and Baylor were unable to come to terms about its content, it was removed to a third-party hosting facility. As a result, Marks was then featured as a "victim" in the creationist propaganda movie *Expelled* (Sager 2008). The *Journal of Evolutionary Informatics* seems to have become defunct before managing to publish a single issue.

These journals failed to make a splash scientifically: articles from none of them appear in major scientific indexes such as PubMed, Web of Knowledge (which subsumes Science Citation Index and Biological Abstracts), and EBSCO's Academic Search Complete, although a few articles from *Origins & Design* are indexed in GeoRef. Google Scholar indexes articles from all of the "intelligent design" journals except the *Journal of Evolutionary Informatics* — but it also indexes articles from such young-earth creationist journals as *Creation Research Science Quarterly*, *Acts and Facts*, and the *Journal of Creation*, betraying a certain lack of discrimination.

Moreover, few articles from "intelligent design" journals are even *cited* in the scientific literature. According to Web of Science, only two such articles, both from *Origins & Design*, have ever been cited in the literature — and not auspiciously. One, Craig (1996), was cited by two ringleaders of the "intelligent design" movement, writing in the theology journal *Zygon* (Dembski and Meyer 1998). The other (Kenyon and Mills 1996; coauthored by Dean Kenyon who also coauthored *Of Pandas and People*) was cited in a notorious paper (Meyer 2004) published in a legitimate scientific journal under suspicious circumstances and subsequently disavowed by the journal (Sager and Scott 2008).

It is not surprising, then, that academic libraries were not inclined to subscribe to *Origins & Design*. Only thirty-two libraries listed in WorldCat show holdings of *Origins & Design*; the majority are libraries of seminaries or of colleges or universities with religious affiliations historically disposed toward creationism in various forms. WorldCat lists fifty-two libraries with holdings of *Progress in Complexity, Information, and Design* — but those libraries need not subscribe to or provide space for a free on-line journal. No libraries apparently have holdings of the *Journal of Evolutionary Informatics* (which is not even listed on WorldCat), or of *BIO-Complexity* (which is listed).

"Intelligent design" journals thus seem to be a scientific cul-de-sac — a fact ironically conceded by the Discovery Institute, which in a "briefing packet for educators" (Discovery Institute 2007) recom-

mends articles from *Origins & Design* and *Progress in Complexity, Information, and Design*, but under the rubric "Science Resources About Evolution and Intelligent Design" rather than "Peer Reviewed Sciences [*sic*] Articles". Scientists with anything scientifically important to say about "intelligent design" will, as Wagner noted, take it to the mainstream scientific literature, which is already widely disseminated and respected, not to a parvenu like *BIO-Complexity*.

Whither BIO-Complexity?

It seems safe to predict that it will be difficult for *BIO-Complexity* to attain its ostensible goal of serving as "the leading forum for testing the scientific merit of the claim that intelligent design ... is a credible explanation for life." But was that really the point? Unable to convince the scientific establishment of the merits of their views, creationists have long been engaged in the project of constructing a counter-establishment, which mimics — or perhaps the *mot juste* is "apes" — not only peer-reviewed journals but also professional societies, textbook publishers, media organizations, natural history museums, and graduate programs at accredited universities.

The purpose of the counter-establishment is not necessarily to challenge the scientific establishment or to affect the public's view of science, although those are certainly accomplishments that would not be despised if they were to come to pass. Instead, the counter-establishment seems primarily to serve to reassure the participants, the supporters, and (perhaps crucially) the funders of the creationist movement that there is a worthwhile project under way. To the extent that *BIO-Complexity* flourishes, it will not be because it is reporting scientific tests of "intelligent design" but because it is evincing, in the otherwise declining "intelligent design" movement, a few feeble signs of life.

Acknowledgments

Michael Barton compared the editorial board of *BIO-Complexity* with the signatories of the Discovery Institute's "Dissent" statement and kindly shared the result.

References

[Anonymous.] 2003. 8th European creationist congress. Available on-line at <http://www.genesis.nu/8thecc/>. Last accessed May 25, 2010.

[Anonymous.] 2006. Bilsan maikalle kampeen [interview with Matti Leisola; Finnish]. Available on-line at <http://www.nuotta.com/nuotta/haastattelu/bilsan-maikalle-kampeen.html>. Last accessed May 25, 2010.

Axe DD, Dixon BW, Lu P. 2008. *Stylus*: A system for evolutionary experimentation based on a protein/proteome model with non-arbitrary functional constraints. *PLoS ONE* 3: e2246.

Biever C. 2006. Intelligent design: The God lab. *New Scientist* 2482: 8–11.

Bottaro A. 2007. Follow the money: More Dembski/Baylor-related mischief? Available on-line at <http://pandasthumb.org/archives/2007/09/follow-the-mone.html>. Last accessed May 4, 2010.

Chang K. 2005 Aug 22. In explaining life's complexity, Darwinists and doubters clash. *The New York Times*.

Craig WL. 1996. Cosmos and creator. *Origins & Design* 17 (2): 18–27.

Dembski WA, Meyer SC. 1998. Fruitful interchange or polite chitchat? The dialogue between science and theology. *Zygon* 33 (3): 415–30.

Discovery Institute. 2007. The theory of intelligent design: A briefing packet for educators. Available on-line at <http://www.discovery.org/scripts/viewDB/filesDB-download.php?command=download&id=1453>. Last accessed May 27, 2010.

Elsberry W. 2006. Can I keep a witness? *Reports of the NCSE* 26 (1–2): 45–6.

Evans S. 2001. Doubting Darwinism through creative license. *Reports of the NCSE* 21 (5–6): 22–3.

Flietstra R. 2008. [Review of Haarsma and Haarsma, *Origins*.] *Reports of the NCSE* 28 (1): 36–7.

Forrest B. 2007. Understanding the intelligent design creationist movement: Its true nature and goals. A position paper from the Center for Inquiry Office of Public Policy. Available on-line at <http://www.centerforinquiry.net/uploads/attachments/intelligent-design.pdf>. Last accessed May 4, 2010.

Forrest B, Gross PR. 2004. *Creationism's Trojan Horse*. New York: Oxford University Press.

Haarsma DB, Haarsma LD. 2007. *Origins: A Reformed Look at Creation, Design, & Evolution*. Grand Rapids (MI): Faith Alive Christian Resources.

Kenyon D, Mills G. 1996. The RNA world: A critique. *Origins & Design* 17 (1): 9–16.

Lynch JM. 2009. Three (YEC) amigos join the Biologic Institute. Available on-line at <http://blog.jmlynch.org/2009/08/07/three-yec-amigos-join-the-biologic-institute/>. Last accessed May 27, 2010.

Meyer SC. 2004. The origin of biological information and the higher taxonomic categories. *Proceedings of the Biological Society of Washington* 117 (2): 213–39.

Nevin NC, editor. 2009. *Should Christians Embrace Evolution?* Nottingham (UK): InterVarsity Press.

Pieret J. 2009. The "pros" from Dover. Available on-line at <http://dododreams.blogspot.com/2009/08/pros-from-dover.html>. Last accessed May 27, 2010.

Richards JW. 2010. *BIO-Complexity*: A new, peer-reviewed science journal, open to the ID debate. Available on-line at <http://www.evolutionnews.org/2010/05/bio-complexity_a_new_peerreview.html>. Last accessed May 27, 2010.

Sager C. Meet the martyrs: Robert Marks, Pamela Winnick, Michael Egnor. *Reports of the NCSE* 28 (5–6): 39–41.

Sager C, Scott EC. 2008. Meet the martyrs: Richard Sternberg. *Reports of the NCSE* 28 (5–6): 36–8.

Scheffler K. 2008. AE [academic editor] comments. Available on-line at <http://www.plosone.org/annotation/listThread.action?inReplyTo=info%3Adoi%2F10.1371%2Fannotation%2F1be4d482-97b9-4d4c-bea3-717ef0730d17&root=info%3Adoi%2F10.1371%2Fannotation%2F1be4d482-97b9-4d4c-bea3-717ef0730d17>. Last accessed May 4, 2010.

Snoke D. 2006. *A Biblical Case for an Old Earth*. Grand Rapids (MI): Baker Books.

Sternberg RV. 2008. DNA codes and information: Formal structures and relational causes. *Acta Biotheoretica* 56 (3): 205–232.

Turner JS. 2007. *The Tinkerer's Accomplice: How Design Emerges from Life Itself*. Cambridge [MA]: Harvard University Press.

Wieland C. 2009. In Charles Darwin's footsteps. Available on-line at <http://creation.com/charles-darwin-voyage-movie>. Last accessed May 25, 2010.

Author's address

Glenn Branch
NCSE
PO Box 9477
Berkeley CA 94709-0477
branch@ncse.com

Quote-mining: An Old Anti-evolutionist Strategy

Michael D Barton

While searching historical databases for material on John Tyndall, the subject of my master's research, I came across an article in *The New York Times* of November 25, 1884, "Turn in the Tide of Thought: Thomas Kimber's Lecture on Science in Relation to Divine Truths." It is an account of a lecture regarding a return to biblical teachings and harmony between scientific discoveries and Scriptural statements. From the article:

> As an illustration of the change of thought, the lecturer spoke of evolution's failure as a strong theory and the downfall of Darwinism. When the theory came out it was seized upon with avidity, and most of the great scholars examined it and accepted it. Now they had given it up. Prof Virchow in the Edinburgh celebration said evolution had no scientific basis. No skull had yet been found differing to any extent from the general type. Prof Tyndall had lately said that "evolution belongs to the twilight of conjecture". Prof Huxley, at first one of its strongest advocates, said the link between the living and the not living had not been found. It must be found to prove the evolution theory.

Michael D Barton, an NCSE member, graduated from Montana State University in Bozeman in 2010with a masters in history. His research concerned the role of John Tyndall as a supporter of Charles Darwin, and he is a participant in the John Tyndall Correspondence Project (<http://www.yorku.ca/tyndall/>). He blogs about Darwin, evolution, and the history of science at The Dispersal of Darwin (<http://thedispersalof darwin.wordpress.com/>). Michael now lives in Portland, Oregon.

John Tyndall (1820–1893), an Irish physicist and science popularizer, was as an ardent supporter of Darwin's theory of evolution, and showed his support most famously in his 1874 address to the British Association for the Advancement of Science in Belfast. He was a member of the X Club — with Thomas Huxley, Joseph Dalton Hooker, Herbert Spencer, and five others — a dining and social club established in 1864 that supported Darwin's theory of evolution and campaigned for the authority of science in British society. Knowing who Tyndall was, when I read "Prof Tyndall had lately said that 'evolution belongs to the twilight of conjecture,'" I immediately questioned the quote. How is it that a man with a well-documented reputation of his support for evolutionary theory became adjoined to a quotation that seems to imply the very opposite of his position? I popped the quote into Google Book Search.

In 1878, Tyndall published an article in *The Nineteenth Century* titled "Virchow and Evolution." Rudolf Virchow (1821–1902), a German physician and biologist, opposed the theory of evolution based on the lack of fossil evidence (openly in an 1877 speech in Munich). Tyndall's article addressed that speech:

> The keynote of his position is struck in the preface to the excellent English translation of his lecture—a preface written expressly by himself. Nothing, he says, was farther from his intention than any wish to disparage the great services rendered by Mr Darwin to the advancement of biological science, of which no one has expressed more admiration than himself. On the other hand, it seemed high time to him to enter an energetic protest against the attempts that are made to proclaim the problems of research as actual facts, and the opinions of scientists as established science. On the ground, among others, that it promotes the pernicious delusions of the socialist, Virchow considers the theory of evolution dangerous; but his fidelity to truth is so great that he would brave the danger and teach the theory, if it were only proved. The burden indeed of this celebrated lecture is a warning that a marked distinction ought to be made between that which is experimentally established, and that which is still in the region of speculation. (p 822)

Two pages later:

> In a discourse delivered before the British Association at Liverpool, after speaking of **the theory of evolution applied to the primitive condition of matter as belonging to 'the dim twilight of conjecture,'** and affirming that ' the certainty of experimental inquiry is here shut out,' I sketch the nebular theory as enunciated by Kant and Laplace. … (p 824, emphasis mine)

Clearly Tyndall did not reject the theory of evolution, but simply made a distinction between what can be known about evolution through experimental inquiry and what cannot. The piece in *The New York Times* either took Tyndall's quote out of context and skewed his intentions or unknowingly borrowed the misquote from another source. This is a perfect example of quote mining, a creationist tactic that members of the NCSE are all familiar with (see The Quote Mine Project at TalkOrigins, <http://www.talkorigins.org/faqs/quotes/mine/project.html>). It is common to find instances of quote-mining

perpetuated by 20th- and 21st-century anti-evolutionists against the words of 19th- or 20th-century evolutionists, Darwin included, but I was rather surprised to find an occurrence of strictly 19th-century quote-mining.

Tyndall did not state that "evolution belongs to the twilight of conjecture," but rather that "the theory of evolution *applied to the primitive condition of matter*" belongs to "the dim twilight of conjecture." Surely those are two different meanings. Darwin explained how species evolved, but not how life first originated. This is what Tyndall was getting at.

We cannot be sure of the intention of the person who wrote the piece in *The New York Times*. The article is neither critical nor laudatory toward Kimber's lecture. What is certain is that Tyndall was not presented accurately in this anti-evolution piece; nor elsewhere. From *The Medical Record* (Dec 1, 1883):

> In other quarters there are indications that the doctrine of Darwin is losing some of its charms for scientists. Some tell us that they accept it as a step to something else. Others find its demands on their credence too great. Your readers know pretty well the opposition it has encountered by such men as St J Mivart, Virchow, Wharton Jones, FRS, and others. A further indication of uncertainty in scientific minds is afforded by the statements of Prof Tyndall, who, in the *Popular Science Review,* says that "Evolution belongs to the dim twilight of conjecture. … Those who hold the doctrine are by no means ignorant of the uncertainty of their data, and they only yield to it a provisional assent. … Long antecedent to his advice I did exactly what Virchow recommends, showing myself as careful as he could be, not to claim for a scientific doctrine a certainty which did not belong to it. … I agree with him that the proofs of it are wanting. I hold with Virchow that the failures of proof are lamentable, that the doctrine of spontaneous generation is utterly discredited. (p 611)

In *Friends' Review: A Religious, Literary and Miscellaneous Journal* (March 22, 1884):

> Probably the following quotations from Prof Tyndall's utterances on evolution, taken from *The Popular Science Monthly,* will surprise some of those who have hastily accepted the theory, and based assumptions upon it. "Evolution belongs to the dim twilight of conjecture, and the certainty of experimental inquiry is here shut out. … Those who hold the doctrine of evolution are by no means ignorant of the uncertainty of their data, and they only yield to it a provisional assent. … Long antecedent to his advice I did exactly what Prof Virchow recommends, showing myself as careful as he could be, *not to claim for a scientific doctrine a certainty which did not be long to it.* … I agree with him that the proofs of it are wanting. I hold with Virchow that the failures of proof have been lamentable, that the doctrine of spontaneous generation is utterly discredited. (p 524)

Samuel D Gross, an American trauma surgeon, wrote in his *Autobiography* (1887):

> If we believe in a great First Cause, as all rational men must, why not assume that all things, visible and invisible, were the product of a special creation instead of a gradual evolution, as asserted by Darwin and his followers? If God could create the earth, the stars, and the mighty planets, of which our world forms only an insignificant part, could He not also, by a special act, have created all the dwellers therein, from the most minute microcosm up to the most complicated form of animal life? I agree with Professor Tyndall that the **whole subject** of evolution belongs to the dim twilight of conjecture. (p 186, emphasis mine)

It is important to note that a common creationist strategy — the intentional misquoting of supporters of evolutionary theory by removing particular passages of their writings from their original context to make it seem they were stating something different from their original intent — has a history that dates at least to the decades following Darwin's publication of *On the Origin of Species* in 1859. Sadly, out-of-context quotes from statements made by supporters of evolution gain a life of their own, being repeated in newspapers, periodicals, books, websites, and documentaries without anyone's consulting the original source. Anti-evolutionists engage in quote-mining because they can only sustain the mistaken view that even experts in biology doubt evolution if they quote selectively. Once quotes are placed out of context, other anti-evolutionists never go back to check the original source. Furthermore, once they are in print, it is easy for an indiscriminate search to find mined quotes.

It is unfortunate that such misconceptions about evolution have been perpetuated by an organization with a repetition for accuracy like *The New York Times*. As The Quote Mine Project attests, and my little bit of online searching shows, it is only a little more complicated to find the proper context, which allows a reader to know the author's original intention in what he or she wrote about evolution.

References

[Anonymous]. 1883 Dec 1. Our London Letter. *The Medical Record* 24 (22): 611–12.

[Anonymous]. 1884 Mar 22. Correspondence. *Friends' Review: A Religious, Literary and Miscellaneous Journal* 37 (33): 524.

[Anonymous]. 1884 Nov 25. Turn in the Tide of Thought: Thomas Kimber's Lecture on Science in Relation to Divine Truths. *The New York Times* 8 (col 2).

Gross SD, Gross SW, Gross AH. 1887. *Autobiography of Samuel D Gross, MD, with Sketches of His Contemporaries.* Vol 2. George Barrie, Publisher.

Tyndall J. 1879 Jan. Virchow and Evolution. *The Popular Science Monthly* 14 (17): 266–90.

Tyndall J. 1879 Nov. Virchow and Evolution. *The Nineteenth Century* 4 (21): 809–33.

Author's address

Michael Barton
c/o NCSE
PO Box 9477
Berkeley CA 94709-0477
darwinsbulldog@gmail.com

The Glendive Dinosaur & Fossil Museum, Glendive, Montana

Randy Moore

FIGURE 1. *At first glance, the Glendive Dinosaur and Fossil Museum in Glendive, Montana, looks like a typical natural history museum.*

From the outside, the Glendive Dinosaur & Fossil Museum looks like any number of other dinosaur-related attractions in Montana. Its 20 000 square feet of displays features the head and jaws of a menacing *Tyrannosaurus rex* protrude through the museum's front wall, and life-sized castings of dinosaur skeletons give the inside the look of a typical natural-history museum (Figure 1). The museum opened in 2009 and in its first months of operation, it attracted more than 1000 visitors per month. Most of the $1.5 million needed to open the museum was raised by the Foundation Advancing Creation Truth from citizens and groups in Montana.

In a state filled with dinosaur-related museums, the Glendive Dinosaur & Fossil Museum is the second-largest dinosaur museum in the state (only the famed Museum of the Rockies in Bozeman is larger). However, the Glendive Dinosaur & Fossil Museum is not your typical natural-history museum. Instead, it's an elaborate young-earth advertisement that uses Montana's rich dinosaur-related history to lure people to lessons in biblical literalism and anti-science nonsense. As Jack Horner, the curator of paleontology at the Museum of the Rockies has noted, "there's nothing scientific about it." Instead, the Glendive Dinosaur & Fossil Museum is "dedicated to the glory of God the Creator" as it combats "evolutionism's nonsense" and the "abyss of scientific deception". Otis Kline Jr, the museum's founder and director, wanted to include his museum in the Montana Dinosaur Trail (see below), but he abandoned the group when it adopted the slogan "150 Million Years in the Making".

Entering the museum, visitors walk over models of the sea floor, which claim that life "couldn't have evolved or developed by chance". Soon thereafter, there appear a 40–foot-long mosasaur, a 16–foot-long sea turtle, and a series of questions that challenge well-established discoveries; for example, did dinosaurs "coexist with man and diminish within the last 5000 years?"

The answers to these and other questions are on the museum's second — and most entertainingly depressing — floor, which rings the main exhibits like a gallery (Fig 1). Atop the stairs is the usual "here's why evolution is a lie" propaganda, including exhibits about "The Failure of Radiometric Dating", Ernst Haeckel, peppered moths, the Glen Rose dinosaur tracks, "irreducible complexity", and a curious model of DNA and a cell. There's also an exhibit of *Australopithecus* ("Lucy is not our ancestor").

continued on page 21

Randy Moore is a NCSE "Friend of Darwin" and author of Evolution 101, More Than Darwin, *and* Chronology of the Evolution-Creationism Controversy.

Facing Challenges to Evolution Education

Despite numerous legal and other set-backs, anti-evolutionism is alive and well. Although the objections to evolution are remarkable stable, there is quite an evolution in the euphemisms that anti-evolutionists use to oppose evolution education. This classic brochure by Molleen Matsumura gives a quick "taxonomy" of typical anti-evolution tactics and suggestions on how to respond. The complete text is available on line at <http://ncse.com/taking-action/facing-challenges-to-evolution-education>.

Anti-evolution strategy: euphemisms

Use euphemisms or code phrases such as "arguments against evolution", "alternative theories", "balanced treatment,""intelligent design theory","abrupt appearance theory", "irreducible complexity." These phrases attempt to bring non-scientific, religious views into the science curriculum.

Response:

No matter what label is applied, it is illegal for public schools to advocate religious views of any kind. Districts that do so are risking expensive law suits that divert funds from important educational programs (and raise taxes!). Different approaches will work with different members of the public; for example, (a) inviting local scientists to explain why "arguments against evolution" (by any name) are not scientific (NCSE can help); (b) calling upon local clergy to expose the underlying sectarian motivations of this approach; (c) reminding boards of education to obtain legal advice when considering such policies; (d) providing Board members and administrators with information about the applicable laws

Anti-evolution strategy: only a theory

Casting evolution as "theory, not fact" or claiming that evolution is "only a theory".

Response:

Proposals like these misconstrue "theory" as a "hunch" or "guess". In science, theories guide research and often give us useful facts about the world around us. Make sure that the public and policy makers understand the issues, and to ensure that correct definitions of "theory" appear in curriculum and policy statements.

Anti-evolution strategy: fairness

Call for teaching "both sides" because that's what's "fair".

Response:

The "fairness" strategy can be very effective at first because it appeals to a widely held value. However, a fair science curriculum teaches children the most up-to-date, accurate information accepted in the scientific community. It's not fair to harm the education of all of the students because of narrow sectarian objections to evolution.

Anti-evolution strategy: critical thinking

Claims that critical thinking skills are enhanced by teaching both evolution and "creation science" or by considering "evidence against" or "challenges to" evolution.

Response:

Teaching critical thinking does not require that any "alternatives" to basic scientific knowledge must be included in the curriculum. It would be appropriate to discuss genuine disagreements within the scientific community — for example, scientific discussions about the pace at which evolution occurred — and also why anti-evolutionist "alternatives" do not make the grade. However, it is nearly impossible to discuss evidence against creationism without criticizing religious beliefs, which public school teachers also should not do.

Anti-evolution strategy: disclaimers

Treat evolution as a "controversial issue" using disclaimers or other methods. A printed disclaimer may be inserted in textbooks, or teachers maybe required to read aloud a disclaimer.

Response:

Evolution is not scientifically controversial; it is the guiding theoretical framework for the modern biomedical and life sciences, and so should not be treated differently from other mainstream sciences. The controversies about teaching of evolution that arise in this contest are social and political controversies, not scientific ones, and they do not undermine the validity of evolutionary theory or make it scientifically controversial.

Anti-evolution strategy: academic freedom

Call for "academic freedom" (for teachers or for students) to use "supplementary materials" or to explore "alternative" theories and models.

Response:

These supplementary materials usually consist of inaccurate, misleading, or false claims about evolution that circulate in creationist sources. Most of them will fail the policies and procedures that school districts set up for adoption of instructional materials. References to "academic freedom" are inappropriate in this context. The American Association of University Professors, the chief watchdog for academic freedom, asserts that academic freedom does not carry with it the freedom to misinform students, which is what happens when these "alternatives" are taught.

Biogeography

Not one but two chapters of Darwin's *Origin* are devoted to the geographical distribution of species, and, as Jerry A Coyne explains in *Why Evolution is True* (New York: Viking, 2009), "These chapters are often considered the founding document of the field of *biogeography* — the study of the distribution of species on earth. And their evolutionary explanation of the geography of life, largely correct when proposed, has only been refined and supported by a legion of later studies." He adds, "The biogeographic evidence for evolution is now so powerful that I have never seen a creationist book, article, or lecture that has tried to refute it. Creationists simply pretend that the evidence doesn't exist." It's high time, then, to explore the biogeographical literature, a generous sampling of which, ranging from accounts from the Victorian era of biogeographical exploration to the latest state-of-the-art textbooks, is now available through the NCSE website: <http://ncse.com/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.

In Darwin's day

The Voyage of the Beagle
by Charles Darwin
Both as a scientific document and as a travelog, *The Voyage of the Beagle* continues to fascinate and delight its readers. The new Modern Library edition contains a preface by the geneticist Steve Jones, author of *Darwin's Ghost*, who justly describes *The Voyage of the Beagle* as "the overture to Darwin's career and to the biology of today ... a serious work of science that can be read on many levels; for the power of its observation and its prose, as an insight into the delight of an educated Englishman faced with the new world of the tropics, and, in the end, as a simple tale of travel and adventure with no match in Darwin's century or since."

Darwin's Armada
by Iain McCalman
Subtitled *Four Voyages and the Battle for the Theory of Evolution*, McCalman's book describes the nineteenth-century ocean journeys of Charles Darwin, Joseph Hooker, Thomas Henry Huxley, and Alfred Russel Wallace, and explains their importance and relevance to the nascent science of evolution. According to the *New York Times Book Review*, "[McCalman's] narratives are as much bildungsroman as scientific analysis, showing how the four voyagers were steeled and transformed by the demands of the sea and the wondrous unfamiliarity of life on distant shores." McCalman is a professor in the Department of History at the University of Sydney.

The Malay Archipelago
by Alfred Russel Wallace
Not only the codiscoverer of evolution through natural selection, Alfred Russel Wallace was also the father of the discipline of biogeography, discovering the Wallace Line separating the ecozones of Asia and (what is now called) Wallacea. *The Malay Archipelago*, published originally in 1869, was one of the most popular journals of scientific exploration of the nineteenth century, praised by Charles Darwin, Charles Lyell, and even the novelist Joseph Conrad (who called it his "favorite bedside companion"). In his introduction to the Periplus reprint, Tony Whitten notes, "[Wallace's] sections on the distribution of animals and plants among the islands are a continuous theme through the book."

Popular biogeography

Here Be Dragons: How the Study of Animal and Plant Distributions Revolutionized our Views of Life and Earth
by Dennis McCarthy
A spirited and readable survey of the history of biogeography, *Here Be Dragons* teems in accounts of unusual animals and exotic locales. The publisher writes, "The story of how animals and plants came to be found where they are — the story of biogeography — brings together two great theories of life and earth: evolution and plate tectonics. In this wonderfully rich telling, that takes in pygmy mammoths and orca whales, Dennis McCarthy traces the powerful forces that have altered the surface of the planet and shaped the pattern of life on earth." The author is a scientific researcher with the Buffalo Museum of Science.

The Song of the Dodo: Island Biogeography in an Age of Extinction
by David Quammen
Combining history, science, and travelogue, *The Song of the Dodo* is at once a beautifully written introduction to the topic of island biogeography and a passionate appeal to save the world's biodiversity in the face of massive habitat destruction. Quammen is the author also of *The Flight of the*

<http://www.ncse.com/store>

Iguana and *The Reluctant Mr Darwin*; Bill McKibben describes *The Song of the Dodo* as "compulsively readable — a masterpiece, maybe *the* masterpiece of science journalism," and the reviewer for *Publishers Weekly* writes, "That a book on so technical a subject could be so enlightening, humorous and engaging is an extraordinary achievement."

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

Modern classics

Phylogeography: The History and Formation of Species
by John C Avise
Phylogeography is the discipline that traces the evolutionary history of genotypes through space. "John Avise is the acknowledged founder of the field that he has named 'phylogeography,'" Svante Pääbo writes. "This book presents the intellectual underpinning of this novel focus of research. It is eminently accessible to students and researchers who approach this problem from a practical angle and are not well-versed in the quite complex mathematics that underline many of these approaches. It is certainly a book I will recommend to my graduate students and will use in my teaching."

The Theory of Island Biogeography Revisited
edited by Jonathan B Losos and Robert E Ricklefs
Almost half a century after the publication of *The Theory of Island Biogeography*, the contributors to Losos and Ricklefs's collection — including Wilson himself, with his retrospective essay "Island biogeography in the 1960s" — take a look back at MacArthur and Wilson's seminal work and a look forward at new directions and dimensions for the field. The reviewer for *Ecology* writes, "For anyone who needs to catch up on where island biogeography has been and is now, and for any graduate students interested in the topic, this book provides a great review and many pointers for the way forward."

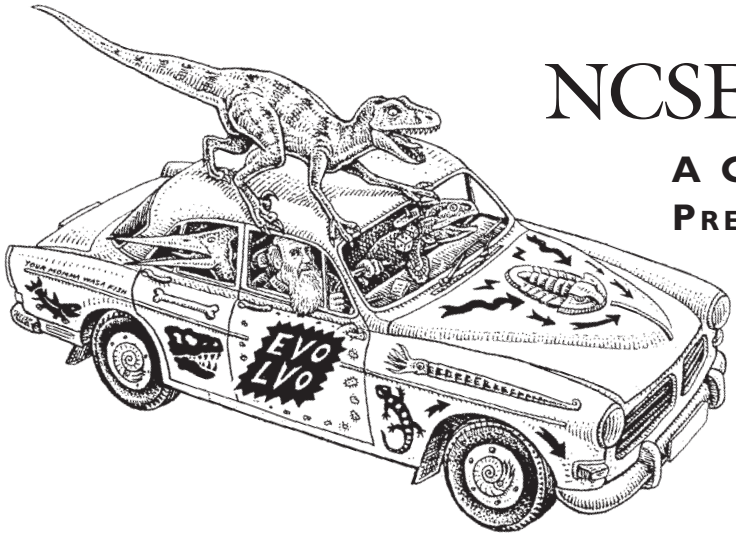
The Theory of Island Biogeography
by Robert H MacArthur and Edward O Wilson
From the jacket copy of the 2001 edition, with a new preface by Wilson: "In this book, the authors developed a general theory to explain the facts of island biogeography. The theory builds on the first principles of population ecology and genetics to explain how distance and area combine to regulate the balance between immigration and extinction in island populations. The authors then test the theory against data. ... *The Theory of Island Biogeography* remains at the center of discussions about the geographic distribution of species." Ted Case describes it as "arguably the most influential book in biogeography in the last hundred years."

Textbooks and sourcebooks

Biogeography: An Ecological and Evolutionary Approach, eighth edition
by C Barry Cox and Peter D Moore
From the publisher: "This new edition incorporates the exciting changes of the recent years, and presents a thoughtful exploration of the research and controversies that have transformed our understanding of the biogeography of the world. It also clearly identifies the three quite different arenas of biogeographical research: continental biogeography, island biogeography and marine biogeography. ... It reveals how the patterns of life that we see today have been created by the two great Engines of the Planet — the Geological Engine, plate tectonics, which alters the conditions of life on the planet, and the Biological Engine, evolution, which responds to these changes by creating new forms and patterns of life."

Biogeography, fourth edition
by Mark V Lomolino, Brett R Riddle, Robert J Whittaker, and James H Brown
The latest and thoroughly updated edition of a classic textbook, which Edward J Miller describes as "an instructor–scientist's dream: attractive, interesting, and questioning; full and broad; with superb graphics; and ranging from pre-historical to historical to today — including nowadays environmental issues. No other biogeography book/text comes close to this one for university teaching." The major sections of the book are devoted to introducing the discipline of biogeography, the geographic and ecological foundations of biogeography, fundamental biogeographic processes and earth history, evolutionary history of lineages and biotas, ecological biogeography, and conservation and the frontiers of biogeography.

Foundations of Biogeography: Classic Papers with Commentaries
edited by Mark V Lomolino, Dov F Sax, and James H Brown
A massive anthology of the essential works in biogeography, from Linnaeus and Buffon through Darwin and Wallace to Mayr and MacArthur and Wilson, together with commentary from leading contemporary biogeographers. The reviewer for *Plant Systematics and Evolution* comments, "It is not possible to do justice here to the dozens and dozens of great studies reprinted in this book — after all, virtually every paper is considered a classic in its own right — but perhaps it suffices to say that it should not come as any surprise when *Foundations of Biogeography* itself becomes a major milestone in modern biogeography."



NCSE on the Road

A Calendar of Special Events, Presentations, and Lectures

Date	Feb 18, 2011
City	Washington DC
Event	Annual Meeting of the American Association for the Advancement of Science
Presenter	Joshua Rosenau
Title	The Challenge of Teaching Evolution in the Islamic World
Time	3:00 PM
Location	Walter E Washington Convention Center
Contact	Josh Rosenau, rosenau@ncse.com

Date	Feb 19, 2011
City	Washington DC
Event	Annual Meeting of the American Association for the Advancement of Science
Presenter	Eugenie C Scott
Title	PANEL: Earth Science and Evolution
Time	1:00 PM
Location	Walter E Washington Convention Center
Contact	AAAS, http://www.aaas.org/meetings/

Date	Feb 20, 2011
City	Washington DC
Event	Annual Meeting of the American Association for the Advancement of Science
Title	Panel: Aiming for Scientific Literacy by Teaching the Process, Nature, and Limits of Science
Presenter	Eugenie C Scott
Time	1:30 PM
Location	Walter E Washington Convention Center
Contact	Jay Labov, JLabov@nas.edu

Date	Mar 11, 2011
City	San Francisco CA
Event	NSTA National Conference on Science Education
Presenter	Eugenie C Scott
Time	10:30 AM
Location	Moscone Center
Contact	Dolores Howard at dhoward@nsta.org

Check the NCSE web site for updates and details — <http://www.ncse.com/ncse-events>.

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) ☐ Charge to: ☐ VISA ☐ MasterCard ☐ AmEx

Credit card number Expiration Date

Name as it appears on card Signature

NCSE Membership

☐ One Year	US: $30	Foreign Air: $39	
☐ Lifetime	$600		
Tax Deductible Contribution to NCSE			
TOTAL			

FIGURE 2. *The badlands outside of Glendive, Montana, have yielded important discoveries of dinosaurs, and include dramatic exhibits of the Cretaceous–Tertiary boundary.*

continued from page 26

Each exhibit claims to prove evolution is a conspiracy perpetuated by scientists, and in the adjacent theatre, you can watch movies such as "Incredible Creatures that Defy Evolution" and "The Faith Behind the Science." Although several museums along the Montana Dinosaur Trail (see below) displayed Bibles, only in the Glendive Dinosaur & Fossil Museum were all of the Bibles open to the same passage: Book of Job 40 (which describes "behemoth") and 41 (which describes "Leviathan"). And, of course, you can help support the museum's anti-science mission by spending some money in the gift shop.

The museum's second floor tells visitors about the biblical flood and stresses how the Colorado River could not have carved the Grand Canyon ("it would have to flow uphill for over 2000 [feet]"). So what *did* form the Grand Canyon? "A global flood is the simplest explanation." There's "scientific" documentation of the remains of Noah's Ark being found on the mountains of Ararat, as well as a large exhibit titled "Noah's Ark — Eyewitness Accounts". I learned that "Noah probably had approximately 16 000 animals on the Ark," and a scale model of the ark shows tiny animals — dinosaurs included — walking onto the Ark two-by-two. How could Noah and the Ark's seven other sailors have handled all of these animals? No problem: the animals "hibernated" to minimize the daily chores of the crew. How convenient.

The Glendive Dinosaur & Fossil Museum is located on the northeast corner of I-94 Exit 215 in Glendive, Montana, and which is also home to Makoshika State Park, an area in the famous Hell Creek Formation that has yielded numerous discoveries of dinosaurs. Nearby, in downtown Glendive, is Makoshika Dinosaur Museum, which opened in 2004 and attracts 2000 visitors per summer.

THE MONTANA DINOSAUR TRAIL

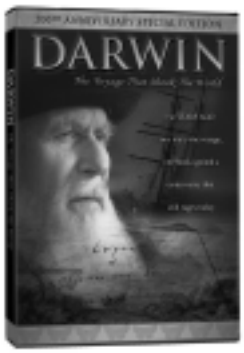
If you're in Glendive and want to see some real science, get on the Montana Dinosaur Trail, a nonprofit set of museums created in 2005 to promote tourism at Montana's dinosaur-related museums. To see all 15 of the Trail's museums, I drove 1348 miles and saw some fantastic exhibits and beautiful countryside. The centerpiece of the Trail is Bozeman's Museum of the Rockies, which is just south of Montana State University. This museum, with one of the largest collections of dinosaurs in North America, is described by *Frommer's Montana and Wyoming* as "one of the premier paleontology attractions in the world." This is not an overstatement, for the museum houses numerous world-class exhibits, including those of the first identified female dinosaurs (an ovulating *T rex*), the world's largest *T rex* skull, and some of the world's rarest fossils.

Some other museums along the Trail aren't nearly as famous or elaborate. Although some of these sites have only a few dinosaur-related exhibits, many are rich in history. For example, the badlands near Garfield County Museum in Jordan, Montana (population 364) are where famed fossil-hunter Barnum Brown in 1902 excavated the first documented *T rex*. These badlands also show some of the most informative exposures of the K-T Boundary found anywhere in the world (Fig 2). The Carter County Museum in Ekalaka, Montana (population 410) was the first museum in Montana to display dinosaurs, and Bynum, Montana's, 27 residents ("25 in the off-season") are justifiably proud of their Two Medicine Dinosaur Center, which houses the world's longest dinosaur (the 137–foot-long *Seismosaurus*). Readers can find more information about the Montana Dinosaur Trail at <http://mtdinotrail.org>.

AUTHOR'S ADDRESS

Randy Moore
University of Minnesota, MCB 3-104
420 Washington Avenue SE
Minneapolis MN 55455
rmoore@umn.edu

BookReviews



MEDIA REVIEW

The Voyage that Shook the World

Con Dios Productions, 2009.
52 minutes

Reviewed by Jim Lippard and John M Lynch

This documentary is a 52-minute, professionally produced work, funded by Creation Ministries International (CMI), that promotes CMI's own creationist researchers as "correcting" Darwin's "mistakes and biases" with a view to setting science straight. This picture is drawn by studiously avoiding any explicit mention of creationism, but instead presenting vignettes from Darwin's life with reputable historians making legitimate points and creationists (with little or no historical training) offering alternative historical and scientific views. The film features excellent cinematography, high-quality graphics and effects, and re-enactments of scenes from Darwin's life by actors in period dress.

The documentary begins reasonably enough; the only initial hint that it might not be a mainstream production is the emphasis that is put on Darwin "making up stories" as a child. The first interviewees to appear are well-known professional historians — Peter Bowler, Sandra Herbert, Janet Browne. Several creationists appear quickly thereafter, though they are not identified as such. The film uses on-screen credentials that put recognized experts with well-established reputations on a par with relative unknowns who haven't established their reputations (additional details are posted on the CMI website). For example, Emil Silvestru is identified by his PhD and as a "geologist and speleologist," but not that he works full-time for CMI. Thus, it seems to legitimize his arguments for a young earth and the creation of geological features by "a flood". The film shies away from common creationist generalizations — Silvestru does not argue that the Grand Canyon was similarly formed, or that all cases of polystrate tree fossils are evidence of rapid deposition, though the viewer may make these incorrect inferences.

Many of the problems with the documentary are exhibited in the short segment dealing with the Galápagos. The film claims that in Darwin's time, science argued for gradual change, fixity of species, and an old earth, while religion argued for rapid catastrophic change, mutability of species, and a young earth. This portrayal of the many positions held at the time on these issues is both historically inaccurate and over-simplistic.

Many of the claims in this section are made by Rob Carter (identified as "[PhD, University of Miami] Marine Biologist and Geneticist" rather than as a CMI employee). Carter is filmed on location dressed in field gear — the viewer is clearly expected to believe that Carter is engaged in field work germane to the issue of speciation, when in fact his research was on fluorescent proteins in Cnidaria. Indeed, despite this biological training, Carter is not afraid to make historical claims. He states that Darwin's contemporary Edward Blyth had a "fully fledged theory of natural selection" and that "Darwin got Blyth's first paper when Darwin was in South America, so when he came here to the Galápagos, he had Blyth's idea of natural selection and Lyell's idea of geology on his mind". The documentary goes on to claim that Darwin was misled by his reliance on Lyell's gradualism initially missing the evidence for natural selection in the Galápagos Islands, in particular with regards the avian specimens he collected. (It is perhaps worth noting here that implicit in the claim is that Darwin somehow plagiarized the idea of natural selection from Blyth, who saw selection as a purely negative force that maintained the type.)

The problems here are twofold. First, natural selection is in no way self-evident from the collections that Darwin — or indeed any other naturalist — could have made. What Darwin observed on his voyage was *variation* and in particular *patterns* of variation — the *processes* behind the patterns would only come to him when back in England. Secondly, while Blyth did indeed have a theory of selection, historians — despite the claim made by Loren Eisley (1959) — have been unable to demonstrate that Darwin had read Blyth's paper of January 1835 before visiting the archipelago in September, or indeed for that matter had ever read the paper. In short, Carter is being inaccurate — or disingenuous — in his presentations of historical "facts".

Voyage defends the view that species change can occur, even across genera, though it avoids addressing the possible implications for humans and other primates. Its version of the religious view is that the wide diversity and geographical dispersal of living things emerged in the last few thousand years since the flood of Noah, with a rapidity of evolution

Jim Lippard is a long-time student of creationism, currently enrolled in the Program in Human and Social Dimensions of Science and Technology at Arizona State University. John M Lynch is an evolutionary biologist and historian of science at Barrett, The Honors College and the School of Life Sciences at Arizona State University.

that evolutionary scientists would reject as implausible. The film gives cases of rapid morphological changes in finch beak sizes, and hybridization between land and marine iguanas in the Galápagos. Carter asserts that the latter is evidence of a young age for the Galápagos, since otherwise the species would have mixed rather than remaining distinct.

At this point, more typical creationist views are made explicit, with arguments that there are "apparent limits" to biological change, "as any pigeon breeder knows," and that it is impossible for evolution to generate new information. Finnish creationist biochemist Matti Leisola asserts that random mutation cannot generate new information or novel structures, that introducing randomness "causes information to disappear," and that we only see new information arise from "intelligent" sources. He fails to provide evidence for his assertions and to specify what notion of information he is using. He goes on to say that genetic engineering originally promised the ability to make arbitrary changes to organisms, but now promises much less — while we can create bacteria that produce insulin, we can't change bacteria into anything but bacteria. We wonder what his view is of synthetic biology.

The film correctly points out that a role for catastrophes has been found in geology, but not to the exclusion of mostly uniformitarian processes over very long periods of time, such as may be found in the Grand Canyon. Likewise, it is correct in pointing out that there have been bursts of rapid biological change (but again, not to the exclusion of gradual changes), and that biology has turned out to be more complex than originally suspected. But these discoveries — made by evolutionary scientists — have not generated support for the creationist worldview, which is remarkable for its *lack* of scientific fruitfulness. The biggest failing of the film is its omission of a complete picture, including any indication of the overwhelming evidence in support of common ancestry, the great age of the earth, and human evolution.

At one point, the film touches on Darwin's racism, and suggests that this was a result of his evolutionary views, as opposed to religion which teaches the common origins of all human beings from Adam and Eve. But both views teach the common ancestry of all human beings, and there was no scarcity of racist religious believers in the mid-19th century. Darwin's views on race were a

Historians misrepresented by creationists

Three historians of science are unhappy about their treatment in a creationist movie about Darwin, as they note in a note in the July 2009 *Newsletter of the History of Science Society* (available at <http://www.hssonline.org/publications/Newsletter2009/July_Perils_Publicity.html>). Peter Bowler, Janet Browne, and Sandra Herbert write:

> We have recently been featured in a documentary film, 'The Voyage that Shook the World,' produced by Fathom Media of Australia and directed by Stephen Murray of Synergy Films, New Zealand. We were led to believe that the movie was being made to be shown as an educational film on Australian broadcast television and possibly elsewhere. Fathom Media was revealed to be a subsidiary of Creation Ministries International when publicity for the movie began to appear on the internet.

Previously, on June 21, 2009, William Crawley, a blogger for the BBC, reported (at <http://www.bbc.co.uk/blogs/ni/2009/06/creationists_defend_darwin_fil.html>) that Bowler was "unhappy to be appearing in what he regards as an 'anti-Darwinian' film which offers an historically distorted portrait of Darwin" and that he along with Browne and Herbert "only discovered that they had inadvertently contributed to a creationist film a month before the film's release." Phil Bell, the CEO of Creationist Ministries UK, acknowledged that Fathom Media was established as a front company, explaining, "At the end of the day ... [when] people see 'creationist', instantly the shutters go up and that would have shut us off from talking to the sort of experts, such as Professor Bowler, that we wanted to get to."

Crawley added, "I asked Phil Bell if this method of securing an interview was 'deceptive'. He said: 'Well, it could be called deceptive. But I think, at the end of the day, I would say that more people are concerned about how we've made a documentary, that's a world-class documentary, clearly with wonderful footage, with excellent interviews, and balanced open discussion.'" A subsequent statement, posted on CMI's website (<http://creation.com/the-voyage-darwin-film-defended>) on June 27, 2009, amplified: "We were and are under an obligation to speak the truth, but not to provide exhaustive information where it was not sought," adding, "Further, and perhaps most importantly, we were determined to deal fairly with the material that the interviewees provided."

The interviewees themselves, however, were not satisfied with the fairness of the movie, writing:

> Janet Browne's remarks about his childhood delight in making up stories to impress people is used to imply that the same motive may have driven his scientific thinking. Peter Bowler's description of Darwin's later views on racial inequality is used in the film, but not Bowler's account of Adrian Desmond and James Moore's thesis [in *Darwin's Sacred Cause*] that Darwin was inspired by his opposition to racism and slavery. Sandra Herbert's comment that Darwin's theory required explanation of many aspects of life was edited down to imply that his theory required explanation of all aspects of life.

Bowler, Browne, and Herbert ended their article by musing, "Academics perhaps do need to be more aware of the fact that the media organizations are not always open about their underlying agendas." (The similar case of *Expelled* springs to mind; see *RNCSE* 2008 Sep–Dec; 28 [5–6] or <http://www.expelledexposed.com>.) "Had we known the true origins of Fathom Media," they continued, "we probably would not have contributed, but the producers do have a point: if academic historians refuse to participate when movements they don't approve of seek historical information, these historians can hardly complain if less reputable sources are used instead." They accordingly recommended a few websites for information on the history of Darwin and evolution, including NCSE's.

So far, *The Voyage that Shook the World* seems to have attracted little attention independently of the controversy over its misleading the historians: no reviews of it appear at Rotten Tomatoes or Metacritic. The sole positive review cited at CMI's website is from Ted Baehr on Movieguide, which, despite its neutral name, describes itself as a ministry "dedicated to redeeming the values of the mass media according to biblical principles, by influencing entertainment industry executives and helping families make wise media choices"; Baehr also gave four stars to *Expelled*. The movie is available on DVD, but did not have a theatrical release in the United States.

product of his social and cultural context, not his views on evolution. The film's suggested dichotomy of evolution-supporting racists versus religious creationist non-racists is false particularly given recent books by Adrian Desmond and James Moore (2009) and David Livingstone (2008).

Near the end of the film, it is stated that in Darwin's time, science was only beginning to emerge from philosophy, and that Darwin's project was philosophical and anti-religious as much as it was scientific (a position probably inspired by Cornelius Hunter, who appears in the documentary identified as a "Molecular Biophysicist & Author" rather than as the Fellow of the Discovery Institute that he is). The film concludes by stating that there are opposing views of evolution and creation, and that "some suggest that they can coexist, but Darwin himself resisted this position." This appears to be a case where the filmmakers want the viewer to side with Darwin, in opposition to accommodationism between evolution and religion. The final statement of the film is that questions about how we came to be here and why we are here refuse to go away.

In all, the film is somewhat better than we expected it would be, and the film can be described as trying to downplay or even hide its own creationism, probably in hopes of functioning as a Trojan horse. As such, it omits key evidence for evolution, and suggests that the viewer infer the reasonability of creationism from the selective evidence that is presented. In its favor, it does depict scientific research and discovery in a largely positive light, which may encourage young viewers to become interested in scientific questions. If so, perhaps some of them will come to discover a more complete picture, with the assistance of online sites such as the NCSE's and the TalkOrigins Archive.

References

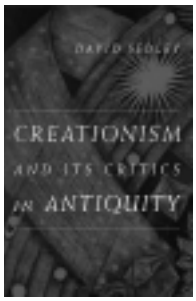
Desmond A, Moore J. 2009. *Darwin's Sacred Cause.* New York: Houghton Mifflin Harcourt.

Eiseley L. 1959. Charles Darwin, Edward Blyth and the theory of natural selection. *Proceedings of the American Philosophical Society* 103: 94–158.

Livingstone DN. 2008. *Adam's Ancestors*. Baltimore (MD): The Johns Hopkins University Press.

Corresponding author's address

Jim Lippard
Program in Human and Social Dimensions of Science and Technology
Arizona State University
PO Box 875603
Tempe AZ 85287-5603



Creationism and Its Critics in Antiquity

by David Sedley
Berkeley: University of California Press, 2007. 269 pages

Reviewed by James G Lennox

In 1900, Jane K Sather endowed a Visiting Professorship in Classics at the University of California, Berkeley, which, beginning in 1920, included an obligation to deliver a series of lectures, to be published as a book, that would make an original contribution to our understanding of the classical world. The series of monographs that has resulted from that endowment contains many of the most important contributions to classical studies of the past century, such masterpieces as Paul Shorey's *Platonism, Ancient and Modern*, ER Dodds's *The Greeks and the Irrational*, and Bernard Williams's *Shame and Necessity*. David Sedley's *Creationism and Its Critics in Antiquity* deservedly takes its place in this noble lineage.

As with many of its predecessors, Sedley's is a controversial book that reaches well beyond the world of classical scholarship. It is a study of defenders and critics of the idea that the cosmos, the orderly world around us, is the product of a divine, extra-natural designer. Sedley leaves no doubt that it is appropriately reviewed in this journal. As Laurence Professor of Ancient Philosophy at Cambridge, he reminds us in the preface that his college, Christ's, was also the college of both the Reverend William Paley, famous for his "watch on the heath" defense of the argument from design, *and* Charles Darwin, famous for arguing that apparent design in nature is due to natural selection. Sedley also reminds us that his Sather Lectures were delivered in America, where "it would have been a mistake to consign the debate [over intelligent design] to history" (p xv). His aim, he tells us, is to use history to shed new light on the debate (p xvi). Though infused throughout with Sedley's mastery of the Greek and Latin sources, *Creationism and Its Critics in Antiquity* achieves its goal of wide accessibility by keeping the scholarly details in footnotes and appendices. For a work of such immense scholarship, the integrity of the narrative is remarkable.

The chapters have a conventional layout in two respects: they examine the key figures chronologically, and they are organized around the narrative's chief protagonists. The first two chapters target two Presocratics, Anaxagoras and Empedocles, chapter 3 the pivotal figure of Socrates, and chapter 4, his disciple Plato. The chief *critics* of "intelligent design" in the Ancient world, the Atomists, are taken up in chapter 5. Sedley apologizes for placing the discussion of that entire tradition, from Leucippus and Democritus to Epicurus and his Roman spokesman Lucretius, before his chapter on Aristotle — justified, since the early Atomists predate Aristotle; yet problematic, because the later Atomists were clearly reacting to Aristotle. Sedley then turns to the Stoics and concludes with a Galenic epilogue, viewing Galen's teleology through the traditions he inherits.

While the layout is conventional, the interpretations are iconoclastic. Some examples:

James G Lennox is Professor of History and Philosophy of Science at the University of Pittsburgh and the author of Aristotle's Philosophy of Biology: Studies in the Origins of Life Science *(Cambridge: Cambridge University Press, 2001).*

Anaxagoras and Empedocles, read through the eyes of Plato and Aristotle as they typically are, are materialists and reductionists, in search of the ultimate material roots of all. In *Creationism and Its Critics in Antiquity*, however, Sedley portrays them as design teleologists, stressing the overarching role of Mind (*Nous*) in Anaxagoras and of Love and Strife in Empedocles. Anaxagoras' *Nous* is a designer (in fact, Sedley suggests, of the agricultural variety! [p 22–24]), but Anaxagoras' motivations are "not theological … but scientific and causal" (p 25). Likewise, Empedocles is portrayed as the author of a cosmic cycle, controlled alternately by the powers of Love and Strife, giving rise to a "double zoogony" — the production of myriad animals both on the way *toward* a perfectly spherical cosmos and on the way *from* it and toward the complete separation of the four elements under Strife's rule. Sedley seeks to unseat "the presumption that teleology plays no significant part in Presocratic philosophy" (p 52), which, he argues, has blinded readers to an obvious role for divine craftsmanship in Empedocles.

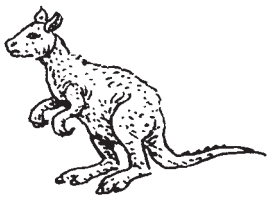
If Sedley's presentation of these two great Presocratics as arch-teleologists comes as a surprise, his portrait of Socrates is eye-popping! Rather than relying on the voluminous, but also problematic, evidence of the Platonic dialogs for his Socrates, Sedley turns to Xenophon's defense of Socrates against the charges of impiety in his *Memorabilia*. "Xenophon's Socrates," Sedley proclaims, "is a fundamentally anti-scientific creationist" (p 78). Our uniquely human attributes (intellect, hands, upright posture) and the clear evidence that other animals exist for our use are evidenced to develop an explicitly "anthropocentric teleology" (p 80). Much later in the narrative we are shown how this very passage serves as a source for Stoic theology (p 212–25), while passages in Aristotle discussing the same human attributes lead Sedley, with far less plausibility, to ascribe the same sort of teleology to the Stagirite (p 201–3).

But Aristotle and the Stoics must wait. I am convinced by the portrait of Socrates painted here, in part because we hear echoes of these arguments in Plato's Socrates as well. Summing up Socrates' argument in *Memorabilia* I 4.2–7 (translation and text appear on p 214–5 during that discussion of the Stoic legacy), he asks, rhetorically, "Do we not have here the earliest instance, or at least direct forerunner, of the Argument from Design?" Even more important, Sedley finds in Xenophon's Socrates an explicitly *theological*, rather than scientific, defense of design. In Plato's *Phaedo* (96–9) Socrates reports his early enchantment and gradual rejection of the natural scientific route to discovering why the cosmos was ordered as it was. In the last pages of this chapter, Sedley neatly returns us to Anaxagoras, whom Plato portrays in the *Phaedo* as Socrates' last hope for a naturalist cosmology. As I noted earlier, Sedley's Anaxagoras is not the one Plato or Aristotle leads us to expect. All the more reason, then, to suspect that the obvious connection we see between Socrates' disappointment in the *Phaedo* and Plato's "later move into physics" in the *Timaeus* (the primary topic of the next chapter) is a link, as Sedley puts it, planted in the text (p 92). Sedley's final assessment is well-justified: "Even at its most mythical or its most comic, it is a profound guide to Plato's own views on the world's teleological origin, purpose, and structure" (p 132). Indeed, Plato's *Timaeus* is my candidate for the single most influential source for the history of natural theology.

Sedley's take on Aristotle on the issue of creationism is as unorthodox as his reading of Anaxagoras, and less convincing. He states it clearly at the outset: "… I want to defend a portrayal of Aristotle's teleological worldview as a reasoned modification of Plato's creationism" (p 167). To give you a sense of the difficulties in the way of such a defense, you only need to be reminded that Aristotle is not a creationist! Sedley says as much: "The world, along with its resident species, is not [according to Aristotle] the product of an intelligent act of creation, for the simple reason that it had no beginning at all but has always existed …" (p 168). Better, then, to see this as a reasoned *rejection* of Plato's (and indeed anyone's) creationism. Likewise, we are told that Aristotle's theory of causation as formal replication is essentially Platonic (p 179). Odd, then, that after presenting a defense of his theory of causality in *Metaphysics* VII 8, Aristotle announces that it renders Plato's account of generation by reference to separate Forms "of no use" (1033b27–30). Aristotle's very un-Platonic understanding of the causes of generation is displayed vividly in his *Generation of Animals*. It is thus unfortunate that, while acknowledging that Aristotle is "the ancient world's greatest zoologist," Sedley announces that "my focus will not be on Aristotle's biological writings" (p 167).

The final section of Sedley's discussion of Aristotle is entitled "Aristotle's Platonism" (p 203–4). Yet it contains the following sentence:

> The result is that, while Aristotle's world retains all the positive values — both functional and other — that Plato had associated with divine craftsmanship, these are now explained by on the one had phasing out the divine craftsman, and on the other representing nature as so closely isomorphic with craft in its structure as to be capable of producing its results even in the absence of a controlling intelligence (p 204; compare p 208).



Especially when one remembers Aristotle's oft-repeated (intentionally anti-Platonic?) maxim that "art imitates nature," it is hard to see the point of referring to this principled rejection of a cosmos created by intelligent design as Platonism.

Similarly, but more plausibly, Stoic cosmology is interpreted as deeply indebted to Socrates (as presented by Xenophon) and to Plato's *Timaeus* (compare p 205–10). This chapter (largely an English version of a 2005 essay published in French) presents the Stoic doctrine of Cosmic Intelligence as reported by the Skeptic Sextus Empiricus. As he had with Anaxagoras, Socrates, Plato and Aristotle, Sedley again detects

an anthropocentrism in the Stoic arguments for cosmic design.

This is an important and timely volume. In the fifth century BCE the Greeks originated a tradition of defending theories about the cosmos and its origins and order by reason. Almost immediately philosophers conceived of "the argument from design," the claim that the apparent order in the cosmos is best understood as created by an intelligent craftsman. As David Sedley recounts the story, the only fundamental attack on this argument was that of the Atomists. My only disappointment with this remarkable work of philosophical synthesis is that it reinforces an injustice done to Aristotle by his Christian apologists. For it was Aristotle who challenged the argument from design by challenging the need for an intelligent creator to explain the order of the cosmos. Sedley acknowledges this, of course, but by treating Aristotle's challenge as a "modified Platonism" he undermines its significance. This one misgiving aside, I urge everyone concerned about the revival of "intelligent design" to read this compelling story of its origins in Ancient Greece.

Author's address
James G Lennox
Department of History and Philosophy of Science
University of Pittsburgh
Pittsburgh PA 15260

The Deep Structure of Biology: Is Convergence Sufficiently Ubiquitous to Give a Directional Signal?

Edited by Simon Conway Morris
West Conshohocken (PA):
Templeton Foundation Press,
2008. 243 pages

Reviewed by Derek Turner and Andrew Margenot

In his book *Wonderful Life* (1989), Stephen Jay Gould argued that evolutionary history exhibits contingency: If you could rewind the tape of life and play it back again, you would observe different evolutionary outcomes each time. Simon Conway Morris, a paleontologist whose work on marine invertebrates of the Cambrian period inspired Gould, defends a view of evolution that is just the opposite of Gould's. In *Life's Solution: Inevitable Humans in a Lonely Universe* (2003), Conway Morris argued that convergence, rather than contingency, is the hallmark of evolutionary history. Evolutionary convergence is the development of a particular trait in independent lineages: for example, the evolution of wings (in bats, birds, insects, and pterosaurs) and the "camera" eye (in mollusks and vertebrates). Most biologists think that convergence occurs when natural selection adapts different lineages to similar environmental conditions. The real question is whether convergence is more than incidental. Might it be "a straw in the wind, pointing to a deeper pattern of biological organization" (p ix)? Does convergence suggest a deeper purposiveness in evolution? This debate about the relative significance of contingency versus convergence represents a new development in evolutionary science as well as in the discussion of the relation between science and religion.

This volume offers twelve contributions of mixed quality by scientists, philosophers, and theologians, including one paper by Conway Morris. Especially noteworthy is the paper by Richard Lenski, whose research team at Michigan State University has done experiments that replay the tape of evolution using populations of *E coli* bacteria in the lab. Following Lenski's piece, paleontologist and theoretical morphologist George McGhee offers some intriguing speculations about the possibility of developing a "periodic table of life". McGhee's paper comes closest to making good on the promise of the title of this book, which is that evolutionary convergence has something to do with the "deep structure" of biology.

The middle part of the book consists of a cluster of scientific papers that explore the evolution of intelligence in plants, social insects, primates, and crows. There is also a fascinating paper by Hal Whitehead on convergent social structures in elephants and sperm whales. These papers illustrate the tricky problem of defining "intelligence". The idea of plant intelligence seems baffling, until plant biologist Anthony Trewavas reveals that 'intelligence' is to be defined in very broad terms, as "adaptively variable behavior". Don't all living things exhibit adaptively variable behavior? This points toward a general problem that philosopher of biology Kim Sterelny (2005) identified in a review of Conway Morris's earlier book: Whether the same trait evolves in two different lineages depends on how broadly or how narrowly you define the trait. If you define "intelligence" broadly enough, that virtually guarantees that intelligence will occur in many lineages.

The last third of the book shifts to talk of purpose in nature. Does evolutionary history have any aim or destination? Michael Ruse provides the clearest and most helpful discussion of purpose in Darwinian science. The functional role of adaptations naturally leads us to see purpose in evolution, but, Ruse and others warn, we must be careful not to conflate adaptational purpose with the idea that evolutionary history has an overarching purpose. The book then takes an abrupt theological turn with essays by Celia Deane-Drummond and John Haught. These authors do not engage much with the scientific details. Instead, they argue that a convergentist evolutionary biology can easily be combined with certain theological views, a claim that most scientists and philosophers would see as unproblematic. Perhaps a more interesting question is whether a convergentist evolutionary biology would lend *support* to those theological views. None of the contributors to this volume go quite so far as to defend an affirmative answer this last question.

In both his introduction and his contributed paper, Conway Morris

Derek Turner is Associate Professor of Philosophy at Connecticut College and author of Making Prehistory: Historical Science and the Scientific Realism Debate *(Cambridge (UK): Cambridge University Press, 2007). Andrew Margenot is a senior at Connecticut College, majoring both in biochemistry and cellular and molecular biology and in philosophy.*

himself seems a little reluctant to lay his cards on the table and say what exactly he thinks about the connection between evolutionary convergence and larger metaphysical and theological questions. In other contexts, however, he has been more forthright. In 2005, he delivered the annual Boyle Lecture at Cambridge University, entitled, "Darwin's compass: How evolution discovers the song of creation" (published as Conway Morris 2006). The lecture provides a stronger taste of his thoughts on science and religion than he offers here. There he writes of a desperate need "to re-examine how science and religion not only must co-exist ... but far more importantly how science reveals unexpected depths to Creation while religion informs us of what on earth (literally) we are going to do about it" (2005: 3). He rejects Stephen Jay Gould's "reckless canard of science and religion defining independent magisteria of influence" (2005: 3). That, in turn, suggests that he does think that evolutionary convergence has some theological significance. It's just not entirely clear what the significance is supposed to be.

Gould, it seems, is the real nemesis here. Although the contributors to this volume represent a diversity of perspectives, no one speaks up for Gould's claim that history is contingent. As many of the selections point out, contingency is the antithesis of convergence. It would have enriched the debate to include some discussion of why Gould thought that the case for contingency is so strong.

And why not expand the discussion of convergence beyond evolutionary biology? What convergence might mean for cultural evolution and the history of science would make for fascinating reading — think of Darwin's and Wallace's "convergent" discoveries of natural selection.

Overall, the science makes the book worthwhile. When the book moves beyond the empirical study of evolutionary convergence, things get a little murkier. The papers on crows and ants, elephants and plants, do leave one with the sense that convergence is an important phenomenon. This book provides an accessible, if one-sided, introduction to the discussion of contingency and convergence in evolution.

References

Conway Morris S. 2003. *Life's Solution: Inevitable Humans in a Lonely Universe*. Cambridge (UK): Cambridge University Press.

Conway Morris S. 2005. Darwin's compass: How evolution discovers the song of creation. Available on-line at <http://www.stmarylebow.co.uk/?download=BoyleLecture05.pdf>. Last accessed September 3, 2009.

Conway Morris S. 2006. Darwin's compass: How evolution discovers the song of creation. *Science & Christian Belief* 18 (1): 5–22.

Gould SJ. 1989. *Wonderful Life: The Burgess Shale and the Nature of History*. New York: WW Norton.

Sterelny K. 2005. Another view of life. *Studies in History and Philosophy of Biology and Biomedical Sciences* 36 (3): 585–93.

Corresponding author's address

Derek Turner
Department of Philosophy
Connecticut College
270 Mohegan Avenue
New London CT 06320
derek.turner@conncoll.edu)

Evolution: How We and All Living Things Came to Be

by Daniel Loxton
Toronto: Kids Can Press, 2010.
56 pages

Reviewed by Joseph Fail, Jr

Daniel Loxton has crafted an adventurous story about evolution. Not only is the science accurate but it is also presented in a way that draws kids of all ages into Darwin's "mystery of mysteries." This book took me back to childhood Saturdays in the library immersed in a journey that I did not want to end. The adventure starts with a dinosaur nearly leaping out of the page, and then Loxton introduces us to the usual evolutionary suspects — Darwin and Cuvier — and unexpectedly to a young woman, Mary Anning, who hunted fossils for a living. The inclusion of Anning is perfect for young girls wondering what adventures to pursue in life — teaching them that they too can indeed take on science.

Our guide wastes no time in providing a clear description of the mechanism of evolution in three easy-to-understand steps: struggle among and between individuals, variation and natural selection acting on it, and the passing on of characteristics to the next generation, and voila! evolution explained. From that point, Loxton gently guides us along the trail of Darwin's big idea — to the land of "Zooks" (imaginary zebra-like beasts), where we learn how species can split, and on to stories of adaptations as answers to questions posed by nature. Here a gorgeous pterodactyl flies off the page, and there the first amphibians crawl on to dry land to mingle with the first vascular plants, portending the later invention of trees with trunks as an answer to the question of how to trap the most light to make the most food. Pretty soon we are face to face with our own ancestors. Loxton makes that speciation event seem as natural as flowing water, and then unobtrusively points out that the species resulting from those early ancestors has control of the destinies of all other species — indeed that of the whole planet — through technological evolution.

Loxton does miss several teachable moments that could provide young students with non-magical and logic-strengthening insights on how life on the planet is interconnected. One of the omissions is a page devoted to the actual molecular basis of evolution — a depiction of the elegance of a DNA molecule. Elementary students easily grasp the concept of molecular structure and the energetic glue

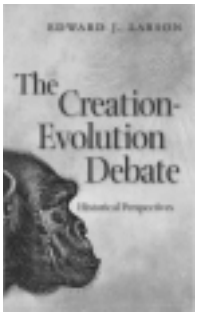
Joseph Fail Jr is Associate Professor of Biology in the Department of Natural Sciences at Johnson C Smith University.

that holds them together, and this understanding can then be applied to the concept of the material basis of evolution — that if a biological characteristic is not written in the codes of the molecule DNA then we are not discussing evolution by natural selection.

One other major oversight is the lack of explanation of the role of photosynthesis as the energetic basis of virtually all life. Students need to understand early on that they are the product of light, and some pages devoted to the story of light and its connection to life would have made evolution so much less magical to young minds. Providing this would have required explaining photosynthesis and respiration, illustrating how the laws of thermodynamics apply to life and thus also to evolution. This is not as difficult a task as it might appear. None of the fourth through sixth graders that I have taught in weekly lessons on biology have been unable to understand these ideas.

Evolution: How We and All Things Came To Be should be an early reading for elementary students' science education curriculum and a permanent part of the classroom library. The book's simple lucidity, stunning art, and connected storytelling teaches students that they can learn science, and it teaches them their own special place in the grand scheme — the "grandeur" as Darwin wrote — of life.

Author's address
Joseph Fail Jr
Department of Natural Sciences
Johnson C Smith University
100 Beatties Ford Road
Charlotte NC 28216
jfail@jcsu.edu



The Creation-Evolution Debate: Historical Perspectives

by Edward J Larson
Athens (GA): The University of Georgia Press, 2007. 66 pages

Reviewed by Mark Largent

This short volume resulted from the 2006 George L Shriver Lectures on Religion in American History, that Larson presented at Stetson University. It consists of three chapters — one on 19th-century British reactions to evolution as it applied to humans, one on the American controversy over creation and evolution, and one providing a general view of the religions of American scientists. The book offers only a brief survey of material examined much more thoroughly elsewhere. It concludes with a short appendix that describes a survey that Larson and Larry A Witham, conducted regarding US scientists' religious beliefs.

Larson's first chapter, "Darwinism and the Victorian Soul," turns quickly from Darwin's and other natural scientists' concerns about the theological significance of his 1859 *On the Origin of Species* and the widespread acceptance of his theory of evolution by natural selection to the scientific community's reaction to his 1871 *Descent of Man*. Larson asserts that the "triumph of evolutionism within the Victorian scientific community during the 1860s did not translate into widespread popular acceptance of the theory, at lease with respect to human origin" (p 8). In general, Larson argues, most people rejected the notion that humans' highly developed brains, morality, and emotions evolved via selection from lower animals.

In the book's second chapter, Larson moves the discussion about Darwin's theories to the United States, explaining, "The American controversy over creation and evolution is primarily fought over what is taught in US public school biology classes" (p 14). It occurred, Larson asserts, in three phases: 1) the Scopes Trial in 1925; 2) the creation-science movement in the mid-20th century; and 3) the "intelligent design" movement that emerged at the end of the century. He concludes the chapter by predicting little progress in the stalemate between evolution and creation, given that "dark clouds remain on the horizon" (p 36).

The third and final chapter of the book examines the interplay between science and religion in 20th-century America. Larson pays special attention to the warfare terminology employed in discussions about science and religion in the United States by showing how firmly rooted it is in both the pro-evolution and anti-evolution narratives. He finishes the chapter by introducing some of the work of the Bryn Mawr psychologist James H Leuba, who conducted a series of surveys of American scientists in 1914 and again in 1933. Leuba reported that about 40% of average American scientists believed in God, but when he surveyed the American scientific elite (as defined by being starred in the *American Men and Women of Science*) he discovered much lower rates of belief.

In the later portion of the third chapter and in the book's appendix, Larson describes the results of his survey of American scientists' religious beliefs. Following Leuba's model, Larson and Witham found similar rates of belief and disbelief among American scientist. They also found, as had Leuba, substantially higher rates of disbelief among the scientific elites in the United States. Larson asks, "Are the deepest contemporary scientific minds drawn to atheism, or does elite scientific society itself select for the trait of disbelief?" (p 50). He concludes — rather unsatisfyingly — that "the answer seems to be a bit of both" (p 50).

Author's address
Mark Largent
James Madison College
Michigan State University
East Lansing MI 48825-1210

Mark Largent is Assistant Professor in James Madison College at Michigan State University, author of Breeding Contempt: The History of Coerced Sterilization in the United States *(New Brunswick [NJ]: Rutgers University Press, 2008), and co-editor, with Christian Young, of* Evolution and Creationism: A Documentary and Reference Guide *(Westport [CT]: Greenwood Press 2007).*

Darwin in Scotland: Edinburgh, Evolution, and Enlightenment

by JF Derry
Dunbeath, Scotland, United Kingdom: Whittles, 2010.
224 pages

Reviewed by Paul S Braterman

Do not judge this book by its cover. Despite the claims made there and in the forewords (by AC Grayling and Stuart Munro, no less), no strong case is made here for the assertion that his time in Edinburgh had any major influence on Darwin. There are references to Darwin's study of taxidermy and to his membership of the Plinian Society, and a paragraph from his autobiography that describes how hearing Grant's views on evolution could have influenced him later, but nothing more on the ostensive central theme. A later two-page description of Darwin's 1838 visit to Scotland and his incorrect analysis of the parallel roads of Glen Roy adds nothing of substance to the more scientifically detailed account in his autobiography.

The book sometimes reads as if aimed at a very restricted audience: those who have personal acquaintance with Edinburgh's High Street ("So, the next time you are passing by his [David Hume's] statue ..."). The chronology is, to put it politely, confusing, with no sense of historical perspective. There is a two-page inventory of sources for Darwin's own writings, and a ten-page list of recommended readings, but the vast majority of these are not taken up in the text. Meantime, almost all of the many excerpts used in the text are presented with little more than the author's or speaker's name.

There is no great emphasis on purely Scottish aspects of the response to Darwin. The three-page chapter on "Scottish Geology" starts with James Hutton's uniformitarianism, and credits him with the discovery in the West of the concept of "deep time," as if Robert Hooke, Nicholas Steno, Benoît de Maillet, and the Comte de Buffon had never existed. There is only one brief reference in this chapter to Charles Lyell, who should surely qualify for more extended treatment, not only because of his long friendship with Darwin, but because he was, after all, a Scot. We have a paragraph on William Thomson's (Lord Kelvin's) thermodynamic objection to uniformitarianism, backed up with a well-chosen quotation, but on this occasion the failure to give an exact reference is more than a trivial annoyance. The passage quoted originally came from Thomson's address to the annual meeting of the Christian Evidence Society in May, 1889. This context is highly relevant to Thomson's beliefs, as is the date to the detailed evolution of his arguments, but you will not learn that here. Nor will you learn that Thomson's publication campaign against uniformitarianism in general, and the deep time required for unguided evolution in particular, began as early as 1862, and that Darwin himself described Thomson as an "odious spectre" and among his sorest troubles.

The major part of the book is actually taken up with interviews by the author of an impressive array of people, many of them based in Scotland, or whom he managed to interview while they were passing through. The list of contributors is impressive, twenty-four in all, from Noam Chomsky, Daniel C Dennett, and Richard Dawkins through Michael Behe and William Dembski to Ken Ham, and supplemented by a useful collection of brief biographies. Again, I would have been glad to know the dates of these interviews, and indeed in some cases whether we are dealing with interviews as such or with excerpts from other materials, such as Web postings. The contributors are encouraged to expound their ideas by gentle questioning, although at times I wished the author, himself a biologist, could have brought himself to ask more elementary questions. Despite this, I found these interviews highly informative. My own perspective was shifted on a number of scientific matters, while a damningly self-revelatory interview with Ken Ham (of Answers in Genesis and Creation Museum fame) gave me insights into a way of thinking that I could not even have imagined.

A chapter devoted to the teaching of evolution, both in the United Kingdom and the United States, is totally unsatisfactory. Confusing cause with effect, the author attributes the opposition to introducing "intelligent design" (ID) in American schools to vigilance over the First Amendment, and fails to understand why the creationists are so eager to market their products as "science". He also describes the ruling in *Kitzmiller* as a rejection of ID's attacks on evolution. True, but the real point is that the school board lost, not because ID is wrong, but because it is an expression of religion. He incorrectly states that Truth in Science (which he associates with ID, although its young-earth creationist and biblical literalist roots are well-known) was "blocked by the UK government from disseminating Discovery Institute material." This is not what happened. The UK government did not and could not stop TiS from sending materials to schools; what it can do, and did do, was reiterate its view that ID and creationism are not scientific theories.

The author is rightly concerned that the "faith schools" set up under the (recently displaced) Labour administration would be sympathetic to creationism, but fails to mention that this problem has already arisen in the most acute form in independent state-supported academies (as documented, several years before this book was completed, in Dawkins's *The God Delusion* [Boston: Houghton Mifflin, 2006], p 331–7). He does not explain the fundamental problem in the UK, which is that as long as schools teach the scientific curriculum to the required standard, they can, and some do, also teach creationism, or even tell their students that the account required for national examination purposes is false.

One further theme is the relationship between evolution and

Paul S Braterman is Professor Emeritus of Chemistry at the University of North Texas and Honorary Senior Research Fellow in Chemistry at the University of Glasgow.

religion. Here the author falls into the trap of presuming a dichotomy, saying in his preface, "The other role for Darwinian evolution puts it at the heart of the science-religion debate, as a counterpoint to contemporary Creationism and Intelligent Design" (p xiv). The mainstream biologists interviewed have no chance to comment on this assertion, since in the main they are asked only about science, while the creationists have space to expound their full range of objections to naturalism. No mention is made of theologies that embrace evolution or the movement represented by Evolution Weekend. It is only at the very end of the book's epilog that we are shown a scientist contemplating the notion that evolution itself might be the work of a creator. That scientist is Charles Darwin.

Author's address
Paul S Braterman
48 Ninth Street
Glasgow G33 2AF
Scotland, UNITED KINGDOM
P.Braterman@chem.gla.ac.uk

Darwin's Island: The Galapágos in the Garden of England

by Steve Jones
London: Little Brown, 2009.
307 pages

Reviewed by Kent Holsinger

In 2009 we celebrated the 200th anniversary of Darwin's birth. We also celebrated the 150th anniversary of the publication of his most famous book, *On the Origin of Species*. Indeed, if you were to ask most people about Darwin and what he wrote, the only work they're likely to remember is the *Origin* — with good reason. It was the *Origin*, after all, in which Darwin laid out the evidence for descent with modification and for evolution by natural selection. If you pressed, some people might remember the *Voyage of the Beagle* or, maybe, the *Descent of Man*, but you are unlikely to get much further.

Steve Jones wants readers to remember that there were many other books as well, from *On the Various Contrivances by which Orchids are Fertilized by Insects* to *On the Formation of Vegetable Mould through the Action of Worms*. And he wants then to remember that these books draw largely on original observations he made on plants and animals in "the garden of England" referred to in the subtitle. He wants to convince you that "[t]he great naturalist's lifelong labours generated an archipelago of information; a set of connected observations that together form a harmonious whole."

He succeeds. For there is a constant thread running through Darwin's work. Even when Darwin is writing about the *Power of Movement in Plants*, the thread of common ancestry is never far from the surface. Darwin couldn't have known that the signal proteins allowing a sensitive plant (*Mimosa pudica*) to respond to touch are related to signal proteins in the human body promoting the production of certain hormones, but even so Darwin couldn't stop himself from writing that "[i]t is impossible not to be struck with the resemblance between the foregoing movements of plants and many of the actions performed unconsciously by the lower animals."

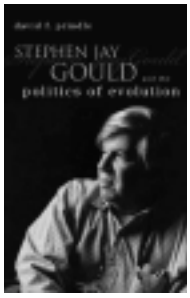
But Jones's object is not merely to describe what Darwin wrote. Rather, he uses each of Darwin's books as a springboard to introduce readers to a wide range of discoveries in modern biology, from signaling proteins to DNA paternity testing to homeobox genes, and to show how this vast diversity can all be understood as a consequence of the two fundamental processes Darwin identified: descent with modification and evolution by natural selection.

The book is not perfect. In discussing *The Effects of Cross- and Self-Fertilization in the Vegetable Kingdom*, Jones first argues that the death of Darwin's first daughter, Annie, "may … in part have been due to her parents' marital history" (Charles and Emma Darwin were first cousins), though the immediate cause was tuberculosis. A few pages later he writes that "[t]he great man's concern about the possible damage to his own children was not justified." Small contradictions like this may be difficult to avoid when telling an engaging story, but they are distracting.

As Jones points out, Darwin wrote to Huxley a few years after publication of the *Origin* that "I sometimes think that general and popular Treatises are almost as important for the progress of science as original work." Chris Mooney and Sheril Kirshenbaum, in *Unscientific America*, and Randy Olson, in *Don't Be Such a Scientist*, have made similar pleas, and science would benefit if more of us paid attention — as Steve Jones has done for more than two decades. Already a popular author and commentator in Great Britain, in *Darwin's Island* he introduces a wide audience to Darwin's other books, books that specialists know well but that few others even realize exist. In doing so he reminds us all of the great fabric that is modern biology and of its warp and weft, which is evolutionary theory.

Author's address
Kent Holsinger
Department of Ecology and Evolutionary Biology
University of Connecticut
Storrs CT 06269-3043
kent@darwin.eeb.uconn.edu

Kent Holsinger is Professor of Ecology and Evolutionary Biology at the University of Connecticut. He is a former president of the American Institute for Biological Sciences and the current president of the Botanical Society of America.



Stephen Jay Gould and the Politics of Evolution

by David F Prindle
Amherst (NY): Prometheus Books, 2009. 249 pages

Reviewed by Patricia H Kelley

As a student of Stephen Jay Gould in the 1970s, I thought it was standard procedure to analyze the social context of scientific thought to determine what possible bias your predecessors, contempo-

raries and rivals brought to their work. A historian and philosopher of science, as well as a practicing paleontologist and evolutionary biologist, he delighted in placing the works of others in their social/political context. I think he would be pleased that David F Prindle, Professor of Government at the University of Texas at Austin, has subjected his work to the same scrutiny in *Stephen Jay Gould and the Politics of Evolution*.

You might wonder, as I did, what a professor of government is doing writing about evolution. How could he possibly know enough about concepts such as punctuated equilibria and macroevolution to critique Gould's work? Prindle has done his homework. He has read all of Gould's books and seminal articles and many additional publications, as well as audited a course on speciation. Except for occasional slips (for example, an inadequate description of species selection, errors in his comments on the Cambrian explosion, underestimation of the acceptance of punctuated equilibria among paleontologists) he gets the science right. But more importantly, I think he gets the politics right.

What's politics got to do with it? A lot, Prindle argues effectively. His thesis is that "Gould's mind worked along two tracks simultaneously, the scientific and the political. ... Gould never penned a line that did not address, if only implicitly, both areas of human thought" (p 11). Prindle argues that Gould was involved in both the internal politics of science and the politics of evolution in society as a whole, that is, in his opposition to creationists.

In the first chapter, Prindle evaluates Gould's political orientation, dispelling the notion that he was a Marxist, arguing instead that he was a "leftist" or "modern liberal" for whom equality of opportunity was key. He also analyzes why Gould's writing had such charm for his readers, taking them on a voyage of discovery, it was personal, informal, and placed ideas in their cultural context.

Patricia H Kelley is Professor of Geology at the University of North Carolina, Wilmington, and a Supporter of NCSE.

The next chapter deals with issues in the philosophy of science — Gould's interest in Kuhn and Popper; the nature of historical science; Gould's opposition to reductionism; his views that evolution is nondirectional and that humans are not "special".

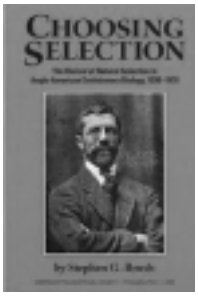
The remainder of the book addresses Gould's involvement in "internal politics". Chapter 3 discusses the controversies in which Gould was involved relating to evolution and life history (gradualism vs punctuated equilibria, macroevolution, species selection, contingency). The next two chapters focus on "politics of human nature," including sociobiology, and on human inequality (Gould's campaign against intelligence testing). Prindle makes a convincing case that Gould's scientific stance was inextricable from his political stance. He also recognizes a number of contradictions and inconsistencies in Gould's writings and relates them to his political aims.

In chapter 6, Prindle discusses Gould's forays into "external politics" — the evolution/creationism struggle. This chapter will be of particular interest to readers of *RNCSE*. He summarizes briefly the anti-evolution movement from Scopes through the 1960s to Reagan and the Arkansas court case, focusing on the testimony that Gould presented as a scientific witness at that trial. Prindle also critiques several creationist arguments (such as lack of transitional forms in the fossil record), dismissing all except the question of "origin of mutations," which he feels (I think unjustifiably) evolutionary biologists have not addressed sufficiently. He examines the way creationists have treated Gould's work, including punctuated equilibrium, the contingency argument of *Wonderful Life*, and the argument about design related to the "panda's thumb." He states that Gould understood that creationism was a political issue; he sees Gould's NOMA approach ("Non-Overlapping Magisteria" presented in *Rocks of Ages*) as politically motivated, because "If there was one American scientist in the 20th century who mixed the magisteria of fact, morality, and ultimate meaning in his work, it was Gould. For him to turn around and recommend the separation of the two spheres begs for some sort of explanation" (p 196). For Prindle, the explanation is that NOMA was a political strategy — an effective one — for building a "coalition of the ambiguous" joining scientists with religious Americans wanting to avoid conflict with science.

Prindle's final chapter assesses Gould's long-term contributions, especially as seen in his *Structure of Evolutionary Theory*. He sees Gould's final book as a call for a new theory, rather a "series of good starts, shrewd critiques, memorable phrases, and half-baked ideas.... His political legacy, then, must be much like his scientific legacy, a set of ideas that cohere more in tone than in conceptual completeness" (p 212). Should a "Gouldian" theory emerge, he predicts it will be anti-reductionist and focus on emergence, macroevolutionary hierarchies, and constraints. But for now Prindle sees Gould's main scientific contributions as "two good ideas" (p 213), spandrels and exaptation, which he admits partly solve the "origin of mutations" problem. He concludes that, though Gould's scientific contributions may not last, his writing will, because "by recontextualizing biological discourse he demonstrated, to scientists, to nonscientists, and even to antiscientists, why it was relevant" (p 217).

This book should interest evolutionary biologists; I can see it being used in seminars on evolution or the philosophy of science, and it would be valuable reading for graduate students who may consider science an objective pursuit. It will appeal to the still strong cohort of Gould's fans, and should be understandable by the educated lay person (for instance, Prindle does a good job of explaining arcane subjects like factor analysis). Even though I thought I knew Steve well, I learned a lot from this book, and much of it rang true to the lessons Steve tried to teach his students.

Author's address
Patricia H Kelley
Department of Geography and Geology
University of North Carolina Wilmington
Wilmington NC 28403-5944
kelleyp@uncw.edu



Choosing Selection: The Revival of Natural Selection in Anglo-American Evolutionary Biology, 1930-1970

by Stephen G Brush
Philadelphia (PA): American Philosophical Society, 2009.
183 pages

Reviewed by Roberta L Millstein

Those of us engaged in defending the teaching of evolution in public schools are aware of the need to understand evolution properly. For example, we emphasize that selection and evolution are not the same thing, pointing out that there are a number of evolutionary processes, for example, selection, drift, mutation, and migration. And we point out that debate among biologists over the relative importance of different evolutionary processes is often deliberately misrepresented by creationists. However, it is also important to understand the *history* of the debate over evolutionary processes, that is, how it is that we came to hold the views concerning the relative importance of selection that we hold today. Stephen G Brush, perhaps most well known as a physicist and a historian of physics, seeks to help us understand that debate as it occurred in the mid-20th century. In that, he is mostly, if not entirely successful.

Brush's thesis is that the "Natural Selection Hypothesis" (NSH) came to be accepted by a "bare majority" of evolutionary biologists in the 1950s and 1960s. The NSH is "*the hypothesis that natural selection, with an ample supply of variation in heritable characters, is not only the major process involved in evolution (with the help of geographical isolation or polyploidy in some cases), but also that Lamarckian effects, random genetic drift, and macromutations have essentially no evolutionary significance*" (p 2; emphasis in original). The thesis is, on the whole, reasonably uncontroversial, but the devil is in the details. Brush focuses almost exclusively on what he calls the "competition" between natural selection and random genetic drift (roughly, the question of whether changes in populations over time are due to differences in fitness or due to chance); there is little discussion of other evolutionary processes or other processes involved in evolution, such as development. Furthermore, many biologists in fact disagreed, and the "majority" position did not remain the majority position past 1970. Finally, and very unfortunately in my view, Brush has left out a detailed discussion of Sewall Wright's shifting balance theory and Motoo Kimura's neutral theory of molecular evolution, both of which were influential views developed during the period Brush is covering and both of which posited a substantial role for drift *and* selection (defying the "either selection or drift, but not both" way of thinking that sometimes characterized this period).

The thing to understand is that the truth of the reception of the NSH is *complicated*; people's views changed over time and could not necessarily be neatly categorized as "accepting" or "rejecting" the NSH. The truth is also difficult to uncover, because like any family dispute where there is widespread general agreement, but disagreement over details (in this case, the particular ways in which evolution is proceeding), arguments can get heated, and it is difficult to find neutral parties whose accounts we can trust.

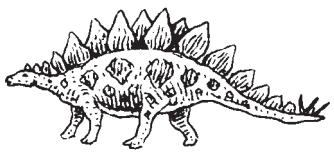
Brush categorizes his book as a "reception" study, stating that while we have studied the reception of Darwin's views immediately after 1859 and the early 20th century, we have not studied the reception of what Brush calls "the modern version of Darwin's theory" in the mid-20th century. The book offers a synthesis of the Modern Synthesis literature, together with a detailed examination of its citation patterns, which (to my knowledge) has not been done previously. Of particular interest to readers of *RNCSE* will be the discussion of the different types of evidence for selection that influenced mid-20th-century evolutionary biologist. Many of these remain classics in the field.

Brush's concern is with the *empirical* reasons why the NSH had the reception it did. He particularly emphasizes the confirmation of "novel" predictions (prediction of facts that were not known at the time that the prediction was made). If the theory of natural selection were to make such predictions, it could either be corroborated or be falsified; in other words, it would be falsifiable. This raises another pair of issues: whether falsifiability is a criterion that demarcates science from pseudoscience and whether the theory of natural selection is indeed falsifiable. Brush suggess that falsifiability is important but should not be considered the sole criterion and argues that the biologists of this period themselves did not seem concerned with confirmation of novel predictions, though many were in fact confirmed. I think readers will enjoy the examples here, especially the brief history of the use and misuse of the falsifiability criterion in creationist attacks on evolution.

I highly recommend *Choosing Selection* for anyone interested in evolution. Scholars familiar with this period will come away having learned some things they didn't know and will appreciate Brush's provocative position on a provocative subject; those new to this area will be introduced to the main players and will receive a wealth of pointers to both primary biological literature and secondary historical and philosophical literature.

Roberta L Millstein is a professor in the Department of Philosophy at the University of California, Davis. She teaches undergraduate and graduate courses in the history and philosophy of science (including the "debates" over creationism wherever she can) and publishes in journals such as Philosophy of Science *and* Biology and Philosophy.

Author's address
Roberta L Millstein
Department of Philosophy
University of California, Davis
One Shields Avenue
Davis CA 95616
RLMillstein@UCDavis.edu



NCSE Thanks You for Your Generous Support

The NCSE Board of Directors and staff would like to acknowledge and extend their warm gratitude to all individuals, organizations, and firms that donated to NCSE. We also extend special thanks for their much-appreciated support to the following people who donated $100 or more during the first half of 2010 (* indicates an NCSE board member or supporter).

Those in the Patrons' Circle donated $1000 or more — a level of support that we consider heroic and that allows us a firm foundation for our efforts.

Thank you to all donors.

Patrons' Circle

Kenneth B Armitage
Michael Barnhouse
Nelson M Barnhouse
David F Blake
Robert D Blue Jr
Paul M Bronstein
Sherman B Carll
Gordon Collins
Lorence G Collins
Truman W Collins
Joel Cracraft*
James E Darnell*
Michael J Fallenstein
Norborn Felton
James T Fielder
Joseph L Gray
Evan & Elaine Hazard
Michael Hebron
David Hewitt
Robert J Holman
Stephen M Holton
Michael W Hunkapiller
David B Jones
Thomas P Jones
Anoush Khoshkish
Malcolm Kottler
G Gordon M Large
Lawrence & Narcinda Lerner
Don & Paula Lindsay
Edward J McConnell
Priscilla C McKenna
Peter O'Donnell Jr
Lydia Rice
Jason Rosenhouse
Howard Schackelford
John Schweinsberg
Andrew Sinauer
John & Kimberly Venton
Margaret I Wilson
Terrence L Zehrer

John Aach
Brant W Abrahamson
Laurie A Abrams
James M Alexander
John K Alexander
Dori Allard
David B Allison
Warren D Allmon
Stanley J Alluisi
Peter C Anderson
Robert F Anderson
Robert H Anderson
Stuart H Anderson
Philip Andrews
Olaf Apel
David M Armstrong
Robert Armstrong
Verna Arnest
Edward M Arnett
Dolores J Arond
William Atkinson
Gary L Audiss
Robert Austin

Samuel Babiar Jr
Richard Babylon
Richard T Bachman
Barbara Backley
James E Bair
Kenneth N Baker
Royce E Ballinger
Phillip T Barnes
Karen E Bartelt
Susan & Frank Bash
Jon Baskin
Thomas Battin
Norman Beachy
C David Beaver
Delvin F Beimfohr
Bryant Y Belknap
Ray & Jann Bellamy
David & Donna Bennett
William Y Bennett
Gene N Benson
William E Benson
Carl S Benson
Julie C Benyo
Edward E Berg
Hans Bergstrom
Nancy R Bergstrom
Claude W Bernard
Lynne F Bernatowicz
Wayne M Bevan
Paul H Bickart
Michael Bishop
Peter B Bishop
Floyd H Blackmore
Robert L Blake Jr
David C Blewett
John D Bloch
Charles Blondino
Charles R Boardman
Gergely Bognar
Thomas & Catherine Boxleiter
Peter & Terry Gamble Boyer
Seth Bradley
Susan Branch
Ethan Braunstein
William T Bridgman
Andrew L Brill
Herman Brockman
Michael R Brooks
Anthony Brown
Jeffrey M Brown
Thomas W Brown
Ann Browne
Stephen G Brush*
Stephen J Bruun
Fredric L Buchholz
Duncan A Buell
Jerry D Busch
Peter Buseck
John A Butemeyer
John B Butler

Catherine A Callaghan
Stephanie Campbell
David Capell
Robert W Carroll
Phillip S Carskaddan
James F Case
Charles F Casey
Michael Z Castleman
Peter A Castruccio
Richard E Caton
Fairfid M Caudle
Anthony J Cavalieri II
Philip J Chamberlain
David D Chapman
James B Chapman
Garvin Chastain
James F Cherry
Jung Choi
Andrew Chong
Gordon Clark
Thomas Cline
James H Cohn
Susan A Cole
Robert D Collins
Dewey J Conces Jr
David Cone
Robert A Cooper
Carol Copp
Richard Corry
Frank Corum
Roy V Crabtree
Richard W Craigo
Roy R Crawford
Caleb & Sheila Crowell
Adam Cunningham
Edward J Cushing
Martin Czigler

John P Dabritz
Ronald E Daley
Garry Dallmann
JDS Danielson
Claire T & William A Dart
Brad A Davidson
Christopher D Davis
Bonnie M Davis
Jeffrey S Dean
John Deane
Jack & Janice DeBaun
Richard A Deitrich
Kirk Deitsch
Andrew Demma
Jamie Deneris
Rodger E Denison
Andrew E Depristo
James R Derby
Robert F Derenthal
Patrick Devereaux
James A Dewar
Michael L Dini
John R Dobyns
Janet Domiano
Erl Dordal
Stephen Q Dornbos
Robert H Dott Jr
Daniel Drake
Mike Draney
H Edward Drexler Jr
David Duffy
Samuel Strong Dunlap

William G Eberhard
William E Edmunds
Charles J Edwards
MW Edwards
Paul & Anne Ehrlich
Mark Elenko
Richard Elinson
Frank C Eliot
Scott L Ellison
Wesley R Elsberry
Winfred S Emmons III
Peter M Enggass
Robert M English
Jon & Susan Epperson
Donald C Erickson
Brad Ericson
Douglas H Erwin
John M Estill
Stefan K Estreicher
Don G Evans
Kenneth E Fahrenholtz
Robert H Fairclough
James V Falvo
R Screven Farmer
Walter Faxon
Herbert Feitler
Russell Fernald
Yanga Fernandez
Dominic Ferro
Karl & Lorraine Fezer
Shirley Fidel
Jeremy Fields
Peter Finlay
Frank L Fire Jr
Morris W Firebaugh
Valerie T Fitzpatrick
Larry Flammer
Bruce L Flanders
Gary Fletcher
James E Fletchinger
William A Forsee
Adam Frahs
Bruce H Frank
Patrick Frank
Leif Fredin
Leonard A Freed
Anthony J Freed Jr
Michael R Freeman
Daniel A Friderici
Jack B Friedman
Philip Frymire
Todd M Furler

Joseph G Gall
James & Sylvia Gallagher
Georgine M Garbisch
Cynthia A Gardner
Elliott Gardner
David Gates
Anthony J Gaudin
Larry Gay
Marc Gelormino
Robert P Gendron
Richard J Gentile
David Gentry

Neal C Gillespie
Alexander Glass
James Gleason
James W Godwin
Jeff Goin
Mary Goldkamp
Brian S Good
Morris Goodman
Robert Goodrich
Robert W Goodwin
James J Goodyear
Jan Gordon
David H Gorski
Harvey E Gossard
Jeff & Judy Gough
Richard G Gould
Milton B Graff
Rebecca Greben
Jonathan Green
Robert Green
Steven Green
Wade C Greene Jr
Kenneth M Gregory
Marie Greider
Jack P Griffin
Mary Frances Groll
Guenter W Gross
George L Grubbs

Michael G Hadfield
Arthur F Hagar
Carl Hagerling
Mark E Hahn
Guy Hall
Sherrie G Hall
Terry L Haller
Daniel A Hamlin
Joseph Hancock Jr
Daniel C Hankey
Jane F Hansley
Jack Harney
Arthur H Harris
Bret C Harvey
Tom Harvey
Robert H Hasek
Gordon B Hazen
Matthew J Heaney
Alan G Heath
Glenn Heck
Andrew B Heckert
Paul W & Jessica O Heiring
Raymond Heithaus
Barbara Hemmingsen
Clyde F & Janet Herreid
Susan W Herring
John H Hessel
Karen Higdon
John Hile
William Himwich
Conrad C Hinckley
William R Hintzman
Nan Ho
Howard Hobbs
Art Hobson
Fred G Hoeptner
James C Hoglen
Maretta Holden
William & Leslie Holmes
Kent E Holsinger
James House
Paul Hudek
Michael J Huffenberger
Terry Huffington
Stuart W Hughes
Delores A Hull
Charles J Huller
William D Hummon
RB Humphrey
H Robert Hunt
Justin Husted
John David Hutsell

Mark & Robin Ikeda
Michael Ikeda
Peter B Imrey
David Isaacson
Jian Isfahani
Dwight Ittner
Paula Ivey Henry

Robert C Jachens
Jason Jackson
John Jagger
Duane E Jeffery*
Stephen H Jenkins
Neal Jensen
William & Beverly Jensen
Hollis R Johnson
John F Johnson
Vaughan Johnson
Steven A Johnson
Clifford J Jolly
Margret Martin Jonah
Anne G Jones
Charles A Jones
Daniel D Jones
Everett N Jones
GM Jones
Gene Joyner
Kim Juhase

Lynn R Kaeding
Ronald L Kaiserman
Jim Kalberer
Robert Kalman
John Karasek
David M Kary
Sidney Kass
Mike & Jean Keane
Charles B Keeling
Dennis & Joanne Keith
Jeremiah Kelley
Robert T Kerr
Daniel Kessler
Stephen Wood Kidner
Richard L Kiefer
Teresa Kim
Brad Kincaid
Elizabeth Kingsley
Peter Kink Jr
Elizabeth Kipp
Marianne & Richard Kipper
Richard Kirchdoerfer
Peter Klaver
William E Klopfenstein
Peter W Knightes
Todd & Nancy Koch
Paul E Koehler
Andrew M Koenigsberg
Sally Gregory Kohlstedt
Alan J Kohn
William Kohn
Arie R Korporaal
Andrew Kramer
Bruce H Krause
Aaron Kriss
Laurel L Kristick
James J Krupa
Alan Kruse
Alice F Kurs
J Richard Kyle

Michael La Barbera
Brian A Laeger
WM Laetsch
Peter & Pauline Lamal
Louise Lamphere
Robert J Lang
Joseph T Lapp
Don Latimer
Robert Lavigne
Frank Lawlor
Donald A Lawrence
Stephen K Lazzo
Geoffrey R Le Plastrier
Loren & Ute Lee
Randy Lee
Teresa Lee
Robert J Leipold

Ben & Maxine Leon
Alan I Leshner
Richard H Lessard
Elliott Lesser
Jack G Levine
Richard LeVitt
Gahl Levy
David R Lindberg
Jan H Lindelow
Sandra L Linder
Richard M Lindstrom
Robin Link
Jim Lippard
Bruce Lobitz
Wiley P Long
John T Longino
Gordon Louttit
Michael J Lowrey
Jonathan D Lubin
Howard C Lucas
Edward Lugenbeal
David Lustbader
Thomas Lutgens

William H Maas
Kemp Maer
Catherine Magill
Anthony Maiolo
Sigrid Maldonado
Joseph D Mandell
Samuel B Marcus
Steven G & Renee Margolin
Barry Markovsky
Thomas J Marlowe Jr
Alan H Marshak
Charles E Martin
Richard & Penny Martin
Robert A Maslansky
John W Mason
Colin Masson
Herbert A Masters
Christopher Mathews
Allyson C Mathis
DS Matteson
Patricia C Matteson
Mark & Joan Matthiesen
Ben Mattox
Robert H Mauritsen
Dan Mayer
Jeffrey Mayne
Matthew D McClain
William McCormick
Thomas R McCrea
Harry E McDonald III
Michael McGinnis
Steve & Kelly McGovern
Cary McMillan
Robert S McMillan
Frank McNeill
Chris I Measures
Gary E Mechler
Betty J Meggers
Douglas Meikle
Marc S Mendonca
Richard S Merrick
Joan D Merriman
Charles W Merwine
Marilyn A Mettler
Alan & Carolyn Meyer
WJ Michaely
Steve J Milazzo
John Miles
Keith B Miller
Lee W Miller
Mary H Miller
Eugene W Minard
Harley J Moe
James R Moore
Randy Moore
Carlos M Mora
Lawrence J Mordan
Jane Morgenstern
Ronald S Morris
Douglas W Morrison
Trevor Mudge
Marvin M Mueller
John L Mulder

Robert T Mullen
Ben & Mary Murray
Daniel P Murray
Marc A T Muskavitch
Brian Myres
Jonathan Nagin
James Lee Naylor
Richard C Neavel
Donald F Neidig
Timothy & Debra Nelson
Virginia Newbert
Robert C Newton
Sheila Newton
Robert B Nicklas
Charles M Nicolet
Richard L Nielsen
Paul M Nollen
Robert M Norris
Kent Northcote
Laura R Novick

Dan O'Gara
Jim Ogburn
Clark S Olson
James P Olson
Robert T Olson
Thor A Olson
Timothy R O'Neill
Gordon H Orians
Connie & Michael O'Sullivan
Margaret "Betsy" Ott
Kevin Padian*
Jimmy Pai
Craig S Palonen
Jack T Pantall
Matthew & Amy Parker
Phillip E Parker
Sue T Parker
William Q Parkinson
E Fred Pashley Jr
Gary Patrik
William H Patterson
David R Patton
Richard E Payne
John & Vicki Pearse
Scott & Elizabeth Pector
William B Peet Jr
Tom Pelletier
John Penick
Robert O Pepin
Robert Perry
David Persuitte
David D Peterson
Richard E Petit
Brady J Phelps
Daniel J Phelps
Ralph Pifer
Daniel Pinkel
Jay Pitocchelli
Jonathan P Pitt
Thomas & Halina Platt
Thomas R Platt
Ronald & Elizabeth Polidan
Marshall E Poole
Thomas R Pope
David Powell
Jeffrey R Powell
John D Powell
Elise M Prayzich
Dwight Pridham
Joseph M Prince
Patricia Princehouse
Frederic L Pryor
Guy W Purnell

David Quint

Janet Rafferty
Anu Ramanathan
Tom A Ranker
Douglas W Rankin
Shannon & Devin Rankin
Britt Ravnan
John B Ray
Donald G Rea
Robert C Reedy
James B Reese
Mark Reiber
Anne Grall Reichel
Anton Reiner
Norm Remp
Robert A Resnik
Michael V Rice
Bradley Rich
Ronald Riegert
Brenda Riggs
Charles E Rinehart
Steve Rissing
Lawrence Rizzolo
Stephen P Robb
Richard & Carol Robie
L Roy Robison
Wolf Roder
Kenneth Rosenzweig
Tim Rossiter
Eric J Rothschild
Ian Rowan
Bruce N Rowen
Richard E Rowland
Catherine Rudin
John Runyan III
Bob Russell
Meredith Rutter
Carol Ann Ryder
George J Rystar

Todd Sagin
John W Salisbury
Roger Sanjek
Frank Sargent
Louella Saul
Vincent Sauvé
Buzz Sawyer
Joseph J Schall
Charles K Scharnberger
Randy Schekman
Frank Schmidt
Stephen Schneider
Lawrence Schonberger
John D Schuyler
William E Scott
Nadrian C Seeman
Roy H Senn
Sarah E Shaffer
TO Shanavas
Paul Shankman
James R Shanks
Jeff L Shelton
Billy J Shilling
Helen Shin
Mark Shotwell
Peter Shulman
Charles H Shultz
Aaron M Shure
Sharie Shute
Edward J Sichterman
Robert P Siemann
John Silberman
Sidney H Silver
Charles Simmons
Joseph D Simon
David S Simons
William H Sims III
Mary Simun
Maxine F Singer
Monroe P Singleton
Rivers Singleton
Jack W Sites Jr
Michael L Sitko
Charlie Sitzes
Louis John Sivo
Sherwin J Skar
Barry P Skeist
Michael Skinner

Linda Skory
Dale L Skran Jr
David G Smith
David R Smith
Elbert G Smith
Gregory B Smith
James J Smith
Jeff Smith
Jim C Smith
Kelly C Smith
George S Smith
Brad Snedecor
Samuel R Snodgrass
Madelaine H Sojourner
Irwin Solomon
Joseph H Sommer
Scott Spear
William Sperber
AF Spilhaus
James D Stack
Frieda A Stahl
David G Stahl
Andrea Stanislaw
Scott W Starratt
Frank Steiger
Philip L Stein
James Stern
William E Stevens
Cindy Stewart
Stephanie A Stewart
Bruce & Carole Stock
Hawley H Stodder
Bernard Stolls
James C Stolzenbach
Paul A Storey
Robert B Strassler
Joan E Strassmann
Deborah W Stratmann

Steven H Strongin
Carl R Sufit
Joan C Suit
Eric T Sundquist
Ray Sutera
SC Sutherland
Harry W Sutton
Donald A Swanson
Michael J Sweeney
Gary Swinsburg
Daniel L Szymanski

Ronald G Tabak
Lee Talbot
C John Tarter
Andrew W Taylor
Stuart Taylor
Richard H Tedford
Mark & Catherine Terry
Bala Thiagarajan
Richard H Thomas
Keith S Thomson
John P Thorp
John R & Louise A Throne
William & Dorothy Titus
Frank Tobin
Diane Tokugawa
Margaret G Towne
Harold Tritz
Rock J Troutt
Debra Turner
Julian Tyacke

Jack D Ullman
Emil R Unanve
Lorraine A Underwood

Focco Van Den Akker
Oakley Van Slyke
Frances S Vandervoort
Gary D Vogin
David H Voorhees
Jim Wagenschutz
Mary Emma Wagner
James & Beryl Wakefield
Leonard F Walker
Steven M Wallace
Thomas R Waller
Ella S Warloe
Bruce A Warren
Gerald J Wasserburg
Steven F Watkins
Allen Watson III
Francis Weaver
Mark E Weaver
Paul Weiss
Leland M Welsh
Paul Wessel
Mary Jane West-Eberhard*
David S Westerman
Ilona Weyers
Roger H White
Carol Whitney
Theodore S Wickersham

Charles W Wieland
Roger A Williamson
Robin Willner
Linda Wilshusen
David Wilson
John J Wilt
Howard Winet
Raymond & Sarah Winter
Donald U Wise
Wolf C Witt
Harry W Woodcock
Gail Wright
Hung-Hsi Wu

Mark Yamanaka
David Young
Matt Young
William Young
J David Yount

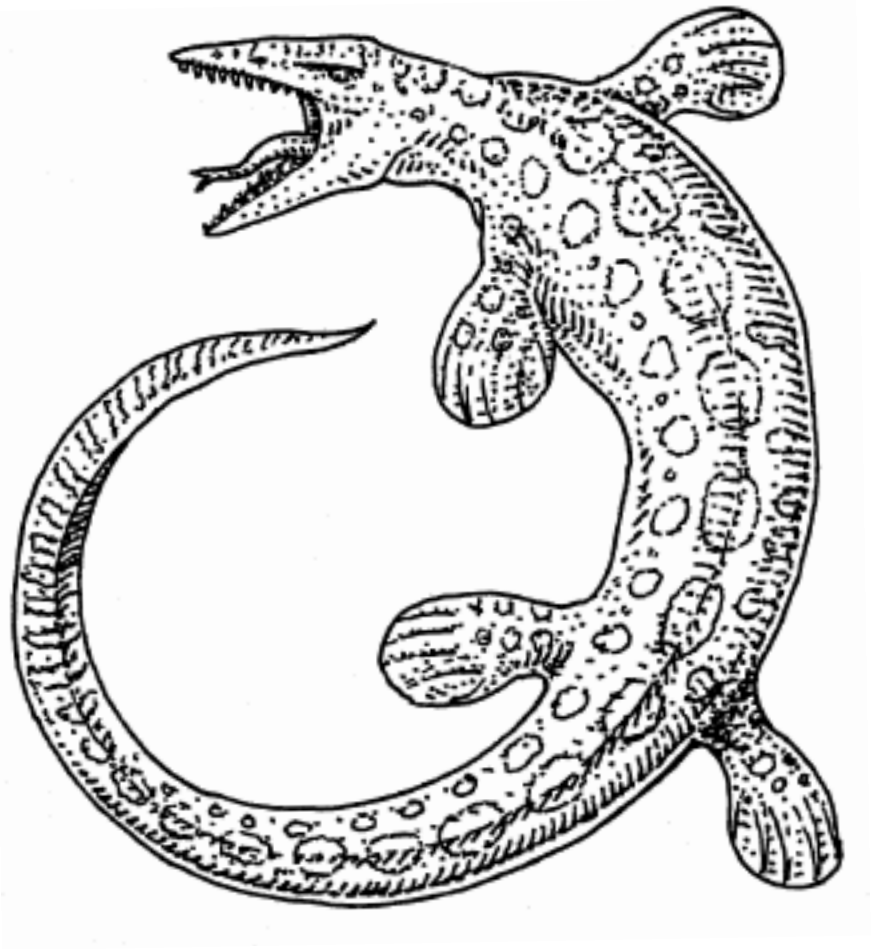
Decie I Zajac
Jerrold H Zar
Stephan Zeeman
Milton Zmijewski
Cynthia Zujko

Memorials

Larry Gay, in memory of Norman Levitt

Albert Vollmer, in memory of his daughter Lisa Vollmer, killed by a reckless driver

Margaret I Wilson, in memory of her father Curtis M Wilson



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

Change Service Requested

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

30(6)

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

☐ Check here if NCSE may share your name with activists in your state
☐ 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 ☐ Check (US dollars) Charge to: ☐ VISA ☐ MasterCard ☐ 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.

Printed on recycled paper.

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@ncse.com

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.