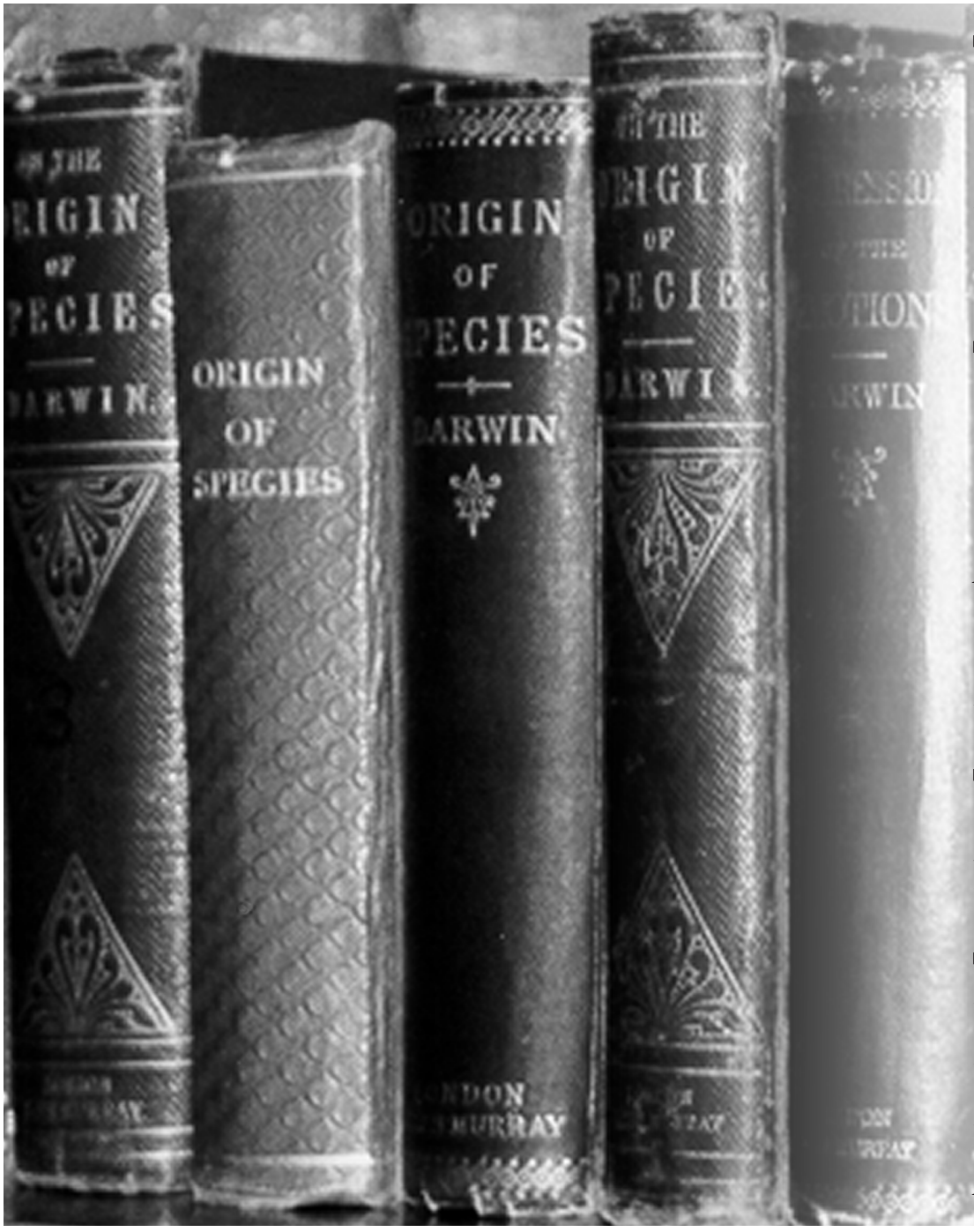
REPORTS OF THE NATIONAL CENTER FOR SCIENCE EDUCATION

DEFENDING THE TEACHING OF EVOLUTION IN THE PUBLIC SCHOOLS

Volume 20, Number 6 **NOV/DEC 2000**

CONTINUES *NCSE REPORTS* & *CREATION/EVOLUTION*



Photograph: Doug Lundberg

Hawai'i Rejects Creationist Science Standards

Reviews of *Icons of Evolution*, *The Wedge of Truth*, Appleman's *Darwin*, and many more

"Gish" Joins NCSE Staff

Senseless in the Senate — the Santorum Amendment

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Cover: Books on a shelf in Darwin's study in Down House, photographed by Doug Lundberg

FROM THE EDITOR

Over the past year, we have seen a large number of books published that support evolution — and, unfortunately, some that oppose it. As a result, we have accumulated a backlog of book reviews that are important and interesting to our readers. In order to keep our readers up to date on these books, we have decided to make *RNCSE* 20 (6) a "book-review" issue — printing a whole issue of reviews in place of our usual features and articles. Check out these reviews of books that you will definitely want to read — and some that you will definitely want to avoid. We hope that our readers find this book-review issue helpful and useful.

Senseless in the Senate

Language in an education bill passed by the US Senate in June 2001 singles out evolution as "controversial". It surprised no one that the text was the handiwork of proponents of intelligent design creationism. Eric Meikle reports.

The state of standards

Our news and updates report on further developments around the country in the implementation of state science education standards. Read about the abortive attempt to introduce creationism into the Hawai'i state science standards. Additionally, in Pennsylvania, Michigan, and Wisconsin, local school board members have pushed districts to include creationism in the science curriculum. To date, these efforts have been unsuccessful.

Ongoing

As we went to press we heard that two of the country's best-known creationist teachers have taken significant actions. Washington teacher Roger DeHart has left his position at Burlington-Edison High School (where he had been reassigned to teaching earth science for failure to teach the prescribed biology curriculum). DeHart accepted a science teaching position in the nearby Marysville-Pilchuk District.

Minnesota teacher Rodney LeVake announced just before press time that he intends to appeal the recent court decision against his claim that he was unfairly and illegally prevented from exercising his free-speech rights in the science classroom when he refused to adhere to his district's prescribed life science curriculum. Look for an update in the next issue.

Looking ahead

In our next issue, we will focus on classroom issues that arise in teaching evolution — including perspectives from teachers and students. If you have a story to tell about evolution in the classroom, please let us hear from you.

Anj Petto

RNCSE 20 (6) was printed in October 2001.

COMING SOON

Teaching and Learning

Randy Moore: Do Standards Matter?

Bob Cooper on Scientific Literacy

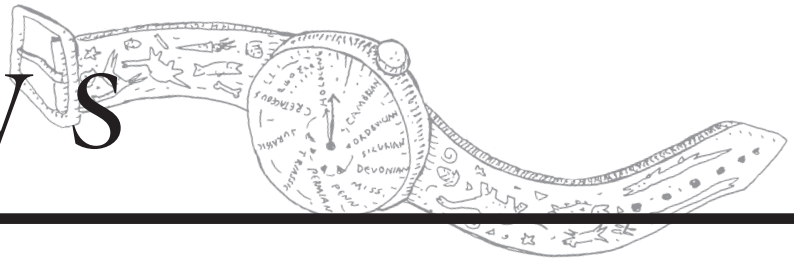
Brandon Seger: A High-School Student's Perspective

Also:

Timothy Goldsmith's review of PBS's Evolution series

John Wilkins on Defining Evolution

NEWS



Senseless in the Senate

Eric Meikle
NCSE Outreach Coordinator

On June 13, 2001, the US Senate adopted a "Sense of the Senate" resolution, proposed by Senator Rick Santorum (R-Pennsylvania), as part of the Elementary and Secondary Education Act Authorization bill, S1, currently under consideration. The resolution (Amendment #799) reads:

> It is the sense of the Senate that (1) good science education should prepare students to distinguish the data or testable theories of science from philosophical or religious claims that are made in the name of science; and (2) where biological evolution is taught, the curriculum should help students to understand why the subject generates so much continuing controversy, and should prepare the students to be informed participants in public discussions regarding the subject.

Although the resolution appears innocuous, it is telling that only evolution is singled out from all possible controversial issues. If the goal of the resolution were simply to encourage discussion of the social dimensions of scientific issues, or critical thinking, or some other secular purpose, the second clause of the resolution might have read, "when controversial issues are taught, the curriculum should help students to understand why the subjects generate controversy, and should prepare the students to be informed participants in public discussions regarding the subjects."

The fact that evolution is singled out from all controversial issues indicates the amendment's intention to discourage evolution education. It is no coincidence that Senator Santorum cited arguments for "teaching the controversy" made by intelligent design proponent David DeWolf in presenting his resolution. In the June 18 *Washington Times,* another intelligent design promoter, Phillip Johnson, is quoted as having "helped frame the language" of the resolution.

The vote to adopt the resolution was 91–8. It seems likely that most or nearly all senators were unaware of the anti-evolution implications of the language of the amendment. However, the tactic of singling out evolution for special mention as controversial is commonly used by anti-evolutionists in states and localities where they challenge its place in science education.

The comments of several senators in the *Congressional Record* suggest that they recognized the implications of the resolution. Senator Sam Brownback of Kansas stated that passage of this resolution would justify the 1999 actions of the Kansas State Board of Education in removing evolution from their test standards. Senator Robert Byrd of West Virginia also expressed doubts about the reality of evolution before supporting the amendment.

The comments of anti-evolution groups following passage of the resolution also show the propaganda value they recognize in this language. The Answers in Genesis ministry web site <http://www.answersingenesis.org/docs2001/0623news.asp?srcFrom=aig_news> headlined its account "US Senate supports intellectual freedom!". AIG also informed its readers how to "… contact your Congressman to express your support of the Senate version of the Education bill that states that evolution is controversial…"A student "intelligent design" club at the University of California at San Diego <http://www-acs.ucsd.edu/~idea/senate.htm> headlined its report "Some Democratic and Republican Senators Feel Questioning of Evolutionary Theory in Schools is Legitimate".

On June 14, the overall bill passed the Senate 91–8. The House of Representatives had previously passed a version of the Education bill without a comparable evolution statement. The two versions are currently before a conference committee, which will resume work on reconciling the bills following Congress's August recess.

Other accounts of the Santorum amendment are available on the American Geological Institute's web site at <http://www.agiweb.org/gap/legis107/evolution_update0601.html> and <http://www.geotimes. org/sept01/scene.html>.

Anti-Evolution Standards Rejected in Hawai'i

Richard Pyle
Honolulu, Hawai'i

On August 2, 2001, the Hawai'i Board of Education (BOE) voted unanimously to reject proposed changes to the state's science education performance standards, including the changes proposed by BOE member Denise Matsumoto to include "multiple theories of origin" and related wording. As a result, the standards will revert to the original wording, which is more in line with the

National Science Education Standards. The BOE members patiently endured 65 three-minute oral testimonials on these changes; about 75% of the presenters opposed the proposed changes. Apparently, this was a record turnout for a BOE hearing. Additionally, the BOE had received over 200 written testimonials.

Testimony opposing the proposed changes came from a wide spectrum of people, including university-level professors, Hawai'i science teachers, concerned citizens, a former BOE member, and a surprising (and encouraging!) number of religious leaders. Almost without exception, this testimony was eloquent and extremely effective in addressing the real points of concern. Those testifying in favor of the proposed changes had a much less unified message to present, covering the typical range of anti-evolutionary positions — attacks on evolution as unsupported conjecture, appeals for children to be given both perspectives and allowed to think critically and objectively to make their own decisions, support of "Intelligent Design" theory as legitimate science, and the moral imperative of teaching the Bible to build character and integrity in our children.

Overall, the testimony provided by supporters of evolution was effective and to the point. Long before the end of hearing, it was evident that this would end up being a "slam dunk" decision by the BOE. There was almost no discussion among board members before making the final, and the final vote was *unanimous* — making it obvious that even Matsumoto conceded the issue. This outcome confirms resoundingly that community support can help level heads to prevail.

In light of this success story, I think that we can renew our confidence in the Hawai'i State Educational system. However, it is clear that we should not allow ourselves to slip into complacency at this point. We were extremely lucky that Matsumoto apparently blundered into the situation with such a naive perspective. Our success was due in part to the disorganization of the opposing side. Had this hearing been coordinated by some of the big anti-evolutionist organizations on the mainland, it might have been a longer, more complicated struggle. What our experience shows is the importance of having a network of concerned and informed citizens ready to act when evolution education is threatened. It is also important that our network reaches beyond the academic world to other interested communities of educators, clergy, and citizens in all walks of life.

Organizations such as NCSE and the American Institute for Biological Sciences (*see sidebar on AIBS state list servers, p 35)* provide resources and connections to concerned communities throughout the nation. These networks allow us to be ready whenever a threat to evolution education pops up again (as experience tells us it will) and to coordinate efforts with maximum effectiveness.

Author's Address
Richard L Pyle
Department of Ichthyology
Bishop Museum
1525 Bernice St
Honolulu HI 96817
deepreef@bishopmuseum.org

Highlights of the evening

- In several extremely well-presented testimonials, religious leaders emphasized both that evolution should be clearly taught as the legitimate science that it really is and that they do *not* want the state's (science) teachers teaching religion to their children.
- One fellow put $5000 in cash on the table and offered it to anyone who could "prove that molecular evolution actually happens". After a moment of stunned silence in the audience (particularly among the molecular biologists in the crowd, who were no doubt already thinking about how to spend the money), he clarified that he would only hand over the cash to anyone who could produce a living cell from raw non-living materials in the laboratory. (Another speaker noted later that his money was safe for now, but that within a few years he may well have to cough up that bounty.)
- By far the funniest moment of the evening was due to the three minutes allowed for each witness. At the end of this period, a timekeeper produced a brief but pugnacious electronic "BZZZZT". Speakers who continued for more than another 30 seconds received a more energetic and obnoxious "BZZZZZZZZZZZZT". One fellow rambled on about how evolution was really just poorly-supported speculation with no real basis in science. He ignored the first warning, continuing his tirade, which culminated with surely the most astounding quote of the evening: "Most scientists do not believe in evolution." With impeccable comic timing, this statement was immediately followed by "BZZZZZZZZZZZZT!!!!". This electronic raspberry brought down the house.
- Probably the most poignant moment of the evening came toward the end, when one woman testified that evolution was itself a religion, based entirely on faith, and therefore had no business being taught in public schools. She explained that largely for this reason, she home-schooled her daughter, who spoke next to the board, largely echoing her mother's sentiments. While I admired their courage for speaking up for what was clearly a minority position, I was also saddened by the consequences the girl is likely to pay for her lack of adequate education. The poverty of a science education like hers may well have been the most compelling reason uniting us in our opposition to the proposed changes to the state's science education standards.

UPDATES

California, Roseville: The Roseville City School District Board voted in June 2001 to adopt district science standards including evolution, but without the suggested inclusion of an "intelligent design" alternative. One board member supported teaching "alternatives" to evolution and suggested that students should be able to "opt out" of classes where evolution is taught. The board voted 4–1 against both of these proposals.

Connecticut, Plymouth: Several members of the Plymouth Public Schools Board of Education have been quoted in the Bristol *Press* (June 14, 2001) as supporting "equal time" for "scientific creationism" in biology classes. The chairman of the curriculum subcommittee of the Board is reportedly unhappy because the district's biology classes "are based solely on the theory of evolution". Another board member hopes to "spur critical thinking" and said that "[w]e should be teaching both sides of the story." At the Board meeting in June 2001, these two members spoke in favor of equal time for "alternative or supplemental theories".

Hawai'i: On August 2, 2001, the state board of education voted unanimously to retain the original wording of science performance standards relating to evolution, thus reversing a board committee's previous action. On July 26, the Regular Education Committee had potentially opened the door for creationism in science classes when it made changes in the proposed standards. The changes had been put forward by board member Denise Matsumoto, who was quoted in the Honolulu *Advertiser* (July 28, 2001) as saying "Evolution hasn't been validated by any concrete evidence. I had a concern about it being taught as a fact and the only way the world began." She then reportedly endorsed teaching creationism as an alternate theory. The committee added language to require students to identify "multiple theories of origin" and elsewhere replaced the phrase "biological evolution" with "the basic idea of the multiple theories of origin". At the August 2 meeting, Matsumoto denied that she wanted creationism taught. Several hundred people, including NCSE members, scientists, teachers, ministers, and members of the local chapter of Americans United for Separation of Church and State, submitted written testimony to the board in advance. Approximately 100 people signed up to speak at the meeting, but only about 60 did so (at three minutes each). The majority of speakers opposed creationism and supported teaching evolution. Editorials in the state's major newspapers opposed the changes, as did many letters to the editor. (*See the report on the board's meeting by Richard Pyle on page 4.*)

Louisiana: House Concurrent Resolution 74 was passed by the state House of Representatives on May 8, 2001. The resolution had originally linked Darwin and Darwinism to racism, but was amended on the House floor to remove all reference to Darwin and evolution, leaving only a condemnation of racism. On May 24, the Senate Education Committee refused the sponsor's request to put Darwin back into the resolution, and on May 29, the Senate passed the measure 29–3. To read the original and final versions of HCR 74, see <http://www.legis.state.la.us/bills/byinst.asp?sessionid=01RS&billtype=HCR&billno=74>.

Michigan, North Branch: On July 30, 2001, the North Branch school board voted 4–3 to adopt a new high school environmental science textbook for the next academic year, following two months of review. Two board members had asked for a delay in approving the proposed text in June because of its presentation of evolution. According to the Flint *Journal* (July 31, 2001), one board member objected to the text because it does not mention creationism and does not refer to evolution as a "theory". Nevertheless, a majority of the board voted to adopt the book. Further delay would have meant no textbooks when school began.

Minnesota, Lancaster: On May 9, 2001, the Associated Press reported that first-year science teacher Colin Dovichin claims to have lost his job because he taught evolution and would not give equal time to creationism. The Lancaster School District board has voted 4–1 not to renew his contract. Because it is a personnel matter, the superintendent would not give specific reasons for the action. Dovichin has been quoted as saying that he felt pressure from parents to teach creationism and that he was called an atheist when he would not comply. The day after the board's action, about half of Lancaster High School's 107 students reportedly rallied outside the school in support of the teacher.

Pennsylvania: On July 12, 2001, the State Board of Education voted 13–2 to adopt a revised version of new science standards. Among the changes from previous proposals were several that positively affected the treatment of evolution, removing potential ambiguity or confusion about the place of evolution in science education. NCSE members and other concerned citizens had been urging for months that such changes were needed. The standards must still be approved by the state legislature.

Pennsylvania, Spring-Ford: In May 2001, the board of the Spring-Ford Area School District voted to adopt new high school science textbooks. Two board members opposed the new books

NCSE NEWS

"Gish" Joins NCSE Staff

Glenn Branch
NCSE Office Manager

What? Has the ICR's veteran debater finally seen the light? No — it is not Duane Gish but Alan Gishlick, "Gish" to his friends, who is NCSE's new postdoctoral scholar in residence. (The postdoctoral scholarship program is supported by a welcome grant from the Richard Lounsbery Foundation.) Gishlick comes to NCSE from Yale University, where he earned his PhD in paleontology under the supervision of Jacques Gauthier; his dissertation was entitled "The functional morphology of the forelimb of *Deinonychus antirrhopus* and its importance for the origin of avian flight". At NCSE, however, his attention is devoted primarily to scrutinizing anti-evolutionary flights of fancy.

Young-earth creationism is of course still going strong, but NCSE's need for a postdoctoral scholar is due primarily to the advent of intelligent design creationism, which disguises its sectarian resistance to evolution as scholarly enquiry. Many of the anti-evolutionary claims of the intelligent design movement have not yet been answered by the scientific community in terms understandable by nonscientists; a major part of Gishlick's project is to compile, develop, and disseminate material to debunk the claims of the proponents of intelligent design.

Gishlick is already off to a running start, working on a comprehensive critique of Jonathan Wells's *Icons of Evolution* (Washington DC: Regnery Press, 2000). Wells's arguments are for the most part specious (*see Jerry Coyne's review, p 15*), but because he possesses scientific credentials (a PhD in cell and developmental biology from Berkeley) and conceals his religious motivations (having been convinced by the

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because of their treatment of evolution, and favored exposing students to "other theories besides evolution". One member was quoted in the Pottstown *Mercury* (May 23, 2001) as saying, "I've been pretty much brought up a Christian, and I think that public schools need to take a few steps forward and take a look at a couple other things, like creationism." He then claimed that studies show "that students who are exposed to only evolution in schools are more likely to become pregnant, commit murder, and engage in more instances of bullying." He concluded by saying, "I know there are people who are going to scoff at what I'm saying, and that's fine. Maybe someday, if more people like myself join boards, things will be different."

Washington, Burlington: On July 22, 2001, the Skagit Valley *Herald* reported that teacher Roger DeHart has been reassigned from biology to earth science classes for the next academic year at Burlington-Edison High School. DeHart has been at the center of controversy in the district for several years over his attempts to teach "intelligent design" as an alternative to evolution (*see RNCSE 2000; 20 [5]: 15*). According to news reports, district officials deny that the reassignment is related to the ongoing controversy. Enrollment in biology classes has declined by the equivalent of two sections. In addition, a newly hired teacher will conduct classes in health, physical education, and biology, as well as coach football and baseball. Just before press time, the *Herald* reported that DeHart had resigned his position at Burlington-Edison High School and had accepted a teaching position at nearby Marysville-Pilchuck High School. His teaching assignments will include life science and physical science. According to the report in the *Herald*, DeHart's new principal is aware of his situation at Burlington-Edison, but did not specifically address whether DeHart would be required to teach

Reverend Sun Myung Moon to devote his life to destroying Darwinism), *Icons of Evolution* has already been a thorn in the sides of those concerned with good science education:

- In West Virginia, a parent cited Wells's book in her lawsuit against Kanawha County concerning alleged textbook inaccuracies (*see* RNCSE *2000; 20 [4]: 15–7*);
- In Pennsylvania, a high school student lobbied his school board to insert Wells-inspired disclaimers into the biology textbook (*see* <http://fyi.cnn.com/2001/fyi/teachers.ednews/05/09/evolution.debate/index.html>;
- In Arkansas, the sponsor of House Bill 2548 reportedly relied upon Wells's discussion of Haeckel's embryos and peppered moths (*see* RNCSE *2000; 20 [5]: 6–7*).

And we have not yet heard the last of Wells yet — *Icons of Evolution* has been a frequent topic of questions received by NCSE staff in the first half of 2001.

Gishlick is in the midst of carefully examining the ten biology books criticized in Appendix I of *Icons of Evolution* to ascertain whether Wells's evaluation is accurate; the results of his research will appear in a future issue of *RNCSE* (as A Gishlick and EC Scott, "Do textbooks mislead students about evolution? A look at *Icons of Evolution*"). The need for his work is manifest from the flurry of requests for the article that followed Eugenie C Scott's reference to it in her review of *Icons* in *Science* (2001 Jun 22; 292: 2257–8). Gishlick is also collaborating with NCSE President Kevin Padian on a comprehensive review of *Icons* for *The Quarterly Review of Biology*.

In addition, Gishlick will be occasionally speaking for NCSE. His first presentation will be to a teacher training workshop conducted by the Natural History Museum of Los Angeles County in December 2001.

Please join us in welcoming this valued new member of our staff! His e-mail address is — of course — gish@ncseweb.org.

Society for the Study of Evolution Mobilizes

Massimo Pigliucci reports that the Council of the Society for the Study of Evolution (the premier organization of evolutionary biologists) has agreed to establish a subcommittee of its Education Committee to study ways in which professional evolutionists can help in the fight against creationism and the intelligent design movement. Pigliucci will be chairing the anti-creationist taskforce for the foreseeable future, and prominent authors and evolutionary biologists — including Robert T Pennock, author of *Tower of Babel: The Evidence Against the New Creationism* (Cambridge [MA]: The MIT Press, 1999) and Joseph L Graves Jr, author of *The Emperor's New Clothes: Biological Theories of Race at the Millennium* (New Brunswick [NJ]: Rutgers University Press, 2001) — have agreed to help. The Darwin Day Program will post news and updates as they become available on its web site at <http://www.darwinday.org>.

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evolution — a required part of the life-sciences curriculum. She told reporters, "Mr DeHart is aware of what our curriculum is. I am certain he will follow the adopted curriculum."

Wisconsin, Brodhead: In April 2001, the Brodhead School Board voted not to accept new elementary and middle school science textbooks recommended by district staff. Press reports in local newspapers (*The Independent Register*, April 25, 2001) suggested that some board members were concerned that evolution was treated in the books "more as fact than theory". District staff reportedly spent a year reviewing texts and developing their recommendations. The board's president pointed out that they had never questioned such staff recommendations before. After having a chance to review the texts and other teaching materials, the board voted in May to accept the proposed books.

Wisconsin, Chetek: In May 2001, a group of parents in the Chetek school district filed a petition asking that creationism be taught in tenth grade science classes along with evolution. The district's superintendent announced plans "to form a committee later this summer to discuss teaching creationism and review the curriculum in the science class", according to an Associated Press report on July 2. In August, Superintendent Al Brown announced that the committee of eight teachers and a high school principal had "decided that the biology curriculum would stay the same — meaning biology lessons would be limited to the theory of evolution", according to another Associated Press report published in the Janesville (Wisconsin) *Gazette* (<http://www.gazetteextra.com/harris081001.html>).

NCSE thanks Jack Bennett, Barbara Forrest, Carl Johnson, Hank Kocol, Michael Malec, Chris Measures, Carol Norberg, and Richard Pyle for information used in this article.

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 a special thanks for their much-appreciated support to the following people who donated $100 or more between July and December 2000 (* 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.

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Eugenie C Scott, in memory of Bob Schadewald

Lowell Sherman, in memory of Samantha Ryan Lange

Friendly Advice from New Mexico

M Kim Johnson

As *RNCSE* readers may know, New Mexico has undergone a bout of creationist activity that began in the summer of 1996. Although less publicized than the affair in Kansas, New Mexico's experience with creationist influence on the state science standards was very similar. A qualified committee had been organized to write a set of draft science standards for New Mexico public schools. These standards were rewritten at the last minute by a creationist school board member. Public input by many distinguished scientists, educators, and organizations was ignored by the board in favor of this very persuasive, but scientifically ignorant, board member. A number of us, primarily scientists, formed an informal group to try to turn this situation around.

This group, the Coalition for Excellent in Science and Math Education (CESE), has grown to about 450 members. We are incorporated and have received our nonprofit, tax-exempt status from the IRS. Two of our members are now on the State Board of Education, and the offending board members are no longer there. We are partners in a pilot initiative that provides teachers with a stipend for learning science content and methodology. We have reviewed school district science and math standards. Our members have led instructional material selection committees. We have also provided a significant amount of data to the School Board and State Department of Education pertaining to various aspects of educational performance. These are new data and analyses that may help shape future policy.

We have accomplished a lot in the past five years. But we are still saddled with the after-effects of creationist efforts to take over education in New Mexico. They are still here, and we still have a long road ahead of us. The creationists are symptomatic of a scientifically uneducated public, and that situation cannot be cured overnight. We believe that it will take a concerted grassroots effort to cure this problem, not just in New Mexico, but around the nation.

In the spirit of furthering such an effort, I would like to share a few lessons we learned with those people who wish to organize their own groups. Although each state's situation and demographics are unique, there are, nevertheless, some tactics that we all will find useful.

1. Diversify. Yes, the immediate issues have to do with properly defining science in light of the creationists' attempts to misrepresent it. Typically it is scientists who become incensed with the situation first because we recognize the travesties that the creationists try to foist on the public. However, scientists by themselves often come across to the public as a vested interest or an out-of-touch faction that is not always to be trusted. Everybody knows that a group composed entirely of university professors must be a bunch of liberal, self-satisfied, sheltered people who understand little of the real world. Gathering a diverse group tends to stymie such preconceptions. At first, we would introduce our group as "a group of people who are concerned about science education". After a while, we started saying, "We are a diverse group of people made up of scientists, educators, clergy, parents, doctors, and so on, who are concerned about science education." This met with a much better response! Similar words are in our charter statement, thanks to Dr Marshall Berman, our first president and now a state school board member. Be sure to get as many clergy involved as possible. They can be your best allies by reinforcing the message that good science education is not antireligious.

There is another benefit from diversification: scientists really do not know everything! Teachers in our organization have opened our eyes to many educational issues about which we had opinions but no knowledge. Politically astute members (which many scientists are not) have helped us to steer clear of political pitfalls. Professional editors have helped us to make our messages clearer. History professors have helped us to see the issues in a perspective that allows us to understand where this all came from and figure out where we wish to go. I think you get the idea.

2. Maintain your focus. Coordinate with other organizations, but do not publicly tie yourselves to them. You want to be identified as a group from within your community. You do not want to carry along others' baggage. Also, if you do diversify, you will find that you have liberals, conservatives, Democrats, Republicans, and folks with every other manner of political persuasion, all with a myriad of opinions about how the world should be run. But you are here to help to fix the status of science education — not to argue about civil liberties, gun control, labor unions, or nuclear disarmament. If you lose focus or become identified with a controversial group, you run the risk of losing your members as well as the ear of the public you are trying to persuade.

3. Try to get a large membership. There really is power in numbers. However, along with numbers come a lessening of security and a need to control communications. You really cannot afford to be answering a hundred or more e-mails a day. Besides, people will become overloaded and not be able to handle all the information. You will probably need to form more than one group, and in at least one of the groups, you will have to require the participants to be nominated by trusted members to ensure that an opposition sympathizer does not become privy to your plans and strategies. That is not paranoia — just caution.

4. Cultivate people in the press and try to gain their respect. They are always looking for a story. It is best that you be the ones to steer them. They will often drive you up a wall with their brand of "fairness", but it is much better if they are friendly and fair to you. And besides, if you are going to be in the news anyway, it is nice to be quoted in a thoughtful manner.

There is much more to be said; these are some of the key lessons we have learned. If anyone wishes to pick our brains, or, just as important, to relate to us some lessons you have learned, please contact me by e-mail at <kandjj@home>, by mail at 9906 Loretta NW, Albuquerque NM 87114, or by telephone at (505) 897-3364 evenings or (505) 247-9660 during working hours.

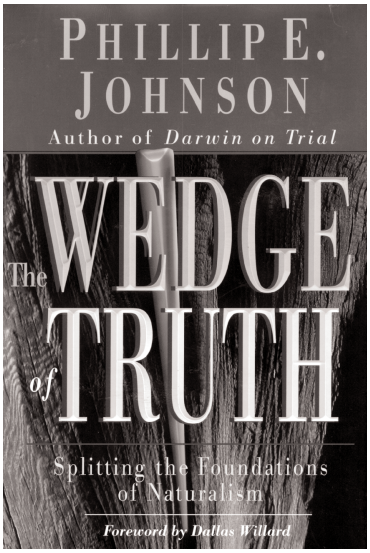
And good luck!

M Kim Johnson is the past President of the Coalition for Excellence in Science and Math Education (CESE), based in Albuquerque, New Mexico. CESE's web site is <www.cesame-nm.org>.

The Wedge of Truth: Splitting the Foundations of Naturalism

By Phillip E Johnson. Downers Grove (IL): InterVarsity Press, 2000. 192 pages.

Reviewed by John F Haught



Paul Tillich, the great German and American theologian, warned theologians never to embrace or reject any scientific idea for purely theological reasons. Such a strategy is theologically injudicious not only because scientific ideas are always subject to revision but also because new ideas from science can be an important stimulus to theological development.

One such idea has been that of evolution. Followers of Tillich's dictum do not reject or edit Darwin's "dangerous idea" if at first it seems not to sit well with certain inherited theological ideas. Instead they embrace it in all of its raggedness and, if need be, modify their theology accordingly. Although skeptics might consider such theological revision a defeat for religion, the fact is that religious thought has often undergone important change in the face of new intellectual challenges. Otherwise it might have died.

Phillip Johnson, however, wants nothing to do with theological revision. A (now-retired) University of California-Berkeley law professor and not a professional theologian, Johnson has written another in a series of books and articles drumming home his opinion that evolutionary science is simply theologically unacceptable. He already knows exactly what he wants in his vision of the universe, and evolutionary science's picture of life does not fit the bill. Unlike Tillich, who refused to allow theology to dictate to science, Johnson has made a second career of telling his readers what to think about evolutionary biology. In each new publication, his message to them is the same: if they want anything to do with God, they must renounce the central tenets of evolutionary biology.

Johnson's anti-evolutionary argument has itself undergone no significant evolution since he wrote *Darwin on Trial* (Washington DC: Regnery Gateway, 1991). We can always safely predict the contours of his impeccable logic:

Major premise:
Philosophical naturalism is atheism.
Minor premise:
Evolutionary science is philosophical naturalism.
Conclusion:
Therefore, evolutionary science is really atheism.

In *The Wedge of Truth* Johnson does not disappoint us. As always, he is readable, interesting, and often clever. But after making our way through this thin volume, we find that the old familiar refrain sounds through once again: The ruling philosophy of modern culture is naturalism, materialism, or physicalism, and evolutionary science is the main carrier of this dour metaphysics. We find here yet again Johnson's firm refusal to accept the distinction that most religious thinkers and scientists make between methodological and philosophical naturalism. To Johnson it seems that if evolutionary science leaves out God as part of its method, this will likely lead scientifically educated people to leave out God in their extrascientific interpretations of the world as well. While most of us are willing to let science refrain from any comments on value, purpose, and the existence of God, Johnson is not. Here again he takes evolutionary biology's silence about things religious to be an outright denial of God's existence.

What is fresh in this book is some of the imagery in Johnson's otherwise predictable message. The "Wedge" of truth will split the "modern" naturalistic synthesis asunder. Its cutting edge consists of the brave (and academically marginalized) defenders of "Intelligent Design", especially William Dembski, Michael Behe, and Johnson himself. Inserted into "the

John F Haught is Professor of Theology at Georgetown University and the author of God After Darwin *(Boulder [CO]:Westview Press, 2000).*

A Case Against Accident and Self-Organization

By Dean L Overman. Lanham (MD): Rowman & Littlefield, 1997. 244 pages.

Reviewed by Rebecca J Flietstra

Christians commonly describe themselves as a "community of faith". This faith, our belief in the inexplicably "foolish" crucifixion and resurrection of Jesus, simultaneously separates us from the world and unites us together as Christ's body. Our history is sprinkled with miracles and visions; our theology embraces events, such as the Incarnation, that we cannot logically explain.

But living by faith creates tensions — the tensions of trying to reconcile what we know and what we hope. And with the rest of society, we often find ourselves searching for proof rather than faith.

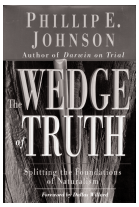
Our hunger for proof is reflected in our apologetics. Not too surprisingly, we have discovered that proof is easier to proclaim than promise. And, when it comes to proof, nothing does it better than science. Many evangelical Christians, therefore, have enthusiastically greeted recent news from the academic community that we finally have scientific proof of God's activity in the world. We have uncovered intelligent design.

Although Dean Overman never specifically uses the phrase "intelligent design" in *A Case Against Accident and Self-Organization*, it is clear he supports this theory. Using language from information theory to explore accident and self-organization in terms of their relationship to abiogenesis (life arising from nonliving matter), he concludes that the improbability of abiogenesis points to an originating intelligence.

Overman compares the gulf dividing nonlife from life to the difference between order and complexity. Order describes something that is repetitious and predictable. Complexity, on the other hand, refers to the "information content" or "minimum number of instructions" that completely define a structure. Crystals are ordered; the genetic code of living organisms is complex. The move from crystal to chromosome, according to Overman, is difficult because, as nonliving things become more highly ordered, they tend to become less complex.

Self-organization research, however, including origin-of-life studies, is a relatively young area of scientific study, and it is thus too soon to claim that science shall never find an explanation for how ordered systems may become complex. Further, while information theory currently appears to be an appropriate paradigm for studying abiogenesis, additional research may reveal that the relationship between order and complexity does not adequately model the move from nonlife to life.

Additionally, Overman's argument contains some crucial misunderstandings of scientific method.



log of naturalism" and hammered home by Johnson's logic, the Wedge — in combination with the cultural influence of evangelical Christianity — will breach the palisade of scientific naturalism and expose the infectious evolutionary ideas that are its main carrier.

The fissure at which the Wedge penetrates the log of materialism is Darwin's science. Once the Wedge has splayed open evolution as nothing more than a decaying veneer of bark that conceals the trunk of atheist propaganda, Darwinism will begin to lose its hold on the minds of people, including teachers and students. Maybe the next generation of Americans will have begun to get things right once again, and science textbooks will have been purged of the idea that new species of life can gradually evolve by natural selection over the course of time from a common ancestry.

Since I am one of the evolution-friendly theologians *The Wedge* brands as "modernist" compromisers of truth, Johnson will not be surprised that I would find fault lines in his own unchanging position on evolution, science, and theology. These are really not hard to locate.

First of all, there is Johnson's highly edited version of biology as ruling out macroevolution (he accepts "microevolution" but claims that it cannot lead to whole new biological types). In rebuttal, there is no need here to reprise the scientific information on evolution that most readers of *RNCSE* have at their fingertips. From my own point of view, though, what is particularly striking is Johnson's violation of the now well-established principle that theology has no business dictating what the range of data for scientific understanding will include. Without admitting it, Johnson, the would-be theologian, is telling scientists to avoid any data that do not fit the Wedge's idea of "Intelligent Design". In effect, this means that he — along with Dembski, Behe, and others — is asking biologists to leave out most of the fascinating story of life on earth.

Second, there is Johnson's unwavering insistence that the evolutionary idea of natural selection is inherently atheistic. While it is no doubt true that some scientific defenders of Darwinism do read natural selection through the lenses of philosophical materialism, the scientific idea itself cannot be any more inherently atheistic than is the law of gravity or any

First, he claims that "inference from the universal to the particular is valid" while "inference from the particular to the universal is not valid". These principles work well in our judicial courts: we start with a universal understanding that murder is wrong, then apply this principle to particular cases. But science is not law; what is necessary for the lawyer is impossible for the scientist. That is, every experiment is a study of the particular, and every theory an "inference from the particular to the universal".

For example, in the early 1800s Theodor Schwann developed the cell theory, which states that all organisms are composed of cells. Schwann had not universally examined individuals from all the different species — or even every individual of a single species — to make sure they were cellularly organized. Instead, he made particular observations of several organisms and developed a universal principle that continues to inform biological studies.

Furthermore, because modern science is necessarily inductive rather than deductive, our understanding of scientific processes, including abiogenesis, is incomplete. For example, biochemist Stanley Miller has shown that an electrical spark applied to a chemical mixture similar (but not identical) to the early earth's atmosphere can produce amino acids. Since this mixture does not exactly replicate conditions present in the early earth, Overman suggests that scientists should not use this experiment as a basis for origin of life theories. Such a conclusion, Overman argues, produces an "invalid syllogism" from an "unwarranted inference" "because most is not all, and there are ingredients in the early earth's atmosphere not included in the mixture so the mixture and the atmosphere are not the same."

But what Overman describes as a logical misstep is more accurately understood as a result of an incomplete understanding of abiogenesis. And so, while it certainly is a leap to move from Miller's experiments to a full-fledged explanation of life's origins, that does not mean it is impossible for us to derive any information from his experiments.

For example, we currently have a limited understanding of cancer prevention and treatment. Thus drugs used for chemotherapy are not always effective. Years from now, when we finally develop a cure for certain cancers, it is doubtful those treatments will employ the drugs currently in use. But those treatments will employ some of the *principles* that underlie current therapies. Similarly, if we discover that the current mechanisms proposed for abiogenesis are incorrect, it is likely that the principles underlying these mechanisms could still have some validity and applicability.

Of course, as Overman reminds us, even if scientists uncover a workable mechanism for abiogenesis, they must still grapple with the mathematical probability of this event. He cites several studies that have attempted to calculate the odds of producing a living cell, including one that places the odds of producing a single bacterium at 1 in $10^{40\,000}$. Based on this calculation, Overman makes this startling claim: "Any theory with a probability of being accurate larger than 1 in $10^{40\,000}$ must be considered superior to random process. The proba-

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other law of nature. If some scientists see atheism as a consequence of evolutionary science, then they are no less guilty of violating the canons of scientific method than is Phillip Johnson, who fully concurs with them in this belief. They are implicitly lending their scientific authority to the minor premise of Johnson's syllogism. In doing so, they themselves unwittingly sabotage science education in an overwhelmingly theistic social setting.

If the evolutionist, in a pensive moment, opines that a universe sponsoring such a "cruel" or "impersonal" process as natural selection must surely be a godless one, let it be admitted that such reflection is not itself part of scientific work. Science does not admit of such metaphysical intrusions. If there is any value in Johnson's work, perhaps it consists in its oblique rebuke to those scientists who recklessly engage in a mixing of science with materialist ideology and then call this amalgam "science". Such a fusion, after all, is no less methodologically inadmissible than Johnson's own conflation of a heavily edited version of biological science with the incurably theological notion of "Intelligent Design".

Third, there is Johnson's theologically disputable squeezing of the idea of God into the mold of "Intelligent Design". To Johnson's credit, he does turn our attention to an issue that deserves serious attention, namely the meaning of "information" and its place in nature. Yet he tends to merge the notion of information with his own rather restrictive idea of design, and then attributes its presence directly to divine influence.

Johnson and other "Intelligent Design" advocates are too eager to bring God into the picture. A God brought in so hastily, however, is inevitably too small for both our minds and our spirits, and will eventually die. The best of our religious wisdom, after all, tells us that God is a reality for which we must somehow wait, perhaps across endless ages. Moreover, as Tillich also wisely says, we are stronger when we wait than when we possess. A God hastily associated with "design" as Johnson conceives of it is too easily possessed, too small to fit the real world, and may not be worth waiting for.

Author's Address

James F Haught, PhD
Department of Theology
Georgetown University
37th & O Street NW
Washington DC 20057-1135

bility that life was assembled by an intelligence has a vastly greater probability."

Besides raising an irreverently obvious question (what numbers enter into calculating the probability of a creator?), Overman's probability argument includes several unsubstantiated assumptions. First, we currently are unaware of all the parameters that may define the development of life from nonlife. And, for those parameters we have identified, we do not know if we have accurately assessed their probabilities. For this reason, it is currently impossible to form an accurate probability calculation.

Second, Overman ignores how contingency, the idea that one parameter restricts other parameters, automatically excludes some outcomes from consideration. It is misleading, therefore, to say that "all outcomes" must be considered. For example, suppose someone decided to produce a genetic replica of me without resorting to cloning. The probability of doing this by a random combination of all genetic possibilities would be extremely low. But the possibility of my parents producing a second "me", while still unlikely, has a much greater probability. Why? Because there are far fewer possible genetic combinations. Going further, rather than trying to produce another "me", my parents' goal could simply be to produce a healthy child — and my specific genetic code is not the only combination capable of producing such a child.

These same considerations must be applied to any analysis of self-organization theories. Besides ignoring contingency, Overman assumes that only one outcome — our present reality — is compatible with life. By "intuition" and according to our current state of knowledge, it may seem that this is the only combination that produces a "healthy" universe. But we honestly do not know how many other combinations could produce life, and probability calculations based on ignorance are not useful.

Third, Overman, by asking "whether the origin was guided, or accidental and by chance", suggests that these two scenarios are diametrically opposed. Instead, a better question might be: "Is it possible to scientifically distinguish between an origin that was guided versus one that is accidental and by chance?" I do not think it is.

Christianity's greatest contribution to modern science has been to differentiate creation from its Creator. As a result, scientists can now study nature independently from a particular understanding of God's characteristics. That is, the same scientific description of a particular biological event could be given by an atheist and by a Christian. This obviously makes many of us uncomfortable — particularly as we reflect on Romans 1: 20. If creation gives evidence of a Creator, science should provide proof for God. We expect that the natural world must exhibit some obviously supernatural traces — particularly as relates to the origin of life.

But there are dangers associated with seeking God exclusively in the supernatural. Primarily, this approach often sets up a false dichotomy, confining God's activity to the miraculous and neglecting his providential control over all aspects of the natural world. Subsequently, as naturalistic explanations are uncovered for seemingly supernatural events, God's role in the world appears to shrink. If natural law is involved, we reason, somehow God cannot be. Since many naturalistic descriptions invoke chance events, we may thus, with Overman, place God against, rather than over, random chance.

Such reasoning ignores that chance itself was created and may be controlled by God in nonmeasurable ways. Just because we view something as random does not mean that it actually is. God could thus work by influencing seemingly random and chance events to guide the emergence of life.

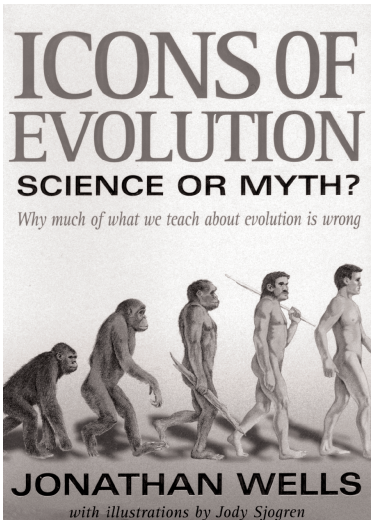
Forfeiting "Intelligent Design's" claim of scientific proof for God is admittedly difficult, but not theologically unprecedented. Absolute proof for God from any source, not just science, is hard to find. Jesus himself, God's clearest revelation, is described as both a "precious cornerstone for a sure foundation" (Isaiah 28: 16) and as "a stone that causes people to stumble and a rock that makes them fall" (Isaiah 8: 14; see also 1 Peter 2: 1–8). In a similar way, both the atheist and the Christian can look at the same scientific facts and come to the same descriptions of natural processes. But our faith separates us from secular scientists because we know that all these seemingly nonteleological processes are actually under the control of the Creator. Such a faith does not contradict science, nor does it look for God in the gaps of science, but it instead proclaims that God is sovereign over all.

[*Flietstra's review of* A Case Against Accident and Self-Organization *appeared together with a review of the same book by Michael Behe, author of* Darwin's Black Box*; each reviewer was given the opportunity to respond to the other's review. Flietstra's response to Behe follows.*]

For advocates of "Intelligent Design", the presence of highly improbable events in the natural world proves there is an originating intelligence. As Michael Behe says, "We recognize design when we apprehend 'specified small probability' — a highly improbable event that fits a pattern." As such, we could say that yellow tulips in a flower bed give the appearance of design, while a lawn dotted with yellow dandelions does not.

The *appearance* of design, however, is not necessarily evidence of a designer. The human eye is overly eager to detect design, and the human brain is equally ready to come up with simplistic stories to explain putative design. In previous centuries, people observed that mushrooms commonly grew in circles.

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



Icons of Evolution: Science or Myth?

Why Much of What We Teach About Evolution is Wrong

By Jonathan Wells
Washington DC: Regnery, 2000. 362 pages.

Reviewed by Jerry A Coyne

Opposition to evolution is found in many corners of the American religious landscape, including the Unification Church. Church founder Sun Myung Moon has frequently condemned Darwinism for giving God no role in the history of life. In 1976, Jonathan Wells, a student in Moon's seminary, answered his leader's call. He writes, "Father's [Moon's] words, my studies, and my prayers convinced me that I should devote my life to destroying Darwinism, just as many of my fellow Unificationists had already devoted their lives to destroying Marxism. When Father chose me (along with about a dozen other seminary graduates) to enter a PhD program in 1978, I welcomed the opportunity to prepare myself for battle." The University of California supplied Wells with his weapon, a PhD in biology and, with *Icons of Evolution*, Wells has fired the latest salvo in the eternal religious assault on Charles Darwin.

This personal history, taken from the Unification Church website <http://www.tparents.org/Library/Unification/Talks/Wells/0-Toc.htm>, is conspicuously missing from the author's biography in *Icons*. The book, aimed at the non-specialist, masquerades as a scientific critique of classic examples of evolution, but is actually a polemic intelligently designed to please Father Moon. *Icons* is a work of stealth creationism, and strives to debunk Darwinism using the familiar rhetoric of biblical creationists, including scientific quotations out of context, incomplete summaries of research, and muddled arguments. But because Wells has scientific credentials, studiously avoids mentioning religion or God (who appears only under the alias "intelligent design"), and presents his book as an objective critique (complete with 70 pages of references and research notes), it is easy for the non-scientist to be taken in. *Icons* has been embraced with glee by anti-evolutionists, who want it included in the American school science curriculum.

Wells's book rests entirely on a flawed syllogism: textbooks illustrate evolution with examples; these examples are sometimes presented in incorrect or misleading ways; therefore evolution is a fiction. The second premise is not generally true, and even if it were, the conclusion would not follow. To compound the absurdity, Wells concludes that a cabal of evil scientists, "the Darwinian establishment", uses fraud and distortion to buttress the crumbling edifice of evolution. Wells's final chapter urges his readers to lobby the US government to eliminate research funding for evolutionary biology.

To see his argument at work, let us look at development, which Wells has referred to elsewhere as "the Achilles' heel of Darwinism". As Darwin first realized, some aspects of vertebrate development

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Convinced that these rings of mushrooms could not arise from natural causes, they supposed that some sort of supernatural event — the dancing of fairies — caused the circular design to appear. Even today, many skeptics are unwilling to accept that the "face" on Mars is only a trick of lighting on an uneven terrain.

The simple use of mathematics does not guarantee a firmer foundation for design than intuition. A probability calculation's reliability depends on the accuracy of our original assumptions. These, in turn, are based on our correct understanding of all the parameters governing a particular event. When it comes to origin-of-life studies, most biologists recognize that our understanding of the parameters affecting abiogenesis is currently so limited as to render probability calculations based on these parameters virtually meaningless. Such attempts are comparable to a 16th-century scientist's trying to calculate the probability that the Copernican view of the universe was correct. The appropriate data simply do not exist.

By uncritically presenting the probability equations catalogued by Overman, Behe tacitly suggests that these calculations accurately describe the probability of life's origin. Behe's acceptance of Overman's numbers is not surprising, since Behe makes similar probability assumptions in his book, *Darwin's Black Box*. For example, Behe suggests that all 19 proteins of the blood-clotting cascade needed to appear simultaneously with

— especially transitory features — provide strong evidence for common ancestry and evolution. Embryos of different vertebrates tend to resemble one another in early stages, but diverge as development proceeds, with more closely related species diverging less widely. This conclusion has been supported by 150 years of research.

Wells tries to refute this mountain of work by noting that, in 1891, the German biologist Ernst Haeckel published illustrations of vertebrate embryos that exaggerated their similarity, and that some biology textbooks still display these doctored drawings. This embroidery, however, was first reported by the British zoologist Adam Sedgwick in 1894, and has repeatedly been used to show the failings not of Darwinism, but of Haeckel (see, for example, *Nature* 2001; 410: 144).

Despite Wells's arguments, one does not need Haeckel's wishful pencil to draw copious evidence for evolution from developmental biology. Human embryos, for example, have pharyngeal pouches, a tail and six aortic arches — all features found in embryonic fish. But our pouches become glands and ducts instead of gill slits, our tail disappears, and our aortic arches (which remain six in some fish) either disappear or are transformed into carotid, systemic and pulmonary arteries. In our first trimester we develop the lanugo, a coat of hair that is shed before birth.

Are these patterns mere whims of the Intelligent Designer, or evidence of our common ancestry with fish and furry primates? Embryos of whales and some snakes develop hindlimb buds that regress before birth; embryos of baleen whales possess teeth that later disappear; and horse embryos have three well-developed toes, with the outer two shrinking to leave the single-digit hoof. Such examples abound, but you will not find them in *Icons*.

Wells also notes that the earliest vertebrate embryos (mere balls of cells) are often less similar to one another than they are at subsequent stages when they possess more complex features. According to Wells, this counts as evidence against biological evolution, which supposedly predicts that the similarities among groups will be strongest at the very first stages of development. But Darwinism makes no such prediction. Darwin himself noted that embryos must adapt to the conditions of their existence, and the earliest stages of vertebrate embryos show adaptation to widely varying amounts of yolk in their eggs. Wells repeatedly fails to grasp the evidential value of phenomena that can be understood only as the result of a historical process, even if the results were not predictable. Perhaps an observer in the early Cenozoic could not have predicted that a lineage of ungulates would lose their hindlimbs as they became aquatic, but the development of the hindlimb in embryonic whales can be understood only as a result of descent with modification from a four-legged ancestor.

When discussing other "icons", Wells uses the same tactic of selective omission to distort a body of literature he pretends to review. Nowhere is this more visible than in his chapter on human evolution. Faced with a series of hominid fossils showing transitions from apelike to modern human traits over 4 million years, Wells can only mumble about the Piltdown Man hoax, and imply that the vigorous scientific debate about the course of human evolution proves that humans did not evolve.

It is telling that, although Wells repeatedly attacks evolution, he gives no hint of his own ideas about the origin and development of life. There is good reason for this. As one learns from his website sermon, *Evolution by Design*, Wells believes that "the human species was planned before life began, and that the history of life is the record of how this plan was implemented". To Wells, the fossil record does not represent a continuum of ancestry, but a succession of creations by the Intelligent Designer, with each species carefully devised to nurture the next product of creation up to the final goal, humans.

Jerry A Coyne is a professor in the Department of Ecology and Evolution at the University of Chicago.

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their production and activation instantly balanced in a way compatible with life. Such a scenario would indeed render a Darwinian account highly improbable.

Behe's assumptions, however, may be premature. We cannot simply assume that the blood-clotting cascade could only appear as a complete system to be functional. Because there is a real possibility that this apparently irreducibly complex system may have arisen in a step-wise manner, any probability calculation based on the presumption that this entire system instantly appeared is without foundation.

Because probability calculations can drastically change as our scientific knowledge increases, it is extremely important that we, as Christians, do not use these calculations as proof for God. For, if we base our apologetic on presumably supernatural events that are subsequently explained by naturalistic processes, God appears to shrink. Such an apologetic eventually compromises our spiritual witness rather than "showing the reasonableness of the faith".

At the same time, we must reject materialism, the belief that the physical world is all that there is, not because there are scientific things "utterly beyond our comprehension" but because we recognize that without God nothing could happen — or even exist. We do not need to inject God into natural history in order to explain sci-

But this argument is blasphemous, for its logical consequence is that the pinnacle of evolution is not *Homo sapiens* but our ectoparasite *Pediculus humanus*, the body louse. It also turns the Great Designer into a Great Deceiver, who, in the manner of Satan, put fossils in the rocks — and tails on embryos — to mislead biologists of the future.

Finally, Wells's main theme about the collusion of evolutionary biologists is simply wrong. Authors of some biology texts may occasionally be sloppy, or slow to incorporate new research, but they are not duplicitous. And, far from representing a conspiracy, it is invariably evolutionists (including myself) who have noted problems with some classic icons of evolution. Wells has it backwards. It is creationists like him who are conspiring to purge evolution from American education. They hide their own differences about issues such as the fossil record and the age of the earth, they pretend to be disinterested seekers after truth, they fail to do their own scientific research, and, like Wells, they avoid at all costs revealing their own theories about the history of life. *Icons* is exactly as even-handed and intellectually honest as one would expect from someone whose "prayers convinced me that I should devote my life to destroying Darwinism".

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entific mystery because our God is entirely capable of working supernaturally through apparently natural processes — not just in the miraculously large steps touted by Overman and Behe.

Science of Today and the Problems of Genesis:

A Study of the "Six Days" of Creation, The Origin of Man and the Deluge and Antiquity of Man Based on Science and Sacred Scripture; A Vindication of the Papal Encyclicals and Rulings of the Church on These Questions. New Edition.

By Fr Patrick O'Connell, BD. Rockford (IL): Tan Books and Publishers, Inc. 1993. 386 pages.

Reviewed by Colin Groves, Australian National University

If there is any book that was really pivotal in laying "creation science" before the public, it is surely Duane Gish's *Evolution: The Fossils Say No!*, first published in 1972. Among other tidbits in this book, there is a 13-page exposé in which Gish purports to demolish the claims for the very existence of "Peking Man", arguing that the conclusions supporting this human fossil are based on not merely bad science, but fraud. The charge of bad science he substantiates by famously misquoting the early 20th-century paleoanthropologist Marcellin Boule (see Ritchie 1991); for his claims of fraud he relies, in the last four and a half pages of the section, on a 1969 book by Father Patrick O'Connell. O'Connell's book has been a bit hard to come by up to now; most of us have just had to take Gish's word for it. But now here it is, reprinted and slightly updated as of 1993, available through Amazon.com. Now we can check: Did Gish misrepresent O'Connell, or did a priest, a man devoted to the truth, really say all that?

He really did say all that, I fear, and more. Gish mentions O'Connell only in those last few pages, but actually relies heavily on him for the whole of the "Peking Man" segment, and for his "Java Man" section, too. Every last libel on anyone involved with *Homo erectus*, every shabby slur on the reputation of these honorable men, is lifted entire, attributed or unattributed, from O'Connell.

O'Connell's book is divided into four parts. In Part I, "The Six Days of Creation", he quotes extensively from Vatican documents, including the Decree of the Second Vatican Council, on what may and may not be believed by a Roman Catholic. O'Connell recounts the history of creation as he sees it and squares it with the Genesis account (he is a day/age man). Part II, "The Origin of Man", is the meat of the book, and I will return to it for a detailed treatment below. Part III deals with the Deluge, which, we learn, intervened between the end of the Mousterian and the beginning of the Aurignacian cultures and did not cover the entire earth but only those parts of it then inhabited by people. O'Connell cites lots of archaeological "evidences" for the Deluge (well, for floods, anyway) from the Middle East and elsewhere. Part IV, "The Antiquity of Man", runs quickly through ways of calculating dates, including radiocarbon but no other radiometric method, and concludes that the human species is about 20 000 years old. There are chapters that are supposed to bring Parts I, III, and IV up to date — but there is no such updating for Part II.

And so to "The Origin of Man" part — the bit that has created all the waves. O'Connell bemoans the way Roman Catholics, both ordained and lay, have not only accepted the evolutionary account but even, like the Abbé Breuil and Fr Boné, contributed to it. His chief

wrath, however, is directed towards Fr Pierre Teilhard de Chardin, the eminent paleontologist who was also a Jesuit, and was forbidden by his superiors to publish during his lifetime his views reconciling evolution with paleontology. Wrath? O'Connell vehemently detests Teilhard, and his assessment of his brother priest, on pages 149–54, is filled with such venom as I would have hoped never to see on the printed page, let alone from a man charged with spreading the religion of brotherly love.

Minor matters are dispatched in a few pages. O'Connell informs us that "Neanderthal Man" was, of course, fully human but not like modern humans, being pre-Deluge. The human fossils that O'Connell regards as genuine either combine Neanderthal and modern traits (Ehringsdorf, Saccopastore, Steinheim) or are fully modern (Swanscombe and Fontéchevade). The obligatory chapter on Piltdown is mercifully brief. The Australopithecines were, he says, "shown to be just great apes"; that takes care of them, then. O'Connell kicks off a great and inglorious tradition by citing none other than Sir Solly Zuckerman as authority. So now we turn to Peking Man.

What actually happened at the "Peking Man" discovery site, Choukoutien (now Zhoukoudian), has been told many times. Jia and Huang (1990) give the full history in great detail. Shapiro (1974) writes about their disappearance during World War II and the subsequent search for them. Van Oosterzee (1999) places the story against the background of China under the warlords and the Japanese invasion. But O'Connell thinks that this well-documented history is all moonshine and is eager to take the lid off what really happened.

Although "Peking Man" — *Sinanthropus* — may or may not be actually ancestral to *Homo sapiens* (and I myself think not), there is absolutely no doubt that it is in every meaningful sense "intermediate" between ape and human. It was vital for O'Connell to discredit the fossils because they are "the only ones that have the support of great names. Hence they are used by advocates of the theory of evolution to support their contention." And he certainly does his level best to discredit them, in the process accusing all four main protagonists of fraud: Teilhard de Chardin (of course); Davidson Black, who was in charge of the excavations at Zhoukoudian until his death in 1934; Franz Weidenreich, who took his place; and Pei Wen-chung (now spelled Wenzhong), the leading Chinese member of the team.

O'Connell's qualifications for his claims? Only that he was in China, reading the Chinese newspapers, during the 1930s. He never, at any time, visited the discovery site, nor, as will become clear, does he have the slightest expertise in anatomy, geology, or even etymology. Gish repeated a few of O'Connell's claims of fraudulence, but even he does not stoop quite to the same depths; O'Connell's only rival in libel is another Catholic creationist, who repeats the claims in only slightly abbreviated form, even adding his own commentary about Pei's diabolical cleverness (Johnson 1982).

I will list O'Connell's main slanders, more or less in order, and follow each one with my own comments, in italics.

- All the human fossils have disappeared (but none of the animal fossils); all we have are "casts or models" (p 126).

  Yes, the fossils have, tragically, disappeared; what we have are casts, not models.

- The skulls did not disappear while being evacuated to America after the Japanese invasion, as the story usually goes. The Japanese did not interfere with the excavations, and in 1943 Weidenreich even wrote an article on the skulls, "and it was published in *Palaeontologia Sinica*, which means that the article passed through the hands of Japanese…" No, the skulls were destroyed by Dr Pei "in order to remove the evidence of fraud on a large scale" (p 127).

  In his 1943 monograph, Weidenreich thanked some American associates "who consented to have this paper printed and edited in the United States as a monograph of the Palaeontologia Sinica *where my main reports on the* Sinanthropus *material have previously appeared". In dedicating it to his Chinese colleagues and to Teilhard, he made it very clear that the Japanese had indeed made the work completely impossible and that this is why he published his monograph in the USA but in a Chinese series. As for Pei's destroying the fossils…!*

- After the war, Dr Pei resumed excavation at Zhoukoudian and found animal fossils, but "no more tell-tale skulls of *Sinanthropus*" (p 128).

  Nonsense. The Zhoukoudian Lower Cave at Locality 1 had been almost emptied by the excavations of the 1930s, but another mandible was nonetheless discovered in 1959, and two cranial fragments in 1966. These latter, incidentally, completed one of the crania found in the 1930s, and they fit the surviving cast exactly — a tribute to the high quality of the original casts.

- Earlier limestone quarrying and burning at Zhoukoudian had under-

continued on page 23

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Darwiniana

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Creationists and other ideological opponents of the theory of evolution like to refer to "Darwinism" — or, indulging in alliteration, "dogmatic defenders of Darwinism" — as if to imply that anyone who accepts the overwhelming scientific evidence for evolution is in the thrall of a dubious guru. And they are equally fond of quoting (especially out of context) Darwin's candid admissions of unresolved problems with his theory, as if to imply that the edifice of evolutionary science stands or falls with the complete accuracy of the *Origin of Species*. Neither implication, of course, is true. Yet Darwin occupies a cherished place in our hearts nevertheless. As Ernst Mayr remarks, "A brilliant mind, great intellectual boldness, and an ability to combine the best qualities of a naturalist–observer, philosophical theoretician, and experimentalist — the world has so far seen a combination only once, and it was in the man Charles Darwin" (*One Long Argument: Charles Darwin and the Genesis of Modern Evolutionary Thought*, Cambridge: Harvard University Press, 1991, p 11). So check out the following books by and about Darwin, now available through the NCSE web site: <www.ncseweb.org/bookstore.asp>. **And remember, every purchase benefits NCSE!**

Darwin Introduced

Darwin: A Very Short Introduction
by Jonathan Howard
In just 144 pages, Jonathan Howard incisively summarizes Darwin's major insights, reasserting the importance of his work for the development of modern biology. The reviewer for *The Times Literary Supplement* exclaims, "Marking the centenary of Darwin's death, Jonathan Howard has produced an intellectual *tour de force*, a classic in the genre of popular scientific exposition which will still be read in fifty years' time." The author is Professor of Cell Genetics in the Institute of Genetics at the University of Cologne. Originally published in the Past Masters series.

Darwin's Ghost:* The Origin of Species *Updated
by Steve Jones
"Ghost" as in "ghost writer", that is. Jones, Professor of Genetics at University College London and acclaimed author of *The Language of Genes*, takes the ideas and concepts from Darwin's *Origin of Species* and presents them in modern English prose, illustrating his points with modern examples drawn from today's science. The London *Sunday Telegraph* describes *Darwin's Ghost* as "a clever book about serious ideas that can be happily read on the beach." Published in Britain as *Almost Like a Whale*.

Darwin for Beginners
by Jonathan Miller
illustrated by Borin van Loon
Lively, clever, and humorous, *Darwin for Beginners* introduces the life and work of Charles Darwin in words and pictures. Although *Darwin for Beginners* is in cartoon form, it is eminently suitable for the adult reader as well. In fact, as Tim M Berra, author of *Evolution and the Myth of Creationism*, quips, it is "the sort of book students could give to their parents to help them understand evolution." Originally published in the centenary year of Darwin's death, 1982.

Charles Darwin: Evolution of a Naturalist
by Richard Milner
In Milner's own words, from the Amazon.com page for his book: "Supposedly for young adults, the book is written at a level everyone can enjoy — Jim Moore, historian of science, calls it '[the] best short biography of Darwin in existence.' (Moore wrote the best long one, with Adrian Desmond.) Yes, I am the same Richard Milner who performs the musical show "Charles Darwin: Live & In Concert" at museums, universities, and cultural institutions all over the world. You may also know my book *The Encyclopedia of Evolution: Humanity's Search for Its Origins*."

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

Darwin biographized

Charles Darwin: A New Life
by John Bowlby
This highly regarded biography was described by Frank Sulloway as "perhaps an ideal introduction to Darwin's life and work for the nonspecialist". A psychologist by trade and the author of *Attachment and Loss*, Bowlby is particularly interested in Darwin's invalidism; he suggests that Darwin "developed a vulnerable personality as the result of a childhood shadowed by an invalid and dying mother and an unpredictable and often intimidating father, and that his symptoms can be understood as responses to stressful events and situations."

Charles Darwin: The Man and His Influence
by Peter J Bowler
In the first chapter, Bowler explains that "What follows is not a biography in the conventional sense, although obviously I shall try to present an outline of what Darwin did and said. Instead I shall offer the reader an opportunity to rethink his or her position on what the various facets of Darwin's life ought to mean to us today." Bowler is the author of numerous books on the history of the theory of evolution, including *Theories of Human Evolution*, *Evolution: The History of an Idea*, and, most recently, *Reconciling Science and Religion: The Debate in Early-Twentieth-Century Britain*.

Charles Darwin: Voyaging
by Janet Browne
This is the acclaimed first volume of Janet Browne's projected two-volume biography of Darwin. Reviewing it for *Newsday*, Ernst Mayr wrote, "There is no better chronicle of Darwin as human being, friend, and indefatigable scientist, nor anywhere a richer description of his milieu, his family life, his social circle, and his scientific connections. Browne's extraordinary knowledge of the literature of the period makes her account particularly insightful.... [A] masterpiece.... Browne knows how to spellbind the reader....The definitive Darwin biography."

Darwin: The Life of a Tormented Evolutionist
by Adrian Desmond and James Moore
Writing in *Nature*, Stephen Jay Gould describes Desmond and Moore's *Darwin* as "Unquestionably, the finest [biography] ever written about Darwin." A thoroughly scholarly work, *Darwin* nevertheless reads like a novel, which prompted Anthony Burgess to comment that "[Darwin's] story is told here with the right energy, irony and affection. His example has driven these two learned doctors to the making of a huge work whose permanent value hardly seems to be in doubt." Desmond's other books include *The Politics of Evolution*; Moore's other books include *The Post-Darwinian Controversies.*

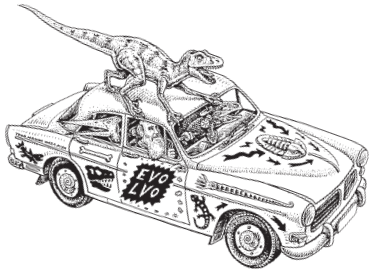
Darwin in his own words

The Autobiography of Charles Darwin
by Charles Darwin, edited by Nora Barlow
On the appearance of the unbowdlerized edition of Darwin's autobiography, Loren Eiseley wrote, "No man can pretend to know Darwin who does not know his autobiography. Here, for the first time since his death, it is presented complete and unexpurgated, as it exists in the family archives. It will prove invaluable to biographers and cast new light on the personality of one of the world's greatest scientists. Nora Barlow, Darwin's granddaughter, has proved herself a superb editor. Her own annotations make fascinating reading."

Charles Darwin's Letters: A Selection, 1825–1859
edited by Frederick Burkhardt with an introduction by Stephen Jay Gould
Frederick Burkhardt, coeditor of the complete edition of Darwin's collected correspondence, was obviously in the ideal position to choose just the right letters to provide unparalleled insight into the thoughts and adventures of the young naturalist whose work was to revolutionize science. The judicious selection of letters in Burkhardt's volume takes the reader from Darwin's university days in Edinburgh through the eventful voyage of the *Beagle* to the publication of the *Origin* in 1859.

On the Origin of Species
by Charles Darwin with an introduction by Ernst Mayr
This facsimile of the first edition of Darwin's epochal work is supplemented with a useful introduction by the great evolutionary biologist Ernst Mayr. "When we go back to the *Origin*, we want the version that stirred up the Western world", Mayr explains. "The first edition represents Darwin in his most revolutionary spirit and this is the edition that stands as so great a monument in man's intellectual history." The publisher, Harvard University Press, proudly — and correctly — says, "For modern reading and for reference, it is the standard edition of Darwin's greatest work."

The Voyage of the Beagle
by Charles Darwin
preface by Steve Jones
Both as a scientific document and as a travelogue, *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."



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A Calendar of Special Events, Presentations, and Lectures

Date October 28, 2001
City Arlington VA
Presenter Eugenie C Scott and Kevin Padian
Title Conversations About Evolution
Event California Science Teachers Association
Time 8:30 AM
Location Key Bridge Marriott
Contact Scott Hays, shays@telis.org

Date November 9, 2001
City Montreal PQ Canada
Presenter Eugenie C Scott
Title Teaching Evolution (Workshop)
Event National Association of Biology Teachers
Time TBA
Location TBA
Contact Julie Benyo, julie_benyo@wgbh.org

Date November 10, 2001
City Atlanta GA
Presenter Eugenie C Scott
Title Intelligent Design and Science
Event Center for Inquiry Conference: Science and Religion
Time 9 AM
Location Atlanta Airport Marriott
Contact Center for Inquiry, 1-800-458-1366

Date November 15, 2001
City Kearney NE
Presenter Eugenie C Scott
Title Creationism Old and New
Event Kearny NE Sigma Xi Annual Meeting
Time TBA
Location University of Nebraska
Contact Dr Wayne Briner, brinerw@unk.edu

Date November 25, 2001
City Kensington CA
Presenter Eugenie C Scott
Title What We Know and Don't Know About Evolution
Event "Personal Theology" Series
Time 9:30 AM
Location Unitarian Universalist Church of Berkeley
Contact Martha Hellman, (510) 525-0302

Date December 6, 2001
City Los Angeles CA
Presenter Alan Gishlick
Title How to Introduce Evolution in Elementary Education
Event Educator Open House: Understanding Science
Time TBA
Location Natural History Museum of Los Angeles County
Contact Leah Melber, lmelber@nhm.org, (213) 763-3240

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mined the hill, causing a landslide, burying everything "under thousands of tons of stone". The so-called fossil deposits result from this burial. The stone tools were actually the remains of quartz stones used to construct the lime kilns. The so-called hearths were from the lime kilns. The modern human skulls were some of the miners. The so-called *Sinanthropus* skulls were those of local baboons and macaques (p 128–9).

The hill was a lime quarry, but there is no evidence for kilns or a landslide. The cave fill was consolidated. Black and others (1933: 6) write, "… the deposit of Locality 1 had been partially exposed at the head of an abandoned quarry…"

- The discovery of modern humans, as well as *Sinanthropus*, had been concealed by Weidenreich and Pei for 5 years; there is no justification for representing them as being later in time, "for both were found buried under the same landslide" (p 130, 143–4).

  Nonsense; papers were published on the near-modern human remains by Black in 1933 and by Pei in 1934 (see Weidenreich, 1939, 205, n 2). They came from the Upper Cave, higher up the same hill as the Lower Cave (Locality 1).

- A skullcap found in 1928 or 1929 was described by Black in 1931 as being "more like man than ape, with a brain capacity more than twice that of a monkey" (p 133), but in 1930 Teilhard described it as a skull, not a skullcap, with a "probably small" cranial capacity and with close similarities to the great apes in length of face, brow ridges, postorbital constriction, receding forehead, triangular (not oval) skull shape seen from behind, and form of the tympanic bone (p 135). O'Connell concludes from this that "it was the skull of a baboon or monkey, for no fossils of apes have been found in China" (p 136).

  That Black emphasized the human features and Teilhard was bound to describe its "ape-like" features says more about the intellectual climate of the times than about the characteristics of the specimen. What is more important is that O'Connell obviously does not know that anatomists use "skull-cap" for anything from the upper vault (calotte) to the major part of it (calvaria), so there is no contradiction at all between the way Black and Teilhard characterized it.

- Boule published a paper in 1937 in which he described the skulls as "monkey-like" (p 137).

  Boule did not describe them as "monkey-like" (see Ritchie 1991).

- Boule also revealed that in all of them "there was a hole in the top of the skull at the occiput, supposed to have been made for the purpose of extracting the brain" (p 137), but there was no such hole shown in the photos published by Black in 1931, which was therefore not the actual skull at all but "an artificial model of the mythical *Sinanthropus*" (p 138).

  So O'Connell does not know where the occipital bone is! (I thought that Catholic priests, before Vatican II, were supposed to know Latin.) Boule wrote (1937: 8), "La partie centrale, c'est-à-dire le poutour du trou occipital, a été détruite" (the central part, that is to say the area adjacent to the occipital "hole", has been destroyed); the occipital bone is at the back *of the skull and extends onto the base, and the "trou occipital" is the foramen magnum, on the* underside *of the braincase.*

- Black estimated the brain capacity at 960 cc, later corrected by Weidenreich to 915 cc, but Teilhard had described the skull as small and resembled that of an ape — more evidence that the model was not even a cast but "a creature of the imagination" (p 139).

  It is clear that "small" is a relative term — in this case, small relative to modern humans.

- Weidenreich alleged that three more *Sinanthropus* skulls had been discovered in 1936, but no photographs of them have ever been published, only of three *incomplete* skulls (that is, of the "artificial models") in a brief article in 1937.

  Nonsense. Photographs and x-rays *of all of them (Skulls X, XI, and XII are the ones in question) were published in Weidenreich's 1943 monograph, which O'Connell mentions but does not appear even to have glanced at.*

- Teilhard stated, in a 1937 article, that the fossils were found in a cave, but "the

existence of any natural cave at either the lower or the upper level is denied categorically by Weidenreich" (p 151).

Nonsense. Weidenreich many times (1939, 1943, and elsewhere) mentioned both the Lower Cave, where "Peking Man" was discovered, and the Upper Cave, at the top of the hill, where the near-modern specimens were found.

After this simply frightening mélange of misrepresentations, anything else must surely be an anticlimax. Yet O'Connell has a few more willful distortions up his sleeve in the following chapter. "Java Man", he reports, was discovered at Trinil in the 1890s by Dubois:

> He brought home a great quantity of bones of various animals, two simian teeth, the thigh bone of a man, and the cap of a skull which some say is that of a man, others, that of an ape, and others still, that of a "missing link". As the brain case is missing, it is not possible to decide to which category it belongs.
>
> He brought home at the same time two human skulls, known as the Wadjak skulls, of large brain capacity… Dr Dubois concealed these on his return… He produced them, however, in 1925, 30 years later… (p 159).

von Koenigswald, he reports, made a final attempt to find more specimens of Java Man in the 1930s, but all he produced was

> parts of four skulls so broken that the brain capacity could not be determined. Romer, in *Man and the Vertebrates*, describes these as "three more skullcaps, a lower jaw and an upper jaw". … As there were only skullcaps, it is impossible to tell what was the brain capacity, but Romer, Vallois and other propagandists for the man-from-ape theory, give the capacity as much the same as that given by Dr Dubois' first specimen — between 800 and 900 cc (p 161).

"Skullcaps" again! Had O'Connell ever seen any of them, even photographs? All four — Dubois's from Trinil, and von Koenigswald's from Sangiran — are substantial specimens, from which it is easy to obtain cranial capacities. This is also the case for at least three of the many, many specimens which have been discovered since then, mainly by Indonesian scholars. As for the Wadjak (now Wajak) skulls, they were not "concealed", but described by Dubois in three separate papers in the 1890s (Brace 1987).

What do we make of O'Connell? His motives are evident: an old-fashioned Catholic, desperately struggling against the modernizers whose efforts to bring the church, kicking and screaming, into the Enlightenment — no, into the *Renaissance* — finally began to bear fruit in Vatican II. Like some other traditionalists, and even some not-so-traditionalists (see Scharle 1999), he harbors a deep well of hatred against his opponents (witness his unedifying attacks on the reputation of Teilhard de Chardin). Because he has right on his side, he can destroy the reputations of those who incur his detestation without a second thought: fortunate for him, perhaps, that by the time of his first edition all his targets were either dead or, in the case of Pei, alive but isolated from outside contact in Mao's China. He is aided in his crusade by his astonishing invention of whole new scenarios, his willful disdain for actually *reading* the books and papers that he disparages, his triumphant ignorance of anatomy — he does not even know what the words mean, and quite obviously he does not want to know.

It says a lot about Gish that he takes this poisonous garbage as his primary, no, his *only* source on "Peking Man" and "Java Man" — that he is willing to lower himself to the level of this unspeakable nastiness. And let us, perhaps, raise at least one, whispered cheer for Marvin Lubenow who has managed to avoid it — although he must surely know about it, he never endorses it. But he and others of his sort might merit some respect from us, their critics, if they joined forthrightly in its condemnation.

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Author's Address

Colin Groves
Department of Archaeology & Anthropology
Australian National University
Canberra, ACT 0200
Australia

Charles Darwin: Interviews and Recollections

edited by Harold Orel.
New York: St. Martin's Press, 2000. 176 pages.

Reviewed by Philip and Phylis Morrison

A life of such renown has been written up in many volumes. Darwin's engaging letters and his self-knowledge have won readers for more than a century now. A few of his intimate recollections are presented here again in one small volume, most helpfully. But to Darwin's own candor and his depth of memory over a long life, the compiler, a scholar and plainly an admirer of this great and modest man, has added the living witness of a dozen people of many walks of life who questioned, visited, or even quarreled with the biologist.

As in a well-made play, the qualities of Darwin's character unfold from these tales, by the protagonist and by those who write of him. Here is the child Darwin, a nine-year-old with a conscience, who admitted to made-up wonders such as the "monstrous fable" of producing primroses of new colors by watering them with colored fluids; here is the man, looking back to regret the old deception. Here is Alfred Wallace, the specimen collector from Indonesia, who wrote a brief letter to Darwin himself to seek aid in publishing the essay that described in brief the very theory Darwin had spent 20 years documenting in sufficient detail to convince the wide world. Young Wallace sent it to that man just as Darwin's big treatise was about ready. What is wonderful is how Darwin and Wallace understood that stroke of fate, and remained lifelong friends in the face of the celebrity Darwin won and deserved, while Wallace's quick insight was given the credit due it.

Here are Darwin's friends — Huxley, Hooker, cousin Galton, his devoted sons — recalling family life over decades. We have from Captain FitzRoy of the Beagle voyage a clear description of the colors of the glacier ice off Tierra del Fuego and of the great wave which threatened the drawn-up boats of a shore party when the glacier calved. Quick reaction from the men on shore, including young Darwin, preserved their boats from becoming prey of the sea. Here too is the feminist London author, Harriet Martineau, "prolific and popular", whose dozens of volumes spanned fiction, history, travel, and philosophical controversy. Abolitionist reporter from America, sympathetic visitor to post-famine Ireland, she was a guest of the Darwins and hostess to them at her own celebrated teas. Her clear estimate of this man (in two letters here) is far-seeing; the *Origin* has "set the world on a great new track…"

One opponent was the pioneer geologist, Professor Adam Sedgwick of Cambridge University. The student Darwin had once spent a happy few days geologizing in Wales with him. But when the mature Darwin sent Sedgwick a copy of the *Origin* upon publication, the senior scholar, still lecturing, sent a reply woven around "more pain than pleasure" in reading it, and about passages that "greatly shocked my moral taste". Sedgwick ended with personal warmth, "your true-hearted old friend". But within months the geologist was writing of "rank materialism", and even complaining that Darwin's work was done "for no other solid reason, I am sure, except to make us independent of a Creator". He remained lifelong an abusive public critic of Darwin and evolution, chiefly on grounds far outside the evidence. The focused power of this pageant of commentary is all but unique among biographies, even though nothing really new is here.

Most touching — and most winning — of all is the little-read narrative by father Charles himself of the life of his oldest daughter Anne, who died at the age of ten of a delayed effect of scarlet fever. With no sentimentality, but with discernment and love, he writes: "She had a truly feminine interest in dress ... such undisguised satisfaction, escaping somehow all tinge of conceit & vanity, beamed from her face, when she got hold of some ribbon ... of her mamma's."

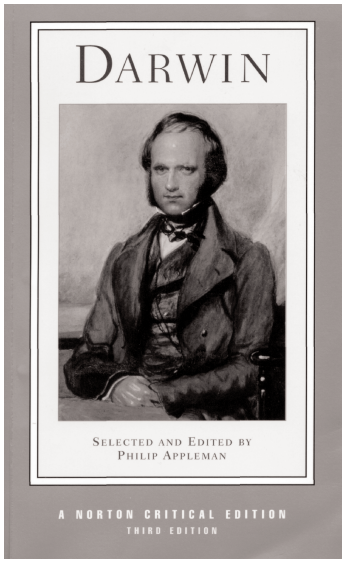
True simplicity, dignity, and precise perceptions shine from this book of many writers. It is a model of compilation and would repay a wide readership even if it were only the drama of an undistinguished comfortable Victorian, and not that of arguably the most influential of all scientists and his wide circle.

Philip and Phylis Morrison have been regular reviewers of science books in Scientific American *for some 35 years. Their writing still graces those pages each month. Their home bookshelves hold about seven feet of Darwiniana, quite well read.*

Darwin, third edition

edited by Philip Appleman. New York: WW Norton, 2001. 695 pages.

Reviewed by John C Greene



For Philip Appleman, editor of this anthology, the work of putting it together was a labor of love. In 1948, having joined the Merchant Marine to help pay for his college education and chancing to read Darwin's *Origin of Species* and *The Descent of Man* while voyaging to the Mediterranean, young Appleman experienced an epiphany that was to shape the rest of his life. Emancipated from "a constrained childhood allegiance to the primitive creationist myths of Genesis", he devoted himself to studying Darwin's life and works and his pervasive influence — scientific, philosophical, political, religious, and literary — in the world at large. The present edition of his anthology builds on the earlier editions of 1970 and 1979, adding selections from writers active since 1980 and devoting special attention to the arguments for and against "creation science" and evolution.

Appleman presents both sides of the evolution controversy in his selections, but the issue is clouded by the absence of clear definitions of the terms "evolution", "science", "creation", "faith", and the like. The selections from the National Academy of Sciences attempt to clarify these terms (p 617–23) but with limited success. Evolution in general is said to claim "that what we see today is different from the past", but that scarcely conveys what Julian Huxley, Theodosius Dobzhansky, Edward O Wilson, and the like mean by "evolution". Biological evolution is said to be summed up in Darwin's phrase "descent with modification", but that avoids the central question whether neo-Darwinian evolutionary science can explain human nature in all its aspects. Darwin acknowledges (p 223) that "spiritual powers" cannot be compared or classed by science. Just what these spiritual powers are as distinguished from "mental faculties" and "mental powers" Darwin does not say. He contents himself with having given reasons for believing that the mental differences between humans and apes are differences of degree and that future researches will disclose a graded series of extinct forms linking these differences.

Turning (p 247) to "the higher intellectual powers of man" — ratiocination, abstraction, self-consciousness, and the like — which make man "the one being" who "deserves to be called a moral being", Darwin speculates that these powers "probably follow from the continued use and exercise of the other mental faculties." Once evolved, Darwin adds (p 248), man's moral nature would have improved "from his sympathies having been rendered more tender and widely diffused through the effects of habit, example, instruction, and reflection." "It is not improbable", he declares, "that after long practice virtuous tendencies may be inherited." Practice makes perfect, if you believe in the inheritance of acquired characters. To which Darwin adds that "the conviction of the existence of an all-seeing Deity has had a potent influence on the advance of morality." Whether this conviction has any basis in fact Darwin does not say. His own hope for a "higher destiny" (p 254) for the human race seems to have been rooted in the idea expressed in his letters to Charles Lyell and Joseph Dalton Hooker dated April 27, 1860, and February 9, 1865, that natural selection and the inheritance of acquired characters would eventually produce a race of men who would look back on Lyell, Hooker, and Darwin himself as "mere Barbarians", unless the cooling of the sun extinguished life on earth before that happy result could occur. "To think", he wrote Hooker, "of millions of years, with every continent swarming with good and enlightened men, all ending in this, and with probably no fresh start until this our planetary system has been again converted into red hot gas. *Sic transit gloria mundi*, with a vengeance."

Like Darwin, the National Academy of Sciences encounters difficulties in dealing with the idea of human spirituality in relation to science. It concedes (p 299) that "science cannot comment on the role supernatural forces might play in human affairs", but quickly adds that science has concluded that "the same forces responsible for the evolution of all other forms of life on earth can account for the

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John C Greene is Professor Emeritus of History at the University of Connecticut and the author of Darwin and the Modern World View *(Baton Rouge [LA]: Louisiana State University Press, 1961),* The Death of Adam: Evolution and Its Impact on Western Thought *(Ames [IA]: Iowa State University Press, 1959; revised printing, 1996), and* Debating Darwin: Adventures of a Scholar *(Claremont [CA]: Regina Books, 1999; revised printing, 2001).*

evolution of human beings." Science, it adds, "is not the only way of acquiring knowledge about ourselves and the world around us." Other ways include "literature, the arts, philosophical reflection, and religious experience", subjects extending beyond the realm of science, which aims "to obtain a better understanding of the natural world." "Science", it continues (p 622), "is limited to explaining the natural world through natural causes. … Whether God exists or not is a question about which science is neutral."

However laudable such a restrained neutral stance may be for collective bodies of scientists, it is certainly not characteristic of individual scientists either historically (Kepler, Galileo, Newton) or in the case of present-day scientists such as Richard Dawkins, Edward O Wilson, and Julian Huxley or of philosophers of science for many of whom the natural world is the only world and science the only reliable way of knowing about it. Even the National Academy of Science, after admitting religious experience as a way of knowing about the world, proceeds to define religious faith as "belief without empirical evidence" (p 622) — although traditionally "empirical" means "based on experience" — and argues that the faith of scientists in the orderliness of nature and the value and integrity of science is not mere belief but verifiable trust. To the contrary, the Harvard astrophysicist Sheldon Glashow says of his belief in an ideology-free science: "This statement I cannot prove. This statement I cannot justify. This is my faith" (*The New York Times,* October 22, 1989, section E, p 24).

Oddly enough, it is a professor of English literature, George Levine, who puts his finger (p 660) on the paradox underlying the ambiguities of the National Academy's position. The 19th-century triumph of the authority of science over the authority of religion, Levine writes, was based on "a rigorously defined 'experience' to be achieved through disinterested observation and experiment." "The peculiar Darwinian wrinkle … is that the observer becomes vulnerable, particularly because — as Darwin extends the rule of science from inorganic to organic phenomena — the observer also becomes the observed."

Scientists are not mere observers. They are actors in the difficult human situation and hence must accept some responsibility for the consequences — spiritual, moral, political, technological — of their scientific ideas and discoveries, as they have done with respect to the environmental consequences of science-based technology. Science works best in explaining facts "out there" held at arm's length by the observer, but not so well in dealing with facts "in here" such as our awareness of our own act of existence, our appreciation of beauty, our sense of moral accountability, our communion with the source of being. Facts of this kind do not lend themselves to scientific formulation. Attempts to explain them scientifically end by explaining them away. But science itself then becomes unintelligible. The ideal scientist is a person seeking insight into the harmony of nature. The harmony and the human spirit seeking to comprehend it are there first. They are prescientific.

Appleman's section on Darwinian influences in literature ably presents contrasting views of the spiritual impact of his writings, but there should also be a section on eugenics, a movement launched by Darwin's cousin Francis Galton and fostered by Darwin's son Leonard and others of the Darwin tribe as well as by such notable scientists as Ronald Fisher and Julian Huxley. The eugenics story is well told by Daniel Kevles (*In the Name of Eugenics: Genetics and the Uses of Human Heredity* [New York: Alfred A Knopf, 1985]) and by James Moore in his most recent study guide and readings for the Open University entitled "Good Breeding: Science and Society in a Darwinian Age". One can perhaps agree with Appleman in excusing Darwin for echoing Victorian attitudes toward women, but Appleman is much too indulgent in portraying Darwin as "straying innocently" (p 10) into "an occasional Darwinisticism" in his remarks on racial and individual competition as engines of progress. In *The Descent of Man* and elsewhere Darwin out-Spencers Spencer in portraying competition of individuals, tribes, nations, and races as essential to the progress of civilization. Only in the case of humans, he writes, are the weak members of society permitted to propagate their kind. "Man", he concludes (p 253),

> has no doubt advanced to his present high condition through a struggle for existence consequent on his rapid multiplication; and if he is to advance still higher, it is to be feared that he must remain subject to a severe struggle. Otherwise he would sink into indolence, and the more gifted men would not be more successful in the battle of life than the less gifted. Hence our natural rate of increase, though leading to many and obvious evils, must not be

> greatly diminished by any means. There should be open competition for all men; and the most able should not be prevented by laws or customs from succeeding best and rearing the largest number of offspring.

As to racial competition, Darwin expressed his views in a letter to William Graham dated July 3, 1881:

> I could show fight on natural selection having done and doing more for the progress of civilization than you seem inclined to admit. Remember what risk the nations of Europe ran … of being overwhelmed by the Turks, and how ridiculous such an idea now is! The more civilized so-called Caucasian races have beaten the Turkish hollow in the struggle for existence. Looking to the world at no very distant date, what an endless number of the lower races will have been eliminated by the higher civilized races throughout the world.

Like Spencer, Darwin looked to improvement in the instinctual and intellectual faculties, brought about by natural selection and the inherited effects of the exercise of those faculties, for the advancement of the human race. It remained for Francis Galton, Julian Huxley, and others to suggest that a similar result could be brought about much more quickly by eugenic intervention.

One further subject would bear fuller development in the next edition of Appleman's *Darwin*, namely, Darwin's influence on philosophy and particularly on the philosophy of science, a subject currently represented in Appleman's selections only by Michael Ruse's essay on evolutionary epistemology. A good starting point would be Pascal Engel's excellent review in *Biology and Philosophy* (2000 Nov; 15 [5]: 737–43) of Werner Callebaut's anthology *Taking the Naturalistic Turn, Or How the Philosophy of Science Is Really Done* (Chicago: University of Chicago Press, 1993) and, as an antidote to the prevailing naturalism among philosophers, Anthony O'Hear's *Beyond Evolution: Human Nature and the Limits of Evolutionary Explanation* (Oxford: Oxford University Press, 1999) and Holmes Rolston's *Genes, Genesis and God: Values and their Origins in Natural and Human History* (Cambridge: Cambridge University Press 1999; reviewed by Michael Ruse in *RNCSE* 1999 Sep/Oct; 19 [5]: 38–42).

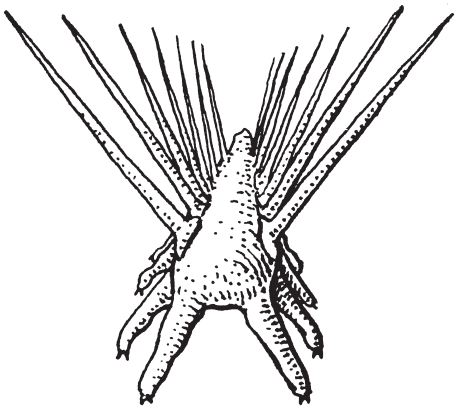
The last paragraph of *The Descent of Man* (p 254) exhibits in miniature the conflicting tendencies in Darwin's thought: the hope for a "higher destiny" for man in the remote future, the subordination of human hopes and fears to scientific reason's quest for truth, the conviction that the "bodily frame" of humans betrays our lowly origin, the unstated implication that our "nobler qualities", so eloquently set forth by Darwin, are also of lowly origin, his "god-like intellect" included.

If Appleman is looking for high tragedy, or at least high pathos, in connection with Darwin (p 254), he might find it in Darwin's own life: his youthful love of natural history, music, and poetry; his mixed emotions of awe, astonishment, wonder, and unrelenting scientific curiosity as he encountered the Brazilian forest, the "primitive" Fuegians, and the Galapagos fauna; his exultation and anxiety on discovering nature's secret of adaptation and evolution by natural selection; his long years of semi-invalid domestic retirement working secretly and doggedly on his grand project despite constant physical suffering and the deep spiritual wound inflicted by his beloved daughter Annie's death; his post-*Origin* years of prodigious scientific productivity amid a storm of public controversy and the slow withering away of his aesthetic sensibility and his deistic faith, so evident in the *Origin*, in a Creator responsible for the laws of nature; finally, late in life, his "horrid doubt", expressed in a letter to William Graham dated July 3, 1881, whether his "inward conviction" that the universe was not the result of mere chance could, given the lowly origins of the human mind, be "of any value or at all trustworthy". "Would anyone", he asked, "trust the convictions of a monkey's mind, if there are convictions in such a mind?"

Here indeed was high pathos: one of the world's greatest scientists driven by his scientific theories to conclude at the close of his life that his intuitions and convictions concerning ultimate reality, and those of mankind generally, were totally untrustworthy. No tragic catharsis here, no redemptive wisdom coming belatedly over the soul through tears and dole, as the Greek tragedian Aeschylus would have it. "I have everything to make me happy and contented", Darwin wrote to his old friend Alfred Russel Wallace on July 2, 1881, "but life has become very wearisome to me." As the present review shows, Appleman's *Darwin* provides abundant food for thought, served up in well-chosen, well-written selections from a wide variety of authors.

Author's Address

John C Greene
651 Sinex Ave Apt B215
Pacific Grove CA 93950-4247



Omphalos: An Attempt to Untie the Geological Knot

by Philip Henry Gosse. Woodbridge (CT): Ox Bow Press, 1998 (originally published 1857). 376 pages.

Reviewed by Robert Ackerman

Philip Gosse (1810–88) was an eminent British zoologist and natural historian (a member of the Royal Society) and a fundamentalist Christian (a member of the Brethren, or Plymouth Brethren, as they were sometimes called). He grew up without any sense of tension between his faith and his scientific vocation. However, by the 1850s, after the publication of Chambers's *Vestiges of the Natural History of Creation* and the finds by Boucher de Perthes of the bones of many extinct animals in the same strata as human remains, many Christians found it increasingly difficult to take the creation narratives of Genesis literally. *Omphalos*, published only two years before *On the Origin of Species*, is a true product of those feverish times.

Ox Bow is not a sectarian publisher trying to resurrect Gosse's theory, and its willingness to bring *Omphalos* back into print is praiseworthy. I should say, however, that anyone interested enough either in the history of ideas in Britain in the 1850s or in Gosse's odd ideas (to be described below) would learn far more by reading a much better and more informative book, *Father and Son* (1907) by the translator, literary historian, and critic Edmund Gosse (1849–1928). Edmund was Philip's son, and the book is a deconversion narrative — a deeply affecting account of how it felt to grow up in a religious home in the 1850s and slowly become estranged from that unworldly society. Just as Tom Stoppard's brilliant *Rosencrantz and Guildenstern Are Dead* (1967) refracts the story of *Hamlet* ironically through the consciousness of two bit players in the royal tragedy, so *Father and Son*, without commenting in explicit detail on the content of *Omphalos*, illuminates its author and his motivations in a way that the book itself never could.

Omphalos is a piece of desperate argumentation, composed by its author to allow himself and other educated Christians to understand the already-large mound of geological and paleontological data for evolution and the great age of the earth and yet hold to their literal biblical faith in creation. Its tricky thesis: God created the world *ex nihilo*, but created it to look *as if* mountains had uprisen, organs had evolved, and evolution had taken place. In so many words, Gosse says that God created everything, including animals and plants bearing apparent evidence of evolution, in six literal days about 6000 years ago, This daffy idea, useless to science, had the great merit for Gosse of being impossible to disprove; once it is accepted, Genesis and geology agree completely and all is well. Thus the title (*omphalos* is Greek for navel) — Adam *did* have a navel, Gosse concludes, not because he was born of woman but because he was of a piece with the rest of creation that everywhere bears seeming marks of change (that in fact had not taken place).

It will not come as a surprise to learn that the book was a failure in its own time — much to the chagrin of its author, who thought he had come upon a wonderful way to have his scientific cake and eat it too. It was attacked from both sides: the faithful were either made uneasy by, or else uninterested in, the dozens of examples from geology and natural history that are discussed in its pages, and the scientific rationalists had no time for it either, dismissing it as the rhetorical diversion it was. For us, it remains an interesting footnote — of interest for its historical value, but not as a serious contribution to either scientific or theological progress.

Until January 2001, Robert Ackerman was the Director of Liberal Arts at the University at the Arts in Philadelphia.

Author's Address

Dr Robert Ackerman
c/o Division of Liberal Arts
University of the Arts
320 S Broad St
Philadelphia PA 19102–4994
robert.ackerman@hotmail.com

MINIREVIEWS

The June 9, 2000, issue of *Cell* featured a special section, "Minireviews on Molecular Approaches to Evolution", containing the following articles:

Robin D Knight and
Laura F Landweber
The early evolution of
the genetic code

Eugene V Koonin, L Aravind,
and Alexey S Kondrashov
The impact of comparative
genomics on our understanding of evolution

Sean B Carroll
Endless forms: the evolution of
gene regulation and
morphological diversity

David Metzgar and
Christopher Wills
Evidence for the adaptive
evolution of mutation rates

Rosalind M John and
M Azim Surani
Genomic imprinting, mammalian evolution, and the mystery of egg-laying mammals

[*Contributed by Thomas Wheeler*.]

MISCELLANEOUS REVIEWS

A Kansan's Guide to Science

by Paulyn Cartwright, Roger L Kaesler, Bruce S Lieberman, and Adrian L Melott.
Lawrence (KS): Kansas Geological Survey, 2000. 20 pages.

Reviewed by David C Kopaska-Merkel.

The Kansas Geological Survey is one of the nation's largest geological surveys and has a well-deserved reputation for excellence. It was therefore with some measure of excitement that I wrote away for a copy of this new science-education publication. My anticipation was honed to a sharper edge by the recent successful battle to keep science in the newly revised K–12 science standards for Alabama.

Not long ago, Kansas scientists and educated persons everywhere received a wake-up call from the Kansas Board of Education (BOE). Responses varied. Some Kansas responded with their votes, and the election of new members to the Kansas BOE resulted in dramatic improvements to the state's science standards. Some scientists responded by writing this book. As the authors put it: "the challenges to the immensity of geologic time, the nature of evolution, and the origin of the universe that motivated the BOE decision [to eliminate or de-emphasize these topics in the Kansas public school curriculum] were ... not backed up by any actual data." The authors of this book (two of whom, Adrian L Melott and Roger L Kaesler, are NCSE members) set out to create a resource that would help nonscientists learn about science and specifically about evolution. If their goal was to produce a concise, clear, and accurate account, then they succeeded.

The book contains four chapters: "The nature of science", "Understanding evolution", "The history of the earth and the history of life", and "The origin of the universe". In "The nature of science", the authors explain the scientific method, making clear the distinction between the experimental and historical sciences, but also drawing attention to their similarities. For instance, both depend on the development of testable hypotheses. Pseudoscience is contrasted with legitimate science: "Creation science, unlike legitimate sciences, does not seek to derive explanations through observations and testing of the natural world but instead begins with a belief system and then seeks to find evidence to support this view."

The second chapter, "Understanding evolution", addresses topics such as the nature of evolution, facts and theories, and the evidence for evolution. The authors make some important points: for example, that "people ask scientists and teachers, in the interest of fairness, to present the evidence against evolution. Scientists and teachers do not present such evidence because there simply is no such evidence". I think that the authors miss the boat in their otherwise excellent discussion of microevolution and macroevolution. They make no mention of historical examples of macroevolution, of which there are many (for example, Grant 1966; Filchak and others 2000; Greene and others 2000; Hendry and others 2000; Pfrender and others 2000).

"The history of the earth and the history of life" covers just that, with an emphasis on what was happening in Kansas. Despite the regional focus, the chapter is comprehensive and its contents are relevant globally. In "The origin of the universe", the authors summarize the history of the universe in 1.5 pages. The Big Bang theory is really the only topic treated adequately in this section, but it is the most important in the context of the creationist opposition to evolution. The book ends with a short list of references, a brief glossary, and suggested readings and educational resources.

A Kansan's Guide to Science obviously draws heavily on other recent publications about the nature of science. It would be a good model for anyone contemplating writing a booklet on the subject. The book's strengths include a low price, conciseness, and clarity. Its chief weakness is also one of its strengths: brevity. I recommend this book especially for people who know little about science and want a quick introduction. If you know a little and want to know a lot more, this is not for you.

David C Kopaska-Merkel is a geologist employed by the Geological Survey of Alabama. He holds a PhD in geology from the University of Kansas. His current research focuses on the sedimentology and paleoecology of ancient reefs and on the origins and physical characteristics of hydrocarbon reservoir rocks.

Acknowledgments

The references on historical speciation were given to me by the evolutionary biologists Victor Albert and Brian Axsmith.

MEDIA REVIEW

Instructional Technology Resources for California Schools

The California Technology Assistance Project, 1998. CD ROM.

Reviewed by Casey Lu, Humboldt State University

Professional Californian educators trained in the assessment of instructional technology have carefully evaluated and identified useful web sites among the myriad of useless and untrustworthy sites currently on the internet; the results of their labors are on the *Instructional Technology Resources for California Schools* CD–ROM, a collaborative effort that involved input from teachers, librarians, administrators, business people, and university faculty. Although specifically evaluated with reference to how well they support California student learning, teachers, librarians, parents, and administrators, the resources are highly useful for anyone involved with education and are based on learning standards that go beyond California's State Academic Standards.

The CD–ROM contains files describing individual projects that are part of the larger CTAP program, CTAP participants and contributors, and examples of the kinds of resources one will find when visiting web sites. But its primary function is to help the user to navigate to the web sites where the actual information exists. I found the web sites so user-friendly that I had little need for the CD other than to get me to the home pages of the main web sites associated with the CTAP project. The main sites include the following: the California Instructional Technology Clearinghouse, Schools of California Online Resources for Education, CTAP Statewide Staff Development, and Statewide Buying and Licensing Opportunities.

The resources on these sites cover all K–12 education, from teaching and learning in the various subject areas (for example, history, mathematics, and science), to a guide for parents who wish to evaluate instructional technology, to instructions on how to participate in statewide buying and licensing opportunities for education. I will focus my evaluation on the value of CTAP for people interested in learning more about the topic of evolution.

The California Instructional Technology Clearinghouse web site includes educational items that are rated as desirable, exemplary, or state-adopted. When I searched on the word "evolution", I received 112 hits, most of which were videotapes. When I narrowed the search to show only items with "exemplary" ratings, I received 18 hits, including several that I consider among the best.

The Clearinghouse site contains a nice feature called the California Academic Standards On-line Search, which allows the user to search the database by California Academic Standards. The search engine was not yet fully operational; I was unable to search high school science standards (grades 10–12). However, it appears that this will soon be a feature of the site. It would be nice if this site would add a search feature based on national standards such as the National Science Education Standards as well.

The science section of the Schools of California On-line Resources for Education (SCORE) web site was especially useful for finding information on the topic of evolution. This site contains the following subareas: Kids' Corner, Teacher's Place, Science Search, Ask A Scientist, and Science Networks. I found the Teacher's Place most useful. In this area, the

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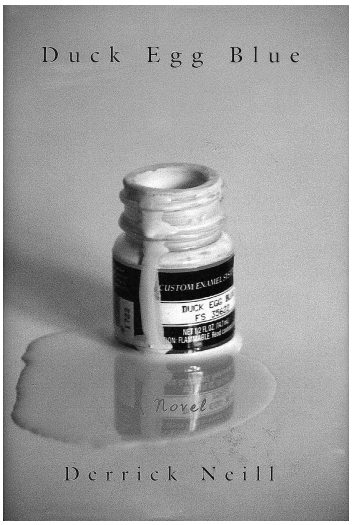
[*Copies of this publication are available from the publications office of the Kansas Geological Survey (785-864-3965). The cost is $7.50 per copy, plus $3.00 postage and handling. Kansas residents should add 6.9% sales tax.*]

Author's Address

David C Kopaska-Merkel
Geological Survey of Alabama
PO Box 869999
Tuscaloosa AL 35486-6999
davidkm@gsa.state.al.us



Duck Egg Blue

by Derrick Neill.
Amherst (NY): Prometheus Books, 1999.
279 pages.

Reviewed by Andrew O Lutes

This novel — the catchy title of which refers to a dye color used in a school project — has two plot lines. One is about the struggle of a middle school science teacher, Mark Edwards, to teach evolution against parental and professional opposition. The other is about the question with which one of the teacher's pupils, Cameron Wright, is faced: is getting the highly esteemed rank of Eagle Scout worth telling lies about his personal beliefs? Cameron doubts the existence of God, whereas the Scout Law insists that "[a] Scout is reverent toward God. He is faithful in his religious duties".

The dilemma that Cameron faces strikes me as unrealistic. I was in Boy Scouts and Explorer Scouts for several years as a preteen and teenager, 1969–1974. In my experience, personal belief in God was neither insisted upon nor inquired about; it was simply taken for granted. For all I know, at that time even godless Scouts who memorized the oaths and knew the knots and coasted along could have attained the rank of Eagle Scout because their lack of belief in God would not have been closely examined. Only the declaration of disbelief, not the disbelief itself, would have disqualified a Scout — primarily on grounds of disruptive non-conformity.

Throughout the book, Cameron wrestles with his conscience about whether to lie about his personal beliefs to get the Eagle Scout rank. But ultimately, in a dramatic scene in a Scout ceremony, he announces that truthfulness is the most important Scout virtue and consequently he cannot lie about his lack of belief in God. He therefore publicly turns down his Eagle Scoutship. To his surprise, he is rewarded with thunderous applause for this act of honesty and courage. Yeah, right. If only the real world were like this! In my community, every adult and every

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MEDIA REVIEW

user is presented with several sites that have been deemed of value by SCORE reviewers, including the Eisenhower National Clearinghouse (ENC) site.

Searching on the word "evolution" from the ENC site produced 651 hits. This was an unmanageable number, so I narrowed the search to evolution, lessons and activities, grades 9–12. This time I received 116 hits and could easily navigate to promising sites, including *Teaching about Evolution and the Nature of Science* from the National Academy of Sciences. Another useful site was Frank Potter's Science Gems, which provided links to many good sites on evolution, such as the site on evolution maintained by the University of California at Berkeley Museum of Paleontology. These sites include accurate information and downloadable/printable educational resources on evolution.

Users are not currently able to search the SCORE site by either California Science Standards or the National Science Education Standards. However, the resources encountered at the recommended sites are clearly in agreement with both the state and national science standards with regard to evolution.

The other areas of SCORE Science also contained some useful sites. While Kids' Corner was not especially useful for the topic of evolution, Ask A Scientist listed two scientists (faculty from California State University at Fresno and Sonoma State) who would answer questions about evolution. The Science Networks provided links to organizations such as the National Science Foundation and the American Association for the Advancement of Science.

In summary, the CD-ROM *Instructional Technology Resources for California Schools* is a valuable web-based instructional tool that provides resources for people interested in learning more about the topic of evolution. Because they contain resources for all K–12 education, the California Instructional Technology Clearinghouse and SCORE Science appear to be the most appropriate programs for people interested in exploring the topic of evolution.

Author's Address

Casey R Lu, PhD
Associate Professor of Biology
Humboldt State University
Department of Biological Sciences
Arcata CA 95521
crl2@humboldt.edu

other kid there would have scowled and muttered "what a weird kid!"

In the other plot line, Cameron's science teacher, Mark Edwards, is initially intimidated by a school administrator into not teaching evolution. But eventually, in a dramatic classroom scene, he declares evolution to be a fact. Despite the ferocious opposition of religious students, he gives the reasons, familiar to all *RNCSE* readers, why this is so. This chapter is worth reading for examples of quick defenses of evolution to present to a hostile audience. You will not convince them, but you will sound good. In general, the religious and scientific argumentation in the novel reminds me of the experiences one can have arguing in high school and college: convincing few, if any, but learning to defend oneself against verbal attack. Later, Edwards faces down the administrator who initially intimidated him, making it clear that he will teach evolution.

The two plot lines are drawn together by Cameron's mother, whom Edwards later marries. Edwards, by the way, is nerdy and balding, so his success with a beautiful woman is sure to be an encouragement to a lot of short, fat, bald, middle-aged, already gray-haired, glasses-wearing, non-macho men, like me. But it seems unprofessional of Edwards to have a sexual liaison with a woman whose son is one of his pupils. Cameron's mother is the ex-wife of a macho, right-wing, anti-evolutionist, religious fanatic. Unsurprisingly and unsubtly, the obnoxious ex-husband is in the forefront of the community's opposition to the teaching of evolution.

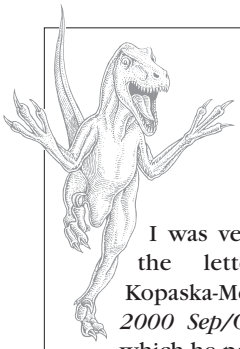
Although *Duck Egg Blue*'s topic will please non-theists and proponents of science, I must honestly give the novel as a whole a negative evaluation. Its simplifications are too vast. The religionists/anti-evolutionists are portrayed as simple-minded and hard-edged people incapable of effectively answering the open-minded and charming proponents of science. In real life, we are all acquainted with both creationists and science proponents of nice and nasty varieties. And, as we know, religious apologists, including anti-evolutionists, can concoct ingenious, though factually wrong, answers to whatever science proponents say to them. Duane Gish, the master debater of the ICR, has made a career of doing so. Anyone who underestimates his ability to make convincing-sounding (though erroneous) retorts will soon be rudely awakened.

As you might guess in a novel this simplistic, the good guys win in the end. Edwards, the science teacher, keeps his job and continues to teach evolution and even gets the girl. Cameron, although he never attains the rank of Eagle Scout, has everyone's respect. Right. As I said, I liked the novel's defense of science, but its characterizations of people and their interactions are much too simplified — even for a novel written for young adults. The real world is not as black-and-white as Neill pictures it.

Andrew Lutes is an active NCSE member in Ohio.

Author's Address

Andrew O Lutes
c/o NCSE
PO Box 9477
Berkeley CA 94709-0477



Letter to the Editor

I was very impressed with the letter from David Kopaska-Merkel (*see* RNCSE *2000 Sep/Oct; 20 [5]: 44*) in which he pointed out a couple of oversights in what was otherwise an excellent treatment by Ken Miller of Oklahoma's textbook disclaimer (*see* RNCSE *2000 May/Jun; 20 [3]: 30–3*). Both of his points were very well taken. However, I think that he should have mentioned another aspect of the claim that macroevolution has "never been observed". Creationists typically discount anything that can not be observed or repeated, mistakenly believing that anything not directly witnessed cannot be scientifically valid. So it needs somehow to be made very clear that inferences, based on an abundance of circumstantial evidence (especially multiple independent lines of evidence), are very much acceptable in science, and, in fact, form much of the core of modern scientific theories (atomic theory, deep structure of earth, plate tectonics, and many other major concepts). The multiple circumstantial evidence of the macroevolution of many groups of organisms is overwhelming (as Ray Sutera's article on whale evolution made clear in that same issue of *RNCSE*). Murderers are convicted all the time on far less compelling circumstantial evidence than we require to convince us of the validity of many of those major theories. It can be shown that the evidence for macroevolution is at least as compelling (and probably more so) than the evidence for virtually any other well-established scientific theory with which the creationists do not seem to have any problem. A very nice treatment of this point has been developed by the codirectors of the Evolution and the Nature of Science Institutes, Craig Nelson and Martin Nickels, in their article "How strong is the evidence for evolution? For human evolution?" A summary outline of this article will be soon added to ENSI's web site, <http://www.indiana.edu/~ensiweb/>.

Larry Flammer
flammer2@pacbell.net

The Creation-Evolution Controversy: A Battle for Cultural Power

by Kary Doyle Smout
Westport (CT)/London: Praeger, 1998. 210 pages.

Reviewed by Eugenie C Scott, NCSE Executive Director

The words *creation, evolution, religion, truth*, and *science* have different meanings by creationists and evolutionists, and arguments over definitions have been a staple of the creation and evolution controversy. Kary Doyle Smout's book is an analysis of the "c/e" controversy as a "terminology battle" and a battle of worldviews.

In some respects this book is a linguistic/post-structuralist variation on the perspective of *The Creationist Movement in Modern America* by Raymond Eve and Francis Harrold (Boston: Twayne Publishers, 1991): Smout analyzes the c/e controversy as a Darwinian struggle for cultural reproduction between competing groups within society. From this perspective, there is a conflict between cultural modernists (for whom the Enlightenment values promoting reason, empiricism, and tolerance are the grounds for decision making) and cultural traditionalists (who rely on revelation, tradition, and authority when making their decisions). Both groups seek to influence the public schools in order to influence future generations. According to Smout, language is a tool each side uses to promote its political agenda.

Smout uses the Huxley–Wilberforce debate, the Scopes Trial, and the 1981 *McLean v Arkansas* "equal time for evolution and creation science" trial as case studies to discuss two competing views of the nature and role of language. In what Smout calls the "philosophical" view, language is seen in the traditional, positivist sense of a namer of things and concepts, a "mirror of reality". Conflicts stem from the inability to communicate, understand, or agree on definitions. In the "rhetorical", or postmodernist, view — favored by Smout — words are regarded as "practical instruments used by groups of people to work out social arguments and to achieve common goals" (p x). Language is thus a means through which groups in society, by imposing their definitions on others, obtain power and authority.

The case studies Smout has selected provide illuminating examples of the role of philosophical and rhetorical strategies. Smout illustrates how in the popular image of the Huxley–Wilberforce debate, "Soapy Sam" Wilberforce works the crowd through glib rhetoric, while the noble Huxley wins the day through a sober and dignified presentation of empirical fact and logic. In the Scopes Trial, Clarence Darrow and William Jennings Bryan square off as icons representing truth versus error, reason versus belief, and science versus religion. History, of course, differs from the popular myths.

Yet Smout demonstrates how both sides in the c/e controversy employ both linguistic approaches. The (rhetorical) strategy of Scopes's lawyers was to link evolution with science, reason, knowledge, and tolerance and the state's position with religion, irrationality, ignorance, and intolerance. Bryan's side argued that evolution was scientifically unproven (in addition to being antireligious and thus opposed to the wishes of the majority). At bottom, because of different fundamental values, both sides define key terms differently, and vie to have their definitions accepted by the public as a way to promote their positions.

I found Smout's linguistic analysis interesting but somehow abstract and not especially relevant to solving the "problem" of creationism and evolution. Readers should know that I find postmodernist approaches annoying, and I may be overreacting. Certainly I can agree that the c/e controversy "is not a battle between rhetoric and philosophy, but a battle between competing rhetorics reflecting competing worldviews" (p 93), but there *are* grounds the public can use to choose between the two sides. There is an external reality beyond "competing rhetorics": either the universe and living things came into existence all at one time in essentially their present forms, or the universe we live in today has a history and living things descended with modification from common ancestors. How do we decide which view is correct?

As important as words are, they only *shape* a person's understanding of reality; they do not create reality. Measured against empirical reality, some people's views are going to be wrong, regardless of whether they are rhetoricians or philosophers. Either it is possible for 4000 feet and 24 layers of Grand Canyon sediments to have been laid down by Noah's flood, or it is not, and defining words differently will not change that reality.

Smout seems to admit, grudgingly, that evolutionists have the better argument, but like most postmodernists he focuses almost exclusively on how words are used, paying little attention to whether they correlate with something "out there".

The prospects for a resolution of the c/e dispute appear bleak, as high stakes and major worldviews are involved on both sides. Unfortunately, although he rejects the status quo — each side still trying to get the other to agree with its definitions — Smout does not provide any alternative for resolution, other than some vague suggestions at the end of the book about focusing less on truth and rationality, and more on justice and fairness.

How one can have justice and fairness without truth and rationality escapes me, though perhaps it is clear to others.

[*Originally published in* Isis *2000 Sep; 91 (3): 600–1; reprinted by permission.*]

The American Institute of Biological Sciences maintains electronic mailing lists in each state for people to discuss threats to science education. See details at <http://www.aibs.org/outreach/evlist.html>.

[Contributed by Wesley Elsberry.]

The Field Guide to Bigfoot, Yeti, and Other Mystery Primates Worldwide

Loren Coleman and Patrick Huyghe.
NY: Avon Books, 1999. 207 pages.

Reviewed by Andrew J Petto,
University of the Arts, Philadelphia PA.

There is nothing as exciting as discovery, and nothing as stimulating as the quest to be the first (or only) person to succeed in identifying new organisms — of going beyond the limits of contemporary knowledge to expand into new territories. Fueled by the monumental work of the naturalists and explorers of the past three centuries, we have added thousands of fascinating and previously unimagined organisms to the catalog of living things.

These naturalists and explorers collected specimens and produced detailed scientific descriptions and sketches, but they also recorded indigenous folklore about local wildlife and plants. Modern scientists who study this folklore recognize that only some of the attributes ascribed to local wildlife stand up to scientific scrutiny. This is because legends about these animals serve important social and cultural functions. For example, Tujela (1987) shows how the perception of the turkey changed from an intelligent, elusive quarry to an absurd, pitiful outcast.

Driven both by the thrill of the quest and by tantalizing descriptions of unusual humanoid beasts, Coleman and Huyghe have produced the archetypal "field guide" to these elusive "primates". The authors are buoyed by the knowledge that some accounts by indigenous peoples of mysterious beasts have proved true and that some previously unknown and unimagined animals have been located — from time to time. This book looks like any other field guide you might pick up. It has drawings, maps, tracks, descriptions of the organisms, and the details of the most prominent sightings or evidence. The material is organized by regions, with drawings of the current and historic ranges of the "mystery primates" in question.

This is not an anti-evolutionary book, but the use of evolutionary theory and evolutionary ecology to support the book's thesis is decidedly not mainstream. Coleman and Huyghe spend a considerable amount of time explaining the evolutionary pathways that could have led to the radiation of these "mystery primates". They even construct a sort of taxonomy that revises the Hominidae into nine tribes that each contain several genera — with the "mystery primates" among them linked to specific ancestral lineages in the fossil record.

The most significant error is the authors' confusion of the "single-species hypothesis" — a hypothesis that only one hominine species could exist at any time and which was based on the relative scarcity of human fossil material roughly through the 1970s — with the competitive exclusion principle:

> For decades anthropologists have held firmly to a rule of thumb called the Single Species Hypothesis when

> looking for our fossil ancestors. That hypothesis essentially states that only one species of a particular kind can inhabit a specific ecological niche at any given time because of competition for food and other resources. But over the past 20 years that view has steadily crumbled.

Although it is true that the single-species hypothesis has been abandoned by the discovery of many new hominine fossils, the authors give the misleading impression that it is the competitive exclusion principle that has been abandoned.

Furthermore, modern paleoanthropologists generally do not regard any particular fossil specimen as *the* ancestor of any other particular specimen. However, Coleman and Huyghe seem quite comfortable making direct links between, for example, *Paranthropus* and "Neo-Giants", such as Sasquatch, or between *Gigantopithecus* and "True Giants", such as *gilyuk, orang dalam, misabe,* or *chenoo*.

Even though this is not an anti-evolutionary book, it is not a scientific book either. True to the long tradition of pseudoscientific "research", the authors seem to accept almost any claim as "evidence". They provide detailed descriptions and drawings of organisms reconstructed from traces presumed to be tracks or footprints. Often the descriptions and classifications are based on "eyewitness" accounts. The authors' chief rationale for accepting this "evidence" at face value is summarized near the end of the book:

> Could there be other primates as yet undiscovered by science roaming the world's wilderness areas? Absolutely. Throughout the twentieth century new primates continue to turn up at an astounding pace. Everything from large monkeys to small prosimians are [*sic*] being discovered (p 172).

Indeed. There is one important difference, however. These newly discovered primate species were found only recently because scientists began looking for them only recently — in systematic and intensive surveys meant to characterize the entire ecological community in which they lived. With the possible exception of the mountain gorilla, their discovery is not the vindication of indigenous accounts of strange, mysterious creatures roaming the wilderness. In contrast, systematic scientific surveys have failed to confirm the existence of any of these "mystery primates".

Coleman and Huyghe do admit that the lack of concrete evidence is a serious problem for their position, and they lament the fact that to "prove" their point someone will undoubtedly have to produce a carcass — or at least, they say, quoting advice from anthropologist Grover Krantz, "cut off the biggest piece [one] can carry and then go for help to retrieve the remainder" (p 178). Of course, that would help to identify the taxonomic status of the organism. But if the experience of the infamous Japanese "plesiosaur" is any indication, any scientific study that refutes the claim of a "mystery primate" would be vigorously and persistently discounted (see Kuban 1997).

The authors provide eight pages of "case sources" — reports of "mystery primates" — and eight pages of resources organized by region. There are also eight pages of bibliographic references, many devoted to the discovery of "new" primate species. However, the only reports in peer-reviewed scientific literature on the so-called "mystery primates" in this field guide are those that conclude that there is no convincing evidence for the existence of such organisms. The same is true for this book — it has no scientific value as a field guide.

On the other hand, anyone interested in how legends and animal lore intersect with modern scientific research would find this to be an intriguing volume. It is an extensive, if uncritical, catalog of all the variations on the "mystery primate" theme organized geographically and annotated extensively. My copy is on the shelf next to White's (1984) *Book of Beasts* and Merian's (1998) *1300 Real and Fanciful Animals*.... And I have reserved more shelf space for what I expect to be equally intriguing volumes written or co-authored by Patrick Huyghe — field guides to extraterrestrials (1996), UFOs (Stacy and Huyghe 2000), and ghosts and other apparitions (Huyghe and Evans 2000).

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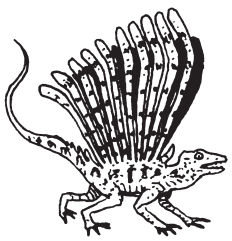
Author's Address

Andrew J Petto
Division of Liberal Arts
University of the Arts
320 S Broad St
Philadelphia PA 19102-4994
ajpetto@uarts.edu



Robot Descendants Evolve Locomotor Adaptations

Andrew J Petto
NCSE Editor

In a project conducted at Brandeis University, a computer following an evolutionary model produced 3 distinct lineages of robot descendants. The computer program began with a list of materials, a description of the physics of the environment in which the descendants would operate, and a practical problem to solve in that environment — successful locomotion. There were, however, no instructions for assembling or using the parts. It was up to the computer program to combine the materials in a way that would lead to successful locomotion in the environment it faced.

The program created many designs and evaluated them for their potential success — whether they could produce successful locomotion. Most were discarded, but those that were the most successful were retained and modified further in future "generations". What is perhaps most interesting from the point of view of evolutionary biology is that the computer program developed designs for several different forms of locomotion — swimming, rolling, repeating action (ratcheting) — which developed into different "evolutionary" groupings.

Once the designs were complete and a model was produced by a prototyping machine, humans intervened to insert a working motor. Otherwise, the design and construction of these lineages occurred without external intervention — the computer program evolved and tested new variations of existing designs, then rejected all but the most likely to succeed, building new variations on the most successful designs of earlier generations. Here is another example of how the mechanism underlying natural selection can produce novelty and divergence in successive generations of descendants.

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[Thanks to John M Lynch for alerting NCSE to this story.]

Variation and Selection Improve Machines Too!

Andrew J Petto
NCSE Editor

Readers of *RNCSE* may recall research in the late 1990s that used the principles of variation and selection to produce a self-organizing system of circuits on a computer chip (*see* RNCSE *1997; 17 [6]: 30*). Now this model of evolutionary change has been applied to help engineers at the University of Wisconsin in Madison to improve the designs of high-performance engines. The goal of this research is to use computer models of "genetic" algorithms to decrease fuel consumption and pollution. The computer models were created by Peter Senecal, a post-doctoral engineer at UW-Madison, and are described in the *International Journal of Engine Research*.

The process begins with five "individuals" that have a range of values for the six characteristics of the engines to be tested. Four of these are subjected to selection; the fifth serves as a baseline to measure change. A computer model examines all the performance characteristics of the four individuals in the selection process, and selects the two fittest "parents" to "reproduce". These produce a new generation, formed complete with "mutations". The process continues until "fitness" — defined by improved performance on the six characteristics — is maximized.

The benefit of using computer modeling for this process, of course, is that the computer can sort through and evaluate thousands of combinations of characteristics in possible engines to chose a few hundred of the best combinations. According to Senecal, human engine designers normally concentrate on optimizing one characteristic, and end up making the other characteristics worse. Senecal's latest diesel-engine model tested at UW-Madison's Engine Research Center reduces nitric oxide emissions by 67% and soot emissions by 50% over the best technology now commercially available. In addition, the model uses about 15% less fuel. The success of Senecal's program has opened the door to the development of similar selection-based research projects on engine design.

[This article was prepared from a University of Wisconsin in Madison news service bulletin. For more details connect to <http://www.news.wisc.edu/releases/view.html?id=5037&month=Jun&year=2000>.]

WEB LOCATIONS VISITED IN THIS ISSUE

NEWS ITEMS

TOPIC Senseless in the Senate
OWNER *American Geophysical Institute*
LOCATION <http://www.agiweb.org/gap/legis107/evolution_update0601.html>
LAST VISIT October 4, 2001

TOPIC Louisiana Resolution Equates Evolution and Racism
OWNER Louisiana Legislature
LOCATION <http://www.legis.state.la.us/bills/byinst.asp?sessionid=01RS&billtype=HCR&billno=74>
LAST VISIT October 3, 2001

BOOK REVIEWS

TOPIC Icons of Evolution
OWNER Unification Church
LOCATION http://www.tparents.org/Library/Unification/Talks/ Wells/0-Toc.htm
LAST VISIT September 29, 2001

RESOURCES

TOPIC AIBS State Evolution List Servers
OWNER American Institute of Biological Sciences
LOCATION <http://www.aibs.org/outreach/evlist.html>
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Reports of the National Center for Science Education (RNCSE) welcomes contributions from its readers and from anyone interested in issues related to evolution as the foundation for the biological sciences, to the place of evolution in the science curriculum, or to the public perception of scientific method and practice. These contributions may be submitted in one of two forms.

News, commentaries, and features describe events or experiences that we wish to relate to our readers and members. These may include reports of school-board elections or local organizing by parent and teacher groups, political or governmental decisions and policies, first-person accounts of experiences with anti-evolutionist speakers, curricula, or organizations, other reports of information related to our primary concerns of promoting good science in education and public life, and, of course, humor related to creation/evolution issues.

Articles include book reviews, scholarly articles, and formal essays. These may explore specific arguments raised by anti-evolutionist scholars, relate new information that may be helpful in promoting evolution, or present original research related to the public understanding of evolution. We also welcome case reports and classroom action research that assess the outcome(s) of strategies for strengthening the understanding of evolution in educational practice.

All articles should be written for a general audience, and authors should provide definitions or descriptions for technical terms and concepts that might not be understood by a non-specialist. All article manuscripts are submitted to reviewers for comments on their technical content and suitability for a general audience. Acceptance for publication does not take into account the author's formal academic background or profession. We encourage query letters from any prospective author.

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5. Reference sections are alphabetical and should conform to the citation-sequence format in *Scientific Style and Format: The CBE Manual for Authors, Editors, and Publishers*, 6th ed., illustrated in the following examples:

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   Kuban GJ. Sea-monster or shark? An analysis of a supposed plesiosaur carcass netted in 1977. 1997; Available from <http://members.aol.com/paluxy2/plesios.htm>. Last accessed March 28, 1997.

   Smith FZ. Geocentrism re-examined. *Journal of Nice Things* 1985; 21 (3): 19–35.

   Waters IC, Rivers HI, and others. Swept away in a flood of enthusiasm [editorial]. *Reports of the National Center for Science Education* 2995 Jan-Feb; 1015 (1): 22–9.

   Zubrow E. *Archaeoastronomy*. Orlando (FL): Academic Press, 1985.

   Do not abbreviate names of publications. Include location of book publishers, and use the abbreviation "nd" for undated material. Multiple entries by the same author are listed in the bibliography in chronological order and those in same year are listed as: 1982a, 1982b, and so on.

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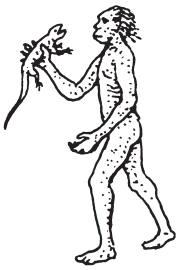

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