

# REPORTS



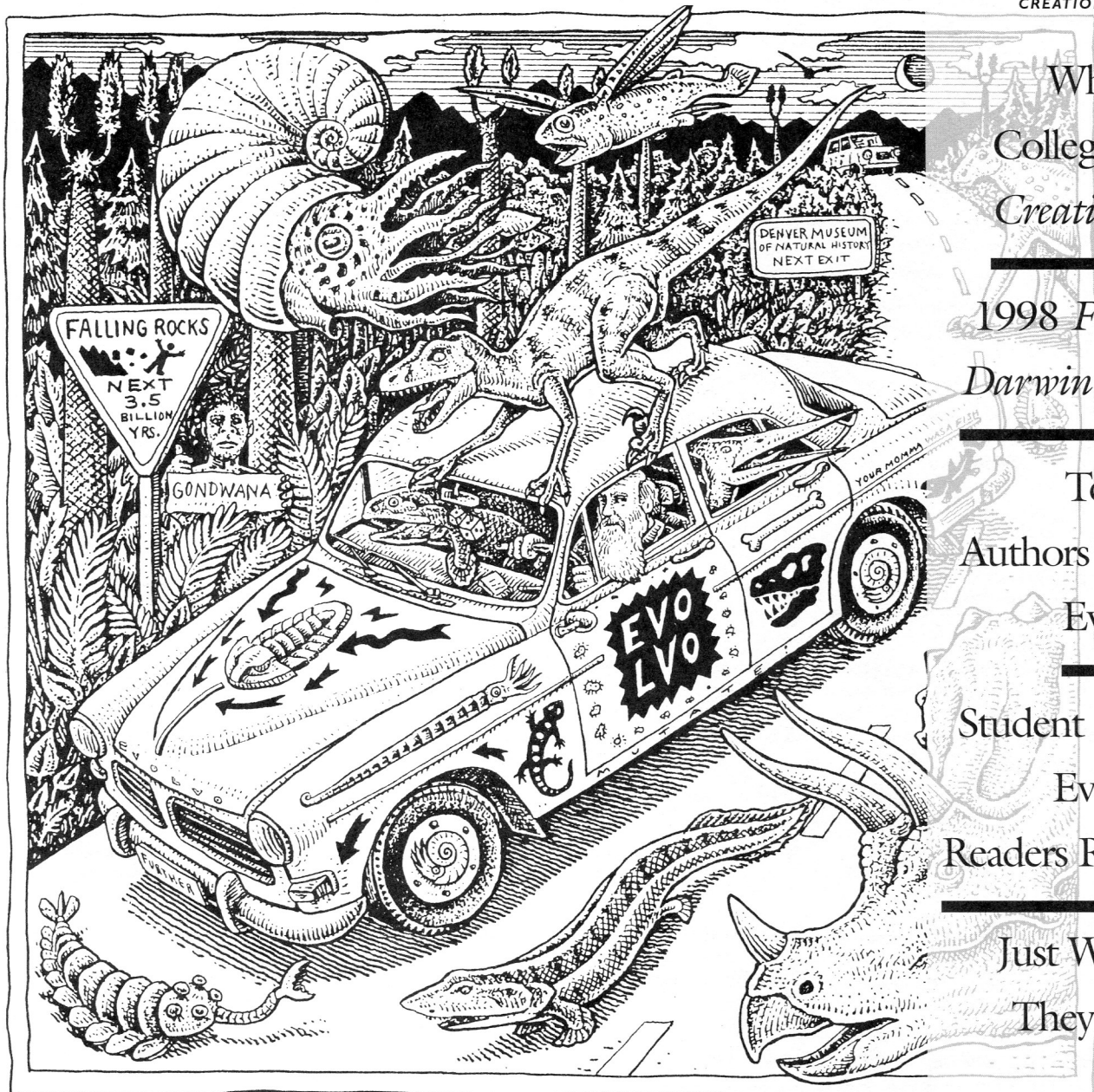
OF THE

NATIONAL CENTER FOR SCIENCE EDUCATION

Volume 19, Number 1

JANUARY/FEBRUARY, 1999

CONTINUES  
NCSE REPORTS &  
CREATION/EVOLUTION



DRIVIN' WITH DARWIN...

Whitworth  
College Holds  
*Creation Week*

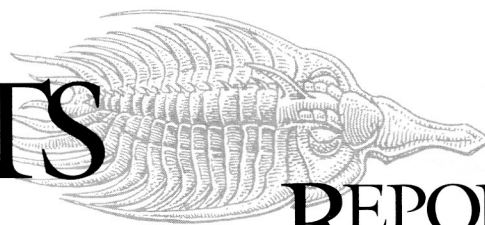
1998 *Friend of  
Darwin Awards*

Textbook  
Authors Defend  
Evolution

Student *Belief* in  
Evolution:  
Readers Respond

Just What Do  
They Say, Dr  
Morris?

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OF THE  
NATIONAL CENTER FOR SCIENCE EDUCATION  
CONTINUES NCSE REPORTS & CREATION/EVOLUTION

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*Printed May, 1999*



This issue, *RNCSE* 19(1), brings us a number of changes. Some represent taking up new directions and ideas; some represent ending old relationships and habits; and others represent picking up threads that began early in the life of the current format.

#### NEW DIRECTIONS

One of the most obvious changes is in the format of the centerfold. This is where we tell our readers about important benefits for NCSE members such as book sales, special trips, and special discounts or other services available to them. Several times in the past 2 years we have experimented with a 4-page centerfold to concentrate all these items in an easy-to-find location, and beginning in this issue, this format becomes standard.

One new feature of the centerfold is a copy of one of our NCSE brochures, *What We Do*. These brochures are available on our website at <<http://www.natcen-sci-ed.org/broclist.htm>> and also by writing or calling NCSE. However, some readers may not know how useful the brochures can be as resources for promoting good science education in their communities. We will publish several of our brochures in a 1-page format in each volume. Placing them on the first page of the 4-page centerfold means that readers can remove the page for photocopying without damage to the adjacent article(s).

The second new feature of the centerfold is the calendar of events in the *On the Road* listing. This calendar will alert members when an NCSE presentation is coming and where; and Ray Troll's fanciful conveyance — the *Evolvo ó* — will grace this feature in each issue. If one of these events is near you, you are invited to drop in to show your support. What's more, you might even be able to arrange a side trip for the speaker to visit your group or community. Check with the NCSE office to see if such an arrangement is possible.

The third new feature of the cen-



terfold is a new membership form. This form complements the form on the back page (which also serves as an order form for back issues). As with the reprinted brochures, this form is laid out so that you can remove it from the issue and use it or pass it on without losing other information you may want to save. We hope that all three of these features make using *RNCSE* easier.

#### SAYING GOOD-BYE

With this issue we also say goodbye to Melinda Carr who has served as production editor for most of the last 3 years. Melinda is located in Madison WI where the editorial office operated from November 1995 through August 1998. She was very helpful in fine-tuning our layout and production process as we made the transition into our new format. We will miss her, and we appreciate all the help, advice, and flexibility that she was able to provide us over the years she served NCSE in this capacity.

#### PICKING UP THREADS

One of the benefits of moving production back to the Bay Area is that we are fortunate to have Debra Turner serve as our production editor. Many of you may remember that Debra was the designer who gave *RNCSE* its look and worked out the details of the new kind of publication that NCSE would produce when we combined *Creation/Evolution* and *NCSE Reports*. Debra also pitched in to do the production work on *RNCSE* 18(3) as we moved the editorial office to Philadelphia. So, this is more of a "welcome back" for Debra.

#### IN THIS ISSUE

Another thread from the inaugural issue in the new format (*RNCSE* 17[1]) is the argument made by consulting editor Brian Alters that teaching students to believe evolution is an important goal of science education. Brian received several responses, both directly and through the editor's office. This issue prints 3 of those responses along with Brian's replies.

We also welcome back old friends Bill Bennetta and William Thwaites. Bennetta provides an update on the state of anti-evolutionary influences in textbooks, and Thwaites reports on the possibility that courses in a university's extension program may escape the scrutiny given the content and teaching in regular departmental curriculum.

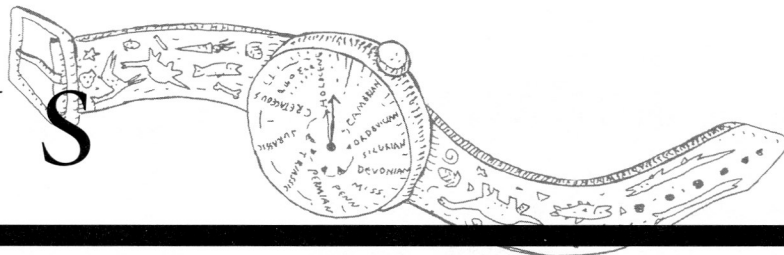
Dean Jacobson reports from Whitworth College on the recent "Creation Week" events, including some unscheduled meetings with administrators from Whitworth and neighboring schools. We also carry the NCSE "Textbook Authors' Statement" which reaffirms the role of evolution in science and in science education. This statement was recently presented at the annual meeting of the National Science Teachers' Association and is signed by a number of authors of life sciences textbooks. This is another resource that you may use, for example, during textbook adoptions in your state or district.

And we also have your letters! We love to hear from you.

*Anj Petto*

[*RNCSE* 19(1) was printed in May 1999.]





## Stephen Meyer and Creation Week

Dean M Jacobson  
Assistant Professor of Biology  
Whitworth College, Spokane WA

### SETTING THE STAGE

Soon after coming to religiously-affiliated Whitworth College to teach microbiology and join an evolution-friendly biology department, I learned that we had a highly vocal creationist among us — a philosophy professor named Stephen Meyer. I had not previously encountered a creationist colleague, and since I do not delight nor excel in verbal skirmishes, I did not relish the prospect of dealing with Meyer.

During my first 5 years at Whitworth I had only one meeting with Meyer — a chance encounter in the science building stairwell that stretched to 45 frustrating minutes. I remember his describing *Archaeopteryx* as a “mere mosaic”, definitely not a transitional form, and making the “no new phyla after the Cambrian explosion” argument. I was surprised that he was unfamiliar with the term neoteny and most of the molecular points I made. I was later reunited with his arguments by reading the creationist high school text *Of Pandas and People*. Meyer and I have since remained cordial, if distant, until “our” (or more accurately “his”) recent Creation Week.

### CREATION WEEK: THE PROPOSAL

Creation Week grew out of a proposal by Meyer to schedule 1 or 2 fora (all-campus student assemblies) involving two off-campus speakers, one on Monday and the other on Friday; Meyer would

select one speaker and the Biology Department the other. Meyer chose University of California law professor Phillip Johnson, author of several anti-evolution books. The Biology Department chose Brown University biologist Kenneth Miller, who had successfully debated Johnson on William F Buckley’s *Firing Line* program. Months later, the week before Creation Week, we had the unpleasant surprise of learning that, in addition to Johnson, Meyer had scheduled (without our knowledge) 4 other “intelligent design” (ID) speakers resulting in 8 events featuring creationists, and only 2 with evolutionists. Further, the brochure titled the event “Detecting Design in Creation”. Consequently, members of the Biology Department were furious, both because we had not been consulted about these 4 additional creationist presenters and because we were concerned that students and others would conclude that this bias reflected an official institutional position.

### ON TO CREATION WEEK

Johnson’s lecture began Creation Week on November 16, 1998. Johnson apparently predicted the nature of his audience well; most students seemed to respond enthusiastically to his energetic, engaging delivery and swallowed his bogus strawmen without hesitation (a student told me later that he still resented the way evolution had been taught in high school, a complaint that must have some validity). Some, my students among them, resented Johnson’s distortions and oversimplifications.

Johnson preached a view of science as a struggle between two opposing sides — one having the freedom to follow the evidence

wherever it leads, the other being blinded by a naturalistic world view which excludes the possibility of God. He characterized all Christian Darwinists as hopelessly indoctrinated into an extreme version of materialism. He says they are enslaved by a Darwinian power structure which smites dissidents with loss of funding and reputation, and they are thus unable to think objectively!

Although feeling a bit nauseated at this point, I continued to take notes. Johnson built a strawman version of neodarwinism, characterizing it as merely a deduction based on materialistic assumptions with no need of evidence beyond what is necessary to persuade (naive) students. To underline his contention that there exists no middle ground between a (his) proper Christian rejection of evolution and an atheistic acceptance of it, he compared the mindless forces of natural selection to John 1:1: “In the beginning was the Word”, not, “In the beginning were the particles, and then you get human beings” (this got a big laugh).

After stating that “anyone can learn enough to make up their minds about evolution in a few days”, Johnson nonetheless demurred “I can’t run through too much evidence; there is not enough time, and I don’t want to bore you”. His one example without which evolution utterly collapses was the “peppered moth story”. Big deal, he said, no new structures or increased diversity is involved. Further, Johnson charged that the data were fraudulent, the whole thing is a hoax, based on a report in a recent (uncited) issue of *Nature*: “The moths don’t even sit on tree trunks; they were put there by scientists!”

By this time, I was thinking that if this was the best Meyer could



come up with, the ID movement was in real trouble. Perhaps I was witnessing a Darwinian principle: Johnson did not have to be "perfect", he just had to be "good enough" (to fool his naive audiences). Johnson ended his talk with two opinions: "Scientists know deep down they can't win" and "It ain't the things you don't know that will hurt you; it's the things you do know that ain't so." In a presentation later in the week, he urged his audience "not to be deceived" by what Miller would tell them. Afterwards, an emeritus Whitworth biology professor told me that he was appalled by such unabashed ideological merchandizing, feeling it was a singular disservice to our students.

During the week Meyer and Johnson breakfasted with the deans of Whitworth College and neighboring Gonzaga University (where Johnson also spoke) and made a pitch for the hiring of ID faculty in biology departments. These colonizers would in effect be "wedges" in a good position to influence subsequent recruitment of like-minded biologists. While I can imagine the frustration experienced by these IDers at their failure to be taken seriously by the scientific community, they seem to be overlooking the way science works: the theory with the greatest explanatory power and which provides the most fruitful research strategy is (provisionally) accepted. The shortcomings of ID theory are substantial, and it hasn't yet *earned* a place in academia. To "wedge" ID into the universities before it has earned a place is not only premature, it's cocky.

The next day Scott Minnick from the University of Idaho in Moscow gave a science seminar (with 5-10 times the normal audience size, dominated by first-timer, off-campus folk). In a polished, well-illustrated presentation, Minnick described the structure, assembly, and genetic control of the bacterial flagellum. Minnick's presentation was as detailed and comprehensive as seminars I have attended at MIT. However, he stressed trivial details, such as the

high rotation rate of the flagellum, failing to mention that such high rates are not so extraordinary given the small scale of the structure, and was rewarded by oohs and ahs; one person even asked him, obviously awestruck, to repeat the 30 000 rpm figure. (I suspect the fact that a bacterium stops in the space of an angstrom would have seemed equally impressive to this audience.) He concluded his straightforward lecture by saying simply, "This is too complex and intricate to have resulted from natural processes."

When I asked Minnick why he failed to mention the similar spinning mechanism of the enzyme Atpnase, he had no answer. He also failed to see the relevance of the structural similarity and apparent homology of a bacterial cell division protein (FtsZ, which links up into rings) and a eukaryotic cell division protein (tubulin, which also links up into rings, sheets and tubules). However, earlier I had been able to force Meyer to concede that this example offers an instance of a protein's developing a novel function, since tubulin is involved in many other activities besides cell division.

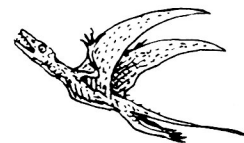
Immediately after this seminar, the two sides (Johnson, Meyer and Minnick vs the Biology Department 4 plus Dean Howard Stein) sat down to chat over coffee and brownies. After 2 hours of talking past each other, the only point of agreement we reached concerned the details of how a design-oriented science "freed from the chains of naturalistic blinders" would improve its productivity. After repeatedly being asked the question, Minnick finally admitted that his own scientific strategy would be the same regardless of his taking a Darwinian or anti-Darwinian perspective. Johnson and Meyer also made a guest appearance in an evening science and society "Core" course (a required non-major course), an event that again brought in twice as many off-campus visitors as students.

Finally, Friday brought evolutionist Kenneth Miller to the podium; he presented a whirlwind

slide-illustrated talk that touched on 4 basic questions: "Has life remained constant? If not, how has life changed? How long have humans been on earth?" And, "Can you approach such questions by science?"

Miller described 2 ways that creationists attack evolution: First, some say that it's all wrong (the ICR approach). In dealing with the concepts of "young earth" and "flood geology" Miller used some clever tactics, 3 of which I will describe. First, the complete list of radioactive nuclides was examined, revealing that only those elements with a half life of less than 80 million years are present on earth, implying an age much older than 6000 years. Second, given that a young-earth explanation for earth's huge sedimentary rock deposits is a global flood that sorted dead animals according to their sinking rates (that is, according to Morris of the ICR, spherical, streamlined objects such as sea urchins sink to the deeper strata), how does one explain the fact that sea urchin fossils are most abundant in the most shallow strata? (After all, sea urchins are not known for their ability to run to higher ground.) Finally, Miller proposed that large Jurassic coprolites (fossilized dinosaur dung) provide a potentially useful test of young earth assumptions, since these assumptions would imply that the remains of "modern" looking mammals such as rabbits might be embedded within the coprolites.

Miller then suggested that the second creationist approach is to turn the tables and describe Darwinian evolution itself as a creation myth and pronounce it to be scientifically invalid, having a flawed methodology and a materialistic bias. This is Phillip Johnson's strategy. Miller challenged the notion that all "types" of creatures were independently created by documenting some striking transitional forms, including some freshwater Mekong River snails, the horse tree (noting that, lacking the context of the tree, the small browser that was once called *Eobippus* would not be recog-





nized as a horse at all), and the famous rhipidistian lobe-fin fish/amphibian transition. Johnson had written that Darwin himself would have been disappointed if the soft body parts of an ancient amphibian could be examined. In fact, such a fossil has been found, revealing internal fish-like gills unlike those found in modern amphibians. Finally, Miller displayed a set of data showing the gradual, seamless increase in an unidentified organismal trait over time, then revealed the trait: cranial capacity from Australopithecines to species within the genus *Homo*.

In conclusion, after alluding to recent, cited studies that indicate the actual rate of beneficial mutations in bacteria is sometimes 107 times greater than would be needed to account for the general time course of fossil change, Miller stated his take on Richard Dawkins, the arch-enemy of creationists. Miller (like myself) greatly respects and enjoys Dawkins's thinking on evolution, but criticizes him for his second agenda, actually an extra-scientific conclusion: that the cosmos is necessarily a place of "blind pitiless indifference", devoid of God. According to Miller, Dawkins and the creationists both make the same mistake: they limit God (or the concept of a deity) to a being who must, to use the pool table allusion, hit each ball into the pocket, rather than one that can clear the table with one shot. In other words, to use Miller's phrase, "They think too little of God." Then Miller surprised many in the audience by revealing his Christian, Catholic faith, and his belief that God had enabled a process of evolution that ultimately resulted in an organism, endowed with free will and free choice, that could know and serve God.

The final event was "Homology in Biology: Common Descent or Uncommonly Designed?", a talk on molecular development by Jonathan Wells, who has PhDs in molecular biology and religion. He explored the expression of apparently homologous homeobox genes (master control genes that

trigger the expression of many other genes during embryonic development), concluding that since the targets of such genes differ (a mouse gene controls brain formation while the equivalent fly gene influences the head) they cannot be used as evidence for common descent. As a parting shot, I asked him how he interpreted the interchangeable nature of two homeobox genes that control eye development: *eyeless* in fruit flies and *pax-6* in mice. Wells, predictably, gave no ground; he saw no evidence of common descent in this admittedly remarkable experiment.

Despite my fear that students would be misled and confused by Johnson and the lopsided schedule of the week, it appeared that at least some students were offended by the skewed approach. The high point of the week was an informal Q and A session between Miller and an overflow classroom on Friday afternoon. The questions were respectful but bold and sincere; the answers were presented both eloquently and compassionately. Fortunately, Miller was able to describe the recent whale transitional discoveries (assisted, ironically, by an overhead transparency provided by a creationist speaker, since the room was too bright for Miller's whale slides) and elaborate on how he personally manages the perilous balance of faith and science. I could not have imagined a better, more effective person than Miller to represent evolution on the Whitworth campus; students responded with great appreciation of him, and at least he got the last word.

Still, Creation Week may have done more harm than good, in that it suggested to the local news media that Whitworth is a refuge for anti-evolutionary ideologues. Such a reputation, in my opinion, is not in consonance with the college motto, "an education of the heart and mind", and may ultimately cost the Biology Department its best recruitment prospects, be they students or staff.

Meyer has undoubtedly benefit-

ed personally from being perceived in the eyes of certain creationist patrons (including a benefactor of Whitworth College) as a leader who courageously spearheaded a confrontation with his Darwinian opponents. As a result the forum increased the visibility and credibility of the ID movement in the minds of some undecided students. This is in keeping with Meyer's directorship of the "Center for the Renewal of Science and Culture". CRSC is a part of the Seattle-based Discovery Institute, a right-wing think tank, and seeks the "overthrow of materialism" — that philosophy of "Charles Darwin, Karl Marx and Sigmund Freud" that "undermined personal responsibility", portrayed humans as "animals or machines", and "spawned a virulent strain of utopianism" and "coercive government programs" (<<http://www.discovery.org/crsc/aboutcrsc.html>>). Clearly, Meyer's intelligent design agenda appears to be just a tip of a much larger iceberg.

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## UPDATES

**California, Oakland:** On January 27, 1999, the Oakland Board of Education granted permission for an elementary school to be converted to a "Waldorf" charter school (charter schools are public schools which, under special conditions, depart from standard curriculum). Though one board member objected to experimenting with an approach that has "no track record", another argued, "We need to give this school an opportunity to succeed" (*Oakland Tribune*, January 29, 1999, local section, p 2). The Waldorf science curriculum contains many out-



moded and erroneous teachings — for example, that colors result from a conflict between light and darkness and that matter is composed of the four “elements” of earth, air, fire, and water (*NCSE Reports*. 14[4]: 20-1). The curriculum is based on the spiritual teachings of Rudolph Steiner and a lawsuit has been brought against other California districts that chartered Waldorf schools, on grounds that they are violating the First Amendment. NCSE Executive Director Eugenie C Scott has been asked to appear as a witness.

**Idaho, New Plymouth:** On April 12, 1999, the New Plymouth School Board approved a policy on “Origins of the Universe, Solar System, Earth, and Life”. The policy states “[I]t is appropriate that weaknesses as well as strengths of Darwinian theory be honestly acknowledged” and concludes with a paragraph listing ways in which “some scientists do not agree with the mainstream scientific community.” This board had presented an anti-evolution resolution rejected by the Idaho School Boards Association in 1998 (see *RNCSE* 18[4]:5-6, 18[6]:5). NCSE member Terry Maley and an organization of “concerned scientists” had sent the school board a detailed discussion of errors in the policy, which was also opposed by the state ACLU.

**Kansas, curriculum standards:** NCSE members report that, while the State Board of Education continues to consider curriculum standards for various subjects, opponents of evolution have not waited for the report of the science sub-committee to be presented at the April 15 meeting. Instead, they expressed their opposition at board meetings around the state during the month of March, 1999. NCSE has encouraged Kansas members to keep involved in the standards process, and will report further developments.

**Kansas, Douglas County:** A group called People for Objectivity in Science and History is lobbying school board candidates to teach creationism alongside evolution in public schools. NCSE member

Adrian Melott is actively opposing their efforts, both advising candidates on the issue of “fairness” in science education and conducting a public information campaign which includes satire among its methods. Melott and others have formed FLAT (Families for Learning Accurate Theories) and published a display ad “criticizing” public schools for teaching that the earth is round and for offering foreign language instruction despite the biblical explanation that language differences are a result of humans’ building the Tower of Babel.

**Michigan, Grand Rapids:** Parents of students attending Vanguard Academy have filed a suit in the District Court for Western Michigan alleging numerous church-state violations, including a second grade teacher’s refusal to teach about dinosaurs because it might offend parents, and a fifth grade teacher’s teaching “creation science”. Vanguard is one of several National Heritage Academies (NHA) that contract to run public charter schools. The plaintiffs’ attorney has consulted NCSE member Carl Bajema about the role of evolution in science curriculum. NHA literature states: “The science curriculum focuses on the Hirsch Core Knowledge sequence with supplemental material necessary to meet the state objectives” (<<http://www.heritageacademies.com/vision/Academic-Excellence.asp>>). Both the Core Knowledge curriculum and Michigan curriculum standards call for teaching evolution.

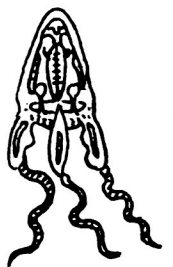
**Missouri:** A proposed amendment to the state constitution’s prohibition on funding of religious schools has stalled in the House Education Committee. If the amendment were passed, the teaching of religious beliefs such as “creation science” in publicly funded schools could not be prevented.

**Pennsylvania:** Pennsylvania’s Department of Education (PDE) held hearings on its proposed curriculum standards in Science and Technology, and Environment and Ecology in February and March

1999. These meetings were conducted as “workshops” in which 15 citizens registered in advance to discuss and make suggestions about the proposed standards. The PDE also invited letters and comments via email or its web pages. The atmosphere at most of the workshops was cordial with little controversy, however the PDE reports having received a deluge of mail challenging the standards on teaching evolution. The most striking came from one of the school districts and was signed by several school board members. The comments we have been able to see are typical of the form-letter formats used in these campaigns elsewhere. They grossly misinterpret current research, misconstrue current evolutionary theory, and make proposals that violate current case law and constitutional standards. NCSE members in the state have been alerted, and we are in touch with members of the PDE to help them weather the storm.


**Washington, Burlington-Edison:** In August, 1998, after considerable local controversy, this district’s new superintendent told high-school biology teacher Roger DeHart to stop teaching “intelligent design theory” (*RNCSE* 18[3]:6). On March 3, 1999, the *Burlington Argus* reported in a front-page story that the district may reconsider some materials that were used. According to the article, Assistant Superintendent Bob Penny said, “Some of these discussions involve attorneys and some involve informal discussions with Roger.... Eventually, there will be a presentation of some of the controversial materials that might get reconsidered.... We just need to make sure anything taught at our schools goes through the proper channels first.” NCSE has already supplied the district with reviews of *Of Pandas and People*, the “intelligent design” textbook the teacher had been using, and will continue to monitor the situation.

**Washington, DC:** In a ruling issued March 30, 1999, the US District Court for Washington DC upheld a 1995 decision by the Internal Revenue Service (IRS) to



## NCSE Members Receive "Friend of Darwin" Awards

Molleen Matsumura  
Network Project Director



In 1994, NCSE established two special awards. The "Huxley Award" for contributions to evolution education was named after Thomas H Huxley, who advocated public education as ardently as he supported the theory of evolution. The "Friend of Darwin" award honors NCSE members for outstanding effort to support NCSE and its goals. NCSE's Board of Directors recognized four "Friends of Darwin" in 1998: Barbara Forrest (see *RNCSE* 17:6[31]), Jere Lipps, Betty McCollister, and Richard Trott.

Jere Lipps, Professor of Integrative Biology and past Director of the Museum of Paleontology at the University of California, Berkeley, is always on the alert for ways to improve the public understanding of science. Under his direction the Museum grew both as a leading research institution and as a leader in outreach to science teachers and the public. For example, in 1991, when the Blackhawk Quarry site was donated to the Museum, Lipps helped create a "community project" in which people from the San Francisco Bay Area could participate in the excavation of specimens. The Museum regularly conducts teacher workshops and lecture series for the surrounding community and has created a

World Wide Web site that is a fine resource for teaching about evolution.

Lipps also works hard to assure that the media accurately present science, especially evolution. Among his many activities in this area is his work with the Council for Media Integrity to encourage accountability among both news and entertainment broadcasters. He also serves on the Paleontological Society's panel of consultants who provide journalists with background information on paleontology.

Betty McCollister was actively defending evolution education even before the founding of NCSE. Long-time members will recall that NCSE was founded as an umbrella organization by autonomous "Committees of Correspondence" working to oppose anti-evolution legislation in a number of states. McCollister was a member of the Iowa Committee of Correspondence, serving as President in 1988. At that time she was in the midst of a 3-year effort to collect and edit position statements by educational, scientific, and religious organizations supporting evolution education; thanks to her, a major accomplishment of NCSE's first year was the publication of the first edition of *Voices for Evolution*.

No task has been too grand or too tedious for Betty. She has participated in countless panel discussions of evolution and evolution-creation controversies, and she has written on the topic for a variety of publications including *USA Weekend* and her regular column

in the Des Moines *Register*. In her years as a contributing editor of *Creation/Evolution*, *Reports of NCSE*, and *NCSE Reports*, she has spent hundreds of hours of painstaking proof-reading and has offered countless thoughtful suggestions, conscientiously representing the viewpoint of non-technical readers.

Richard Trott is one of those VIPs who works tirelessly behind the scenes to make sure the show goes on. He has contributed articles to NCSE publications and the TalkOrigins FAQ <<http://www.talkorigins.org>>. He has generously shared information he has gained from his research in creationist literature and his attendance at creationist lectures. Like Betty McCollister, Trott has devoted countless hours to proof-reading *NCSE Reports* and *Creation/Evolution*, the predecessors of *Reports of NCSE*. (When you heard him exclaim, "Bring on the intravenous coffee!" you knew another issue would appear soon.) A computer scientist, Rich has also helped bring the defense of evolution to cyberspace, taking an active role in organizing the information collected at the TalkOrigins FAQ.

Still an undergraduate at Rutgers University when he joined NCSE, Trott recently moved to California and had hardly arrived when he visited NCSE's office looking for ways to help. He has donated hardware, software, and programming expertise so that we could add Macintosh computers to our office equipment, adding to our flexibility and improving our

## UPDATES *continued*



revoke the tax exemption of the Church at Pierce Creek in Vestal, NY. The IRS found that the church had violated restrictions on political activity by non-profit organizations when it published full-page advertisements urging people to vote against Bill Clinton in the 1992 elections. The same advertisements solicited tax-deductible contributions to cover the costs of

advertising. With the help of Rev Pat Robertson's American Center for Law and Justice, the church sued for revocation of the decision, but Judge Paul Friedman ruled: "The IRS clearly may revoke the tax-exempt status of any organization that publishes an advertisement in opposition to a candidate for public office." The IRS policy that was upheld would apply to

endorsement of or opposition to any political candidacy, including candidates running for state and local boards of education, even when the office is non-partisan.

[With thanks to Ken Atkins, Carl Bajema, Dan Dugan, Douglas Glazier, Bruna and Laurent Lawton, and Adrian Melott.]



ability to work with graphic designers and printers on producing *Reports of NCSE* and other printed materials.

As NCSE Executive Director Eugenie C Scott has said, "NCSE depends heavily on its members for so much of the important work we do that the hard work and imagination contributed by Friends of Darwin are indispensable. This award is just a small part of our thanks."

## OFFICE BIZ

Erik Wheaton  
Circulation Manager

### Subscription alert!

Many NCSE members who renewed from August through early November of 1998 received notices with *Reports of the National Center for Science Education* Volume 18, number 5 (mailed in February 1999) indicating that they had one issue left of their subscriptions. If your copy of this issue has a "last issue" flier, this is not an error.

We base membership subscriptions on receipt of 6 issues of *RNCSE*, not on calendar dates. Usually, 6 issues of *RNCSE* are delivered in a calendar year, so the two will coincide. However, we have been behind in our publishing schedule. Catching up means that your 6-issue subscription was filled in less than a calendar year.

Members who renewed last fall had their subscriptions expire with receipt of Volume 18, number 6 (the November/December 1998 issue, mailed 3/22/99). Here is our printing history for Volume 18:

Issue	Date Mailed
18.1	9/17/98
18.2	11/24/98
18.3	12/10/98
18.4	1/09/99
18.5	2/24/99
18.6	3/22/99

That's 6 issues in a little over 6 months! We are still behind in our printing schedule and hope to catch up by the end of 1999. Thank you for your understanding, patience, and support of the NCSE.

# Textbook Authors Join NCSE in Defending Evolution Education

*On March 26, 1999, NCSE released a statement by 23 authors of science textbooks at a press conference held at the annual meeting of the National Science Teachers Association (NSTA). These authors were responding to numerous incidents over the years, in which state or local school districts have censored or disclaimed evolution in textbooks, or have decided not to adopt textbooks that included "too much" evolution (see for example, NCSE Reports 15[4]:10-11, 16[2]:1, 9, 16[3]:9, 16[3]:16, RNCSE 17[1]:5, 17[3]:8).*

*Below are NCSE Executive Director Eugenie C Scott's remarks at the conference, outlining the recent history of censorship of evolution in textbooks and describing the circumstances leading to issuance of the statement. The complete text of the authors' statement and a list of its signers are on page 11).*

Evolution has been under attack for several decades now. Neither the Scopes trial nor the Supreme Court's 1987 decision against "equal time" laws has ended the assault on evolution in the classroom. Just as the Scopes Trial was precipitated by John Scopes' using a textbook to teach evolution, so today are textbooks still under attack for including an idea considered basic to modern science.

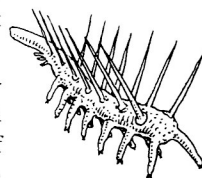
The attack upon evolution in textbooks has waxed and waned over time. After the Scopes trial, textbooks that included evolution tended not to be adopted and the subject was quietly excised from textbooks until, by 1930, it had virtually disappeared. It was brought back into textbooks during the mid-to-late 1960s as commercial publishers, inspired by the National Science Foundation-sponsored Biological Sciences Curriculum Study textbooks, began to include evolution again. By the mid-to-late 1970s commercial publishers found themselves

again under pressure to drop or downplay evolution in textbooks, and many of them, once again, bowed to market pressure. Legislation to require "equal time" for "creation science" was introduced in 24 states, and 2 states passed such legislation in the late 1970s.

Another anti-evolutionary pressure came from the state of Texas, which required that any book mentioning evolution contain a disclaimer to the effect that evolution was "theory only" — though cell theory, germ theory, and other theories were not so disclaimed. Evolution again began to become scarce in textbooks, or publishers would disclaim evolution as they did no other scientific theory with phrases like, "some scientists believe...". The age of the earth was downplayed in many books, with "long ago" and such euphemisms replacing previous, more specific statements about "millions of years ago".

Scientists and teachers protested this development, and in fact, in the late 1980s the state of California rejected all junior high life science books — because they didn't contain evolution. Simultaneously, Texas revised its directive to publishers and required that evolution be included in both geology and biology books. Publishers responded to these market forces by bringing evolution back into textbooks, and by 1995, when Texas next adopted textbooks, NCSE could honestly proclaim that "evolution is back in textbooks".

Those of us familiar with this controversy realize, however, that one cannot ever assume that the victory for sound education has been won. It is the case today that, even though the advisory National Science Education Standards and all state standards require that evolution be taught, there still exists considerable pressure on textbook publishers to downplay or dis-



claim evolution.

NCSE's records over the past couple of years show that textbooks are being rejected at the local level because they have "too much evolution". In another example, a school district asked the publishers of an elementary school book to remove a chapter discussing the evolution of the solar system. The superintendent of one district even glued together the pages of a textbook because it covered only the Big Bang, and didn't give equal time to Genesis; and in 1996, the state of Alabama required a disclaimer be pasted into the front of all biology books. This disclaimer presented erroneous information about evolution and also made the ubiquitous statement about evolution's being "only a theory". This disclaimer in one form or another has metastasized into textbooks in several school districts, and was introduced (fortunately, unsuccessfully) as legislation in the state of Washington.

Last summer, a religious right organization sent to all school districts in Texas an analysis ranking biology textbooks according to how much or how little evolution they contained — and recommending the books with the least evolution be adopted.

Scientists dislike this trend; teachers dislike this trend; and textbook authors — who are teachers and scientists — dislike this trend. To publicize recent attacks on evolution in textbooks, NCSE coordinated an effort to have the authors of all the best-selling biology textbooks join in a statement condemning disclaimers and other efforts to downplay or diminish the coverage of evolution in textbooks. These authors are university scientists and master teachers. They have all made a point of emphasizing the importance of evolution in their books, and you can bet none of them wanted their books on a "soft on evolution" list!

The books these authors have written have been published by the largest textbook publishers in the country, including:

Addison-Wesley  
Benjamin Cummings  
DC Heath  
Garland  
Glencoe  
Holt, Rinehart  
Kendall/Hunt  
Prentice Hall  
Southwestern  
Worth.

The textbook publication business is highly competitive. These

authors and their publishers compete vigorously to write the most up-to-date and interesting books, and they compete for the highest sales, but when it comes to the importance of evolution in science education, they agree; and when it comes to defending good science from sectarian attacks, they cooperate.

This afternoon, we have several of these scholars and teachers here. I want to introduce some of these authors to you, and then we'll take questions.

*[Note: Besides introducing several textbook authors, Scott distributed an information packet containing position statements by the National Science Teachers Association and the National Association of Biology Teachers. These have been reprinted in NCSE's book Voices for Evolution and are also available online at <<http://www.natcensci.org/voices.htm>>. The authors' statement on p 11 is on our website <[http://www.natcensci.org/textbook\\_statement.htm](http://www.natcensci.org/textbook_statement.htm)>. NCSE wishes to thank Richard Golden for his extensive help with the Textbook Authors' Project.]*

## Jacob Eugene "Jack" Gair USGS GEOLOGIST

NCSE member Jacob Eugene "Jack" Gair, 75, an internationally known economic geologist who retired in 1987 from the US Geological Survey, died Jan 1 at his home in Kensington MD. He was born in Pittsfield MA and grew up in Lee. He attended the University of Rochester before and after his service in World War II where he received a BA degree in Geology and English in 1946. Dr Gair earned his PhD in Geology from Johns Hopkins University in 1949.

He taught geology at the University of Oregon from 1949 to 1952 and joined the USGS in 1952, working out of a USGS field office

in Iron Mountain MI. From 1954 to 1956 he lived in Belo Horizonte, Brazil, undertaking geologic studies of iron deposits in the Itabira District. He returned to the USGS and from 1957-1968 continued research on the Marquette and Iron Mountain iron deposits.

Dr Gair moved to the Washington area in 1968 and from 1971 to 1973 he served as Deputy Assistant Chief Geologist and Acting Chief of the Office of Mineral Resources of the USGS. From 1976 until 1984 he served as US representative to an international UNESCO-sponsored project on massive sulfide deposits of the Appalachian and Caledonian mountain belts.

Dr Gair was the author of nearly

100 scientific papers, maps, and abstracts; an editor of several volumes; a Fellow of both the Geological Society of America and the Society of Economic Geologists; and a member of the Geological Society of Washington. He received the Meritorious Service Award of the US Department of the Interior in 1987.

He enjoyed photography and world travel and was active in the Science and Religion Group of the Cedar Lane Unitarian Church in Bethesda. He was also an Associate Member of the Women's National Democratic Club. Survivors include his wife of 53 years, Peggy Lou Gair; 3 children, 2 brothers and a granddaughter.



# Statement on EVOLUTION IN TEXTBOOKS *by Authors of Biology Texts*

## Evolution and Science

The coverage of evolution in biology textbooks we have written reflects the broad consensus in the scientific community. As noted in a booklet issued by the National Academy of Sciences, "Evolution pervades all biological phenomena. To ignore that it occurred or to classify it as a form of dogma is to deprive the student of the most fundamental organizational concept in the biological sciences" (NAS 1985: 22).

Our textbooks are written from this point of view. Evolution occupies a prominent position, and is covered explicitly. Many sections use evolutionary concepts to explain the diversity of living and fossil organisms, the adaptations of organisms to their environments, and similarities of structure and function shared by related organisms. In this way, we present students with the understanding of biology shared by the overwhelming majority of working scientists in the United States and throughout the world.

## What Do States Require of Biology Textbooks?

Although state requirements vary, the majority require that biology curricula must include extensive coverage of evolution. The few states where standards or curriculum guidelines do not mention evolution by name nonetheless require the coverage of evolutionary topics. If we omitted proper coverage of evolutionary facts and theories, we would not be in compliance with these and other curricula that require complete, accurate, up to date, and conceptually based educational materials.

## Our Message to Textbook Adapters

As scientists and teachers, we find it unacceptable that school districts considering our books for adoption would be encouraged to choose one book over another based on the perception that teachers should avoid the topic of evolution. **We encourage school districts deciding among our books to use genuine scientific and educational criteria.**

We also deplore the efforts made in some states and districts to require that evolution be disclaimed. Such disclaimers single out evolution from all other scientific ideas as somehow less reliable or less accepted by scientists, or as "only a theory". Evolution is a normal part of science and should be treated the same way as all other scientific ideas. It does a disservice to students to mislead them about the important position that evolution holds in biological and other sciences.

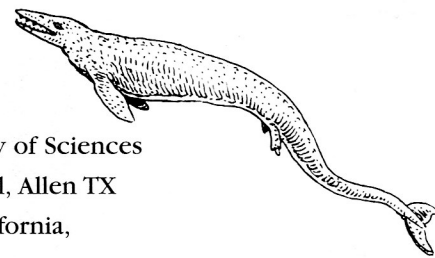
Those who have joined in this statement do so as individuals. We do not speak on behalf of our publishers, but for ourselves, as biologists, authors, and educators.

## Statement Signed by

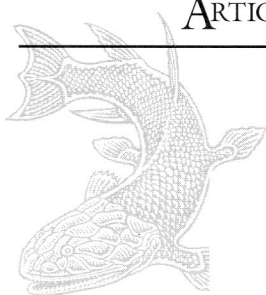
Bruce Alberts	National Academy of Sciences
Alton Biggs	Allen High School, Allen TX
Neil Campbell	University of California, Riverside
Helena Curtis	Sag Harbor NY
Michael Dougherty	Biological Sciences Curriculum Study
Carol Gontang	Mountain View High School, Mountain View CA
Paul Hummer	Hood College, Frederick MD
Alexander Johnson	University of California, San Francisco
George Johnson	Washington University, St Louis MO
William Leonard	Clemson University, Clemson SC
Joseph Levine	Science Writer/ Consultant, Boston
Marilyn Lisowski	Eastern Illinois University, Charleston IL
Linda Lundgren	Bear Creek High School, Lakewood CO
James McLaren	Newton South High School, Newton Center MA
Joseph McInerney	Biological Sciences Curriculum Study
Kenneth Miller	Brown University, Providence RI
Raymond Oram	Peddie School, Hightstown NJ
John Penick	North Carolina State University, Raleigh NC
Peter Raven	Missouri Botanical Garden, St Louis MO
Gerald Skoog	Texas Tech University, Lubbock TX
Eric Strauss	Boston College
Albert Towle	Retired, Auburn CA

National Academy of Sciences (NAS). *Science and Creationism: A View from the National Academy*. Washington DC: National Academy Press 1985.

[Authors are listed in alphabetical order;  
their institutions are listed for identification only.]







# RECAPITULATIONS

*[In the inaugural issue of Reports of the National Center for Science Education Brian Alters suggested that it was a part of our mission to teach our students more than just to understand evolution (RNCSE 1997; 17(1):15-6). He suggested it was also necessary for us to teach them to believe in it. Alters' article stimulated several responses. We print a selection of those comments here, followed by Alters' reply.]*

## J DAVID ARCHIBALD

Alters proposes that we should try to teach students to *believe* in evolution. I am sympathetic both to his wish to have students accept the basic foundations of any science, in this case evolution, and to his thesis that the words *believe* and *accept* are very similar in meaning as commonly used. This said, Alters' proposal would only serve to confound the differences between how science and other human endeavors approach the world.

When I am asked whether I *believe* in evolution, I answer no. I explain that evolution is not a belief system, such as a religion that is founded on faith, but a system of *knowing* the world through a methodology that we call science, namely empiricism. In all cases the person asking the question is a nonscientist or sometimes an undergraduate majoring in some field of science. Even if we scientists have somewhat differing views as to the nature of science, most agree that it has increased our knowledge of the world many times over. This point is very well demonstrated in the introductory remarks of Richard Dawkins's article in the same issue (p 8): "Aristotle could walk straight into a modern seminar on ethics, theology, or political or moral philosophy, and contribute. But let him walk into a modern science class and he'd be a lost soul. Not because of the jargon, but because science advances, cumulatively." It is a system of *knowing* the world around us.

Whether we wish to use *believe*, *accept*, *know*, or some other words, we must as scientists be able to explain to nonscientists how the pursuit of science differs from other human endeavors. This is the key issue — not semantic concerns as to whether *believe* and *accept* (or *know*) mean the same; for whether they do or not, science is a fundamentally different way to look at the world.

This is demonstrated well in Alters' example of the individual who builds a bridge that fails because he did not *believe* what his college physics professor told him. In this case Alters is not confusing science with belief systems based on faith, but rather is making an even more frequent mistake. He confuses science with engineering and technology. As the saying goes, in science we try to build things or ideas so that they are potentially falsifiable, while in engineering (and technology in general) we try to build them to last. Scientists and engineers, when they are being scientists, test the strength of materials and designs, both mathematical and real models, and seek to learn from past failures. Thus, the young engineer's bridge failure was not the result of being a poor scientist or even misunderstanding science, but because he was a poor engineer who did not *believe* scientifically tested calculations on how to engineer this particular bridge.

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## NINA SHINE



After reading "Should Student Belief of Evolution Be a Goal?", I am compelled to share my convictions as a public school science educator that the term *belief* or any similar concept does not have a place in the teaching of science, or in any science context for that matter. While I'll have to take Alters on his word that *belief* is synonymous with *acceptance*, my thesaurus includes *faith* as a synonym for *belief*. Semantics aside, from the religious perspective *faith* and *belief* are much more than mere synonyms — they comprise an indistinguishable, fundamental concept. It follows that for most scientists and Christians, the term *belief* has entirely different assumptions attached to it from those attached to *acceptance*.

The use of this emotionally charged term by those of us in the science community, in my opinion, only serves to reinforce the misconception that we are deliberately attempting to undermine religious belief. This is what my vocal Christian students are taught in their churches. Consequently, I have found it very practical to use alternative modes of speaking in my classroom, such as "the current scientific evidence shows..." or "according to this study..." or "so-and-so's work led to ...."

When challenged by a student on religious grounds, I have also found it especially useful to distinguish between belief and scientific evidence. I do teach my students that religion and science are two ways of knowing about the world and our place in it; that the former is absolute and founded on faith (that is, belief); the latter is flexible and based on empirical evidence, all the while acknowledging that both ways of knowing have a valuable purpose in our lives.

This may very well be quite courageous of me in today's climate, but it works. Not only does it quickly extinguish the offensive, but it also fosters a mutual respect and promotes genuine learning by expanding my students' thinking to include differing explanations. Given that the majority of conservative Christians perceives the science community, and particularly those of us in education, as their primary threat, what is the harm in allowing them the ownership of *belief*? We need not encourage our students by the choice of our words to accept our teaching on faith when the evidence clearly speaks for itself.

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## PHILIP S KEARNEY

Alters' conclusion is that "a goal of belief with regard to biological evolution be given the same rational evaluation as the goal of belief concerning other subjects that are taught in schools." In my opinion, it would be a mistake to make belief the goal of teaching of any science. In my own experience, I can remember when continental drift was "believed" by almost all earth scientists to be a crazy idea with no validity, or when Soviet biologists "believed" in the ability of humans to direct evolution by modification of the environment. Beliefs such as these were disastrous for the advancement of science and held back important discoveries or developments. Good science must be dynamic and cannot be held back by such concepts as faith, orthodoxy or heresy.

I also disagree with Alters' statement that "believe" and "accept" are synonymous "for all practical purposes". Our culture views "belief" as a moral concept. Faith, in fact, is one of the 3 theological virtues. A belief does not change, and is not dependent on reason or observation. In the Gospel of John, Jesus tells the apostle Thomas, "because thou hast seen thou hast believed; blessed are they who believe but have not seen".

### ACCEPTING EVOLUTION AS AN IDEA

One of the shortcomings of absolute belief in any idea is that it makes the believer intolerant of contrary or competing ideas. This interferes with the believer's ability to learn about new ideas and denies those who have contrary ideas an audience. As history has shown, faith can become the enemy of progress.

Acceptance, on the other hand, is tentative. The accepted idea can be superseded by new and better ideas and can even be shared with contrary beliefs. Thus, a religious person could accept evolution as a working hypothesis but continue to believe in creation as a religious obligation. This, of course, is what most church-going people have been doing for close to a century. This may not be very logical, but it certainly is no more illogical than most of religion.

Alters' argument, of course, is part of a much broader argument: that one of the goals of education should be to induce students to "believe" in a broad array of ideas and activities which are "good for them". Examples would be: that smoking is dangerous to one's health, that our country and its institutions are the best in the world, that it is wrong to have "sex" outside of marriage, and so on.

I would deny that "belief" even in these great ideas should be the "goal" of education. I think it would be preferable to stick to the facts and to teach that these are tried and true ideas and that one violates them at one's own risk. Behavior, not belief, should be the "goal".



## ACCEPTING EVOLUTION AS AN IDEA

In addition to the pedagogical objection to attempts to instill “belief” in the immature mind, there is the religious objection that evolution is a heresy. This is the motive behind the clamor to “teach evolution as a theory not a fact”. That dictum may not be extremely logical, but we understand what it means: you can teach our kids evolution, but don’t require them to believe in it. I think we can live with that. After all, evolution is too important an idea to be held hostage to theology!

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## BRIAN ALTERS REPLIES

### ARCHIBALD

I certainly agree with Archibald that science and religion are different ways to look at the world and that this distinction is important to teach to students. However, it is not my proposal that confounds the differences between how science and other human endeavors approach the world, but rather Archibald’s assertions that confound such distinctions by claiming that science is empiricism and falsificationism.

Archibald does not discuss what he means by empiricism, but if he means simply that science attempts to corroborate ideas by observations, then the explanation confounds the differences he wishes to demarcate because other disciplines, not just science, use this meaning of empiricism in attempting to corroborate their claims. For example, historians and literary scholars often appeal to observation of historical facts or corroborating textual data. If on the other hand, Archibald means specifically logical empiricism, then it should be noted that logical empiricism has been discarded.

Concerning falsification, Ernst Mayr in his 1997 book *This is Biology* states the inappropriateness of falsification:

“It [falsification] is particularly ill-suited for the testing of probabilistic theories, which include most theories in biology....And in fields such as evolutionary biology . . . it is often very difficult, if not impossible, to decisively falsify an invalid theory” (p 49).

It is the creationists that often advocate falsification as a science criterion (for example, DT Gish, *Teaching Creation Science in Public Schools* 1995; and HM Morris, *History of Modern Creationism*, 1993.)

As stated in my article, what is of importance is on which data and arguments one bases a particular belief or acceptance. Here is one example of a clear

distinction between science and creationism. In contrast to the expectations of the science community, when some creationists come across conflicting data they appeal to arguments that are based on their interpretation of the Bible, or as John Morris, President of ICR puts it: “In the scientific realm, one must interpret all scientific observations in light of Scripture” (*Acts & Facts*, March 1996).

Archibald claimed (falsely) that I confused science with engineering and technology. Archibald is correct in his labeling of Dave in my article as a “poor engineer,” not because of Dave’s grades — he did well in college — and not because of any inability to correctly construct a bridge — he could have easily constructed an excellent bridge in an orthodox manner if he so desired. Dave is a poor engineer because he wanted to build the bridge in his unorthodox manner due his beliefs concerning some fundamentals of physics. But even if Archibald is correct in stating that Dave “was a poor engineer who did not *believe* the scientifically-tested calculations of how to engineer this particular bridge,” this still illustrates my point that belief should be a goal in education, unless of course, one does not mind turning out “poor engineers”.

When a student asks me whether I believe in evolution, I often reply: “Why do you believe dinosaurs existed?” They answer with the typical rationales based on the fossil evidence. Then by analogy to their response, I discuss my justification for knowing that evolution is an accurate theory. I (and presumably Archibald) believe for good reason that evolution occurred (and is occurring); for me to state the contrary would be inaccurate. However, in the same paragraph where Archibald quotes Richard Dawkins to support one of his points, he discloses his dislike for evolution belief discourse: “When I am asked whether I believe in evolution, I answer no.” Archibald might not be aware that Dawkins holds a much stronger view than I concerning people’s belief in evolution: “It is absolutely safe to say that if you meet somebody who claims not to believe in evolution, that person is ignorant, stupid or insane (or wicked, but I’d rather not consider that)” (*New York Times*, April 19, 1989; p 35).

### SHINE

Shine contends that students may have religious associations with the word belief and therefore it should not be used in the science classroom. I never stated that teachers should use the words “belief” or “believe” in the classroom as Shine implies; I argued only that belief should be (and currently is implicitly anyway) a goal of instruction — I never discussed pedagogy.

However, even if I had advocated such a position as to explicitly use the “B” word in a science classroom, students would not necessarily relate the word to a religious context. Among most, if not all devoutly religious students, the term belief also has non-religious connotations. For example, try asking



a devoutly religious student why they *believe* OJ Simpson was guilty or innocent; the probability is extremely low that you will hear a religious reply. Relegating the “B” word to only religious applications is incorrect and to make such change for the future would require an immense social reconstruction of the meaning of the word not just in academic circles but also in general society. In three paragraphs alone in the AAAS *Benchmarks for Science Literacy*, (1993, p 5) the word “belief(s)” is used five times in discussing scientists’ views that underlie their work. And with regard to pedagogy, the National Academy of Sciences’ *National Science Education Standards* (1996) states: “Teachers also change their plans based on the assessment and analysis of student achievement and the prior knowledge and *beliefs* students have demonstrated” (p 30). Most education researchers know that the social use of a word outside of the classroom is a far more powerful conveyor of meaning than how teachers may use it in their courses, and the current social use of the word is certainly not just religious.

Shine states that “the evidence [for evolution] clearly speaks for itself.” But if we are not trying to raise students’ confidence level in the accuracy of evolution, then why are instructors presenting evidence? Instructors present the evidence because it is the justification for the belief. The AAAS states at virtually every set of their benchmarks that “Students should know that [X],” not “Students should know that most scientists know X.” To know that X (where X is any proposition, statement, or phenomenon) is, in part, to *believe* X. If a teacher is not facilitating the changing of students’ beliefs, then that teacher is not facilitating the changing of students’ misconceptions.

This is not to say that belief and knowledge are synonymous; there are typically 3 conditions for knowledge: belief, justification, and truth. With regard to the justification condition, the belief must be based on adequate grounds, where in the realm of science instruction the adequate grounds would be those used and valued by the current scientific community. The truth condition for most science instructors is a common sense condition of knowledge — it is the case that X. It would be improper for science instructors to state that their students know X with regard to science, when it is known in the scientific community that it is not the case that X.

For example, science instructors would not say that their students know that the sun goes around the earth. The students may strongly believe that this is the case, and they may have some very limited justification for such a belief — the sun appears to them to be going around the earth. However, in the scientific community it is known that it is not the case that the sun goes around the earth. As such, science instructors certainly would not consider that the students possess scientific knowledge with regard to earth/sun motion. A proper statement would be that the students believe they know that

the sun goes around the earth. This illustrates that even though belief is a condition of science knowledge, belief is not synonymous with science knowledge. If a teacher is not facilitating the changing of students’ beliefs, then that teacher is not facilitating the changing of students’ misconceptions.

# KEARNEY

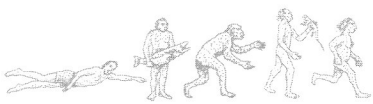
I wholeheartedly agree with Kearney that no student should be required to believe that evolution is accurate; yet I still contend that student belief should be a goal in education for reasons I discussed previously. Pedagogically this goal would be pursued by the teacher’s facilitating student belief for good reasons — appealing to the student’s sense of reason — not through anything even remotely similar to intimidation, indoctrination or brainwashing. If, by the end of the course the student still believed that evolution is inaccurate, then the student should be treated and evaluated no differently than those students who believe that evolution is accurate.

The term belief is used in non-religious connotations in all disciplines, and acceptance is no more tentative than belief. Even the Skeptics Society, certainly no bastion of religiosity, holds that “When we say we are ‘skeptical,’ we mean that we must see compelling evidence before we believe” (*Skeptic*, 1998, #1, p 9). Kearney contends that even in matters that are dangerous to students’ health, “behavior, not belief, should be the goal.” But if students do not believe that a behavior is dangerous to their health, the probability is higher that the students may perform the unhealthy behavior.

Kearney’s proposal that “a belief does not change, and is not dependent on reason or observation,” however well-intentioned, is flawed in several respects. Numerous devoutly religious people modify their religious views, or change their religion from one to another based on reason and/or observation. Many previous believers have even become agnostics or atheists based on reason and observation. Moreover, the creationists often evangelize by attempting to make evolution appear unreasonable. Even Darwin once believed in special creation, then through reason and observation was compelled to reject the belief.

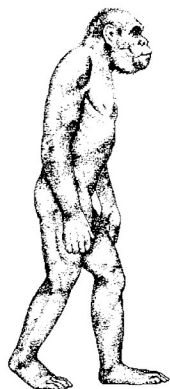
To support the point that belief is not dependent on reason or observation, Kearney cites a verse from the Book of John: “blessed are they who believe but have not seen.” However, most creationists and those trained in Protestant Christian apologetics often cite a passage from I Peter: “Always be prepared to give an answer to everyone who asks you to give the *reason* for the hope [belief] that you have” (3:15). Recently Pope John Paul II stressed the teachings of the Catholic Church Fathers: “To believe is nothing other than to think with assent... Believers are also thinkers: in believing, they think and in thinking, they believe... If faith does not think, it is nothing” (Encyclical Letter, issued September 18, 1998, *L’Osservatore Romano*).





# Creationism in Schoolbooks: Where Do We Stand Now?

William J Bennetta



Let's start by reviewing some history. During the 1970s and 1980s, most of the high-school biology texts and middle-school life-science texts printed in this country offered a mangled form of "biology" that reflected decades of pressure from certain religious fundamentalist groups. Some publishers — for example, Addison-Wesley, DC Heath and Company, the Macmillan Publishing Company, and Holt, Rinehart and Winston — issued books that concealed the fact that modern biology is a coherent science unified by the central concept of organic evolution. The books said nothing of evolution or the history of life on earth, or they buried those topics under mounds of details. If one looked for certain terms or concepts in evolution, they could often be found in glossaries, or "mentioned" in the text; so the publishers could claim that the topics were "covered". However, they gave no sense of the importance of evolution, and the entire topic could be easily avoided. This was convenient both for school districts that preferred not to treat evolution and for publishers that preferred not to publish alternate editions of the same coursebook.

In many cases, the schoolbook writers went out of their way to teach students that scientific statements about the history of life were nothing more than speculations. For example, *Heath Life Science* (1984) depicted the ancient dinosaurs as mere figments in which "some scientists

believe", and *Scott, Foresman Life Science* (1987) taught that no one knew whether ichthyosaurs and pterosaurs had really existed.

Some writers made vague allusions to evolution while replacing the word *evolution* with false synonyms, such as "development" (a completely different biological discipline) or "natural selection" (a mechanism of evolution) or even "environmental change" (which one normally associates with weather and climate). Others mentioned evolution by name, but they presented it as an eccentric "theory" left over from the 19th century which had no modern significance. They also taught that the word *theory* merely meant a belief, and they urged students to learn about "other theories" pertaining to the origins of organisms. The phrase "other theories" was, of course, a code-word for Bible stories. This led directly to the "two-model" approach of creation and evolution advanced in school districts by many creationists of the 1970s and 1980s.

Other schoolbook authors — such as certain contributors to Laidlaw's *Experiences in Biology* (1981) or Holt, Rinehart and Winston's *Holt Science* series (1986) — went even further. They rejected evolution entirely. They didn't mention the word, nor did they refer to the concept, and so they effectively excluded the biology of the 20th century.

In the late 1980s, however, the major schoolbook publishers sensed a demand for biology and life-science textbooks that would

present some real science. Since then, they have undertaken — with greater or lesser success — to produce lots of new books that include conspicuous passages about evolution and the evolutionary histories of important lineages. Some of today's biology books even tell students explicitly that evolution is biology's central organizing concept.

Against that background let us consider the situation that prevails today. It has three major aspects:

1. *evolutionary content*
2. *contemporary evolutionary concepts*
3. *resistance to evolutionary ideas.*

## EVOLUTIONARY CONTENT

If we look at the content of current books, we see that creationist influence has almost disappeared. Exceptions occur in *Addison-Wesley Biology* and the two *Science Probe* books issued by South-Western Educational Publishing. I described the case of *Addison-Wesley Biology* in *The Textbook Letter*, January-February 1997:

There are scientific theories, and there are "other theories". Scientific theories are explanatory principles that have been tested and confirmed. Each scientific theory is a structure of ideas, confirmed by preponderant evidence.... [It] explains a body of observations and thus explains some aspect of nature.

The "other theories" are Bible stories. The expression "other theories" is one of the [euphemisms] that creation-

[Editor's note: A colleague recently asked Bill Bennetta for an update on the influence of creationism on schoolbooks. He sent a copy of his reply to us at NCSE, and we invited him to revise it for our readers. Bill is the editor and publisher of *The Textbook Letter* and can be reached at [textbook@earthblink.net](mailto:textbook@earthblink.net).]



# What We Do

**The National Center for Science Education**, founded in 1981, engages in a number of activities advancing two primary goals: improving and supporting education in evolution and the nature of science, and increasing public understanding of these subjects. This work is supported primarily by membership contributions with some additional assistance from grants.

## GRASS ROOTS WORK

NCSE provides information and guidance to citizens faced with local creationist challenges:

- Expert testimony for school board hearings.
- Advice on how to organize, including referrals to others who have faced similar problems.
- Information (including article reprints) on evolution, "creation science", and the evolution/creation controversy.

## PUBLICATIONS

- *Reports of the National Center for Science Education*, a bimonthly journal with news of current events; discussion and commentary on issues in evolution education and the creation/evolution controversy; resources for evolution education; scholarly refutations of "scientific evidence against evolution"; and reports on developments in evolutionary science and on public understanding of the issues.
- *Reviews of Creationist Books* — scientific evaluations of creationist textbooks.
- *Voices for Evolution* — position statements by scientific, educational, religious, and civil liberties organizations.
- Pamphlets on specific topics.

## ASSISTANCE TO EDUCATORS

- Directly or through our state representatives and local volunteers, NCSE participates in curriculum development and text reviews.
- NCSE offers workshops at teachers' conferences on how to teach about evolution.
- NCSE answers requests from teachers concerning methods and materials for teaching evolution.
- NCSE sponsors the Human Evolution Education Network (HEEN) — bringing together scientists and K-12 teachers.
- NCSE's Pre-Publication Review Project helps publishers locate scientists who review textbooks for accurate, up-to-date content.

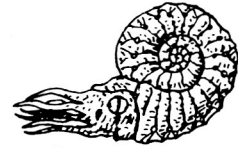
## EDUCATING THE PUBLIC THROUGH THE MEDIA

- NCSE provides background material and commentary to journalists who are covering the creationism controversy.
- Executive Director Eugenie Scott, PhD, writes articles about science education, and the problems posed by creationism, for numerous general, scientific, and educational publications.
- NCSE's speakers, especially Dr Scott, participate as guests on national and local radio and television programs.

## NETWORKING WITH OTHER ORGANIZATIONS

- *Referrals*: People concerned about other issues frequently call and are given referrals to appropriate organizations (for example, anti-censorship groups); these other organizations also refer people concerned about evolution/creation conflicts to NCSE.
- *Consultations*: NCSE provides expert witness referrals and/or consultation to legal organizations in litigating creation/evolution cases.
- *Speakers' bureau*: NCSE sends speakers to scientific, educational, legal and civil liberties organizations, informing them of the issues and recent events.
- *News and information sharing*: Examples — A speaker for a civil liberties organization who had been invited to take part in a radio talk show reviewed NCSE-provided materials to prepare for questions concerning creationism; organizations preparing reports on the state of education, and controversies in education, contact NCSE for information about science education and the creation/evolution controversy.
- *Coordinated action*: NCSE regularly works with science education and civil liberties organizations. For example, when the governor of Alabama distributed the anti-evolution book *Darwin on Trial* to the state's science teachers, NCSE, the National Association of Biology Teachers, and People for the American Way jointly mailed to those teachers information about the constitutional, scientific, and educational issues.

# NEW FROM NCSE!



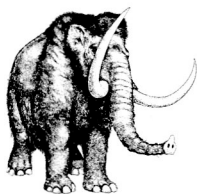
## ***Darwinism Comes to America*** by Ronald L Numbers.

With his earlier work, *The Creationists*, Ronald Numbers became known as the leading scholar of this movement in America. In this book, he puts to rest a variety of misconceptions — about the impact of Darwin's work on the religious ideas of scientists, the Scopes trial of 1925 and its consequences, and the regional and denominational distribution of attitudes toward evolution. *Darwinism Comes to America* focuses on crucial historical issues to give new insight into the ongoing creation/evolution struggle. Numbers examines a wide range of scientific and religious responses from Pentecostalism to the "Intelligent Design" movement of the 1990s. Paper, 228 pages. *List price \$18.95, member price \$15.15.*

## ***Discovering Dinosaurs in the Old West : The Field Journals of Arthur Lakes***

by Michael F Kohl, John S McIntosh, and John H Ostrom (eds).

This is a facsimile edition of the field journals of a geologist whose work was crucial to the emerging field of vertebrate paleontology in the late 1870s. Cloth, illustrated with 24 drawings and 13 photos, 198 pages. *List price \$24.95, member price \$19.95.*



## ***Taking Darwin Seriously: A Naturalistic Approach to Philosophy***

by Michael Ruse.

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final chapter! Ruse, founding editor of the journal *Biology and Philosophy*, offers a spirited defense of the naturalistic methods of science. He applies evolutionary biology to traditional philosophical problems, arguing that we must base our understanding of the problems of both knowledge and ethics, on the realization that we are the end-products of a natural process of evolution. At the same time, he warns against making a secular "religion" from scientific knowledge. Ruse pays careful attention to what science can tell us, demolishing the arguments of anyone who would push creationism as a credible alternative to scientific evolution in public schools, universities, and public discussions. Paper, 340 pages, illustrated. *List price, \$18.95, member price \$15.15.*

## ***Science Times Book of Fossils and Evolution***

Nicholas Wade (ed).

Selected from the *New York Times*' Tuesday "Science Times", these essays include such topics as the evolution of "bigness", announcements of significant fossil finds, the origin of life, and recent paleontological research on the evolution of humans. There's something in this illustrated volume for every science enthusiast! Cloth, 256 pages. *List price \$25.00, member price \$20.00.*

## ***Science Times Book of Genetics***

Nicholas Wade (ed).

More from the *New York Times*' "Science Times" section. This volume contains thorough, non-technical reports of recent discoveries in genetics research, well-illustrated with line drawings. Cloth, 288 pages. *List price \$25.00, member price \$20.00.*

## ***Being a Christian in Science***

by Walter R Hearn.

Hearn, a retired professor of biochemistry, also spent 20 years as editor of the newsletter of the American Scientific Affiliation, an organization concerned with issues relating Christianity and science. Writing from a deeply held conviction that science and faith are complementary, not conflicting, aspects of an individual's life, Hearn describes both the practical aspects of a scientist's working life, and his own personal approach to harmonizing career and conviction within the context of a scientific career. Paper, 178 pages. *List price \$10.99, member price \$8.80.*



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# NCSE on the Road

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

**DATE** April 29, 1999  
**CITY** Columbus OH  
**PRESENTERS** Eugenie C Scott, Andrew J Petto  
**HOST** American Association of Physical Anthropologists  
**EVENT** Brown Bag Lunch: Teaching Evolution  
**TIME** 12:00 - 2:00 PM  
**LOCATION** Hyatt Regency Columbus  
**CONTACT** scott@natcensci.org

**DATE** May 16, 1999  
**CITY** Santa Rosa CA  
**PRESENTER** Eugenie C Scott  
**TITLE** Science and Myth:  
Understanding Anti-evolutionism  
**HOST** Oakmont Sunday Symposium  
**TIME** 10:00 AM  
**LOCATION** Oakmont Retirement Community, Santa Rosa CA  
**CONTACT** John Lynn, 707-833-1113

**DATE** May 21, 1999  
**CITY** Pasadena CA  
**PRESENTER** Eugenie C Scott  
**TITLE** What Americans Believe About Evolution  
**HOST** The Skeptic Society  
**EVENT** Panel discussion: Reinventing Evolution:  
The Great Debate at the High Table  
**INCLUDING** Michael Ruse, Niles Eldredge,  
Jack Horner, and Michael Shermer  
**TIME** 9:00 - 10:15 AM  
**LOCATION** Pasadena Hilton  
**CONTACT** skepticism@aol.com; 626-974-3119

**DATE** June 21, 1999  
**CITY** San Francisco CA  
**PRESENTERS** Eugenie C Scott, Kevin Padian, Chairpersons  
**TITLE** Science and Religion  
**HOST** Pacific Division of the American  
Association for the Advancement of Science  
**EVENT** A symposium organized for the Pacific Division  
of the AAAS  
**TIME** 8:00 AM - 12:00 PM  
**LOCATION** San Francisco State University  
**CONTACT** Dr Robert I Bowman, ribowman@sfsu.edu

**DATE** June 22, 1999  
**PRESENTER** Eugenie C Scott  
**CITY** Madison WI  
**TITLE** Problem Concepts in Evolution  
**HOST** The Society for the Study of Evolution  
Annual Meeting  
**EVENT** Workshop on Teaching Evolution to  
Undergraduates  
**INCLUDING** Brian Alters, Marion Meyer, Jean Heitz, Will  
Provine, Steve Arnold, and NCSE Board Members  
Duane Jeffery and Andrew Petto  
**TIME** Workshop from 1:00 - 5:15 PM  
**CONTACT** Dr. Irene Eckstrand, eckstrai@nigms.nih.gov

**DATE** June 25, 1999  
**CITY** Seattle WA  
**PRESENTER** Eugenie C Scott  
**TITLE** Human Evolution: Why the Controversy?  
**HOST** Tufts University Wright Center and the  
Foundation for the Future  
**EVENT** Workshop: Humankind Emerging: Biological,  
Cultural and Technological  
**TIME** TBA  
**CONTACT** John Bannister-Marx, aejbmarx@sedona.net;  
617-627-5395

**DATE** October 6, 1999  
**CITY** Montreal (Canada)  
**PRESENTER** Eugenie C Scott  
**TITLE** TBA  
**HOST** McGill University School of Education  
**LOCATION** McGill University, Montreal, Canada  
**TIME** TBA  
**CONTACT** Brian J Alters, alters@education.mcgill.ca

**DATE** October 23, 1999  
**CITY** Denver, CO  
**PRESENTER** Eugenie C Scott  
**TITLE** Science, Religion, and Evolution  
**HOST** The Paleontological Society  
**EVENT** Evolution: Investigating the Evidence; a work-  
shop for teachers; held in conjunction with the  
Geological Society of America Annual Meeting  
**LOCATION** Denver Convention Center  
**TIME** TBA  
**CONTACT** Judy Scotchmoor, judys@ucmp1.berkeley.edu

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ists employ when they try to promote the teaching of biblical myths in science classes. They use it in lines like these: "If students learn about the evolution theory, they have to learn about other theories too," or "If schools don't teach other theories about the universe, they shouldn't teach any theories at all."

...Addison-Wesley *Biology* [is] a book that Addison-Wesley sells for use in high schools. In both the original version (1994) and the later version (1996), evolutionary biology is introduced in chapter 13. And in both versions, the material at the end of chapter 13 includes this "portfolio" exercise:

*There are opponents to the scientific theory of evolution. Conduct library research on the various beliefs and on the evidence for other theories about the origin of life.*

For sheer frugality, that's hard to beat. In a single short item, doubtless based on some creationist handout, the Addison-Wesley writers have done 3 of the creationists' favorite routines. They have conflated theories with mere "beliefs", as if those were equivalent. They have promoted one of the creationists' baffle-phrases — "other theories". And in keeping with the creationists' established practice, they have falsely equated "evolution" with "the origin of life".

In the *Science Probe* books: the writers do not acknowledge any modern interpretation of the fossil record or any genealogical connections among the organisms of different periods. One could easily gain the impression that each period's "characteristic collection of life forms" originated *de novo*. You may find interesting the reviews on The Textbook League's Web site

at <http://www.csulb.edu/~ttl/92probe.htm>.

At this point, the *Addison-Wesley Biology* and the *Science Probe* books are exceptions. The rule nowadays is that high-school biology books and middle-school life-science books are full of references to evolution, often accompanied by phylogenetic diagrams and other illustrations that purport to reflect information about evolution.

#### CONTEMPORARY EVOLUTIONARY CONCEPTS

These books contain information about evolution — so far, so good. But the evolutionary "information" that the books provide is often bogus. It has been hurriedly cobbled together by writers who don't understand what they are trying to write about, and it is often erroneous, incomprehensible, and self-contradictory.

Some of the books are utterly bizarre: They are full of alleged "information" about evolution, yet they resolutely cling to the old practice of viewing the living world in terms of the pre-Darwinian, metaphysical notion of "nature's ladder". The writers are confused about basic concepts such as homology, convergence, and common ancestry. They know little about the physiology and metabolism of living organisms or about their evolution, so they often guess, and guess incorrectly. They think that all scientific methods are experimental, and that the history of life is a ladder toward increasing perfection. For a further exploration of these shortcomings, readers may look at these pieces on our Web site:

<http://www.csulb.edu/~ttl/66livsys.htm>  
<http://www.csulb.edu/~ttl/73shark.htm>  
<http://www.csulb.edu/~ttl/81holt.htm>

#### RESISTANCE TO EVOLUTIONARY IDEAS

Regardless of whether the information is right or wrong, books loaded with information about evolution pose a real problem for state agencies or local school boards that are controlled by creationists. So the creationists have

counterattacked with ... stickers! That's right — stickers that are pasted into schoolbooks to tell the students that evolution is just a flimsy "theory" and that it should not be taken seriously. An example is Alabama's disclaimer:

This textbook discusses evolution, a controversial theory some scientists present as a scientific explanation for the origin of living things, such as plants, animals and humans.

No one was present when life first appeared on earth. Therefore, any statement about life's origins should be considered as theory, not fact.

The word "evolution" may refer to many types of change. Evolution describes changes that occur within a species. (White moths, for example, may "evolve" into gray moths.) This process is microevolution, which can be observed and described as fact. Evolution

may also refer to the change of one living thing to another, such as reptiles into birds. This process, called macroevolution, has never been observed and should be considered a theory. Evolution also refers to the unproven belief that random, undirected forces produced a world of living things.

The entire text and commentary are on our Web site along with some commentary at <http://www.csulb.edu/~ttl/65bama.htm> and <http://www.csulb.edu/~ttl/74edtr.htm>.

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**Books loaded with information about evolution pose a real problem for state agencies or local school boards that are controlled by creationists.**

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## MIXED SUCCESS

So it appears that there are some gains to celebrate. Nearly all textbooks now attempt a straightforward treatment of evolution, and few attempt to avoid or hide it completely. On the other hand, because

most of the textbook writers have not been adequately trained in evolutionary biology (and frequently not in other aspects of biology either), they misunderstand both the basic principles of evolution and the relationship of evolution to other fields of life and earth science. It will probably require another generation of textbooks —

assuming that the industry actively solicits the contributions of scientists who are strongly trained in the field — to bring the treatment of this discipline up to some approximation of our present understanding of evolution. However, if educators (and citizens) demand such improvements, they will probably be made sooner.



# Just What Do They Say, Dr Morris?

Troy Britain

The March 1999 edition of *Back to Genesis*, written as usual by the President Emeritus of the Institute for Creation Research (ICR), Henry Morris, was titled “What They Say”. As we have come to expect from such a title, it was yet another example of a creationist bashing evolutionists with their own words. Knowing that quotes of mainstream scientists given by creationists are not always exactly what they appear to be, I read the article with a wary eye. My skepticism was vindicated when I happened upon the following:

There are no evolutionary transitions fossilized anywhere, although billions of fossils are there still preserved in the rocks.

“One of the outstanding problems in large-scale evolution has been the origin of major taxa, such as the tetrapods, birds, and whales, that had appeared too suddenly, [sic] without any obvious answers, [sic] over a comparatively short period of time.”

Professor Carroll, an eminent Canadian paleontologist, is well aware of such highly publicized fossils as *Archaeopteryx* (the alleged half-reptile, half-bird) and the so-called walking whale,

but he still has to acknowledge that birds and whales arose suddenly without obvious ancestors (Morris 1999: b).

What first made me suspicious about this was the past tense of the sentence (“had appeared”) which Morris quoted. Second, I knew that the implication Morris was gleaned from the quote simply wasn’t true, and given my understanding that Robert Carroll is a competent paleontologist, I suspected something might be wrong. So I went to look up the context. The text selected by Morris for quotation is indicated in italics.

Is macroevolution conceptually different than microevolution? The main driving forces are the same as at the species level: population growth, genetic variation, and behavioral plasticity. At both time scales, external factors of the biological and physical environment control the rate, scope, and direction of change.

*One of the outstanding problems in large-scale evolution has been the origin of major taxa, such as the tetrapods, birds, and whales, that had appeared to arise suddenly, without any obvious ancestors, over*

*a comparatively short period of time.* Increased knowledge of the fossil record has greatly increased our understanding of these and other transitions, and show that they do not necessarily require processes that differ from those known to occur at much lower taxonomic levels. To Simpson and others of his generation, higher categories were recognized by a combination of factors: morphological and adaptive distinction, a significant number of included taxa, and appreciable longevity. From examples considered in this text, it can be seen that adaptive change, morphological change, and radiation can be decoupled in that each may occur at a different time. We now see that the overall rate of evolution is not greatly faster during the origin of a group than it is within the ancestral or the descendant lineages, and with the discovery of intermediate forms, we see that they are not necessarily any more poorly represented in the fossil record than single lineages might be at other stages of evolution (Carroll 1997: 391).

So not only does the very next



sentence in the paragraph contradict Morris's implication but a few sentences later Carroll specifically refers to the existence of intermediate forms and explicitly states that the evolution of higher taxa did not occur at a different rate than that of groups at lower taxonomic levels. Even if one were to disagree with Carroll about the facts of the matter it is clear from the context that Carroll is saying the very opposite of what Morris implied he was saying.

But what about being more specific? For example Morris refers specifically to *Archaeopteryx* and the evolution of birds. What does Carroll say about avian origins in the very book that Morris is quoting from above?

Despite the enormous gap in anatomy, physiology, and way of life between modern birds and the other long-recognized vertebrate classes, the fossil record provided singularly informative evidence of the origin of birds long before we understood the ancestry of tetrapods, amniotes, or mammals. Historically, the question of the origin of birds has concentrated on a single genus, *Archaeopteryx* from the Upper Jurassic, which appears as an almost ideal intermediate between "reptiles" (specifically dinosaurs) and birds.... [U]ntil recently little was known of either the ancestry of *Archae-*

*opteryx* or of animals intermediate between this genus and essentially modern birds of the later Mesozoic. Within the past twenty years, a host of new discoveries have begun to fill both these gaps, outlining the accumulative evolution of avian characters over a period that spans approximately 40 million years, from the obligatory terrestrial dinosaurs to an essentially modern avian anatomy (Carroll 1997:306-7).

And what about whales, which Morris also takes great pains to emphasize as a problem Carroll must admit to?

The transition between mesonychids and primitive but obligatorily aquatic whales is represented by a sequence of intermediate animals from the upper portion of the lower Eocene and the lower half of the middle Eocene of Pakistan, continuing into the later middle and upper Eocene of Egypt and southeastern United States (Fig 12.20). This sequence extends over a period of 10-12 million years, beginning with riverine sediments, including primarily fossils of terrestrial mammals, through shallow coastal marine, to deep neritic deposits at the edge of the continental shelf. Several genera are recognized, showing the progressive reduction in the size of

the appendicular skeleton, freeing the tail for aquatic locomotion, and a succession of modifications in the structure of the middle ear (Carroll 1997: 330).

Morris concludes his article saying, "most everything they [evolutionists] say...seems potentially something that can be used against them" (Morris 1999:c). Well, I suppose if one is willing to rip a scientist's words completely out of context and twist them to imply the exact opposite of their original intent, then Morris might be correct.

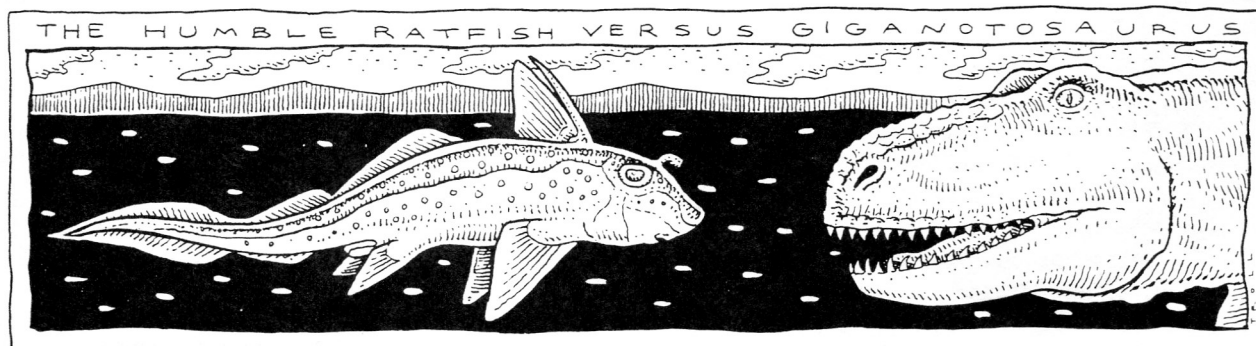
There is a further irony in a footnote Morris includes to the above statement which refers readers to his recent book *That Their Words May Be Used Against Them* (1998). There, he says, one may find almost 3000 additional quotes of the same nature as those in this article (Morris 1997: c). Considering the way in which the quoted sections misrepresent the intent of the works Morris cites, we would have to ask of what use such a tome would be to the serious seeker of knowledge.

#### REFERENCES

- Carroll RL. *Pattern and Processes of Vertebrate Evolution*. New York: Cambridge U Press; 1997.
- Morris HM. *Back To Genesis* 1999; 3:b-c.
- Morris HM. *That Their Words May be Used Against Them*. Green Forest (AR): Master Books; 1998.

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TroyBritain@compuserve.com



WHAT MAKES RATFISH SO COOL? BESIDES LOOKING LIKE A SCIENCE EXPERIMENT GONE WRONG, THESE FISH EVOLVED OVER 300 MILLION YEARS AGO. THAT'S WAY BEFORE THE DINOSAURS ROAMED THE EARTH. THE BIG DINOS ARE GONE, BUT RATFISH STILL SWIM IN THE OCEANS TODAY. RATFISH HAVE CHANGED VERY LITTLE OVER TIME SO THEY TRULY ARE LIVING FOSSILS. RATFISH ARE ALSO KNOWN AS CHIMAERAS. THEY ARE CARTILAGINOUS FISH AND ARE CLOSELY RELATED TO SHARKS. THERE ARE ABOUT FORTY SPECIES ALIVE TODAY.

## Complete Skeleton of Early Fossil Mammal

Andrew J Petto, NCSE Editor

The early history of the mammals is constructed from a series of small, fragmentary finds, for some groups consisting of little more than a few teeth and pieces of bone. Now researchers at a site in China report in *Nature* the recovery of a nearly complete skeleton of a triconodont, a mouse-sized, insect-eating species that lived about 145 million years ago. This period was the heyday of the

dinosaurs and over 80 million years before the period known as the "Age of the Mammals". This specimen was found in the same Liaoning fossil beds that have produced the bird *Confuciusornis*, the feathered reptiles, *Sino-sauropteryx*, *Protarchaeopteryx*, and *Caudipteryx*, and many other significant fossils.

The features present in the new skeleton show a mosaic pattern of evolution. Some of the features are typical of those exhibited only by mammals, and others are more typical of premammalian vertebrates. For example, the shoulder blade and collarbone were flexible, and, with other parts of the skeleton, indicated that the animal could stand and move in a variety of ways. The animal had lost its first or "milk" teeth, and some of the permanent teeth had replaced them.

However, triconodonts are not considered closely related to modern mammals. Their 3-cusp tooth structure (hence TRI-CON-O-DONT — three-coned-tooth) is similar in complexity, but different in structure and mechanics from the tribosphenic molar which characterizes all modern mammals (marsupials and placentals). Furthermore, this more "mammalian" dental anatomy was set in a more "reptilian" jaw — one that retained several other

bones along with the dentary (the only bone in the lower jaw of modern mammals).

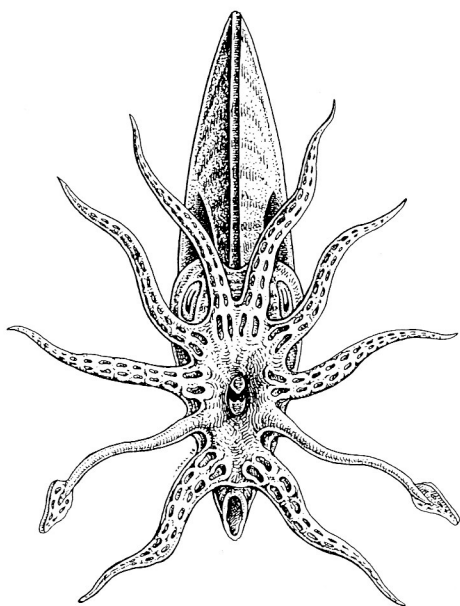
This specimen is an excellent example of what paleontologists would consider a transitional fossil — one which combines physical features characteristic of a number of different evolutionary lineages. In this case, we see a mammalian tooth-replacement pattern in a multi-boned reptile-like jaw, and other features in the skeleton show a similar mix of traits. The recovery of the whole skeleton of an animal which is typically represented only by teeth allows scientists to add another piece to the puzzle of evolution. In this case, a primitive mammal has precisely the mix of characteristics predicted by evolution — a combination of "conserved" vertebrate traits, borrowed reptilian traits, and uniquely modified structures found only among animals emerging along a new evolutionary branch.

### Further Reading

Qiang J, Zhaxi L, Shu-An J. A Chinese triconodont mammal and mosaic evolution of the mammalian skeleton. *Nature* 1999; 398: 326-30. Abstracts available via free subscription to *Nature Online* at <<http://www.nature.com>>.

[Thanks to Chris Nedin and Jonathan Woolf for information used in this report.]

THE LAST  
VIEW  
FOR  
MANY A  
CRETACEOUS  
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JAN/FEB 1999

REPORTS



## Which Came First: The Drumstick or the Wing?

Andrew J Petto, NCSE Editor

**R**ecent research in evolutionary developmental biology has helped to explain how highly specialized structures such as wings can develop from "ordinary" or generalized precursors. Malcolm Logan and Clifford Tabin reported recently in *Science* on their experiments with a limb-development gene in chickens called *Pitx1*. By modifying this gene, Logan and Tabin have been able to turn chicken wings into drumsticks. When they injected

*Pitx1* into the tissues which normally produce wings, the chicks developed hindlimbs, or "drumsticks", instead. These limbs had bones, muscles, joints, and claws which were typical of hindlimbs and lacked the appearance or structures necessary for wings.

Perhaps more important for understanding the evolution of novel structures through developmental change is the fact that 3 genes identified to date which act to determine the differentiation

into a forelimb or hindlimb seem to be very stable through evolutionary history. The same genes appear to operate in the same fashion in all the vertebrates tested, including humans. In birds, they make wings and drumsticks; in humans, arms and legs; and in fishes, pectoral and pelvic fins.

It is likely that other, as yet unknown genes also play a role in defining the shapes of limbs. No one yet knows, for example, what accounts for the wide variation in limb structures among species.

### Further Reading

Logan M, Tabin CJ. Role of *Pitx1* upstream of *Tbx4* in specification of hindlimb identity. *Science* 1999 Mar 12; 283: 1736-9.

Vogel G. New findings reveal how legs take wing. *Science* 1999 Mar 12; 283:1615-6.

Abstracts available at Science On-Line <<http://www.sciencemag.org>>, last accessed Mar 30 1999.

[This article was compiled from information in an article by Karin Jegalian posted on Discovery Online News and from the original article in *Science*.]

### RESOURCES FROM THE PALEONTOLOGICAL SOCIETY

The Paleontological Society has free brochures available to the public. Set your browsers to "Paleontological Society Brochures" at <<http://www.uic.edu/orgs/paleo/free.html>>.

[Contributed by Paul Heinrich.]



# Watch Those Extension Courses!

William Thwaites

**F**aculty search committees put in countless hours trying to find competent people who are up to speed on all the latest techniques, results and conclusions. Curriculum committees try their best to devise course requirements that yield graduates who also reflect up-to-date scientific thinking.

**Was [San Diego State University] going to offer a course that would have been approved by the Institute for Creation Research?**

Thus there seems to be little chance that a university or college department could offer an astronomy course grounded in astrology, a nursing course based on "therapeutic touch," or a biology course claiming that molecular structures show the hand of an "intelligent designer" rather than natural selection acting

on the results of random mutations.

Well, think again. Your school probably offers courses that are completely immune from the normal checks that keep outdated science and superstitious nonsense out of the curriculum. These courses are offered by your *extension division*. Most extension divisions have no curriculum or search committees. Most of them offer whatever course they think would be in demand. They have a pretty good idea of what types of courses might be in demand, but they are not experts in every subject.

The following course announcement appeared recently in a San Diego State University (SDSU)

Extension Division catalog:

Evolution: Chance or Design?

Was evolution accidental or planned by a higher consciousness? Were humans and all varieties of life the result of blind chance or intelligent design? This course will explore this fascinating and controversial issue. You will learn about the different theories of evolution, focusing primarily on Darwin's theory of natural selection. Learn why many molecular biologists today have challenged Darwin's theory and are arguing instead that all life evolved by conscious design.

The announcement was spotted by NCSE member Jim Moore, of the University of California at San Diego (UCSD) Anthropology Department. Moore contacted Eugenie Scott of NCSE, who in turn contacted me, since I am a retired SDSU professor. I, in turn, contacted Dr David Archibald, another NCSE member who is still teaching at SDSU.

What were we to think? There it was in print: "different theories of evolution... many molecular biologists [challenging Darwin's theory]... arguing instead that all life evolved by conscious design." It surely sounded like creationism to us. Some of us can name all of the "molecular biologists" who espouse "intelligent design." This short list includes Gary Parker, Michael Denton, and Michael Behe, and that's about it. I dare say that the list of molecular biologists who see the hand of evolu-

tion in the "design" of protein structures is a bit longer. To claim that "many" molecular biologists see conscious design in molecular structures is misleading in the extreme.

Had an out and out creationist sneaked in the side door, so to speak? Was SDSU going to offer a course that would have been approved by the Institute for Creation Research? Archibald tracked down the author of the extension announcement. It turns out that Bruno Leone, the instructor of the presumed creationism course, is a historian by training. It is his intent to show that evolution is a time-tested, legitimate idea. It is his intent to show his students the religiously-motivated criticisms of evolution in their historical context. Archibald is convinced that Leone has no intention of espousing creationism.

So it would seem that the SDSU Extension "Intelligent Design" course was a false alarm. Still, we should remain vigilant. If instructors of such courses do not have backgrounds in molecular biology (or other aspects of biology), they may not be up to the task of convincing students that molecular structures show a "tinkering" process—one composed of successive rounds of gene duplication, translocation, base substitution, and so on, nudged by natural selection—rather than divine design. Hopefully Leone will recommend a reading of Jacob's classic article on the subject. (F Jacob. Evolution and tinkering, *Science* 1977; 196:1161-6.)

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# BOOKREVIEW

## BURIED ALIVE: THE STARTLING TRUTH ABOUT NEANDERTHAL MAN

By Jack Cuozzo. Green Forest, Arkansas: Master Books, 1998. 349p.

*Reviewed by Colin Groves,  
Australian National University*

Jack Cuozzo is an orthodontist who works in a hospital in New Jersey, trained in forensic anthropology by the noted physical anthropologist WM Krogman. He is fascinated by the Neandertal fossils and has personally examined and X-rayed many of them; this makes him unusual, possibly unique, because he is also a creationist. I know of no other creationist who has even tried to look at original fossil hominids — not Lubenow, not Bowden, certainly not Gish, all of whom snipe away from a position of profound ignorance. But Cuozzo has studied the originals: what difference does it make to his assessment of them?

His descriptions and basic assessments of the fossils, informed by his training and his skills in the orthodontic field, are almost uniformly excellent, especially in his concluding "Research Notes" section. The way he reconstructed the subadult skull from Le Moustier is a case in point; his radiographs are routinely used by curators to "put it together correctly" (p 300). In four and a half pages (p 274-9) he demolishes the notion that the distinctive Neandertal morphology is entirely due to disease, taking apart the three proposed hypotheses — arthritis, syphilis, rickets — one by one; he even chastises a fellow creationist, Lubenow, for getting caught up in the rickets hypothesis. So one is

the more astonished to read, in the next page and a half, from this man who has so clearly established that Neandertal morphology is real, that the entire appearance of the Kabwe (Broken Hill, Rhodesian) skull was caused by acromegaly!

Running throughout the book is a rivulet of paranoia. A rivulet, did I say? — an ocean, more like. The entire book is soaked in it, and it even infuses the descriptions of the fossils themselves. The entire first section of the book, 15 chapters long, is a paean of paranoia: There, in 1979, is our hero, with his wife and 5 children, travelling to Paris. They breach the defenses of the Musée de l'Homme, that bastion of evolutionism, hiding their X-rays from the staff lest their true purpose be discovered. They are dogged by a mysterious Mr McCue in Normandy, and a furtive visit to the Louvre is spent dodging a sinister American (doubtless an evolutionist sent to tail them). Their suspicions are confirmed when he is detected that evening dining in the same pizzeria, after which there is a high-speed car chase through the suburbs of Paris, in which Cuozzo is followed by not one but two cars driven by evolutionists. Contact with friends is thwarted because their phone number, copied down by the conniving evolutionist lab secretary in the museum, turns out to be just a phone booth. Finally it gets so bad that, at the airport hotel, they have to unscrew the bathroom doors of the two rooms they occupy, to wedge them against the doors of their suites lest the evolutionists push their way in.

This all reads like the screenplay for an Indiana Jones movie, but there is one little difference; there is *not* a scrap of evidence that anything — *anything* — onto-

ward was going on, that any "evolutionist" was the least bit interested in them, let alone giving them wrong phone numbers, following their car, or trying to get into their rooms. And the paranoia of those first 15 chapters never goes away. He meets with nothing but helpfulness in European museums, whether in Paris, London, Liège or Berlin, yet he persists in having dark thoughts about evolutionists looking over his shoulder. He finds a fossil that has been incorrectly reconstructed and immediately concludes *not* that those responsible had been simply mistaken, even a bit incompetent, but that they had been frauds, trying to make the fossil look more ape-like than it should be.

Time and again we meet this theme. Take, for example, the Kabwe skull (already mentioned above). Ronald Singer's early (1958) X-ray of it almost seems designed, he implies in Chapter 16, to hide an uncomfortable fact about it — that it has a bullet hole in it! Aha! Not an ancient, primitive skull at all, but a modern acromegalic that had been killed by a shot from a gun! Now, were I as paranoid as Cuozzo, I might at this point accuse him of concealing contrary evidence. Instead, I will do him the courtesy of suggesting merely that he has overlooked relevant literature. Montgomery and others (1994) described and discussed that "bullet hole" in some detail, drawing attention to previous published discussions, and identified it as a partly healed pathological lesion.

Later in Chapter 16 Cuozzo implies that Dean, Stringer and Bromage were covertly responding to his (unpublished) findings in a 1986 paper on growth in Neandertals — specifically the Gibraltar II child — and of getting it wrong because they assumed uniformitarianism, and did not allow "the skull and jaws ... to speak for themselves" (p 76). Actually, shortly afterwards Stringer and colleagues (1990) looked again at Neandertal aging, using the Spitalfields dental data to

assign a probable age to Gibraltar II, and commented at length on the implications of these data for growth in the skull. As before, I choose to interpret Cuozzo's failure to mention this study, which has certain rather profound implications for his own model, as mere ignorance of the literature rather than as a need to suppress information incompatible with creationism.

Then there is the "chin" of the La Quina V skull, apparently depicted in a 1911 excavation photograph reproduced on the cover of the book. On page 42, Cuozzo describes how evolutionists, over time, gradually replaced the chin (a sign of modernity) by "a plastic-like material" and made the skull appear chinless (a more ape-like condition). The fact is that the specimen lacked a chin when discovered. A careful look at the excavation photo shows that the front of the jaw, except for the lowermost margin, consists of a smooth pale substance (plaster?) which was doubtless put there as the excavation progressed to hold the lower teeth in place. The presence of a "chin" then was as much an artifact as its absence is now, though as we know that some Neandertals did have some symphyseal protrusion it does not matter one way or the other, and I can't see why Cuozzo gets so excited about it.

And there is the Le Moustier skull. On page 166 is a photo, which he took in the public exhibition section of the museum in Berlin, supposedly of a reconstruction of the skull, and on page 167 is a drawing taken from a color slide which can be purchased at the museum. Both, says the author, are fraudulent. The specimen in the exhibition is "very ape-like" (p 165), while on the slide the mandible is dislocated and set much too far forward, so it is being "passed off as evidence for evolution" (p 166).

Now, I can find no photo or drawing of Le Moustier anywhere that looks like either of these two illustrations. The exhibit appears to be actually a poor reconstruc-

tion not of Le Moustier at all but of "Pithecanthropus IV" from Sangiran, Java; presumably the labels got mixed up? As for the slide, it should be remembered that the Le Moustier remains were thought to have been destroyed during the war (until about 1989, when apparently they were returned from the USSR where they'd been all the time), so inaccurate drawings and casts may have been all that the museum authorities had had to work with. Experience teaches that a mix-up is usually far more plausible than a conspiracy.

And now, finally, to what Cuozzo deduces to be "The Truth about Neanderthal Man"; they were all extremely, incredibly old. Using modern standards — itself a little surprising, in view of his continual tirades about uniformitarianism — he extrapolates from the infant Pech de l'Azé skull to the late juvenile Le Moustier specimen and through to the adult La Chapelle-aux-Saints and La Ferrassie I skulls. Cuozzo concludes that Le Moustier was in his 30s at death, while La Chapelle and La Ferrassie were hundreds of years old! And, by Jove, wasn't this exactly the ages that, according to *Genesis*, people were achieving immediately after the Flood? So that, friends, is who the Neandertals were: they were Arphaxad and Company, Shem's descendants.

Actually, how many hundreds of years old *were* La Chapelle and La Ferrassie? You get different answers from different measurements. From near-maturity (Le Moustier's age) into old age, modern human cranial length increases at 0.06 mm per year, according to the figures Cuozzo quotes and which I see no reason to doubt. La Ferrassie's cranial length is 16 mm greater than Le Moustier's, so this represents 267 years of growth. Total facial height, on the contrary, grows at 0.18 mm/yr, giving a difference of only 137 years' growth between Le Moustier and La Ferrassie; while lower facial height grows at 0.063 mm/yr, giving 278 years' growth; basal skull length

grows at 0.052 mm/year, giving 365 years' growth; and so on. There is, in other words, variability. Moreover, calculating the growth from Le Moustier to La Chapelle, you find using some measurements that La Chapelle is older than La Ferrassie, but using others that it is younger.

There is a further internal difficulty with this: wouldn't their teeth have worn out completely, long before they reached 300 years of age? Cuozzo's answer is simply astounding: their enamel regenerated! He quotes papers about the salivary enzyme statherin, which does indeed recalcify enamel in a minor way — but there is absolutely no evidence that it rebuilds teeth and keeps them functioning for hundreds of years. While one can perhaps admire his honesty in recognizing that there is a problem, his sheer invention of a solution, out of thin air, does him no credit at all.

Now, I have no quarrel at all with the proposition that Neandertals may have lived to high ages. If one accepts the arguments of Cutler (1975), their potential longevity was about as great as ours, into the 90s perhaps. But 90 or 95 years is hardly 300 or 400.

Neandertals were consistently different from us, at any age. Infants as well as adults have a whole suite of characters which are distinct from modern humans (Schwartz and Tattersall 1996). What evidence is there for Cuozzo's (uniformitarian) assumption that their growth from infancy to maturity, and the changes they underwent as adults, were the same as ours? None; in fact, the evidence is to the contrary, as witness the fact that you get different ages for La Ferrassie according to whether you extrapolate rates based on basal length, facial height or other variables (see above). The changes they underwent, both during growth and during adult life, were different from ours, that's all; and if part of this lay in some overall faster rates, so what?

Longevity has been declining since the flood, says Cuozzo, and



he quotes evidence that people are maturing earlier and earlier to this day. The evidence actually suggests that age at maturity, at least in Europe, has fluctuated through history, but Cuozzo argues for a regular, continuing trend from the Flood to now. He is able to do this by very carefully selecting his evidence and by cavalierly dismissing contrary evidence which does not fit (such as the evidence from Aristotle that menarche occurred "in the 14th year of life"; p 192).

As for the equation of Neandertals with immediate post-flood people in *Genesis*, it fails the test of internal consistency. On p 253 there is a diagram of the decline of longevity from father to son implying that their achieved ages were characteristic of their respective cohorts, derived (with some allowances for different transliterations) from *Genesis*, 11:10-24. The genealogy goes Shem-Arphaxad-Salah-Eber-Peleg-Reu-Serug-Nahor-Terah, which is the same as that given by 1 Chronicles, 1:17-26 but *not* the same as that given by Luke, 3:34-6, which says that Arphaxad's son was called Cainan and it was he, not Arphaxad himself, who was the father of Sala (=Salah). Sorry, but if one genealogy is right, the other must be wrong. To bring up inconsistencies in the Bible may seem a bit petty, but if Cuozzo is going to insist that the assumption of biblical inerrancy is as valid as what he calls the "assumption of evolution" then he must be able to show that the Bible really is inerrant and does not contradict itself.

Reading Cuozzo's book has been an interesting exercise. His obvious competence as a forensic anthropologist suggests that he could make important contributions in the professional literature, if only he could lay his paranoid fantasies to one side and let the facts, in his own words, "speak for themselves". There are not many creationists of whom one could say this. Yet he is firmly convinced that there is a gigantic "evolutionist" conspiracy, and this leads him to regard everyone else in the pale-

# BOOKREVIEW

## THE OUTRAGEOUS IDEA OF CHRISTIAN SCHOLARSHIP

by George M Marsden. NY: Oxford University Press, 1997. 142 pages.

Reviewed by Eugenie C Scott,  
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George Marsden, professor of history at the University of Notre Dame, is best known to members of NCSE as an evangelical Christian who testified for the evolution side in the 1982 "equal time for creation science" case, *McLean v Arkansas*. Some evangelicals strongly criticized him for his participation in this case. In *The Outrageous Idea of Christian Scholarship*, he explains why he objected to the Arkansas law mandating the teaching of "creation science" whenever evolution was taught. Marsden felt the "equal time" effort was counterproductive to the larger goal establishing the legitimacy of religion in the scholarly world, because such legislation promoted a sectarian, bib-

lical-literalist view and posited a false dichotomy between evolution and creationism:

Legitimate efforts to relate Christianity to academic life are hurt by such heavy-handed attempts to privilege by law a viewpoint of dubious intellectual merit that only a minority of Christians affirm.

... Biological evolution, moreover, has become a symbol for such pure naturalism, and is often used to ridicule believers who are so naive as to think that ultimately there may be design and purpose in the universe. Viewpoints that take into account the possibility of the divine origins of reality ought to be given a fair hearing in academia. People who believe that contemporary evolutionary theory has been overrated in the interest of supporting secular world views should be heard from as well. That is far less likely to happen, however, if the fundamentalists and their allies succeed in conveying

oanthropology field as a fraud and, very likely, out to get him. His technical training in anatomy has not actually introduced him to the nature of science; in the end his book becomes an exercise in mas-saging the data to fit a biblical mold.

### REFERENCES CITED

- Cutler RG. Evolution of human longevity and the genetic complexity governing aging rate. *Proceedings of the National Academy of Science of the USA* 1975; 72:4664-48.
- Montgomery PQ, Williams HOL, Reading N, Stringer CB. An assessment of the temporal bone lesions of the Broken Hill cranium. *Journal of Archaeological Science*

1994; 21:331-7.

Schwartz JH, Tattersall I. Toward distinguishing *Homo neanderthalensis* from *Homo sapiens*, and vice versa. *Anthropologie*, 1996; 34, 79-88.

Stringer CB, Dean MC, Martin RD. A comparative study of cranial and dental development within a recent British sample and among Neandertals. In: C DeRousseau, ed. *Primate Life History and Evolution*. New York: Wiley-Liss, Inc; 1990. pp 115-52.

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the impression that the only alternative to the exclusion of God from the picture is a "creation science" based on a literalistic reading of Genesis (p 39-40).

After the Arkansas trial, Marsden wrote *The Soul of the American University: From Protestant Establishment to Established Nonbelief, Fundamentalism and American Culture*, and *Understanding Fundamentalism and Evangelicalism*. In *Outrageous Idea...* he returns to the theme of *The Soul of the American University* to discuss the "incoherence of mainstream higher education". Higher education would, he thinks, profit greatly if it were "more open to explicit discussion of the relationship of religious faith to learning."

At the university level, as Paul Gross and Norman Levitt document in their book *Higher Superstition*, one sees subjects in many disciplines being presented from the perspective of (or "informed by", as the jargon goes) one ideology or another: Marxism, feminism, multi-culturalism, environmentalism, or what have you. As I discussed in an earlier article, the "Christian Scholarship" movement — stimulated in part by Marsden's work — argues that if these ideologies are acceptable as platforms for teaching and research, why not Christian ideology also? (see RNCSE 18/2:30).

Answering this question requires asking three others: Can an ideology be scholarly? Can a religious ideology qualify as scholarly? What is the relationship between ideological approaches to scholarship and the particular scholarly enterprise known as "science"?

#### IDEOLOGY AND SCHOLARSHIP

I have argued that if knowledge is to be distinguished from opinion, valid scholarship requires some referent outside the individual — which is why many ideologies fail as scholarship (Scott 1996). Data are often contradictory. Scholar-

ship requires the weighing and judging of information in order to come to reliable and valid conclusions. A particular perspective based on an ideology (such as Marxism or feminism) may be scholarly, but because ideologies by definition contain a component of belief, there is always the potential that empirically-based knowledge will be supplanted or denied because of ideology. Creation "science", for example, fails as scholarship precisely because the desire that nature conform to a particular pattern takes precedence over empirical evidence.

Similarly, if the referent for what is true is what "feels good" or what seems to be most politically palatable (serves the downtrodden better, increases profits, or whatever) then it is doubtful that sound scholarship will be produced. History from a Marxist or other ideological perspective can be good history if its conclusions can be measured against external non-ideological standards, however they are agreed upon. Similarly with art history, literature, or music: what are the agreed-upon external standards against which we measure scholarship? A religious ideology used to explore such fields is no more inherently objectionable than any other ideological position — but to be scholarly, it has to follow the rules. There must be standards outside individual opinion — and in the case of religious ideologies, outside of Revealed Truth — against which ideas are evaluated, and upon which scholars in the field agree.

Marsden seems to agree:

In the corridors of the pragmatic academy Christians and non-Christians can readily share basic standards of evidence and argument. ...What would make [an argument] distinctively Christian is likely to depend on claims of revelation, or sources of knowledge not shared by others. Hence it would violate rules essential

for promoting fruitful public discourse (p 47). ... It simply does not advance the discussion to argue on the basis of an authority that some people regard as supreme and others regard as bogus.... It simply does not advance the discussion to introduce an authority that other people do not accept (p 48).

#### WHAT ABOUT SCIENCE?

While all sound scholarship requires the collection of information and its logical evaluation against agreed-upon standards, scientific standards are particularly stringent. Scientists have to measure their explanations against the natural world, while not violating certain rules including those of logic and probability, and their explanations have to "work" in the sense of predictability or "postdictability". This makes science particularly unsuitable for presentation from an ideological perspective. There is no scientific faction agitating for a feminist thermodynamics or Marxist meiosis.

Obviously there is subjectivity in science, and it is no great revelation to state that historical, political, and social factors influence the course of science, and even the conclusions reached. Science is a human endeavor, which means it is cumbersome, subject to human egotism, messy, and slow. At any given time, some of it will be in error. Fortunately, scientific explanations are subject to later revision, which is much more difficult in ideologically-driven scholarship, where belief and opinion play a larger role.

There is a built-in correction factor in the adversarial nature of science: whether or not my biases are balanced by your biases, we each have to convince one another and third parties using logic, reason, and evidence. The mental picture of Marxist vs capitalist meiosis is amusing because it is clear that the economic ideology of the investigator is irrelevant to an understanding of how meiosis works.



Marsden seems to agree that science is different. He treats science rather gingerly:

The fact is that explicitly Christian convictions do not very often have substantial impact on the techniques used in academic detective work, which make up the bulk of the technical, scientific side of academic inquiry (p 47). ...Furthermore, the distinguishing feature of Christian scholars working in mainstream academic settings is not that they are going to identify the workings of the Holy Spirit in the Great Awakening or use God to explain any gaps in current scientific theory, but rather they do not believe that empirically demonstrable explanations are the only, or even the most important explanations (p 74).

Without coming right out and saying so, he in effect exempts science from his call for "respectability" for religious views in post-secondary education. He begins Chapter 2 with a discussion of science and religion, specifically with a discussion of how current philosophical trends — which he claims downplay empiricism — should include religion as an acceptable foundation for scholarly inquiry.

But then he quickly shifts the focus away from science as a way of finding out about the natural world, to science as a basis for philosophy. "Even among academic moderates who have little patience with postmodern fads, the idea of scientific objectivity as an obtainable standard for the larger questions of life is generally considered passé" (p. 26). But since when is the major goal of science to answer the "larger questions of life?" What if you just want to know how meiosis works?

What really concerns Marsden is his belief that the "naturalistic presupposition" has been so successful in science that it has been expanded to other areas of scholarship, which, in his view, leaves

no room for spiritual concerns. But he confuses naturalism as a methodology with naturalism as an ideology, implying that the one leads inexorably to the other:

Scientific naturalism is, of course, a very useful methodological stance, which Christians employ all the time in the technical aspects of their scholarship. However, like the liberal culture of which it is a part, scientific naturalism is not ideologically neutral. Sometimes the bias of scientific naturalism against religious and spiritual concerns is made explicitly, as by those natural scientists who use it as the basis for a metaphysical world view. They proclaim that knowledge gained by empirical observation is the only knowledge there is (p 74).

He seems confused about whether "scientific naturalism", an admittedly "useful tool" to understand the natural world, is inherently inseparable from philosophical naturalism. It is philosophical naturalism that has a "bias against religious and spiritual concerns", not scientific naturalism, which is neutral to such phenomena since they are by definition outside of scientific investigation.

Marsden often shifts from natural science to social science or the humanities. "It is now commonplace among contemporary scholars, including many moderate liberal scholars, to acknowledge that, while empirical investigation should be valued in its place, pretheoretical influences such as social location substantially shape interpretations in the humanities and social science. Almost everyone concedes, for example, that being an African American or Native American makes a difference in how some things are perceived" (p 27). But an African American is going to see the same chromosomal behavior in meiosis as a Native American, which is

why science really is different from some other scholarly disciplines.

## CONCLUSION

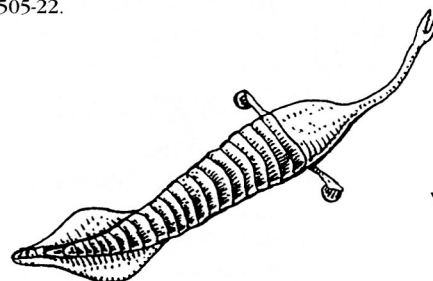
Marsden persuasively argues his case for a broader intellectual scope on university campuses, and I believe he is speaking for a growing academic minority. My experience as I travel around the country confirms Marsden's complaint that religious individuals feel marginalized on the largely secular modern campuses. People come up to me after a talk and almost whisper that they appreciate my not bashing religion. If Marsden's book encourages a more open academic culture which is truly pluralistic and willing to evaluate many perspectives in the sifting and winnowing of ideas, this would generally be to the good.

Since he largely renders unto science that which is science's, Marsden's appeal for greater recognition for a Christian ideology in academia will probably have little effect on the science departments of universities and colleges. Ideological views — by definition based at least partly on belief and supported by emotion — have not demonstrated success in science because of the empirical and logical foundations of this discipline. It remains to be demonstrated that a Christian ideology will make a contribution to scientific scholarship, wherever it may lead in other scholarly fields.

## REFERENCES CITED:

Gross PR, Levitt N. *Higher Superstition: The Academic Left and Its Quarrels with Science*. Baltimore: Johns Hopkins University Press, 1997.

Scott EC. Creationism, ideology, and science. In Gross PM, Levitt M, Lewis MW Lewis, editors. *The Flight From Science and Reason*. Annals of the New York Academy of Sciences 1996 Jun 24; 774: 505-22.





# Letters to the Editor

## Work Toward A Truly Open Discussion

I have just read Molleen Matsumura's article on "Equal Time" in school libraries. Though there is nothing to dispute concerning the facts she presents, I take issue with her general implication (not really stated right out) that public and school libraries ought not make a habit of including anti-evolutionist literature on their shelves — or, at least, that NCSE members ought to discourage this. Although I am sympathetic with the reasons for this, I would rather see NCSE members working toward truly open discussion of all important issues related to science education, including the religious issues related to evolution. Thus, I would like to see at least a few anti-evolutionist books included in school libraries, along with books advocating evolution. I realize other controversial issues exist and libraries can't be expected to represent all sides of all issues, but this is an issue of great importance to many families whose views need to be respected, no matter how erroneous they may seem to many NCSE members. My point is simply about respect, not about truth.

I should add that I am puzzled why the list of "creationist" books at the end of the article includes books by Howard Van Till and Davis A Young. Neither Van Till nor Young is a "creationist" in the sense usually meant by this journal. Both of them believe in God the creator, as I do, but neither is a critic of evolutionary theory. Perhaps Ms Matsumura assumed these books represent creationism, simply because they were published by evangelical presses?

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## Molleen Matsumura replies:

Indeed, the Van Till and Young books are not creationist in the "young-earth creation science" meaning. Because of space considerations, the article could only list the table of contents of *Reviews of Creationist Books*, and not any excerpts from the book. In *Reviews* editor Liz Rank Hughes noted concerning Van Till's *Science Held Hostage*, "This is not a 'creation science' book as most of the others reviewed here are. However, the authors are evangelicals, and they do address the issue of 'scientific' creationism — albeit in a very different way from the others. Thus a review of it seems well worth including." The combined review of Davis Young's and Henry Morris's books contrasts their views, noting among other differences that Young argues for the "great antiquity" of the earth.

I recognize that Dr Davis' "point is simply about respect, not about truth." Surely there is a better way to treat families with respect than to place inaccurate books in libraries, especially when those books also express contempt for the views of other families in a school — for example, families of theistic evolutionists. Perhaps a better approach would be to consider acquiring, for the social studies section, books which objectively study the evolution/creation controversy and its participants. Examples would be Numbers' *The Creationists* and Harrold and Eve's *The Creationist Movement in Modern America*.

## CORRECTION

In *RNCSE* 18(5):13 the final item in the bibliography of creationist books incorrectly combined titles by Young and Morris into one. Davis A Young wrote *Christianity and the Age of the Earth*, and Henry Morris wrote *Science, Scripture, and the Young Earth*.

## A Losing Strategy

Twice in the same issue of *RNCSE* ("Science and Religion, Methodology, and Humanism" and "Science and Religion", 'Christian Scholarship' and 'Theistic Science': Some Comparisons," *RNCSE*, Mar/Apr 1998) Eugenie Scott argues that the best way to blunt the attacks of creationists and other detractors of science is to characterize scientific explanations as being restricted to "using only matter, energy, and their interactions," excluding anything "supernatural" or "nonmaterial". I believe this to be a losing strategy. As the creationists happily point out (see *The Creation Hypothesis* edited by JP Moreland, which Scott references), this seems unfairly to exclude their ideas, not empirically, but a *priori* by fiat, and it suggests that scientific explanations are the best, not of all possible explanations, but only of those consistent with certain preconceived biases.

Scott seems to feel that mentioning "falsification, parsimony, repeatability, open-endedness," and the like would complicate the issue, even though she uses such notions in her own arguments. In fact these ideas are the true essence of science, providing criteria that explanations must meet, rather than limit the concepts that may appear in those explanations. Moreover, no such limitations really exist. Matter and energy have survived so long in science only because they have been continually redefined in the light of advancing knowledge. Anyone who supposes that "matter" and "energy" meant the same things to the classical physicists of earlier centuries as they do to the relativists and quantum mechanicians of today needs a refresher course in physics.

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### A Suggestion

In the article by Stephen B Hunter (*RNCSE* 1997; 17/5: 17) he says: "Evolution is a scientific theory, not a philosophy." Could I make a suggestion, please? Here's the background.

In 1543 Nikolaj Kopernik proposed his heliocentric theory. At the time it had no more experimental justification than the Ptolemaic theory. Its advantage was that it was simpler, with circular orbits of the planets around the sun, rather than the complex system of cycles and epicycles. But later it was proven absolutely that the sun is at the center of the solar system. We don't speak of the "theory of the sun's being at the center of the solar system".

Likewise, in 1859 Charles Darwin proposed the theory of evolution. He had some evidence, but only a little. Since that time literally millions of pieces of evidence prove that evolution of life on earth has actually occurred. No other fact is better demonstrated than the fact of evolution. The theory of how it occurred is a different matter. The basics are agreed to by all scientists, but there are differences in details.

So let us say, constantly, over and over: "Evolution is not a scientific theory, it is a scientific fact." To say that it is a theory leads directly to the creationists saying: "Oh, evolution is only a theory." Now I realize that to you or me that demonstrates an ignorance of the nature of science, but the fact is that it allows the creationists to fool an enormous number of people. This group of deceivers is constantly using just such sleight of hand to fool innocent people. We can sidetrack the deception.

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### "To Teach Evolution"

I greatly enjoy reading *RNCSE*, except when I meet the phrase "to teach evolution." The prospect for good education in America would be improved, wouldn't it, if NCSE could persuade everyone not to use this phrase? The trouble is that it muddles together two very different things:

- 1) teaching children what the theory of evolution amounts to — what it proposes,

and

- 2) teaching children that humans appeared on earth without God's help.

If presented *alone*, the first idea has a promising chance of being accepted. Whenever it is muddled together with the second, opposition arises and prospects plummet.

Any public-school teacher faced by a parent with strongly held narrow beliefs is in a tough spot and needs all the help we can give. All teachers will be helped if we try to abolish that tiresome confusing phrase. We might need to use a few extra words, such as "to teach what the theory of evolution amounts to" but that is *far* fewer words than would be used in arguing against opposition. In this regard, prevention is heaps better than cure. Giving every child a good education would still be difficult, but at least one source of difficulty and misunderstanding would be gone. And the wise words that recur in *RNCSE* would have more impact, if we could always keep (1) separate from (2).

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## CORRECTION

In *RNCSE* 18(6), there were two errors in our printing of Daniel Phelps's review of *Cataclysm!* What we reported as the "Cleavers" Hoax should have been the Calaveras Hoax. In addition, our calculation of the speed required for the remnants of the Vela supernova to have traveled to our solar system in only 2000 years should have been about 2/3 the speed of light.

### IAN BARBOUR WINS TEMPLETON PRIZE FOR PROGRESS IN RELIGION

This year's winner of the Templeton Prize for Progress in Religion is Professor Ian Barbour, physicist, theologian, and pioneer in the field of religion and science. Barbour launched a new era in the interdisciplinary dialogue between science and religion more than three decades ago and is now one of the world's most forceful advocates for ethics in technology. He is the Winifred and Atherton Bean Professor Emeritus of Science, Technology and Society at Carleton College in Northfield, Minnesota. His groundbreaking book, *Issues in Science and Religion* (1965) drew attention to the concept of interdisciplinary dialogue. An exploration into the relation of religion to the history, methods and theories of science, *Issues* set in motion the ongoing scrutiny of areas where science and religion might meet. Subsequent writings and lectures by Barbour cultivated the dialogue and examined the social and environmental impacts of technology, and ethical issues in such areas as energy policy and genetic engineering.

This and related information can also be viewed on the Templeton website at <<http://www.templeton.org>>.

[Contributed by Billy Grassie.]



## INTERNET LOCATIONS VISITED IN THIS ISSUE

### NEWS

**TOPIC** "Academic Excellence" (curriculum description, p 7)  
**OWNER** National Heritage Academies  
**LOCATION** <http://www.heritageacademies.com/vision/Academic-Excellence.asp>  
**LAST VISIT** April 8, 1999

**TOPIC** TalkOrigins Frequently Asked Questions (p 8)  
**OWNER** TalkOrigins Archive  
**LOCATION** <http://www.talkorigins.org>  
**LAST VISIT** April 8, 1999

**TOPIC** Contents of *Voices for Evolution* with links to contents (p 10)  
**OWNER** National Center for Science Education  
**LOCATION** <http://www.natcensci.org/voicont.htm>  
**LAST VISIT** April 8, 1999

**TOPIC** Statement of Textbook Authors Supporting Evolution Education (p 11)  
**OWNER** National Center for Science Education  
**LOCATION** [http://www.natcensci.org/textbook\\_statement.htm](http://www.natcensci.org/textbook_statement.htm)  
**LAST VISIT** April 8, 1999

**TOPIC** NCSE Events (p 20)  
**OWNER** National Center for Science Education  
**LOCATION** <http://www.natcensci.org/coming.htm>  
**LAST VISIT** April 8, 1999

**TOPIC** Templeton Science-Religion Prize (p 33)  
**OWNER** Templeton Foundation  
**LOCATION** <http://www.templeton.org>  
**LAST VISIT** April 8, 1999

### FEATURES

**TOPIC** Reviews of K-12 Textbooks (p 21)  
**OWNER** The Textbook League  
**LOCATION** <http://www.csulb.edu/~ttl>  
**LAST VISIT** April 8, 1999

### RESOURCES

**TOPIC** Free brochure listing (p 25)  
**OWNER** Paleontological Society  
**LOCATION** <http://www.uic.edu/orgs/paleo/free.html>  
**LAST VISIT** April 8, 1999

**TOPIC** Complete Fossil Mammal Skeleton Found in China (p 24)  
**OWNER** Macmillan Publishers (*Nature* online)  
**LOCATION** <http://www.nature.com>  
**LAST VISIT** April 8, 1999

**TOPIC** Genetics of Chicken Limb Development (p 25)  
**OWNER** American Association for the Advancement of Science (*Science* online)  
**LOCATION** <http://www.sciencemag.org>  
**LAST VISIT** March 30, 1999



## INSTRUCTIONS FOR CONTRIBUTORS

*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, curriculum, 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 whose meanings might not be evident to the nonspecialist. Article manuscripts are submitted to reviewers for comments on the technical content and the 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*, illustrated in the following examples:

Chan L. Exciting potential of scholarly electronic journals. *Canadian Association of University Teachers Bulletin* 1996; 43(7):9. <<http://www.caut.ca/bull/ejournal.html>> Accessed April 17, 1997.

Kehoe AB. Modern anti-evolutionism: The scientific creationists. In: Godfrey LR, ed. *What Darwin Began*. Boston: Allyn and Bacon; 1985. pp 165-85.

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>> Accessed Mar 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* 1995 Jan-Feb; 1015(1):22-9.

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

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