REPORTS OF THE NATIONAL CENTER FOR SCIENCE EDUCATION

Volume 19, Number 5

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NCSE REPORTS &
CREATION/EVOLUTION

Ocean Salt: A Geological Embarrassment?

Science Education News from Idaho, New Mexico, West Virginia, Kansas, Oklahoma, and Louisiana

A Profile of Kent Hovind: Creation "Science" Evangelist

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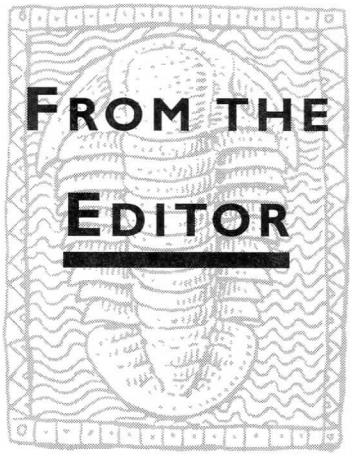
Address editorial correspondence to the editor. Style guidelines can be found on the inside back cover of this issue. Write to the publisher regarding address changes, missing issues, purchases of back issues, reprint rights, and related issues.

Cover:
Gustave Doré's rendition of the transformation of Lot's wife into a pillar of salt at the destruction of Sodom and Gomorrah!



FROM THE EDITOR

One of the most valuable lessons my father taught me is "if you have to explain a joke, it was not a very good one in the first place." This certainly applies to our last cover. We have heard from several of you who felt that the cover skewered the *citizens* of Kansas. Our real target was the contrived justification for stripping evolution and related concepts in natural sciences and even in social sciences from the state's educational standards — *local control*. Of course, all the proposed standards to date — at both the national and state levels — do offer local control. However, this local control is in the shape and delivery of the curriculum, and it remains firmly within the purview of local school boards and their educational professionals. What we meant to convey is that local control of *standards* is basically a way to have no standards at all. But, if you have to explain a joke ... .

As if to prove the point, Kansans themselves have rallied in support of science education. In this issue we carry 2 items related to the action by the Kansas State Board of Education. Robert Hemenway, the chancellor of the University of Kansas, took up the cause of good science education in his remarks to the annual fall convocation of the university community. His remarks are excerpted on page 4. On page 6, Molleen Matsumura reports on polls that indicate that Kansans approve of evolution education and disapprove of the state board's decision on the science education standards.

As if to emphasize the point, the University of Kansas and the American Association for the Advancement of Science announced a conference entitled, "Science, Teaching, and the Search For Origins". The conference will run April 14 - 15, 2000, and interested readers can learn more or register by calling 1-877-404-5823 or connecting to <http://tatania.phsx.ukans.edu/KU-conf/>. Details in our next issue.

In short, the echoes from the Kansas State Board of Education decision are still being felt. It may still be too soon to know how many other states will follow Kansas, but NCSE is watching the approval process for science education standards in several states.

Meanwhile, disclaimers are still hot in Louisiana and Oklahoma, and teachers in West Virginia have refused to endorse an anti-evolutionary curriculum.

A Grain of Salt

In our articles section Thomas Wheeler explores predictions made by ICR's Stephen Austin and D Russell Humphreys regarding the processes that maintain the salinity of the oceans. Wheeler shows that creationist models cannot account for the conditions we observe in the oceans today and that several aspects of the Austin and Humphreys model are not consistent with the consensus of professional opinion among earth scientists and specialists in marine environments.

Introducing Dr Dino

One of the most active anti-evolutionists we have encountered is Kent Hovind whose web site bears the moniker "Dr Dino". Hovind promotes what he calls "Creation Science Evangelism", and his busy schedule had him delivering his "seminars" near several NCSE members in the New Orleans and Philadelphia areas. In this issue we carry 2 reports of Hovind's activities. Barbara Forrest describes how she used Hovind's own writings to diminish his impact in the New Orleans area. Andrew Petto, Stephen Meyers, and Bob Leipold report on Hovind's visit to a large Christian church in North Philadelphia.

In Review

Our book reviewers have been busy. NCSE Supporter Michael Ruse reviews *Genes, Genesis and God* — a recent book by Holmes Rolston, III. Rolston argues against those philosophers and scientists who would seek a naturalistic explanation for our ethical and moral sensibilities.

Ruse's own recent book, *Mystery of Mysteries*, is reviewed by Matt Cartmill. Using evolutionary theory as his case study, Ruse explores the notion that science is more than "just" a social construct.

Lisa Blank reviews a different kind of book for our pages. *The Beast in You* is a collection of educational and entertaining activities that help middle-school children learn evolution. Lisa recommends the book, as does Editor, Jr — our resident 6th grader and in-house expert on middle-school learning.

Great Offers for our Readers

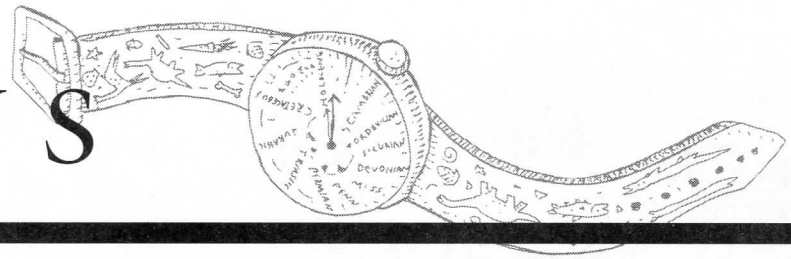
Finally, you will find several interesting offers for NCSE members. New in this issue is an offer from the National Academy of Sciences. When you order either *Teaching About Evolution and the Nature of Science* or the *National Science Education Standards*, NAS will send you a free copy of its 1999 edition of *Creationism: A View from the National Academy of Sciences*. NCSE members can also receive an additional 20% discount for online orders. And our expanded book program means that members can now receive discounts on many books that NCSE was unable to stock in the past. Check the Members' Pages in the centerfold for more detail.

Thanks to the generosity of Astronomy Incorporated, we are continuing our offer for free astronomy calendars for educational use. These calendars are now available for *all* educational uses, both in and beyond the classroom.

Anj Petto

RNCSE 19(5) was printed in March 2000.

NEWS



Another View From Kansas

The address of Chancellor Robert Hemenway to the 1999 University of Kansas Opening Fall Convocation included these remarks:

The third theme of our Strategic Plan, "Building Premier Learning Communities", seems particularly important given the recent actions of the Kansas State Board of Education. The board's actions raise for us the question of what constitutes an excellent curriculum for the study of science.

In case you have been stranded on a Pacific island without contact with the outer world this summer, let me briefly summarize what the Kansas Board of Education has done.

The board voted 6-4 not to include evolution, as it has been commonly defined, in science standards recommended to Kansas public schools. The board also removed from the proposed set of science standards references to radioactive aging of rocks, continental drift, and the "big bang theory" of the origin of the universe, apparently because some people have religious beliefs which hold that the universe is only about 10 000 years old, rather than the billions of years as confirmed by the geological evidence.

The board's action grew out of an earlier attempt by 3 board members to rewrite the set of science standards requested by the board from a group of 27 board-appointed science teachers and science professionals. This rewritten version became an alternative document which included numerous explicit references to "creationism" and "intelligent design" and also made the claim that since both evolution and gravity were only scientific theories, neither should be taught as fact.

This alternative document was eventually abandoned however, [and] ... [t]he science standards which were finally adopted by the 6-4 vote, made references to evolution in terms of "micro" evolution — minor genetic changes observed in a population over time — but eliminated references to evolution as scientists normally understand and define it, and certainly as the accumulated empirical evidence of the past 2 centuries would seem to support it.

...We live in an exceedingly complex world shaped in many ways by scientific knowledge. As citizens we have to form opinions about scientific issues. If we don't, we fail in our responsibility to be contributing members to the democratic discourse that ultimately determines the nature and quality of our society. Whether it is the environment, medical care, or highways, science affects our life. ... Being able to understand these debates is becoming as important to you as being able to read. You must become scientifically literate.

... Scientific literacy as I define it here means quite simply a sufficient understanding of science to understand and contribute meaningfully to debate on public issues. Scientific literacy is not "doing science". Only highly educated professionals "do science". A scientifically literate person "uses" a knowledge of science to understand the ways that scientific discoveries will affect one's life and change one's society. For example, science literacy is not the ability to sequence DNA, but an ability to understand and comprehend the ways in which the mapping of DNA in the human genome project will affect the practice of medicine, and consequently, one's health care.

I suspect that there are many, both within the state and nationally, who will be willing to help us if we move ahead. They know that what has happened in Kansas could happen in other states. Of one thing I am certain: there is a need for scientific literacy everywhere in the country, not just in Kansas. If those who were shocked by the Board of Education's decision really care about young people learning science ... or the people of Kansas, they should be the first to enlist in our cause.

[*The full text of the Chancellor's remarks can be found at <http://www.ukans.edu/gateway/chancellor.shtml>.*]

Emphasis on Teaching Evolution

Andrew J Petto
NCSE Editor

The National Center for Improving Student Learning & Achievement in Mathematics & Science (NCISLA) announced on September 15, 1999, that a team of teachers and researchers in the Madison, Wisconsin, area are working to include *more* evolution in their biology courses by integrating the teaching of evolution into the active learning process. Instead of toning down the evolutionary process, this approach puts evolution in the spotlight.

According to the NCISLA press release:

> The new 9-week course initiated at Monona Grove High School shows how evolutionary biology can be taught as an investigative process, versus the traditional approach of dishing out definitions and theories for memorization. The course challenges juniors and seniors to grapple with 3 his-

torical explanations for species' origins. It also gives them a chance to elaborate their own explanations based on rich data and Darwin's theory of natural selection. As they work together on research cases, the students become a research community and gradually learn that scientists are similar to detectives, piecing together evidence and theory.

One goal of the new course was to give students the opportunity to learn evolution as inquiry — an objective set out by the new national science education standards for *all* science learning. The team reported that the students showed more excitement and energy in their studies of evolutionary biology than when they took the more usual approach of learning evolution from a textbook based on pages of definitions and classical examples.

The research team was led by University of Wisconsin-Madison Professor Jim Stewart and collaborating teacher Sue Johnson in an ongoing process of designing and evaluating science-as-inquiry courses for over 12 years. The team has been developing and pilot-testing the evolutionary biology course for the past 4 years.

The value of this approach, according to the team, is that "[s]tudents learn how difficult it is to sift indirect evidence as they evaluate data that range from the rich to the perplexing. Working together, the students begin to learn that science is as much about collaborative inquiry as drawing conclusions. They construct explanatory models about increasingly complex research cases and present thse to their classmates for discussion, analysis, and debate. The course builds a scientific community, as the students learn to ask questions and critique one another's work."

The team is well aware of the challenge that its success poses for other schools. Because it does not rely on traditional textbooks for curriculum coverage, and because the investigations are driven by student inquiry, the course also redefines the role that the teacher plays in the classroom. Wider implementation of the pilot program may involve some rethinking of teaching strategies and educational goals.

One noteworthy outcome of the program is that 2 of the students who had taken the course presented a poster at the annual meetings of the Society for the Study of Evolution in Madison in June 1999. Now the team will refine the course as it collects a second round of data in the 1999–2000 school year.

[*For more information, connect to the NCISLA web site at <http://www.wcer.wisc.edu/ncisla> or view the complete press release at <http://www.wcer.wisc.edu/ncisla/what's%20new/index.html>.*]

Idaho Board Rejects *Pandas*

Gary Bennett

On December 9, 1999, an official of the Idaho State Curricular Materials Selection Committee confirmed that the committee voted not to approve *Of Pandas and People* as a biology textbook. The committee expressed appreciation for my review and for my getting others to send in reviews and letters and e-mail messages (thank you, NCSE!).

The recommendations of the textbook committee was forwarded to the Idaho State Board of Education for its January meeting. Normally the board approves the committee's recommendations. When I asked if the creationists on the textbook committee could file a minority report (much as one individual on the high school exiting standards did), the official said no and told me that last year 3 members of the textbook committee tried to get the board to overturn a committee recommendation but the board refused to consider it. The board took the position that the committee had followed procedures and there was no basis for overturning the committee's decision.

From January 17 to 20, the Idaho legislature held hearings with the Exiting Standards Commission and the Board of Education on the exiting standards (which currently support the teaching of evolution). The conservative legislature could change the standards, so a number of local evolutionists are standing by. There is a legislative web site where schedules and agendas for hearings are posted (<http://www.state.id.us/legislat/legislat>).

[*Ed: Gary Bennett's review of* Pandas *appears on The Textbook League web site (<http://www.textbookleague.org/>). An abbreviated version of Gary's review, along with Frank Sonleitner's annual bibliography of pertinent scientific research literature, appears in* RNCSE *20(1)*.]

Court Refuses Louisiana Disclaimer Appeal

Readers may recall that, after losing their appeal of Judge Marcel Livaudais' ruling that the Tangipahoa (LA) Parish evolution disclaimer is unconstitutional, the school board asked that the case be heard by the full, 15-member Fifth Circuit Court of Appeals. After a review of the current decision, the Fifth Circuit denied the school board's request by an 8–7 vote. Livaudais's ruling prohibiting the evolution disclaimer will stand unless the school board moves to appeal to a higher court.

[*A news report received on Feb 22, 2000 indicated that the Tangipahoa Parish School Board voted to appeal the Circuit Court decision to the US Supreme Court. Details in a future issue. Contributed by Barbara Forrest.*]

Resolution Supports Evolution

Denis Coyier

On November 11, 1999, the Democratic Party of Dane County, Wisconsin, passed a resolution to address the introduction of religion-based ideas into the public

school science curriculum. The resolution, entitled "On Avoiding Confusion In Science Education", was escorted through local Democratic Party channels by Resolutions Committee Chair William Scanlon and Executive Board (and NCSE) member Dennis Coyier. The resolution was sparked by the anti-evolution decision made by the Kansas State Board of Education coupled with the rumblings of creationists in Wisconsin.

Vital technical advice was generously provided throughout the process by numerous professional, scientific, civil-liberties, and education organizations, including NCSE. The resolution went through several drafts and preliminary debates at the county level before being approved. The final resolution was pared down for presentation to the broader membership of the Party in Wisconsin, which limits such resolutions to 100 words.

Dennis Coyier provided the 100-word version in November:

On Avoiding Confusion in Science Education

> WHEREAS, evolution by natural processes is the scientifically established basis for present species and several science-based theories explain the universe's origin with natural phenomena; and
>
> WHEREAS, many religions have ideas about species and universe origins but religion-based ideas and science-based theories are fundamentally different; and
>
> WHEREAS, presentation in science classes and textbooks of religion-based ideas on natural phenomena undermines science education;
>
> NOW, THEREFORE, WISCONSIN DEMOCRATS RESOLVE:
>
> Science-based theories of evolution and universe beginnings be presented in science classes and textbooks in Wisconsin's public schools without reference to religion-based ideas.

Poll Finds Majority of Kansans Favor Teaching Evolution

Molleen Matsumura
Network Project Director

Ever since a bare majority of the Kansas Board of Education voted on August 12 to adopt standards that make evolution education optional, citizens all over Kansas have tried to remind the rest of the nation that these 6 board members do not represent the views of all Kansans and may even have trampled on the wishes of the majority. For example, Robert Hemenway, Chancellor of the University of Kansas, made an eloquent plea for scientists to defend the integrity of science education (*see p 4*). His address to the annual convocation of the university community began this way:

> The Kansas Board of Education decided in August to impose upon the rest of us in the state its doubts about evolution, its aversion to scientific explanations for the origins of the universe, and its disbelief in geological evidence for the age of the earth.
>
> Kansas is a proud and progressive state with good schools, commonsense government, and an excellent system of higher education. It is neither as flat nor as unsophisticated as some people claim. Today, many Kansans are working busily to protect Kansas schoolchildren from the poor science of the Board of Education.
>
> ... In fact, most local school boards in Kansas proudly endorse the teaching and testing of evolution. In Lawrence, for example, the board voted unanimously, on the day after the state board acted, to continue the teaching of evolution.

The question of Kansans' attitude toward evolution was settled on November 7 when 2 Kansas newspapers, the *Kansas City Star* and the *Wichita Eagle*, released the results of a poll conducted October 22-26. According to the sample of 604 Kansans, a majority of the state's citizens *do* think that evolution should be taught in the public schools, and those who disagree with the board's decision are more likely to vote than those who do not (see Table 1). The poll found that while most Kansans also believe in God (Table 2), they are split on the question of a possible relationship between evolution and divine creation — at least where humans are concerned (see Table 3).

A lot can happen between a poll and an election, but if Kansas scientists answer Chancellor Hemenway's call to action with the efficiency and enthusiasm displayed by New Mexico scientists when their Board of Education watered down science standards (see "New Mexico's Board of Education Restores Evolution to Science Standards" p 9), then within a year Kansans could have a Board of Education that really will support good science in their schools.

TABLE 1
ANSWERS TO SELECTED QUESTIONS FROM KANSAS EVOLUTION POLL

QUESTION	STRONGLY AGREE	SOMEWHAT AGREE	NEITHER AGREE NOR DISAGREE	SOMEWHAT DISAGREE	STRONGLY DISAGREE	UNSURE
Millions of years ago, the earth was populated by animals such as dinosaurs	67%	14%	5%	2%	10%	1%
Fossils have been discovered that indicate some sea creatures developed into land animals	45%	20%	15%	6%	11%	3%
Students in science classes in public schools should study and be tested on the idea of evolution, the theory that living creatures have common ancestors and have changed over time	39%	18%	13%	7%	21%	2%
Please indicate the extent to which you agree or disagree with the state board's decision on evolution	21%	11%	13%	14%	38%	2%
The Kansas board's decision on evolution will make you more likely to vote in the next state school board election	36%	16%	20%	8%	18%	3%

TABLE 2
KANSANS' RELIGIOUS BELIEFS*

Which statement comes closest to expressing your belief in God?	Percentage of Respondents
I don't believe in God.	1%
I don't know whether there is a God, and I don't believe there is any way to find out.	2%
I don't believe in a personal God, but I do believe in a Higher Power of some kind.	7%
I find myself believing in God or a Higher Power some of the time, but not at others.	4%
While I have doubts, I feel that I do believe in God.	12%
I know God really exists and I have no doubts about it.	73%

*Adapted from Evolution Poll Results, *Kansas City Star*, November 7, 1999, <http://www.kcstar.com/item/pages/home.pat,local/3773fc94.b06,html>, last accessed Dec 20, 1999; margin of error +/- 4%; numbers may not add up to 100% because of rounding.

TABLE 3
"WHICH OF THE FOLLOWING STATEMENTS COMES CLOSEST TO YOUR VIEWS ON THE ORIGIN AND DEVELOPMENT OF HUMAN BEINGS?"**

Statement	Agreement (KS)	Agreement (US)
Human beings have developed over millions of years from less advanced forms of life, but God guided the process	43%	40%
Human beings have developed over millions of years from less advanced forms of life, and God had no part in this process.	6%	9%
God created human beings pretty much in their present form at one time within the last 10 000 years or so.	45%	47%

** The Kansas column (KS) represents answers to the *Kansas City Star* – *Wichita Eagle* poll; the nationwide column (US) represents answers to similarly worded questions in a Gallup Poll reported in Moore 1999.

REFERENCES

Beem K. Kansans have mixed views on religion and evolution, poll shows. *Kansas City Star* 1999 Nov 7;A1.

Hemenway RE. The evolution of a controversy in Kansas shows why scientists must defend the search for truth. *The Chronicle of Higher Education* 1999 Oct 29; B7.

Moore DW. Americans support teaching creationism as well as evolution in public schools; Divided on origins of human species. Gallup News Service, August 30, 1999 <http://www.gallup.com/poll/releases/pr990830.asp>, last accessed December 20, 1999.

Oklahoma Textbook Committee Adopts Evolution Disclaimer

Molleen Matsumura
Network Project Director

On November 5, 1999, the Oklahoma State Textbook Committee, which is charged with approving textbooks for the state's 540 school districts, voted to require publishers to affix a disclaimer to any science book that discusses the theory of evolution. The committee's decision is not subject to review by any other state agency, including the State Board of Education, and the only way individual districts could avoid using the sticker would be to purchase textbooks without state assistance.

The text of the disclaimer is identical to the disclaimer adopted by the Alabama State Board of Education in 1996 (*see* NCSE Reports *1995; 15[4]:10-1 and sidebar*).

According to an Associated Press news report (<http://www.ap.org>, last accessed on December 11, 1999):

> Committee member John Dickmann, who introduced the disclaimer, said it was added because biology texts do not give enough attention to alternate explanations of the development of life.
>
> "Some of us on the committee wanted to send a strong statement to the publishers that we are fed up with textbooks that only present one side of the story," said Dickmann, a Broken Arrow Central Middle School teacher. "I'm not just picking on science, either. I have concerns in other subjects, too."

The committee is a body of 12 members appointed directly by the governor (one position is currently unfilled). Of the 11 sitting members, 7 belong to the Association of Professional Oklahoma Educators (APOE), an organization founded only a few years ago whose members represent only a fraction of the state's teachers;

most public school teachers belong to the Oklahoma Education Association (*Tulsa World,* November 11, 1999). Speaking for the Governor's office, Mike Brake told the *Tulsa World*, "We asked if they knew people in the district who follow the governor's point of view on education. It's no surprise they are members of [the Association of Professional Oklahoma Educators]. ...The governor hasn't selected members on the basis of teacher organization," Brake said. "We look for philosophy first" (*Tulsa World,* November 11, 1999, "Conservatives fill textbook panel," <http://search.tulsaworld.com/archivesearch/default.asp?WCI=DisplayStory&ID=991110_Ne_a1conse>, last accessed on December 11, 1999).

There seem to be no statements about evolution at the APOE web site. However, the APOE position on evolution is evident from the sites listed on its "links page", which consists primarily of links to "Alternatives to the NEA [National Education Association] in other states" and to educational policy organizations ("Professional Organizations and Educational Links", May 15, 1999, <http://www.apoe.com/page10.htm>, last accessed on December 11, 1999). The site also contains a link to the conservative Family Research Council(FRC; <http://www.frc.org/perspective/pv99i1ed.html>, last accessed December 11, 1999). An FRC policy paper declares:

> It was in the 19th century that America's Judeo-Christian foundation started to erode. One contributing factor was Charles Darwin's theory of evolution, which began to replace the theory of intelligent design as the accepted explanation for the origin and purpose of the universe and life. America's intellectual elites concluded that God was a myth and that the universe, life, and society had evolved on their own — a conclusion most Americans dispute. The intelligentsia's acceptance of this explanation resulted in the replacement of the Judeo-Christian worldview with humanism's shifting moral and legal standards (*Family Research Council Perspective*, "The ten commandments belong in schools").

Early reactions to the committee's decision were mixed. The AP wire story reported, "State Schools Superintendent Sandy Garrett expressed deep annoyance and said, 'We are concerned with this action and are looking into it further'... Education Secretary Floyd Coppedege expressed some sympathy for the committee's opinion but said such decisions 'should have been left to the local textbook committees'." State legislators first said they did not intend to address the issue (*Tulsa World,* November 11, 1999, "Lawmakers avoid textbook issue" <http://search.tulsaworld.com/archivesearch/default.asp?WCI=DisplayStory&ID=991111_Ne_a10lawma>, last accessed on December 11, 1999). However, legislation introduced later authorized the committee to require the disclaimer, legitimizing the action that it had already taken.

The Executive Director of Americans United for the Separation of Church and State — a national civil-liberties group — sent a letter to state officials that read in part, "I am writing today to let you know that this action raises serious constitutional concerns and that failure to reverse it could result in a lawsuit" (Americans United, "Americans United urges Oklahoma education officials to block textbook committee's anti-evolution crusade," <http://www.au.org/pr111199.htm>, last accessed December 11, 1999).

Scientists and interfaith groups in Oklahoma are organizing to oppose the Textbook Committee's action and have turned to NCSE for information on the history and legality of evolution disclaimers. NCSE will continue to inform Oklahoma members of opportunities to support evolution education and to keep *RNCSE* readers informed of further developments.

AIG Debate Policy Evolves

Ken Ham of Answers in Genesis (AIG) accepted then pulled out of an October 11, 1999, radio debate on KOA in Denver. Host Mike Rosen had also invited NCSE Executive Director Eugenie Scott and Hugh Ross from Reasons to Believe. In a statement posted on the AIG web site (<http://www.answersingenesis.org/docs/4134.asp>), AIG cited Ross's participation as the impetus for Ham's withdrawal.

According to the statement, Ham "had no problem agreeing to the debate with Dr Scott." However,

> As soon as we heard that... Ross would be participating in the debate, we realized that this could end up being a very poor Christian witness for the secular community with two people representing Christianity but holding very different views (i.e., Ken Ham and Hugh Ross) and an ardent evolutionist/humanist (Eugenie Scott) who would agree with much of what Hugh Ross was stating in opposition to the literal creation position.

An AIG official asked to include young-earth creationist D Russell Humphreys in the program or to have a one-on-one debate between Ham and *either* Scott or Ross. According to the statement, when Rosen refused this request, "Answers in Genesis decided that it would be best not to participate."

The statement concluded "Answers in Genesis is willing to debate the topic of creation/evolution and the book of Genesis under conditions that are fair and agreed upon."

New Mexico Returns Evolution to Science Standards

Dave Thomas

At its meeting on October 8, 1999, the New Mexico State Board of Education voted 13 to 1 in favor of a proposal to revise state science teaching standards to include evolution and related concepts, such as the age of the earth, which had been removed during the development of science standards approved in 1996. On the previous day, a strategic planning committee unanimously (7-0) endorsed the proposed standards. The chair of that committee is Dr Marshall Berman, a physicist and founder of Coalition for Excellence in Science Education (CESE), who won election in 1998 by defeating a 20-year incumbent who supported anti-evolutionists' attempts to influence the content of the science curriculum in New Mexico.

The vote followed a series of statements by the public. Initially, the only speaker opposed to the proposed pro-science revisions was allowed 6 minutes to present his case against teaching evolution in biology classes. This presentation was followed by 9 individuals speaking in support of the proposal and of the board's consideration of improved standards. Two late arrivals who opposed changing the standards were allowed about 2 minutes each.

The first vote — apparently unanimous in favor of the revisions — was temporarily set aside because some board members felt it needed more discussion. A lively discussion did ensue, and Marshall Berman provided an eloquent description of science as ongoing, critical inquiry, quite unlike "theories" based on religious explanations like creation and "Intelligent Design", which explain *everything*, but only by terminating the whole inquiry. After the discussion, a final vote found only one member in opposition. The fuzzy language in New Mexico's standards, which has encouraged creationists and anti-evolutionists for 3 years, is now officially history.

Changes to Content Standards, Benchmarks, and Performance Standards for Science, K–12

1a Delete the current Content Standard #4, Grade Cluster 9–12, Benchmark F, and replace it with the following benchmark:

> Employ the concept of evolution as a series of changes, some gradual and some sporadic, that account for the present form and function of objects, ranging from micro-organisms to galaxies; and describe the general idea of evolution as the present arising from materials and forms of the past.

1b Delete Performance Standard 2 under Content Standard #4, Grade Cluster 9–12, Benchmark E.

1c Delete Performance Standard 3 under Content Standard #4, Grade Cluster 9–12, Benchmark F, and replace it with:

> Discuss the evidence for the current scientific theory of evolution including relatedness of species, the fossil record, radiometric dating, geological studies, genetics, and biochemistry.

1d Delete Performance Standard 4 under Content Standard #4, Grade Cluster 9–12, Benchmark F and replace it with:

> Discuss the various mechanisms proposed to explain and interpret the evolutionary process, including but not limited to: natural selection, mutations, punctuated equilibrium, genetic drift, isolated subpopulations, self-organized criticality, and the neo-Darwinian (or modern) synthesis.

2 Add the following new benchmarks for Content Standard #5, Grade Clusters K–4, 5–8, and 9–12, as Benchmark C:

> K–4: Scientists develop explanations using observations (evidence) and what they already know about the world (scientific knowledge). Good explanations are based on evidence from investigations.
>
> 5–8: Scientific explanations and theories emphasize evidence, have logically consistent arguments, and use scientific principles, models, and theories. Well-accepted scientific theories are formulations of apparent relationships or underlying principles of certain observed phenomena that have been verified to a very high degree.
>
> 9–12: Scientific explanations must adhere to criteria such as: a proposed explanation must be logically consistent; it must abide by the rules of evidence; it must be open to questions and possible modifications; and it must be based on historical and current scientific knowledge. Scientific theories must be capable of being falsified, and are restricted to finding natural causes for natural phenomena.

3a In Content Standard 10, *Life Science*, 9–12, Benchmark A, replace the 6th bullet with:

> the evidence that the great diversity of life is the result of more than 3.5 billion years of natural selection and biological evolution, which have filled every available niche with life forms.

3b In Content Standard 10, *Life Science*, 5–8, Benchmark A, in the 7th bullet, insert the word *genetic* between "small" and "differences".

> That small *genetic* differences between offspring and parents may accumulate...

3c In Standard 10, *Life Science*, 9–12, Benchmark A, replace performance standard 17 with:

> Discuss the various mechanisms proposed to explain and interpret the evolutionary process, including but not limited to: natural selection, mutations, punctuated equilibrium, genetic drift, isolated subpopulations, self-organized criticality, and the neo-Darwinian (or modern) synthesis.

[*Contributed by Marshall Berman.*]

UPDATES

Colorado, Loveland: The Poudre Board of Education voted unanimously that Liberty Common School had violated its contract with the district by adopting its policy limiting evolution education and completely omitting coverage of human evolution. The policy contains the statement: "Discussions of evolutionary theory can lead to discussions of whether or not supernatural forces play a role in the mechanism of evolution or the origin of life. These topics extend beyond the scope of science and will not be taught at Liberty Common School." According to the *Denver Post*, the board found that the policy is "probably unconstitutional". Board member Bob Bacon commented "We're not in Kansas" and added that the district school board also wants to make it clear that charter schools must abide by public-school policies (October 27, 1999, <http://www.denverpost. com:80/news/news1027e.htm>). The school has been instructed to revise its policies to meet district requirements. NCSE members Linda Rosa and Larry Sarner, whose child attends Liberty Common School, had complained to the board about the policy and inadequate classroom coverage of evolution (*see* RNCSE *1999; 19[4]: 4-5*). According to the *Rocky Mountain News*, a state official said, "The school is believed to be the only one in the state to prohibit the subject" (October 28, <http://insidedenver.com:80/news/1027evol7.shtml>).

Idaho: On October 23, the State Board of Education adopted graduation standards that call for teaching evolution. The board also voted 7-1 against a proposal to add a "sample" of classroom practice that called for students to know "two strengths and two weaknesses in the evolution theory". Not all hurdles have been cleared, however. The board-approved standards must be accepted by the legislature, and opponents began preparing to do battle in January 2000. The *Idaho Statesman* reports that the Executive Director of the Idaho Christian Coalition and several state legislators plan to oppose evolution in the standards, and Senate Education Committee Chair Gary Schroeder (R-Moscow) said he will resist such efforts, commenting, "We passed two unconstitutional ... laws because the Legislature didn't want to stand up to what they thought public sentiment was" (*Idaho Statesman* October 23, p A1). Even if evolution survives legislative review, assessment tests could be the next battleground, since local districts will have the option of using state science assessments or developing their own tests for approval by the state board. [*Look for a report by Gary Bennett in an upcoming issue of* RNCSE *on textbook adoption and science education standards in Idaho.*]

Illinois: Illinois' omission of

Tulsa Interfaith Alliance Says Disclaimers Not OK!

The Tulsa Oklahoma Interfaith Alliance held a press conference on December 10, 1999, at the Tulsa City/County Downtown Library (4th and Denver). The purpose of this news conference was to protest the decision of the Oklahoma Textbook Committee requiring the inclusion of a disclaimer that questions the theory of evolution in each biology textbook purchased by state funds. At the news conference, the Tulsa Interfaith Alliance (TIA) also announced that it will support legal action challenging the constitutionality of this disclaimer.

The Reverend Russell Bennett, President of TIA, read this statement at the news conference:

> The recent decision by the Oklahoma Textbook Committee to require a disclaimer regarding evolution is the latest tactic of religious extremists to interject their views of religion under the guise of "creation science" into the public schools. Despite claims that they are only trying to ensure "accuracy" in school science, the effect is to stifle the teaching of well-documented facts of the history of the earth
>
> The Tulsa Interfaith Alliance, an organization of laypersons and clergy representing Protestant, Catholic, Islamic, Jewish, and Unitarian faiths, asserts that religious beliefs have no place in influencing public school curricula, a position that is supported by numerous Federal Court and Supreme Court decisions. Further, the TIA asserts, on behalf of its members and their respective religious faiths, that there is no conflict between the findings of science and a belief in a Creator/God. Science seeks to discover the facts and develop theories of how, when, and where life, the earth, and the universe have evolved after creation.
>
> The Oklahoma Textbook Committee, whether knowingly acting from a creationist agenda, or simply influenced by creationist literature that distorts science, put forward a disclaimer that advocates a creationist (and, therefore, a particular religious) agenda.

The Tulsa Interfaith Alliance is a network of clerics and laypersons from many religious backgrounds who are concerned about the numerous threats to the separation of church and state posed by politico-religious extremists who are dedicated to tearing down that wall. The TIA has been in existence since 1997. For more information on the Tulsa Interfaith Alliance and its mission, readers are invited to contact Russell Bennett, President, Tulsa Interfaith Alliance, c/o Fellowship Congregational Church, 2900 S Harvard, Tulsa OK 74114. Bennett may also be reached by telephone at (918) 747-7777 or by fax at (918) 747-8720.

requirements to teach evolution is back in the news, with a report that there is no coverage of evolution in state science assessments. The omission reflects a 1996 decision by a "controversial issues" committee that districts would cover evolution at their own option, without assistance from the state (RNCSE *1997; 17[2]: 6,7*). The current Superintendent of Education, who was not in office at the time, will study the situation, and NCSE members in the state have already begun encouraging him to change the policy.

Kansas: On October 12, the Kansas State Board of Education (KSB) rejected a motion to adopt science standards originally developed by an appointed writing committee in favor of alternatives that eliminated evolution. Instead it instructed Superintendent of Education Andy Tompkins to rewrite standards it had adopted. Tompkins was charged with changing the adopted version to make its publication possible without requiring copyright permission from the National Science Teachers Association, the National Academy of Sciences, and the American Association for the Advancement of Science. All 3 organizations say that extensive quotations of their publications in the Kansas standards distort the intentions of the source documents and have denied copyright permission for their use in the proposed standards (*see* RNCSE *1999; 19[4]: 8-9*). At the KSB's December meeting, members of Kansas Citizens for Science Education testified about the extent to which an outside organization had participated in board members' rewriting of the standards. The board later voted to obtain an external review of Tompkins's version which is expected to delay eventual implementation of the standards by at least several months.

Kansas, Lawrence: Parents in this district have complained to the Board of Education about discussion of dinosaurs in a kindergarten class. Their objections to the dinosaur content were that the materials implied an old age of the earth and do not satisfy the recommendations of the science education standards for lower elementary grades.

Kentucky: Against the recommendations of science teachers in the state, staff of the Education Department have omitted explicit reference to evolution from science assessment standards, substituting the phrase "change over time", on the grounds that "evolution" is a "sensitive" word. Officials insist that the *concept* is covered and the word choice is unimportant. The Kentucky Paleontological Society and the Kentucky Academy of Sciences have issued position statements urging the Board of Education to overrule this decision [*see sidebar p 36*].

Nebraska: On October 8, the State Board of Education defeated a proposal to direct Department of Education staff to write a policy

Ashley Montagu Dies

Ashley Montagu died on November 26, 1999, at age 94. Born Israel Ehrenberg in London's East End, he made the acquaintance of Sir Arthur Keith at age 12 when he brought the famed anatomist a skull found by a friend's father on the bank of the Thames. He studied anthropology in the early 1920s at University College London and the London School of Economics, and came under the influence of Bronislaw Malinowski.

In college he reinvented himself as Montague Francis Ashley-Montagu (later abridged simply to Ashley Montagu) and emigrated to New York in 1927. While he would take a cultural anthropology doctorate under Franz Boas and Ruth Benedict at Columbia, his first professional appointment was at the NYU dental school — a physical anthropology position he secured with the aid of Aleš Hrdlička. Montagu later moved to Hahnemann Medical School in Philadelphia and then to Rutgers — ultimately having to leave Rutgers and academia in the 1950s, a victim of the "red scare" of the times, to devote his life to popular writing and speaking.

Although sometimes disparaged as a "popularizer", Montagu in fact made significant contributions to the primary anthropological literature on a regular basis. His 1933 study of the variation in the pterion region of the side of the primate skull (*American Journal of Physical Anthropology* 1933; 18: 189-336) was a definitive work. His monograph on Edward Tyson, who published the first anatomical description of a chimpanzee in 1699, was a labor of love (*Memoirs of the American Philosophical Society* 1943; 20: xxix-488).

Montagu's most courageous contribution was to undermine the scientific basis of the race concept (*Journal of Heredity* 1941; 32: 243-7), which helped earn him the enmity of the most powerful mid-century physical anthropologists and biologists. This work, however, culminated in the strong and prescient first (1950) UNESCO statement on race.

He joined forces with geneticist Theodosius Dobzhansky to publish "Natural selection and the mental capacities of mankind" (*Science* 1947; 105: 587-90). This collaboration later challenged the racist science of Carleton Coon's 1962 *The Origin of Races*, which held the social, economic, and political oppression of dark-skinned peoples to be a biological consequence of their having evolved into *Homo sapiens* more recently than Eurasians, and which was being avidly embraced by segregationists, with Coon's blessing.

Montagu was an early advocate of the idea of neoteny in human evolution, and in books such as *Touching* (1971) and *Growing Young* (1981), he blended evolutionary anthropology and pop psychology skillfully. He was a frequent guest on the television talk shows and published extensively in popular venues, working tirelessly to bring human evolutionary science to the public. He edited the anthology *Science and Creationism* in 1984. Montagu's prodigious output ultimately included over 60 books. Of these, *Man's Most Dangerous Myth* and *The Natural Superiority of Women* were recently released in new editions.

Jonathan Marks, UC Berkeley

on teaching a "variety of origin theories" in science classes. The board had already changed science standards to state that students should understand "whether" evolution explains life's diversity (*see* RNCSE *1999; 19[2]:* 5). The new proposal was 1 of 4 put before the board by "Concerned Citizens for Objective Science Education".

West Virginia, Kanawha County: Teachers in the largest school district in the state were asked to comment on a proposed Board of Education resolution that would have reversed the existing policy and permitted teaching "theories for and against the teaching of evolution" and housing "Creation Science materials...in the school library." The proposal was introduced by Kanawha County board member Betty Jarvis. Governor Cecil Underwood, a former teacher, told the Associated Press that he does not oppose teaching creationism in public schools. "I think education is a search for the truth. We need to look at all theories to decide what is the truth," he said. NCSE members in the state supplied the Board of Education with information on flaws in the policy, and NCSE worked with other concerned organizations as well. On December 16 the county board defeated the resolution in a 4-1 vote. [*Look for a full report on the meeting and subsequent events from Karl Fezer in an upcoming issue.*]

[*NCSE thanks Gary Bennett, David Bloomberg, Liz Craig, Karl Fezer, Dan Phelps, Linda Rosa and Larry Sarner, Mac West, and Kansas Citizens for Science Education for information used in this story.*]

NCSE NEWS

NCSE's Scott Receives Alberts Award

Eugenie C Scott, Executive Director of the National Center for Science Education, has been named the second ASCB-Bruce Alberts Award winner by the Education Committee of the American Society for Cell Biology.

Scott was nominated for her dedication to protecting the teaching of evolution through writing, speeches, media appearances and, importantly, presentations to school boards, teachers, churches, and parents.

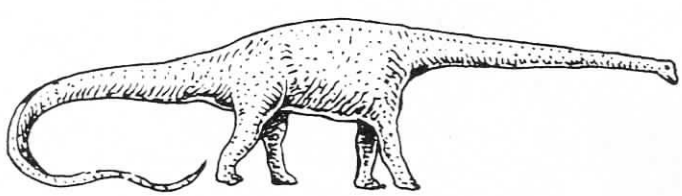
Bruce Alberts, President of the National Academy of Sciences, presented the award to Scott on Sunday, December 12, 1999, at the 39th ASCB Annual Meeting in Washington DC.

NCSE Named Working Assets Donation Recipient

On December 9, 1999, Working Assets, a telephone company, announced that NCSE has been selected as one of just 60 not-for-profit organizations that will receive a share of donations generated by its activities in 2000. When Working Assets customers use its credit card, long distance telephone service, or other services, a percentage of their payment is added to a donation fund. Then, every year, customers receive a ballot listing qualified organizations and vote for distribution of funds to one or more organizations. The percentage of profits received by each organization is determined by the percentage of votes it receives.

The selection process begins with a list of nominations received from Working Assets customers. This means that a number of NCSE members asked that we be added to the donation list. Once again, all of NCSE's staff and Board of Directors gratefully acknowledge the creativity and generosity of our members in finding so many ways to support us!

If you are a Working Assets member and have internet access, you can choose to vote online rather than waiting for a mailed ballot. Set your browser to <http://www.workingassets.com> and click on the link to the online ballot. In addition, the company will announce the list of the recipients earlier in the year than it has in the past, so that customers will know in advance what causes they are benefiting. Therefore, the 2001 ballot will be posted on the web early in 2000, so that members can vote any time during the year. Working Assets hopes to raise over $4 million in donations in 2000.



If you do not use Working Assets yourself, you can help to maximize NCSE's share by encouraging friends who use it to cast their votes to support evolution education. They don't have to join NCSE to benefit NCSE!

Some readers may wonder whether there are similar programs that could benefit NCSE. There are. For example, many contributors giving to the United Way already designate NCSE. You may also be able to donate through matching grant programs at your workplace, if your employer has such a program. To find out, simply ask the administrator what information is necessary to qualify an organization for matching grants, and then contact NCSE. We will supply the information your employer needs.

Office Biz — A New Face at NCSE

Erik Wheaton
Circulation Manager

In November 1999, NCSE added a new staff member, Glenn Branch. Glenn's responsibilities include helping with member requests and with the production of *RNCSE*, and he is already making a big difference.

With Glenn's arrival, we've added an email address, and readers with internet access will want to update their "e-dress" books as follows:

For general questions, continue writing to <ncse@natcenscied.org>. Glenn will answer you or redirect your mail to the appropriate person.

For changes of address or questions about your subscription, write to me as usual but use my **new** email address, <ncseoffice@natcenscied.org>.

Finally, should you hear an unfamiliar voice next time you call NCSE, please join us in welcoming Glenn aboard!

NCSE Thanks You for Your Generous Support

The NCSE Board of Directors and staff would like to acknowledge and extend their warm gratitude to all the individuals, organizations, and firms that donated to NCSE. We also extend a special thanks for their much-appreciated support to the following people who donated $100 or more between January and June, 1999 (* indicates an NCSE board member or supporter). Those in the Patrons' Circle (indicated by a +) donated $1000 or more — a level of support that we consider heroic and that allows us a firm foundation for our efforts. Thank you to all donors!

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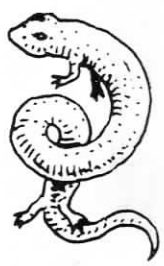

RECAPITULATIONS

"STEPHEN MEYER AND CREATION WEEK"

FROM BILL KVASNIKOFF AND WINSLOW GERRISHBE

We are Whitworth College alumni who attended the Creation Week lectures described in Dean Jacobson's article, "Stephen Meyer and Creation Week" (RNCSE *1999 Jan/Feb; 19[1]: 4-5*). We are disturbed by Jacobson's report on several counts.

First, Jacobson implies that he and Stephen Meyer never spoke except once in a stairwell before Creation Week. But Jacobson had spoken in Meyer's Philosophy of Science class (at Meyer's invitation) defending neo-Darwinism the week before Creation Week. It is also well known that Meyer has attended a number of Jacobson's cell biology classes.

Second, Jacobson suggested that Creation Week was somehow a creation of Meyer's. It was actually the Forum Committee, a group that brings speakers to Whitworth, that both planned and organized the week. Meyer did recommend a number of speakers and did plan additional events. In fact we were disappointed by the biology department's apathetic response to Creation Week. Jacobson and the Whitworth biology faculty could have played a more active role and brought balance to any bias that they thought was present. We would have liked to have heard what they had to say, and if some of the speakers at Creation Week presented inaccurate information, the 5 biology faculty should have spoken up. If falsehoods were being taught, didn't they owe this to the students? However, at most of the Creation Week events, it appeared that Jacobson was the only Whitworth biology professor who even showed up.

When Jacobson himself spoke up, he exhibited profound misunderstanding of the arguments presented. Obscurely, he asked biologist Jonathan Wells about the interchangeable nature of two *homeobox* genes from different animals. From his report of the incident in his article, it is clear he thinks this is a problem for Wells's argument. But we believe that the fact he cited was evidence for the truth of Wells's argument.

Instead of presenting evidence during the event, Jacobson chose to attack Meyer after the fact and to describe Creation Week inaccurately. In his article he mentioned some of the conclusions of the design theorists but failed to mention any of the evidence they presented to justify their conclusions. This made them appear irrational and deceptive. For example, he mocks Phillip Johnson's statement that in the popular textbook pictures, scientists placed peppered moths on tree trunks; yet an article in the May 24, 1999, edition of *The Scientist* ("Second thoughts about peppered moths") validated Johnson's claim.

In addition, Jacobson describes Miller's attack on young-earth creationism and flood geology, giving the impression that some speakers at Creation Week endorsed such positions. However, none of the speakers argued for a young earth or a flood geology perspective. Miller critiqued a view that none of the speakers defended (logicians call this a "straw man" argument).

Overall, we are puzzled by Jacobson's article. We naively hoped he would advocate open discussion of neo-Darwinism. After all, if Meyer and other design theorists present bad evidence and arguments, open scientific discussion will discredit them. Instead, Jacobson has contributed to the growing body of evidence that neo-Darwinists fear all public scrutiny of their theory.

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FROM SCOTT MINNICH

I recently was made aware of the article by Dean Jacobson on "Creation Week". As I was a participant for one day of the conference, the skewed views of Dr Jacobson in his analysis of my talk makes me wonder how biased the rest of the week's reporting was concerning events I did not witness.

On page 5 Jacobson states I stressed trivial details citing the rotation rate of the flagellum as an example. My slide showing that the rotation rate is 6000 to 17 000 rpm (not 30 000 as he states) was included with other parameters of the flagellum. These are not trivial by any means. When taken together they have led Howard Berg to state that the bacterial flagellum is the "most efficient machine in the universe" and David DeRosier to state the bacterial flagellum has all the "appearances of a machine designed by a human" (see *The turn of the screw: The bacterial flagellar motor.* Cell *1998 Apr 3; 93[1]: 17-20*). I also stated that the bacterial flagellum is the only known rotary engine for propulsion.

During the question period Jacobson brought up ATPases, which function in a rotary manner as well. I did respond to this question stating that, yes, ATPases "spin", but there is no connection between the rotary engine of the flagellum and ATPase other than the fact that there is a specific ATPase involved in the protein secretion component of the flagellum. There is no biological relevance of the "spinning" action of an enzyme complex to the spinning of an organelle.

Jacobson also mentions his reference to *E coli FtsZ* and my failure to recognize the relevance of the structural similarity and apparent functional homology with eukaryotic tubulin. As I recall, Jacobson simply asked, "How do you explain *FtsZ*?" He was referring to a just-published *Science* paper showing that the crystal structures of *FtsZ* and eukaryotic tubulin are very similar. Contrary to his claim that I failed to recognize the relevance of his question, in actuality he failed to understand the relevance of my answer. I alluded to the fact that if you claim common descent, it is more of a problem on evolutionary terms to explain the lack of primary sequence similarity but conserved crystal structure. Obviously Jacobson failed to see the connection. But more importantly, I had just spent 50 minutes reviewing the biochemistry and genetics of bacterial flagellum assembly, and his questions had nothing to do with the case I had just presented.

He concludes his critique by stating that I ended by saying, "This is too complex and intricate to have resulted from natural processes." This was a qualified statement on my part. I had preceded this with the statement that, even though flagellum biosynthesis is one of the best understood organelles in bacterial systems, of the several thousand papers on this material, none to date addresses an evolutionary scenario as to how this machine arose by a natural process. Finally, I read the conclusion from a recent *Science* editorial by Paul Berg and Maxine Singer that essentially stated that "nothing made by man approaches the complexity found within the cell." This is not some God-of-the-gaps argument, because when we see highly sophisticated machines with rotors, U-joints, drive shafts, propellers, and so on, the simplest inference is to design.

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Dean Jacobson Responds

I can certainly understand why Bill Kvasnikoff and Winslow Gerrishbe would be disturbed by my views, but I am rather surprised by the points they choose to dispute. The accusations, including alleged inaccuracies involving my contacts with Dr Stephen Meyer, my reporting of the Johnson and Miller talks and the supposed lack of initiative on behalf of the Biology Department are groundless. The purpose of my article was not to detail every encounter I had with Meyer, only those that were relevant. As I stated, I had met with Meyer only once during my first 5 years at Whitworth College.

Furthermore, I did not especially welcome Meyer's auditing my Advanced Cell Biology course. I could reasonably assume he was seeking ammunition against evolution in the style of Behe's irreducible complexities, but I chose in the spirit of collegiality to agree to his attending. I attribute my reluctance to Meyer's apparent intellectual recklessness, immaturity, and voluntary ignorance, which causes him at times to appear more like a crank or a demagogue than a professor. For example, at one point he voiced his enthusiasm for a theory quite unsupportable by data: that the HIV virus was not the cause of AIDS after all, a view also favored by his colleague Phillip Johnson. Does Meyer distrust the honesty and integrity of the scientific enterprise so much that he believes both evolution and HIV biology are fraudulent? To do so suggests a lack of patience and scholarship, a prejudging of issues without bothering to consider the evidence adequately.

I stand by the effort I expended in selecting and recruiting Dr Kenneth Miller as an evolution speaker. Since we were never informed of Meyer's selection of the 4 additional creationism speakers, we quite reasonably trusted the forum committee's assurance that the ID side would be represented by a single speaker, Dr Johnson, not 5 speakers. In effect, much of Creation Week was indeed Meyer's creation. Given the pathetic history of the voluntary ignorance, distortion, and deception by those in the so-called "scientific creationism" movement, the hesitancy that some in our department might have had with regard to engaging these anti-evolutionists is, I believe, understandable (Scott Minnich, however, seemed open to reason, and I conversed with him).

I apologize if my treatment of Scott Minnich's talk seemed excessively harsh. After Phillip Johnson's talk, I can only plead that my mental state was somewhat "provoked". However, I stand by my comments. When one makes extraordinary claims, extraordinary evidence is required. Further, when making a sophisticated molecular presentation (especially one with a distinct, controversial, and ideological bias) to a lay audience, I believe that one is ethically obliged to supply contextual background information. For example, lay audiences cannot be expected to understand the fundamental differences between their intuitive understanding of macroscopic physical processes and scientific observations of the physical processes that occur on a molecular scale. To use a more tangible example, is the fact that a hummingbird's tiny heart beats 600 times a minute a matter for wonder or merely a logical consequence of scale?

Similarly, given that enzymatic reactions, like the rotor, that involve a series of mechanical motions within and between proteins can occur hundreds or thousands of times per second, how difficult is it to explain a rotation rate of 17 000 rpm? The rotational speed of the spinning rotor may indeed *seem* wondrous, but is it so wondrous when considered in the proper context?

Minnich also asks, in response to my introduction

of the spinning ATPase complex, what the biological relevance of the "spinning" action of an enzyme complex is for the spinning of an organelle. It may have as much relevance as feather scales used for insulation have for feathers later used for flight, or cranial bones first used for jaw support have for tiny auditory ossicles later used for sound transmission. Given our profound ignorance concerning bacterial diversity, there may well be other yet-to-be discovered rotors. The case of the bacterial rotor conveniently (for proponents of "Intelligent Design") lacks historical (fossil) evidence for possible precursors; while some rare bacteria may fossilize, such proteins evidently do not. It is one thing to ask, given these practical limits of scientific study what evidence is likely to be forthcoming. However, it is quite another thing to claim this rotor as a victory for anti-evolutionists due to our lack of knowledge concerning the natural evolution of the rotor.

If the study of nature teaches us nothing else, we should at least be able to agree on this: nature is often stranger than we can imagine. So, one can admire the efficiency of this lovely rotor and still see in such ID claims a classic case of the "God of the gaps" argument. The "miraculous" bacterial rotor will no doubt continue to be the ID poster-child for as long as it takes biologists to unravel the mystery. In the meantime, the countless transitional forms found in larger organisms (including single-celled protists) with a wealth of so-called "missing links" will be conveniently ignored.

As in *FtsZ* and tubulin, a similar structure with a profoundly divergent amino acid sequences is only superficially a problem for common descent. With such ancient divergences as the ones we propose for these compounds, such a pattern is precisely what one may honestly expect. Given the gradual random substitution of functionally interchangeable amino acids over literally billions of years, it is not surprising that the oldest footprints of evolution have been so effectively obscured. It is clearly not an ideological or theoretical problem for evolution, but it certainly is a great methodological challenge!

I am accused by Kvasnikoff and Gerrishbe of making the ID speakers appear "irrational and deceptive" because I "failed to mention any of the evidence that the speakers claimed justified their conclusions." In fact, I did mention such evidence from the one talk that I attended in full that managed to present any evidence (Scott Minnich's on the bacterial flagellum). Sadly, I was unable to do so with Phillip Johnson's forum address, since, as I previously indicated, he was unable or willing to present any evidence. He chose instead to do his best to discredit evolutionary scientists in a dishonest and insulting manner.

I am also accused by Kvasnikoff and Gerrishbe of describing "Miller's attack on young earth creationism and flood geology [in such a way] which leaves the impression that some speakers at Creation Week endorsed such a position" and of being guilty of constructing a straw man argument. I simply reported what Miller said, as completely as space allowed, and I believe that a careful reading will show that I never implied the above. Miller chose to speak to the issues of young earth and flood geology (as well as more sophisticated forms of creationism) because he assumed (rightly) that some in his audience held those beliefs. He is not at all guilty of a straw man argument; he never suggested that any of the other speakers held these bizarre positions, and he clearly indicated throughout his talk that he wanted to deal with (at least) 2 distinct approaches to attacking evolution, 2 types of creationism. Referring to young-earth creationism, which rejects everything about evolution, he says, "It is so easy to argue against *this kind* of creation[ism]" (Miller's emphasis). Admittedly, I could have described Miller's analysis of a second creationist approach that accepts the age of the earth as being over 4 billion years old, the fossil record, the validity of radiometric dating and even the geological ages, more fully. But, I repeat, neither Ken Miller nor I constructed any straw men.

Concerning the genetics and development talk given by Jonathan Wells (who is the author of the peppered moth article noted by Kvasnikoff and Gerrishbe), I plead ignorance. I arrived late and did not realize (nor can I yet fathom) that his point was that "genes do not control [embryonic] development". (This is an actual quote from a letter he kindly sent.) While development is, of course, *influenced* by cytoplasmic factors found in the ovum, I find this to be a remarkable and extremely radical position. I wonder how he would explain this view to the parents of a Downs Syndrome child or the victims of any number of other genetic afflictions. With the vast majority of professional biologists, I would refer to the relevance of this most remarkable experiment: the successful interchange of the master control genes for eye development in the mouse and the fruit fly. Evidently genes do control development, since damaging or knocking out these particular genes prevents eye development in their respective organisms.

As for the ludicrous claim that I, as a neo-Darwinian, fear public scrutiny of our view of nature, I can only wonder what evidence led to that conclusion. Let me add that, on the contrary, there is little that I would rather do than talk to anyone who shows at least a modicum of interest in and curiosity about the evidence for common descent. This evidence screams loudly from a detailed examination of life at any level of life: gross morphology, geographic distributions, fossil record, cell structure, and molecular sequences. I am profoundly weary of this charade of creationistic objectivity and openness that so utterly fails to hide a dishonest dogmatism.

I appreciate the reference to the essay by Jonathan Wells entitled "Second Thoughts about Peppered Moths", which reviewed valid criticisms of these famous observations (*The Scientist* 1999 May 24; 13[11]: 13). Because this essay was published months after I wrote my report on Creation Week, I could not comment on it earlier. However, this essay (which

Examining a Creationist Argument Concerning Ocean Salt

Thomas J Wheeler
University of Louisville

As part of a "Back to Genesis" presentation in Lexington Kentucky in 1991, Institute for Creation Research (ICR) geologist Steven Austin discussed the level of salt in the ocean, using calculations made earlier with physicist D Russell Humphreys (Austin and Humphreys 1990). These calculations deal with amounts of sodium ion (Na^+), the major positive ion dissolved in the ocean and the positive ion in ordinary table salt (NaCl). In their article, Austin and Humphreys sum all known inputs and outputs of the ocean's sodium and conclude that 4.6×10^{11} kg/yr enter the oceans and 1.2×10^{11} kg/year are lost. Thus, the oceans appear to be gaining 3×10^{11} kg of sodium per year.

In order to give every possible advantage to the old-earth "evolutionary model", which they oppose, Austin and Humphreys (1990) also calculate minimum estimates of inputs over geologic time and maximum estimates of outputs. These values (3.6×10^{11} kg/yr and 2.1×10^{11} kg/yr, respectively) also give a net influx of sodium. Using these values, setting the initial concentration of sodium to 0, and applying an equation which takes into account the fact that output will depend on the concentration of sodium in the ocean at a given time, Austin and Humphreys calculate a maximum age of 62 million years for the ocean. Therefore, they argue, the ocean should be much saltier than it is at present if the earth were really billions of years old. In his "Back to Genesis" talk, Austin claimed that the missing salt was an "embarrassment" to evolutionists.

In contrast to the model that Austin presented in Lexington, Austin and Humphreys (1990) outline a creationist model in which the ocean contained a "substantial fraction" of today's sodium at creation. They propose a catastrophic addition of sodium during the worldwide flood, followed for thousands of years by influx levels higher than at present.

Estimating Oceanic Salt Inputs

In reviewing the major inputs and outputs of sodium calculated by Austin and Humphreys, I found that many of them appear to be in accord with modern assessments of geologists. However, 3 of their estimated inputs appear to be suspect — rates of release of sodium from the ocean floor into the water, rates

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appeared as an opinion column and not as a peer-reviewed research article) shows that biology is fraught with initial methodological problems. (In my field, this includes oceanic phytoplankton that do not grow as well in the growth-measuring bottle as in the wild.) However, as has often been said, science is ultimately (and typically, rapidly) self-correcting. The deficiencies of a few moth studies (along with some fashion-conscious textbook writers) do not endanger the concept of natural selection, given the myriad examples of microevolution (including the evolved resistance of mosquitoes to DDT and of bacteria to antibiotics, among so many others).

However, a more serious concern for me is that much of the program of Creation Week seemed to rest on an emotional appeal to the audience that scientists are not to be trusted. And this really is the fundamental point: creationist appeals replace reason with emotion and knowledge with faith, even while disguising their attacks on evolution as objective and scientific. They will always win over uninformed audiences because emotions are far more powerful and appealing than intellectual ideas, no matter how rigorously tested these ideas are. However, waging such a dishonest campaign, even for the best of reasons, has its dangers, including driving the most honest and intelligent away from your brand of religion. This is an ugly way to serve Christ, one that lacks the empathy, wisdom, and love of my savior. To me, our deity is a God of knowledge and truth, one who delights in the efforts scientists make to understand and appreciate the intricacies of His creation.

for addition of sodium to the ocean water via seepage from groundwater, and rates of silicates added directly to the ocean by glaciers.

For release of sodium from ocean floor sediments (as potassium and magnesium replace sodium in clay), Austin and Humphreys base their value of 11.5 x 10^{10} kg/yr (the largest of their calculated inputs) on a value in Table 1.4 of Drever and others (1988). However, Drever and others note some problems with these values and conclude that they "are too high by a factor of at least 2" (1988: 28–30).

An even more dubious value is their estimate for entry of sodium to the ocean via seepage of groundwater, which Austin and Humphreys estimate to be 9.6 x 10^{10} kg/yr. Citing Garrels and Mackenzie (1971), they calculate the flow of groundwater as the 10% difference between estimates of global rainfall (minus evaporation) and river runoff. Checking the original reference, I found that the authors characterize the estimated flow as "shaky", and state that the 10% difference "could be accounted for by errors in either estimate" (Garrels and Mackenzie 1971: 104). On the other hand, a more recent study (Moore 1996) indicates that groundwater seepage in Carolina coastal waters is much larger than this estimate (about 40% of river flow). However, it is not known how representative this value is. Austin and Humphreys admit that the average sodium concentration for groundwater entering the ocean is not known, but assign it a value of 5 times that of average river water, and the resulting estimate of sodium input into ocean water from this source is the second largest in their list.

Thus, the Austin and Humphreys estimate of the total sodium input appears to be higher (... by as much as 50%) than experts in the field would conclude.

Finally, the estimate of sodium from silicates added to the ocean by continental glaciers, 3.9 x 10^{10} kg/yr, is also based on the difference between two estimates. The source for these estimates notes that they are uncertain, though probably of the right order of magnitude (Schultz and Turekian 1965).

Thus, the Austin and Humphreys estimate of the total sodium input appears to be higher (perhaps by as much as 50%) than experts in the field would conclude. However, despite the obvious opportunity for serious errors in estimating the rate of sodium inputs from groundwater and erosion, their estimates of the present-day processes that produce a net influx of sodium appear to be relatively consistent with reports in the literature. As discussed by Drever and others (1988: 50), chloride and sulfate "appear to be accumulating in the ocean at appreciable rates" (changes in chloride ions will roughly match those in sodium ions). They go on to conclude: "These solutions must be removed in occasional bursts owing to the formation of restricted basins in which large volumes of evaporites or sulfides are deposited."

The geologic evidence indicates that the salinity of the ocean has not changed greatly during the last 600 million years. When salt water evaporates, various minerals will be formed in sequence as the solubility of their component salts is exceeded. Holland (1984) has shown that the sequence of these minerals in evaporites (and the absence of certain other possible minerals) places constraints on the relative concentrations of various ions in seawater. He concluded that "the concentration of many of the major constituents of seawater could have varied only modestly during the Phanerozoic Eon" (Holland 1984: 461). Holland also shows that the magnesium-to-chloride ratios of brine inclusions in Permian and Silurian halites do not differ significantly from those of recent salt deposits, adding weight to the argument that the salinity of the oceans has been relatively stable for several hundred million years.

Salt Deposits

Since it appears that there may be a net influx of sodium to the ocean at present, while its salinity has remained roughly constant over geologic time, the critical issue is the extent to which halite, the major component of evaporites, can remove the excess sodium. Austin and Humphreys note that very few halite deposits appear to be forming at present and estimate the current output of sodium via this mechanism at less than 10^{8} kg/yr. To estimate the maximum output over geologic time, they use the extensive halite deposits of the Permian System (10^{18} kg), assume that the deposits were twice as large before eroding to their present size, and divide by the number of years in the Permian Period to obtain a rate of 4 x 10^{10} kg/yr. Since this is much smaller than the present sodium input from erosion of continental rocks, they conclude that halite deposits cannot be large enough to remove the added sodium over geologic time.

However, this estimate is flawed because the Permian deposits represent the *net* accumulation of new halite during the period. The deposition of new halite would have been offset by an unknown amount of halite erosion (of both the new Permian halite and older deposits). If the newly formed halite had been eroded away at the present rate of halite erosion, the total deposition in this interval would have been nearly 3 times as large as Austin and Humphreys calculate.

Another approach Austin and Humphreys use to estimate the rate of sodium removal from the ocean by halite deposition is "time averaging" of currently known halite sodium (4.4 x 10^{18} kg) over the 6 x 10^{8} years of the Phanerozoic (since virtually no older halite deposits are known). They obtain an average removal rate of 7 x 10^{9} kg/yr. Again, this value

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approximates the *net* removal rate, not the total output, since sodium from halite is constantly being returned to the ocean.

The flaw in the calculation of Austin and Humphreys can be seen by noting that they set the maximum sodium removal over geologic time at 4 x 10^{10} kg/yr (from the Permian data), but use the minimum sodium input from erosion of halites at 7.5 x 10^{10} kg/yr. However, the latter process depends on halite deposited in the former, and halite could not have been eroding away twice as fast as it was deposited over geologic time. Indeed, the fact that a considerable portion of the present input of sodium to the ocean comes from Phanerozoic halites demonstrates that oceanic sodium is largely being recycled via halite deposition and erosion.

A further error is found in the calculation of the maximum age of the ocean. Austin and Humphreys recognize that processes removing sodium from the ocean will depend on the salinity, and their equation takes into account the hypothetical increasing salinity over time. However, they assume that inputs would be constant over time, which is not the case for at least 3 of the major input processes. Sodium deposited on land as sea spray, and returned via rivers, will obviously depend on the salinity of the ocean. Input from halite erosion, discussed above, cannot have reached modern levels until considerable halide deposits had time to accumulate. Sodium in ground water, to the extent to which it depends on halites, would similarly change with time.

In contrast to Austin and Humphreys's calculations downplaying the role of evaporation in removing sodium from the ocean, Holland estimates that "the probable minimum area of evaporite basins during the last 600 million yr" was about 1.3 x 10^{11} m^2 (Holland 1978: 210). For a typical evaporation rate of 1 m/yr (Holland 1978: 209), only 10% of this area would need to evaporate to dryness in order to bring oceanic sodium into balance. This calculation is, of course, very rough, but it shows the enormous potential of halite formation as a mechanism of sodium removal.

In an endnote, Austin and Humphreys acknowledge that the late Miocene evaporites of the Mediterranean provided an extremely large rate of sodium removal: 5.8 x 10^{17} kg over about 10^6 years, or about 6 x 10^{11} kg/yr. This "truly extraordinary event," they feel, cannot be used to estimate rates of halite deposition over geologic time. However, it provides an insurmountable obstacle to young-earth creationism. As described by Morrison and Morrison (1987), the deposits appear to have been formed by the complete desiccation of the Mediterranean (over perhaps a few thousand years). This was followed by repeated formations of salt layers in numerous salt pans over perhaps hundreds of thousands of years, with a subsequent catastrophic refilling of the sea. It is difficult to see how this could have occurred in only a few thousand years, either pre- or post-Flood. Moreover, for the latter case, surely the early civilizations of the Mediterranean would have noticed such remarkable changes in the regional geography. But there are no historical reports of such events.

Summary

Austin and Humphreys (1990), using estimates of sodium input that likely are too high, and flawed calculations of outputs over geologic time, claim that known geological processes cannot possibly prevent massive increases in oceanic sodium over hundreds of millions of years; therefore the earth must be young. In contrast, geology shows that, even though there may currently be a net influx of sodium, episodic halite deposition has occurred and provides a plausible mechanism for sodium removal. While there is evidence that oceanic sodium has been in balance during the Phanerozoic Eon, there is insufficient evidence to construct a precise balance sheet of the inputs and outputs over this time period. This gap in our knowledge does not justify abandoning the vast amount of evidence establishing the age of the earth, nor does it present a "dilemma" or "embarrassment" for evolution, as claimed by Austin.

The gap in our knowledge does not justify abandoning ... the evidence establishing the age of the earth, nor ... present ... an "embarrassment" for evolution.

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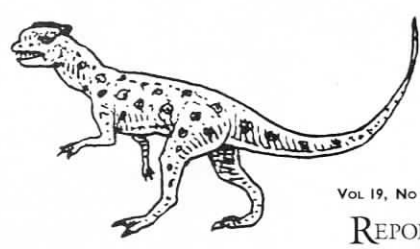

Dr Dino Does 'Delphia

Andrew Petto
with Stephen Meyers and Bob Leipold

The Setting

Kent Hovind, alias Dr Dino, presented a "Creation Seminar" at Calvary Chapel in Philadelphia, Pennsylvania, on May 7-8, 1999. Flyers advertising the event were distributed throughout the area, but we might have missed it entirely if someone hadn't sent out a mailing addressed generically to "Science Teacher" at a number of local schools and colleges. Based on this advance publicity, we were able to rouse an NCSE contingent to attend. Three of us took in the presentation in overlapping shifts and compiled this report from our combined notes based on the presentation.

The flyer advertising the event asked, "Is the World a Product of Random Chance?" It also promised to answer 3 key questions posed in this way:

- Does Science Contradict the Bible?
- Did you know that Dinosaurs are Mentioned in the Bible?
- Is there a Political Reason Evolution is Being Promoted in the Public Schools?

The central image in the flyer, which also graces Hovind's home page, depicts a human, a dinosaur, and a woolly mammoth eyeing each other warily while a flying reptile glides over a banner bearing the words "CREATION SCIENCE EVANGELISM" (<http://www.drdino. com>, last accessed December 11, 1999). With this information and the knowledge that the event would be held in a conservative nondenominational Christian church, we expected a strong religious component to the presentation.

Philadelphia's Calvary Chapel is a large facility with a worship area, classrooms, and meeting facilities. An elementary school and a number of other social and educational programs are affiliated with the church. The main sanctuary, where Hovind made his presentation, is a large room arranged like an amphitheater with a capacity for about 1000 persons. The sloping floor of the hall puts the speaker on a level above the heads of those in the first several rows. In the middle of the hall is a large media area from which technicians can control lighting, sound, and recording equipment. The crowd for Hovind's presentation was far below the capacity for the facility, though there were easily several hundred people in attendance.

Style and Format

Hovind's presentation was animated and entertaining. The format was an illustrated lecture — almost a multimedia performance; Hovind used presentation software to project images, partial quotations from the scientific literature, and biblical references. The high-quality graphics made for some interesting viewing. However, the presentation was purely expositional; it was nothing like a true seminar in which the participants are supposed to provide some of the intellectual content and critical analysis. Hovind talked and showed his illustrations; everyone else listened.

Thanks to the presentation software, the images and the text supporting the lectures were easy to see, while the viewing angles were "creative". For example, quotes from the scientific literature were scanned in at an angle. This just may have been an attempt at an "aesthetic" presentation of boring old quotes, but scanning at an angle solves 2 problems at once. First, Hovind can say that he didn't quote out of context, because, after all, there is the quote right there on the page with the rest of the text. Second, the angle of the view made it difficult to see what the rest of the text really said, because it contains partial segments of a number of sentences — some quite complex. To someone familiar with scientific writing, however, it was clear that a proper reading of the excerpts did not agree with Hovind's interpretation.

The content of the presentation came directly from the materials in Hovind's videos and web site (<http://www.drdino.com>), though in a much abridged form. Indeed Hovind repeated at regular intervals how little time there was for detail, adding that the videos and other materials for sale out in the corridor contained all the documentation to support his claims.

Because this presentation was made in a church and before a sympathetic crowd, the connections between the "science" and the Bible were made explicitly and often. As if to underscore the point, Hovind often capped his "scientific" tidbits with a Bible verse.

At the outset, Hovind listed his objectives for the seminar.

continued on page 25

Facing Challenges to Evolution Education

Molleen Matsumura, Network Project Director

In 1983, the National Center for Science Education (NCSE) was founded to promote excellence in science education, improve public understanding of evolution, and defend evolution education from sectarian attacks. In 1987, when the US Supreme Court struck down a Louisiana anti-evolution law, many observers thought the "creation science" controversy had been put to an end. Instead, it returned to the local level, where new strategies appeared in countless communities; eventually, the problem re-appeared at the state level as well. Parents, teachers, and other citizens are increasingly looking for guidance in coping with the evolution/creation controversy in their communities. Here are some strategies that are commonly used to introduce "creation science" into public schools, followed by suggestions on how to respond.

STRATEGY: Proposals to teach "creation science" may be disguised by euphemisms. Common examples are "arguments against evolution", "alternative theories", "intelligent design theory", or "irreducible complexity". Such euphemisms often arise after court decisions. For example, the US Supreme Court ruled in 1987 in *Edwards v Aguillard* that it was unconstitutional for the state of Louisiana to require that "creation science" must be taught whenever evolution was taught. By avoiding the term "creation science" and calling instead for "alternatives to evolution", anti-evolutionists hope to avoid legal entanglements.

RESPONSE: These phrases are code words for an attempt to bring non-scientific, religious views into the science curriculum. Regardless of the labels attached, it is illegal for public schools to advocate religious views of any kind. Districts that do so are risking expensive law suits that would divert funds from important educational programs. Different members of the public will respond to different kinds of information, so it is advisable to use many approaches. For example:

- invite local scientists to explain why "arguments against evolution" by any name are not scientific (NCSE can help);
- call upon local clergy to expose the underlying religious motivations of this approach;
- remind boards of education to obtain legal advice when considering such policies;
- provide board members and administrators with information about the applicable laws (NCSE can provide summaries of relevant court decisions and help to locate complete texts of decisions); or
- use authoritative statements by scientific, educational, religious, and civil liberties organizations whose position papers have been compiled in *Voices for Evolution* (available at <http://www. natcenscied. org/ voicont.html> or by contacting NCSE).

STRATEGY: Legislation or curriculum proposals that call for teaching evolution as "theory, not fact": These proposals use the ordinary definition of "theory" as "hunch" or "guess", claiming that evolution is "only a theory".

RESPONSE: Discuss what does constitute a scientific theory. The goals are both to make sure that the public and policy makers understand the issues and to ensure that correct definitions appear in curriculum and policy statements. The California State Board of Education Policy on the Teaching of Natural Sciences contains this good, concise definition from the 1986 edition of the *Hammond Barnhart Dictionary of Science*: "Theory... an explanation or model based on observation, experimentation, and reasoning, especially one that has been tested and confirmed as a general principle helping to explain and predict natural phenomena...." More information, including the flyer, "What's Wrong with 'Theory, Not Fact' Policies on Teaching Evolution?", is available from NCSE.

STRATEGY: A very persuasive argument for introducing anti-evolutionary materials is that fairness requires teaching "both sides of the issue," meaning both evolution and some form of "creation science".

RESPONSE: Point out that "fairness" has different requirements in different contexts. In court, fairness is guaranteed by an undemocratic process: attorneys on both sides and all the jurors must obey rules of evidence and other procedures enforced by the judge. In the same way, science is a fair process, but not democratic. Scientific questions are decided not by taking votes, but by presenting and examining evidence. A variety of views may be presented, but only those theories (explanations) that work are accepted. A fair science curriculum is one that teaches the most up-to-date, accurate information that is accepted in the scientific community. A good curriculum also requires science teachers and students to use scientific standards of evidence and inference in classroom discussions, rather than dogma and unsupported opinions.

STRATEGY: Questionable "alternate" or "supplementary" books are donated to school districts or proposed for classroom use. Donations in particular can be a problem because it seems impractical to refuse gifts, and school personnel may not wish to seem ungrateful.

RESPONSE: Given the limitations on library and classroom space, books offered as gifts should meet the same criteria as books that would be purchased. Contact NCSE for scientific evaluations of the proposed books and if the gifts are sub-standard, follow your district's procedures for requesting a review of curriculum materials. You can distribute copies of scientific evaluations to the reviewers and, if necessary, obtain additional help from NCSE.

Attacks on evolution have been part of the American educational scene for decades, and as quickly as one strategy is defeated, another appears. While this summary gives you much of the information you need to recognize and respond to anti-evolution in your community, it is possible that you will have to cope with a whole new approach. If that happens, or if you simply need more information, never hesitate to contact NCSE. We're here to help.

Call NCSE at 1-800-290-6006. Fax us at (510) 526-1675. Email us at ncse@natcencied.org. You can even write us a letter: NCSE, PO Box 9477, Berkeley CA 94709-0477.

Books (Formerly) Undreamt of in Our Philosophy

Milestones

Each of these books represents a milestone in 20th-century evolutionary science. From timeless classics to recent sensations and from paleontology to population genetics, these are books that have made major contributions to what we know and how we think about evolution.

Vertebrate Paleontology and Evolution
Robert L Carroll

The Selfish Gene
Richard Dawkins

The Genetical Theory of Natural Selection: A Complete Variorum Edition
RA Fisher (edited by Henry Bennett)
A special edition first published in November 1999.

Ecology and Evolution of Darwin's Finches
Peter R Grant
If you've read *The Beak of the Finch* (also available from NCSE), you know the story of Grant's painstaking work studying the finches of the Galapagos. This is Grant's detailed scientific account of all he's learned.

A Brief History of Time
Stephen Hawking
Evolution is cosmological as well as biological, and this classic clearly explains the evolution of our universe.

At Home in the Universe: The Search for Laws of Self-Organization and Complexity
Stuart Kauffman

In this issue, we feature important and interesting books that we have never before been able to offer to our members because we could not carry them ourselves. We are excited and delighted (no exaggeration) to recommend these books simply because they are well worth reading. The books listed here are on 2 special themes, but they are located in our on-line book catalog in one of the existing categories Evolution, Creationism, Critiques of Creationism, General Science, Children's Literature, and Humor. All you have to do to locate a particular book in our catalog is to choose "search" from your browser's edit menu, and then type in the author's name or part of the title. All of these books, and many more, are listed on our website at

Genetics, Paleontology, and Macroevolution
Jeffrey Levinton

The Crucible of Creation: The Burgess Shale and the Rise of Animals
Simon Conway Morris

The Major Transitions in Evolution
John Maynard Smith, Eors Szathmary

Adaptation and Natural Selection: A Critique of Some Current Evolutionary Thought
George C Williams

Evolution and the History of Thought

Guns, Germs, and Steel: The Fates of Human Societies
Jared Diamond

The Mismeasure of Man
Stephen Jay Gould

The Death of Adam: Evolution and Its Impact on Western Thought
John C Greene

Social Darwinism in American Thought
Richard Hofstadter (introduction by Eric Foner)

The Great Chain of Being: A Study of the History of an Idea
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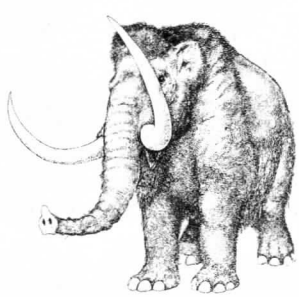

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Thanks to the generosity of *Astronomy Incorporated*, NCSE has a limited supply of astronomy calendars for the year 2000 that we can donate for educational use. These calendars are illustrated with beautiful, high-resolution images of celestial bodies. Use them to bring the history of the universe to the walls of your classroom, add them to resource packets at science teachers' workshops, or award them as science-fair prizes!

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These stunning calendars can be previewed at <http://www.astronomyincorporated.com>.

NCSE on the Road

A Calendar of Special Events, Presentations, and Lectures

DATE	March 22, 2000
CITY	Minneapolis MN
PRESENTER	Eugenie C Scott
TITLE	"Intelligent Design Creationism": The New Kid on the Block
EVENT	American Physical Society
TIME	11:00 AM - 1:25 PM
LOCATION	Hilton Minneapolis, room TBA
CONTACT	Barry Karr SkeptInq@aol.com

DATE	April 6-8, 2000
CITY	Orlando FL
PRESENTER	Eugenie C Scott
TITLE	Cans, Can'ts, Shoulds and Shouldn'ts: Teaching Evolution
EVENT	National Science Teachers Association Annual Meeting
TIME	12:30 - 1:30 PM
LOCATION	Orange County Convention Center Room 207
CONTACT	David Berenhaus dberenhaus@nasta.org

DATE	April 21, 2000
CITY	Des Moines IA
PRESENTER	Eugenie C Scott
TITLE	TBA
EVENT	Iowa Academy of Sciences, 112th Annual Meeting, Plenary Lecture
TIME	8:00 PM
LOCATION	Hotel Fort Des Moines
CONTACT	Dr David V McCalley, (319) 273-2021

DATE	April 22, 2000
CITY	Des Moines IA
PRESENTER	Eugenie C Scott
TITLE	TBA
EVENT	Iowa Academy of Sciences, 112th Annual Meeting, Iowa Science Teacher Section Symposium
TIME	TBA
LOCATION	Hotel Fort Des Moines
CONTACT	Erica Larson elarson@tipton.k12.ia.us

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

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A. Strengthen people's faith in the Bible
B. If you're not saved, I'll try and get you saved
C. If you are saved and not busy for the Lord, I will try to make you uncomfortable.

These also appear on his web page (<http://www.drdino. com/SeminarAudio/Part1/index.htm>, last accessed December 11, 1999).

The "scientific" presentation was a string of summary statements repeated out of context and in the most absurd way possible. Hovind followed each one by a "Now, isn't that ridiculous?" or "How could they be so silly?" Then he would give his own interpretation of the data: that the world was created in 6 days about 10 000 years ago — a chant he repeated often throughout the program and had the audience repeating along with him by the end of the first evening's presentation.

Much of the presentation focused on the "political" reasons that biblical creationism is not taught in the schools — after all, Hovind's presentation "proved" that true science supports the accuracy of the Bible as a literal scientific and historical document. Most of these reasons revolve around an international conspiracy Hovind called "The New World Order" (NWO) consisting of Ted Turner (and his then-wife, "Hanoi" Jane, of course), the British Royal Family, the state of Israel, the ACLU, and a smattering of former and present US government officials, business leaders, and social activists (particularly those advocating population control).

What is most remarkable is that Hovind claimed that the "target date" for the implementation of the NWO's world-domination plan is May 5, 2000 — not coincidentally, Hovind noted, the 50th anniversary of the founding of the modern state of Israel. This is also the date, according to Hovind, by which the NWO wishes to reduce the world's population to no more than 500 million people (less than 10% of the current population). You can watch the countdown before the fateful day by connecting to <http://www.mindspring.com/~tallulah/hovind/>.

Hovind's "Science"

The presentation began pretty much with standard literalist anti-evolutionary fare: micro- versus macro-evolution, the second law of thermodynamics (stated incompletely, of course), and the alleged correlation between teaching evolution and the rise in crime rates, divorce, and venereal diseases. These negative social changes also correlate, according to Hovind, with a decrease in "moral values", SAT scores, and IQ — though Hovind provided no documentation of the extent, severity, or duration of any of these negative outcomes. Finally, Hovind gave the "evolution fairy tale" — the frog that turns into a prince — to ridicule the evolutionary expectation that existing species can give rise to entirely new species, as Hovind argues evolution must require.

Throughout the "seminar" Hovind also made a number of remarkable claims and citations of research. Most, of course, had to do with the "anomalies" and "inconsistencies" in the scientific literature, such as inconsistent radiometric dates and mathematical approximations that turn out to be inaccurate. Most of these had to do with first approximations or broad estimates and extrapolations made with very poor data. What Hovind left out, of course, was that these errors and miscalculations were generally identified quickly *by scientists* in the normal process of peer review and critical assessment of models and results — and without invoking divine intervention.

He also used supposed evidence from studies on population growth, star evolution, cometary travels, decay of the speed of light, oil fields, fluctuations in the earth's magnetic field, the saltiness of the ocean (*see Wheeler p 17*), the age of the Sahara Desert, geological erosion rates, and more to prove that the earth cannot be older than about 10 000 years old. The details of his "logic" are burdensome, but one example is that of the oldest tree. Since the oldest tree is no more than a few thousand years old, how, Hovind asks, could the earth be any older? Interested readers can hear an audio version of these arguments and "evidence" on Hovind's web site (<http://www.drdino.com/SeminarAudio/Part1/index.htm>, last accessed December 11, 1999).

Briefly, here are the major points covered by Hovind in his May 7–8, 1999 presentation at Calvary Chapel:

On evolution and paleontology

Darwin has been disproved at <http://www. darwindisproved.com>. [Unfortunately for Hovind, this site was an April Fool's joke, which would have been obvious to anyone who was scientifically literate (*see* RNCSE *1999 Mar/Apr; 19(2): 30–1)*.]

Fossilized insects and animals were enormous before the flood; reptiles never stopped growing.

How did Noah get all those animals on the ark? He took 2 of each *kind*, not necessarily 2 of each *species*. He also took baby animals because they were smaller, ate less, and would have longer lives to devote to reproduction after they left the ark.

Hovind: Dinosaurs are alive and well on planet earth!

All species were vegetarians before the flood, so animals had no fear of humans.

On dinosaurs

Human and dinosaur footprints were found together in the Paluxy River bed in Glen Rose, Texas. NOVA filmed creationist Carl Baugh and an unnamed evolutionist during this dig, but would not document the findings. The evolutionist refused to examine the evidence.

Dinosaurs are alive and well on planet earth! Someone saw a yellow dinosaur with a beard. A small dinosaur caught in Lake Erie near Lakewood, Ohio, is now on display in Carl Baugh's museum in Texas. There are many reports of pterodactyls flying around Papua, New Guinea (this information came from Carl Baugh, who has been there!).

Hovind: [I]t is "perfectly legal" to teach "creation science" in schools. The US Supreme Court ... has said so, and [a] conspiracy ... is preventing its implementation.

Rounded stones allegedly collected from a cave near Ica, Peru, show clear drawings of dinosaurs, humans, and domestic animals together. These images indicate that humans and dinosaurs lived together. Hovind again referred people to the hoax web site <http://www.darwindisproved.com>.

The "leviathan" mentioned in the Bible is a fire-breathing dragon. In ancient literature what were called "dragons" were actually dinosaurs. The way the ancients killed these dragons (for example, *Tyrannosaurus rex*) was to pull off their small forearms and let them bleed to death.

We don't see the sea monsters (dinosaurs) that were reported by ancient seafarers because modern ships' engines make too much noise and scare the animals off.

ON GEOLOGY AND EARTH SCIENCE

A clay doll was found in rocks dated at 12 million years old in Nampa, Idaho.

There was no Pangaea and no continental drift!

Radiometric dating is wrong because the same moon rocks give different dates (see <http://www.jpdawson.com>). Carbon-14 dating is inaccurate because two bones from the same mammoth date 22 000 and 40 000 years old.

ON HEALTH

Hovind reported a cure for cancer. A vitamin B17 deficiency causes cancer just as vitamin C deficiency causes scurvy. Taking B17 plus C will cure cancer. Hovind referred the audience to <http://www.canceranswer.com> or <http://www.worldwithoutcancer.com>.

"The whiter the bread, the quicker you're dead" because white bread lacks vitamin E and lecithin. Cancer incidence increased when vitamin E and lecithin were removed from breads to make white bread.

One reason Adam and Eve lived so long (more than 900 years) is that they were vegetarians. The average life span of humans before the flood was 912 years. Noah was 600 years old when he built the ark.

A hyperbaric chamber can heal the sick and grow giants like those that lived before Noah's flood when the level of oxygen and atmospheric pressure were twice what they are today. This is confirmed by scientists who studied the air bubbles in amber (see Time 1987 Nov 9; p 82). Under these conditions, Dr Mori in Japan grew a tomato plant 40 feet high yielding 15 000 tomatoes.

ON SOCIETY AND GOVERNMENT

We should not have any public schools. See <http://www.exodus2000.org>.

The 10th amendment to the US Constitution requires that the federal government stay out of education.

Democracy, which always leads to a dictatorship, is an illegitimate form of government because it presumes that rights are conferred by Man [*sic*]. In a constitutional republic like the US, rights are conferred by the Creator.

"AUTHORITATIVE" SOURCES

Following the presentation, one of us (SM) managed to contact Hovind and ask some specific questions about the sources of his claims. His replies indicate that he accepted at face value the claims of anyone who shared his particular vision of Christianity and who seemed (to Hovind) to be a reliable source. When asked specifically about certain claims, he replied that he felt no need to investigate.

For example, he accepts vitamin B17 as the cure for cancer because he spoke with people who were convinced that it had cured them of cancer. With regard to the "yellow dinosaur with a beard", he said that is what someone reported. When asked for evidence to support his conclusions, he repeatedly provided personal testimonies and people's phone numbers as proof positive. When asked if he investigated any of these stories, he replied that he takes them at face value.

Finally, we asked Hovind about his claim that dinosaur and human tracks were found side-by-side in the Paluxy River. This claim had long ago been discredited and disavowed by anti-evolutionists (*see JD Morris's "The Paluxy River Mystery"*, Impact *1986: 151*), but Hovind made no reference to this report. Furthermore, the president of Philadelphia's Institute for Bible Studies and Science was present at the excavation of a supposed human footprint at the Paluxy River site and made a cast of the print. He had it examined by an expert who determined that it was definitely not a human foot print. We offered Hovind the phone number of the witness as "proof".

HE JUST KEEPS ON ...

An important part of the program is Hovind's reminder that it is "perfectly legal" to teach "creation science" in schools. The US Supreme Court, he claims, has said so, and it is the conspiracy of the NWO that is preventing its implementation. There is now, he claims, an "approved" Bible curriculum for public schools that can be adopted for use; of course he neglects to mention that this curriculum has failed to overcome constitutional challenges to its implementation in the public schools.

Hovind is also undaunted by challenges to his interpretation of Scripture. He relies on the King James Version as the authoritative text, even when biblical scholars point out to him the different ways in which passages are rendered in earlier versions, particularly in Hebrew versions. Hovind replied in a phone conversation (with SM) that he would consider this, but there is no evidence on his web site that there has been any significant change in his evaluation of the specific objections to his interpretations nor any acknowledgment that he has considered any of them.

Hovind returned to the Philadelphia area in mid-November. The host church was Limerick Chapel in Limerick,

Please Define Evolution, Professor Mastropaolo

Bill Thwaites

The November 1999 issue of *Impact* (nr 317) contains another creationist classic. It was written by Joseph Mastropaolo, PhD, a professor at the Institute for Creation Research. The article is entitled "Evolution is Biologically Impossible".

Those of us who have studied evolution know that we can describe evolution just as Darwin did 141 years ago: (1) descent with modification, and (2) modification by means of natural selection (and also by chance effects such as genetic drift and mutation). The first theory postulates that new species are the modified descendants of pre-existing species. The theory is supported by the stratigraphic and geographic patterns formed by the appearance and disappearance of fossil species in the geological record. The second theory, modification by natural selection, postulates a mechanism by which modification can occur.

Showing that biological evolution is impossible would involve finding incontrovertible evidence that one or both of Darwin's theories is wrong. For example, if someone found glaring inconsistencies in the stratigraphic record, the observation would disprove descent with modification. Such an inconsistent observation might involve something like the discovery of koala bear and elephant fossils embedded in hitherto unambiguous pre-Cambrian deposits.

The disproof of modification by natural selection perhaps might involve a series of genetic discoveries that provided a mechanism for limiting the total amount of genetic change any species could tolerate. Such a mechanism would at last provide some substance to the anti-evolutionists' claim that macroevolution, as they define it, is impossible. "Macroevolution" in anti-evolutionist lingo includes all evolutionary changes — in anatomy, genetics, physiology, behavior, or any other measurable traits — equal to or greater than the change from the chimp/human ancestor to chimps and humans.

I have thought of 2 mechanisms that might limit the extent of evolutionary change. There must be others that I haven't thought of, but the following mechanisms will have to suffice for the moment.

One mechanism would depend on the existence of a gene that I will call an "anchor gene". The anchor gene would be an immutable gene that is highly specific for a given created kind. Even if the anchor gene could mutate, all mutations of it would be lethal or cause complete sterility. I further postulate that an anchor gene would somehow embody the essence of a particular created kind. Every other piece of genetic information in that kind would have to act in harmony with the immutable anchor gene. No other gene could stray too far from the requirements dictated by this master gene. Thus there would be a limit to the variability that could occur within a created kind. The immutability of the anchor gene would also suggest that the gene had appeared in its present form in a single step because no variation of it would be compatible with life. Unfortunately no one so far has identified an anchor gene or anything that remotely resembles one.

Another mechanism that might provide for the fixity of created kinds would involve some sort of genetic "memory". The memory would be of the genetic information in the original example of that particular created kind. Presumably the memory mechanism would involve a means of replicating genetic information

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Pennsylvania. Limerick Chapel is a big church with a big school. In keeping with the suggestions of Barbara Forrest (*see p* 28) and Pierre Stromberg (*see* RNCSE *1998; 18[5]: 28 - 30*), one of our members wrote to the pastor to warn him about Hovind. There was no reply before the scheduled appearance.

While in the area Hovind managed to make at least one appearance on a radio talk show. When a local NCSE member requested a chance to go on the air at a later date to refute the *religious* aspects of Hovind's presentation, the producer demurred, saying that the station wouldn't do another program on this topic for at least several weeks.

Hovind's next scheduled visit to Pennsylvania will be November 4-6, 2000. If you want to see when Hovind will visit your area, just connect to <http://www.drdino.com/itinerary.htm> for all the latest. You will be amazed!

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Unmasking the False Prophet of Creationism: Kent Hovind

Barbara Forrest
Southern Louisiana University

The headline in the October 16, 1998, *Daily Star*, **"$10,000 to prove him wrong,"** told me immediately that the article in my local newspaper was about Kent Hovind, an itinerant creationist who presented a "seminar" at Immanuel Baptist Church in Hammond, Louisiana. Hammond is in Tangipahoa Parish, Louisiana, where the school board is involved in an ongoing court case involving its evolution disclaimer. (*see* RNCSE *1998; 18[6]: 4 and p 5 for the most recent information on this case*). To many interested in teaching evolution in public schools, Hovind is familiar, but as an expert at self-promotion rather than evolution. His true agenda, which he shares with other members of the Religious Right, is undermining public schools by attacking the teaching of evolution. It was essential to expose Hovind locally, so I sent the newspaper a letter, which was published after his visit. Hovind's lack of scientific training makes it impossible to engage him on a professional level, so I decided to inform the public of some of his most preposterous ideas, juvenile rhetorical tactics, lack of credentials, and anti-public-school agenda. This strategy may be useful to others. (The letter is on Ken Harding's web site <http://www.geocities.com/Tokyo/Temple/9917/evolution/barb_forrest.html>).

Rather than *describing* Hovind's message, I let *him* speak through selections from his book, *Unmasking the False Religion of Evolution* <http://www.hsv.tis.net/~ke4vol/ evolve/cover. html>. The following are some of the most egregious, and therefore most effective, quotes (the bracketed insertions are mine):

> The Smithsonian Institute [*sic*] has 33 000 sets of human remains in their basement ... Many of them were taken while the people were still alive. They were so desperate to find missing links, so desperate to prove their theory that they murdered people to prove it. It was the philosophy of evolution that drove them (Hovind, Ch 4).
>
> Five billion people [yes, he says ***billion***] could drown in Loch Ness, and no one would show above the surface. It is a big lake. . . .As of the 1960s, there were over 9000 sightings of the Loch Ness Monster. Today, there have been over 11 000 such sightings (Hovind, Ch 2).
>
> The Trail of Tears was where the Cherokee Indians were driven out of the Chattanooga area all the way to Oklahoma. ... Evolution is responsible for what happened to the Indians. How any Indian can believe in evolution just blows my mind. ... [T]he evolution theory is what destroyed them (Hovind, Ch 4).

[This quote exposes Hovind's historical as well as scientific ignorance. The Trail of Tears occurred in America in the 1830s. Darwin's *The Origin of Species* was not pub-

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without any error whatsoever. Alternatively, it might require a means by which each generation of a created kind could go to some sort of genetic archive and compare its own genetic information with that of the original example of that kind. Finally, the memory idea would have to postulate a mechanism that could cause the death or sterility of any individual whose genes had strayed too far away from the original genetic information.

The discovery of even one element of such a memory/comparison/rejection mechanism would be an exciting development, not only for "creation science", but for science in general. At the very least such a finding would be worthy of publishing in *Impact*.

Thus it was with eager anticipation that I read Mastropaolo's article. Had he actually discovered an element of one of my postulated fixity mechanisms, or had he discovered still another mechanism that I had not anticipated? Had a barrier between micro- and macroevolution finally been discovered by a "creation scientist" doing original research?

Alas! I was deeply disappointed to find that Mastropaolo's *Impact* article did not deal with either descent with modification or modification by means of natural selection. Instead the article was entirely devoted to the origin of life. It was nothing more than a frivolous attempt to disprove a theory that has not yet been formulated.

I must admit that some of the postulates of a theory for the origin of life seem to be falling into place. There is, for example, a growing body of evidence to suggest that protein-mediated metabolism has augmented an earlier system that was largely based on the

lished until 1859 in England.]

> I believe the Great Pyramid was built to be the Bible in stone. The Egyptians did not build it. (Hovind, Ch 6).

> Adam and Eve probably had hundreds of children. They lived 800 years, and one could have a lot of children in 800 years (Hovind, Ch 6).

> There has been research that indicates nearly all homosexuals come from families that have a weak father figure, and a dominant mother ... research shows that there is a social link where the children are raised to be wimps or whatever (Hovind, Ch 6).

[The connection in Hovind's mind between homosexuality and evolution is unclear, but this quote demonstrates Hovind's mean-spirited, flippant stereotyping of homosexuals and their families.]

> My first question [to God, after Hovind goes to heaven], believe it or not, will be, "Did Adam and Eve have a belly button?" I don't know why, but that has bothered me for years (Hovind, Ch 6).

> The only book that I have read that really struck home with me giving a possible explanation for UFOs was... *The Cosmic Conspiracy* by Stan Deyo. ... Deyo, a Christian, is a genius who wrote the book way over my head. ... He says that Satan has always used that mode of transportation to get around because the devil can only be at one place at one time. ... I do not know if it is true, but it is an interesting theory (Hovind, Ch 6).

I ended the quotes with a selection from Hovind's web site, reflecting paranoid ideas common in far-right movements:

> Microchips may play an important part in the mark of the beast. One example of technology is the UPC, or bar code. ...[T]he two skinny lines at the beginning, middle, and end of every bar-code stand for "6" in binary code: 666 [the mark of the beast]. ...[F]our people have called me from Arkansas and Missouri to report seeing customers at the grocery store pay for purchases by scanning their hand (Hovind, FAQs <http://www.drdino.com>).

I offered a final gem from his video series (which he usually sells at his seminars). In Part 4 of "Dinosaurs, Creation, Evolution: A Creation Seminar", Hovind shows a slide of a bird hatching from an alligator's egg: "Maybe a reptile laid an egg and a bird hatched out." Hovind's use of this absurd explanation of punctuated equilibrium demonstrates his strategy of discrediting evolution with ridicule. (Readers can download an example of his rhetorical technique in an audio clip, "November 13, 1998, Tuesday, Kent Hovind — 'Evolution, Check Your Brains At The Door'" [<http://www.audiocentral.com/rshows/missler/archives.html>], accessed January 25, 1999.)

In case my audience was *still* unconvinced of Hovind's scientific incompetence, I included information about his credentials. Hovind says on his "drdino" web site that he graduated from Midwestern Baptist College in Michigan with a major in education and Bible and received his master's and doctoral degrees in education from Patriot University, "a small Christian University in Colorado" (<http://www.drdino. com/FAQs/FAmisc.htm#Q: Where did you get your degree?>). In Part 1 of his seminar, he boasts of his "PhD in education." A little research about his credentials is enlightening.

MBC offers little science instruction, and it is saturated with religious doctrine; the objective of the MBC Department of Education is to train students "for teaching in Christian schools" (<http://www.midwesternbaptist.edu/school/courseeducation.htm>). The Division of Science offers only 4 undergraduate courses (one is "Creation Science"), all slanted toward Biblical literalism <http://www.midwesternbaptist.edu/school/coursescience.htm>. The objective of taking the sole science education course offered by the MBC Department of Education is to learn "to present to an elementary class the universe which God has marvelously created" (<http://

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catalytic properties of RNA. To my knowledge no one has yet produced an RNA that is fully capable of replicating copies of itself. But at least we can envisage such a simple one-molecule form of life.

Mastropaolo, like most creationists and much of the general public, erroneously assumes that the theories of evolution attempt to explain the origin of life as well as how biological evolution occurs. In an ironic and spectacular failure to grasp the concept, Mastropaolo challenges evolutionists to demonstrate the "feasibility" of life's originating according to the theories of evolution. This makes as much sense as saying that evolution is false because fish don't ride bicycles.

Evolution only pertains to systems that self-replicate, mutate, and respond to natural selection. Nonlife doesn't do any of those things. Life does them all. Having life start from a self-replicating RNA molecule is an attractive idea because it allows the conceptualization of something simple enough to have originated by natural processes which conceivably could possess all the essential characteristics of life. But until someone can demonstrate the "feasibility" of this or some other origin-of-life scenario, we won't have an origin-of-life theory.

Meanwhile Mastropaolo blindly rushes on with a torrent of irrelevant probability calculations and quotations based on poor understanding of outdated models for the origin of life. In the end, not a single word in the entire piece is related to evolutionary theory. The title of the article could not be more misleading.

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www.midwesternbaptist.edu/school/courseeducation.htm>). Hovind's education at MBC would never qualify him to teach in any school with a legitimate science curriculum.

Hovind's credentials from Patriot University are even less substantial. PU was formerly in Colorado Springs, Colorado, but is now in Alamos, Colorado, in a house near the College Heights Baptist Church. The street address listed in the "External Studies Department Bulletin" (Fall 1997) is the residential address of PU's Executive Director of External Studies, Dr Lonnie Skinner. The Bulletin indicates how a university could simply relocate to another town: There is no faculty, and credit is offered for "life experience and ministry evaluation". The courses, workbooks, audiotapes, and videotapes can be completed in 2–4 weeks. Tuition is a voluntary, monthly "freewill offering". The *only* graduate science course is "SC 701 — Biblical Basis of Modern Science". The DMin is offered in Biblical Studies, Pastoral Studies, Evangelism and Missions, Christian Education, and Christian Counseling.

When I e-mailed Skinner to inquire whether Patriot offered a PhD and whether Hovind had received one, the unsigned reply stated that "Kent Hovind did receive a PhD in Christian Education from Patriot in 1991. I think that may have been the last year Patriot awarded the PhD" (personal communication, January 21, 1999). Patriot is accredited only by the American Accrediting Association of Theological Institutions, which Steve Levicoff in *Name It and Frame It* classifies as an "accrediting mill" (Levicoff, Ch 12). The US Department of Education does not recognize AAATI as an accrediting agency (US Department of Education, September 1998, p 28). Hovind's PhD clearly does not meet even minimally respectable academic standards.

Finally, my letter addressed Hovind's true agenda: attacking public schools for teaching evolution. Hovind clearly favors eliminating public schools: "Should we have a public school system? ... I believe if the government was out of the education business ... many other problems would be eliminated." He urges parents to remove their children from public schools to deprive them of funds: "Transfer your child from public school to private or home school. Public schools lose funding when enrollment drops" (Hovind, FAQs).

In Part 1 of his video series he also instructs public school students to ask an impertinent question during lessons on evolution: "Excuse me, teacher, but were you there?" (I advised local teachers to be ready for this.) Hovind's attitude toward teaching evolution was revealed in a remark he made during a debate with Dr Karen Bartelt, a professor of organic chemistry at Eureka College, who debated him in Fall 1998 and provided me with an account. According to Bartelt, Hovind asserted that anyone teaching evolution to children will go to hell.

Concerned citizens should be alert for local churches' booking his "seminars", which sometimes attract hundreds. More ominously, he also claims in his video series to visit public schools. His itinerary is on his web site but sometimes changes, so local newspapers should be watched. In fact, not only should local papers be watched for *announcements* of his visits, but for their *content.* Local reporters can be deceived by his promotional propaganda. Prior to his Hammond seminar, the *Daily Star* portrayed him as a biblical and scientific authority:

> The Rev Lonnie Wascom, Immanuel's pastor, said Hovind's seminars are fact-filled, exciting and informative, causing even the most devout evolutionist to sit up and take notice. ... Hovind is considered one of the foremost authorities on science and the Bible. He has debated evolutionists across America and is dedicated to proclaiming factual scientific evidence supporting the Biblical record of creation and the history of the world *(Daily Star*; October 16, 1998, Hammond, Louisiana).

Flabbergasted at this misleading representation, I found during my research that the wording was taken virtually verbatim from the web site containing Hovind's book (<http://www. hsv. tis.net/~ke4vol/evolve/introng.html>). The newspaper did not reference the source, probably obtaining it directly from the pastor.

Hovind presents to gullible audiences neither real science nor intelligent religious doctrine, but a juvenile attack on evolution, which he does not understand. Exposing Hovind in letters to newspapers can counteract his damage. On the afternoon my letter appeared, I received an e-mail message from an Immanuel member who thanked me, saying he had wondered during the seminar about Hovind's credentials (personal communication, October 30, 1998). He has since related that there was a "big discussion" at the church subsequent to my exposé. Writing letters *can* make a difference.

Acknowledgments

The author thanks Ed Brayton, Skip Evans, and Karen Bartelt for assistance in gathering information for the letter and the article.

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Hemoglobin's Clue to Biochemical Evolution

Andrew J Petto, NCSE Editor

Anti-evolutionists often challenge evolutionary theory to "explain" the emergence of complex systems from less complex forerunners. Living things are made up of so many interrelated parts that work together in order for organisms to function and survive, they argue, that it is impossible for evolution to build functional components out of partial structures. There is an all-or-nothing quality to the operation of these systems in living things, and perhaps nowhere is this more obvious than in complex biochemical pathways — at least according to many in the "Intelligent Design" (ID) camp.

A recent article in *Nature* has addressed the issue of the relationship between biochemical structure and function by studying the actions of hemoglobin in parasitic worms. These worms live in the human intestine in an oxygen-free environment, yet, according to the authors, have large hemoglobin molecules that bind "oxygen nearly 25 000 times more tightly than does human hemoglobin" (Minning and others 1999: 497). If there is no oxygen for the hemoglobin to bind, then what else does hemoglobin do? Is it possible that its function as an oxygen transport chemical is only *one* of its biochemical talents? The answer in the article by Dena Minning and her colleagues is a hearty "Yes!"

Minning and colleagues discovered that hemoglobin combines with nitric oxide in the parasitic roundworm and then goes on a search-and-destroy mission for oxygen molecules. The function of hemoglobin in these organisms is to bind to and destroy free oxygen in the tissues of this worm, not to *enrich* the tissues with this oxygen.

In an interview with *The New York Times*, coauthor Jonathan Stamler, a biochemist at Duke University, said, "Hemoglobin first evolved to destroy nitric oxide, a gas that poisoned early microbial life. Later it captured nitric oxide and put it to work destroying oxygen, a gas that poisoned primitive worms and other invertebrates. Now, hemoglobin with the help of nitric oxide moves oxygen around the bodies of large animals with backbones."

The *Times* article also carried interviews with several physiologists who reported that hemoglobin exists in all the kingdoms of living things — even in those organisms that require oxygen-free or oxygen-poor environments. The key to the adaptation of oxygen-seeking hemoglobin from a destroyer to a supplier is the way in which nitric oxide is harnessed. In vertebrates, Stamler told the *Times*, nitric oxide is used in very low concentrations to locate tissues that are in need of more oxygen.

The research reported in *Nature* proposes that the evolution of a complex biochemical pathway proceeds by building on both pre-existing structure and function and modifying the interactions of chemical compounds to serve the organism better under new environmental conditions. Hemoglobin maintained its biochemical attraction for oxygen and nitric oxide, but it combined these attractions in new ways to move from being a destroyer to being a supplier. The traces of this descent with modification can be seen in the comparative physiology of living organisms that use hemoglobin as an oxygen binder and transporter. Minning and others (1999) have shown us the outline of the steps in the process of building a complex and very specific function by adding to or modifying existing biochemical structures and functions.

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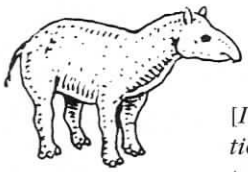
An Opportunity for Writing Reviews of Creationist Books

David Persuitte



[In past issues of NCSE *publications we have discussed ways to promote evolution and resist anti-evolutionary activities in the public forum. Now we add a new outlet to the list of radio call-ins, letters to the editor, and community-access TV — the online review of books at the web sites of internet book sellers. Ed.]*

When the non-scientifically inclined bookstore browser picks up the latest tome by Duane Gish or some other anti-evolutionist author, he or she has no way of judging the scientific validity of what is in the book from reading the online descriptions. Indeed, the unsuspecting reader might get the impression that the book presents valid scientific information, since the description of the book includes the term "creation *science*". Of course, we NCSE members know better, and we would all agree that if each creationist book had a critical review posted beside it on the bookstore bookshelf the potential reader might be forewarned.

Such reviews are not likely to be posted in real bookstores, but they can be posted in the best-known virtual bookstore on the Internet: <http://www.amazon.com>. Amazon.com provides any reader of a book with the opportunity to post a review on the same page as the book's listing. Moreover, this review can be posted free of charge.

We NCSE members should take full advantage of this opportunity. Amazon.com has a vast listing of books, both in-print and out-of-print (they offer to find used copies of books that are out-of-print), and they have listings for most of the anti-evolutionary books that have been published. What is more important is that this is another opportunity for NCSE members to reach out to the public with information about these books that would not be readily available elsewhere.

If you have read a creationist book and would like to post a review, here is the procedure:

1. Enter the URL <http://www.amazon.com> in the location field of your browser.
2. When the Amazon.com home page appears, click on the *Books* tab. A bar with several options will appear under the *Books* tab.
3. Click on the *Book Search* option. The search page that subsequently appears provides fields to enter the author's name and the book title.
4. After entering the information, press the *search now* button. If the result brings up more than one selection, click on the selection you want.
5. When the listing comes up, note the link, *write an online review*. However, you might first scroll down to read any reviews have already been posted.
6. Click on the link, *write an online review*, and if are not registered with Amazon.com, follow the registration instructions. (This is easy to do, and you will not incur any obligations.)
7. Click on the *review guidelines* link for information about writing your review. After reviewing the information, click on the *back* button to return to the review page.
8. The first item that you are asked to enter is your rating of the book. Click the down arrow to select a rating from 1 to 5 stars.
9. Enter a one-line title for your review in the second entry block. For example: "This book is a minefield of misinformation."
10. Enter your review in the third block. The review can be up to 1000 words.
11. Enter the relevant personal information in the remaining blocks, then click the *"preview your review"* button. If everything is satisfactory, submit the review. In a few days your

David Persuitte works as a technical writer/editor in Maryland. His book, Joseph Smith and the Origins of the Book of Mormon, *which had been out of print, will be published in a revised and enlarged second edition in the summer of 2000.*

review will be posted below the listing.

That is all there is to it. However, for your review to be the best it can be, here are some suggestions for writing a good review:

- Write the review beforehand, rather than online. It is probably best to write the review with a plain text word processing program to avoid incompatibility problems with the Amazon.com web page. (If you are using Windows®, you can use the Windows® Wordpad or Notepad utilities). Check for proper grammar and spelling.
- Do not generalize. Point out specific problems with the book. Give specific examples of misinformation, errors of fact or interpretation, and so on.
- Break up the review into easy-to-read smaller paragraphs covering single topics.
- When you are satisfied with the review, copy it and paste it in the review block of the Amazon.com review page. Double-check the pasted copy, making especially sure that there is no excess spacing where the lines ended in your original text. If there is excess spacing, simply delete it.
- Follow the instructions in the guidelines.

Remember, this is a great opportunity for us to promote scientific literacy and good science in the public arena and to expose and counter the misinformation that appears in creationist books. It would be great if every creationist book listed by Amazon.com were to have a critical review.

Don't forget that you can also write a *favorable* review of your favorite books dealing with evolution. This can be helpful in helping the general public understand current scientific research and why certain new books are worth reading. This may also counteract the unfavorable reviews that may have been posted by those who do not understand evolutionary science or who have a nonscientific agenda to promote.

One final point: pages on the internet frequently change, and steps somewhat different from those outlined above may be required by the time you read this. In fact, the steps had changed while this report was in process. However, any changes are likely to be minor, and you should be able to post your reviews simply by following the instructions posted on the Amazon.com review pages.

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More Online Reviewing Opportunities

Although Amazon.com is a leader in online book information, a number of other web sites offer the opportunity for readers to post reviews of books they have read. Here are a few examples.

Barnes and Noble:

Connect to <http://www.barnesandnoble.com> or <http://www.bn.com>. When you click on the title that interests you, you will see a link offering you "More Info". Click on this link to bring up the details for the book you wish to review and then click on the link "Write Your Own Review". Then compose or paste in your review.

Borders Books:

Connect to <http://www.borders.com>. When you click on the title that interests you, you will see a link offering you an opportunity to "Write a Review". Then compose or paste in your review.

Yahoo.com:

Connect to <http://shopping.yahoo.com/books>. Then click on the title that interests you and you will see a link offering a chance to "Write a Review". Click on this link and write your review or paste in one that you have prepared.

National Center for Science Education:

You can ask NCSE to list a book in the "member request" section of our online catalog at <http://www.natcenscied.org/bookcat.htm>. When you request a book from one of the categories listed on the page, we will post a link within a week and notify you. Then you can post your feedback on the NCSE book page! Tell us in 80 words who you are, why you ordered the book, and why other readers might enjoy it.

Whenever you come across a retail site that offers books for sale, check for the possibility of posting a book review of your own.

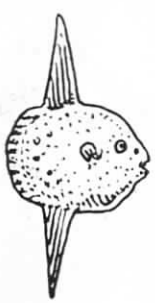
Ken Miller on Life's Design

NCSE Supporter Ken Miller's article from *Technology Review* on the appearance of "design" in biology is now available on the Brown University web server. Miller writes: "Though some insist that life as we know it sprang from a Grand Designer's original blueprints, biology offers new evidence that organisms were cobbled together layer upon layer by a timeless tinkerer called evolution."

To view this article, connect to <http://biomed.brown.edu/Faculty/M/Miller/TR/Lifes-Design.html>.
Miller KR. Life's grand design. *Technology Review* 1994 Feb/Mar; 97 (2): 24-32.

A Scientist Responds to Behe's "Black Box"

Karen Bartelt , Eureka College



Dr Michael Behe, author of *Darwin's Black Box*, appeared recently at Lincoln Christian Seminary in Lincoln, Illinois. In *Darwin's Black Box*, Behe proposes that certain cellular structures are "irreducibly complex" — that all parts must be functional for the structure to work. His main assertion is that gradual Darwinian evolution does a poor job of explaining these features; therefore, there must be an "intelligent designer".

Prior to his appearance, Behe was the subject of a large article by Michael Miller, religion editor of the *Peoria Journal Star*. Piqued by what Behe might have to say to a receptive, but nonscientific, audience, I attended 2 of the 3 lectures. What follows are my responses — as a scientist — to Behe's lectures at the seminary and to his October 3, 1999, interview in the *Peoria Journal Star* (*PJS*).

In his *PJS* interview, Behe described 3 lines of criticism of his work by scientists. First, he said that scientists consider his findings to be of a religious rather than scientific nature. Since the standard definition of science tends to be something like "the systematic study of the natural world", it is hardly unfair, then, for scientists to respond in this manner! Behe went beyond this in his talk at Lincoln, however, saying (supposedly to mimic scientists), "That Behe fellow is a known Christian.... Therefore design is a religious idea." This is a ridiculous assertion. Some of Behe's most vehement critics are also "known Christians". The idea of design has never been rejected because it comes from a particular religious group; it is rejected by the bulk of the scientific community because there is absolutely no evidential support.

But what about the evidence that Behe put forward — all of those wonderful examples of irreducible complexity (IC) in *Darwin's Black Box*? Behe cited many of them at Lincoln. They have all been soundly refuted in scientific journals and on the Web. Behe proposed that a mousetrap is irreducibly complex (all parts must be there for it to function) and therefore a good metaphor for IC in biological systems. On PBS's *Firing Line* in 1997, evolutionary biologist and "known Christian" Kenneth Miller demonstrated how that analogy fails. There is a more basic flaw in Behe's assertion, however, that a molecular machine must perform a specific task or else be useless to the organism. Just as a mousetrap without a critical part might function as a great paperclip or a very interesting earring, a mutated flagellum or enzyme might lead to all manner of interesting innovations. That's basic evolutionary biology.

This brings me to Behe's second allegation: that scientists say that he "isn't the proper type of scientist to be discussing evolution". From my reading of many reviews, the criticisms tend to center on the reviewers' assessment that either Behe is selectively ignorant of the evolutionary literature that exists or else he just doesn't know how to do a computer search! For example, at Lincoln he said that if one looks in the scientific literature for evidence of Darwinian evolution of these complex cellular structures, this literature "is absent". In *Darwin's Black Box* (p 179) he is even more emphatic: "There has never been a meeting, or a book, or a paper on the details of the evolution of complex biochemical systems." How, then, could John Catalano have done a keyword search of the word "evolution" and come up with 13 000 hits <http://www.talkorigins.org/faqs/behe/publish.html> — articles describing the evolution of the immune system, cilium, flagellum, blood-clotting system, eyes, and so on — articles that Behe says do not exist! Perhaps Behe could be forgiven for being sloppy in 1996 when his book came out, but to make this statement in 1999 indicates either arrogance or continuing ignorance. Scientists have penetrated the "black box" to a much greater extent than Behe would have audiences believe!

Behe's purported third area of criticism from the scientific community is that he hasn't published enough in scientific journals on this topic. Behe agreed, saying later that he wants to see "real laboratory research on the question of intelligent design". Well, so would the rest of us scientists, and then perhaps intelligent design (ID) would be taken seriously! A recent keyword search of the words "intelligent design" turned up exactly one article, and it was about robots! The small, well-funded (by the Discovery Institute) cadre of ID proponents is great at attending and hosting conferences, traveling and giving speeches (usually to general, not scientific, audiences), and writing apologetic books. Their own journal, *Origins & Design*, which I read regularly, should be brimming with research articles on "intelligent design". Instead, there are theological arguments and critiques, articles that address the design issue in general but do not detail any original research that supports intelligent design, book reviews,

reports from conferences, and advertising for ID books, videos, tapes, and study kits.

Perhaps part of Behe's publishing dilemma is that neither he nor anyone else in the ID movement can come up with a definition of design that differentiates designs produced by their proposed "designer" from products of natural selection (Elsewhere, fellow ID proponent William Dembski admits this, saying, "In principle, an evolutionary process can exhibit such 'marks of intelligence' as much as any act of special creation." [Dembski 1998]). At Lincoln, Behe relied upon a particularly egregious "folk-science" definition of design: Using a Far Side cartoon showing a person swept into the air and impaled by a jungle trap, Behe said, "You look and realize that the trap was designed. Just look at how the parts interact." In other words, you just know design when you see it!

In fact, humans are not always able to distinguish real design from apparent design and tend to impose design when it is not there; hence the "face on Mars" and the sightings of the Virgin Mary on the side of a building or the face of Jesus in a tortilla. Furthermore, if we assume that Behe is correct, and that humans can discern design, then I submit that they can also discern poor design (companies are sued for poorly designed products all the time!).

In *Darwin's Black Box,* Behe refers to design as the "purposeful arrangement of parts". What about when the parts aren't purposeful, by any standard engineering criteria? When confronted with the "All-Thumbs Designer" — whoever designed the human spine, birth canal, prostate gland, the back of the throat, and so on — Behe and the ID people retreat into theology. At Lincoln, Behe rebuffed a critic who pointed out (referring to biochemical systems) that "no Creator would have designed such a circuitous and contrived system" (Doolittle 1998). Behe accused Doolittle of defending evolution on theological grounds (also saying that God could do whatever God wanted), but in fact, Doolittle was asking only that an "intelligent designer" design intelligently! This is a big problem for ID proponents, as they admit elsewhere: "Charles Darwin ... saw the existence of what he regarded as poor biological engineering (suboptimality) ... as *prima facie* evidence that God could have not directly created the world. This viewpoint continues to undergird much evolutionary reasoning in our own day, and poses a difficult challenge to theories of intelligent design" (Anonymous 1999).

Behe has set himself (and the other intelligent design proponents) as Davids-with-slingshots against the intractable Goliath of science. In the *PJS* article, Behe stated that "the scientific community resists such unorthodox ideas as intelligent design", and "I guess every profession has its codes, unwritten or written, and anybody who speaks out, especially in the field of biology, and especially in the field of intelligent design, risks some consequences to their career." In answer to a question at one of the lectures, Behe stated that though there really is "no place to go", scientists hold to Darwinian theory because they are confirmed atheists and materialists.

Scientists are conservative and don't support new ideas, he continued, noting that the chemiosmotic hypothesis was not supported initially and that the person who came up with the idea committed suicide. It is the height of arrogance for Behe to misrepresent this information so completely! Peter Mitchell proposed the chemiosmotic theory in the 1960s. It did meet with resistance at first, but was widely accepted by the 1970s.

Behe also (conveniently?) left out a few little teensy facts: Mitchell was awarded the 1978 Nobel Prize for this theory — a nice monetary vindication! And Mitchell died in 1992. I don't know whether he committed suicide, but his demise occurred 14 years after he basked in the glow of a Nobel Prize. This subtle demonization of the orthodox scientific community is important to the ID proponents. Since they have no data to support their hypotheses, they must rely solely upon casting doubts on well-established theories like evolution, and one way to do so is to make science look like a closed union shop unable to respond to new ideas.

So what to make of Behe and ID in general? Rather than a "shockwave in the scientific community", as one of the introductory speakers at Lincoln described *Darwin's Black Box*, it's really kind of a yawn. Behe and others are attempting to bring back the "argument from design", which goes back at least to the early 1800s and William Paley. This argument was repudiated in that century, and Behe offers nothing new. Behe is welcome to attempt to resuscitate this dead horse, but he had better do so by taking an honest and complete look at the literature before he eliminates natural selection as an agent of apparent design. He should stop using his Christianity as a crutch to prop up his dubious science, get back into the laboratory, and start producing some results that support his conclusions.

New ideas in science are treated with skepticism — not only Peter Mitchell, but also Barbara McClintock, Motoo Kimura, and Sewall Wright went through periods where their ideas were thoroughly scrutinized and criticized. Why have they prevailed and their ideas become cornerstones of biology? Because they were able to support their ideas with evidence and a productive research program. Ten years after the book *Of Pandas and People* first introduced ID as an alternative to evolution, we are still waiting for its proponents to produce either.

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About the Author

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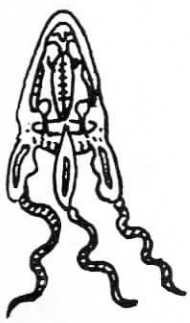
RESOURCES

New Chinese Fossil Reinforces Vertebrate Evolution

Kevin Padian
NCSE President



The January 2, 1999, issue of *Nature* carries an article by Jun-Yuan Chen, Di-Ying Huang, and Chia-Wei Li, An early Cambrian craniate-like Chordate. This article is about the new finds that push the origin of chordates back an additional 35 million years or so. Some news reports have called these organisms "fishes", but it's important to dispel this characterization. The term "fishes" in this sense is used in a way that even Linnaeus would not have intended, that is, everything that isn't a tetrapod but is a chordate gets called a "fish". However, these organisms have no bones, jaws, fins, or any of the defining characteristics that modern biology considers to be associated with the taxa grouped together under the "fish" rubric.

The new animal, *Haikouella*, has "a heart with a ventral and dorsal aorta, an anterior branchial arterial, gill filaments, a caudal projection, a neural cord with a relatively large brain, a head with possible lateral eyes, and a ventrally situated buccal cavity with short tentacles." Except for the heart, these characteristics qualify the new organism as a true chordate — on an early branch of the vertebrate family tree — recovered from deposits about 530 million years old.

The description of these fascinating animals is quite conventional. The authors accept fully that lancelets are the best living proxies for the latest common ancestry of cephalochordates and craniates. They say, "Although it is commonly considered that the origin of the craniates was signaled by the relatively simultaneous appearance of a conspicuous brain and an endoskeleton including a cranium, our finding indicates that the craniates originated through a set of separate events over a long interval of time. The appearance of a conspicuous brain may have been the earliest of these events, occurring long before full endoskeletization."

In other words, characters that we associated with vertebrates appeared gradually and piecemeal, not all at once. So the origin of vertebrates is less mysterious than thought. These new discoveries plug stratigraphic gaps and, as the authors say, "will add to the debate on the evolutionary transition from invertebrate to vertebrate". Furthermore, these findings indicate that the evolutionary branches leading respectively to the hemichordates and to the vertebrates were already distinguishable in the early Cambrian,

What is perhaps more significant about this article is that, prior to its recent publication, anti-evolutionists had been touting the fossils from this region as a "problem" for evolutionary biology, claiming in particular that new data pushing the divergence of vertebrates from invertebrate ancestors back into the pre-Cambrian would be another coffin nail for evolutionary theory. On the basis of this article, we must conclude that the report of the theory's demise is somewhat premature.

Further Reading

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Shu D, Zhang X, Chen L. Reinterpretation of Yunnanozoon as the earliest known hemichordate. *Nature* 1996 Apr 4; 380: 428–30.

Chordates Page at the University of California Museum of Paleontology: <http://www.ucmp.berkeley.edu/chordata/chordatamm.html>.

Kentucky Paleontological Society Statement on Teaching Evolution

The Kentucky Paleontological Society (KPS) was founded in 1993 for the purpose of promoting interest in and knowledge of the science of paleontology. The Society is a network for the exchange of data between professionals and serious amateurs in the field. Its mission is to advance science by bringing untapped talent into the field and to help create a more scientifically literate public through its educational efforts. Correcting misunderstandings about science is clearly part of any educational mission. Because KPS thinks it is vital that all scientific organizations stand against pseudoscience, the Society issued the following statement on October 12, 1999:

> The Kentucky Paleontological Society (KPS) is opposed to any attempt to teach creationism or omit mention of evolution from public school instruction. Furthermore, evolution should be called "evolution" in curriculum guidelines and other documents; euphemisms such as "change over time" are intellectually dishonest for they attempt to conceal the terminology used by scientists.
>
> Paleontology relies for its evidence on two different but historically related fields, biology and geology. Biological evolution is the central organizing principle of biology, understood as descent with modification. Evolution is equally basic to geology, because the pattern of fossil distribution in the rock record makes no sense without evolution. Evidence

for the progressive replacement of fossil forms has been adequate to support the theory of evolution for over 100 years. Paleontologists may dispute, on the basis of the available evidence, the tempo and mode of evolution in a particular group at a particular time, but they do not argue about whether evolution took place. The record of the evolution of life is exciting, instructive, and enjoyable, and it is our view that everyone should have the opportunity and the privilege to understand it as paleontologists do.

Kentucky's students deserve and require a high-quality science education, grounded in scientific evidence and free of sectarian influence. The content of science courses should be determined by the standards of the scientific community.

Most people who subscribe to religious views have developed belief systems that are compatible with evolution. We fully respect the religious views of all persons, but we object to attempts to require any religious teachings as science.

Our Executive Committee approved this statement. We wish to make it clear that we do not restrict our membership to avowed evolutionists. We insist only that our members conduct themselves responsibly and safely when doing field work and collecting specimens.

The KPS encourages its members and other professional scientific groups to give support and aid to those classroom teachers who present the subject matter of evolution fairly and encounter community objection. We also encourage administrators and individual teachers to oppose the inclusion of nonscientific concepts in the science classroom.

For Further Information

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New Books on Evolution from the Paleontological Society

The Paleontological Society has recently published 2 sourcebooks for teaching and understanding evolution which are aimed at general audiences, including teachers and informed laypersons. Both contain papers by NCSE President Kevin Padian and Executive Director Eugenie Scott, as well as many of our members and supporters. The books manage to cover a lot of useful ground in accessible form. You can own one for $20 and a one-time order processing fee of $1.50. Small orders also require $2 postage per book, but orders of 5 or more require only $10 to ship the whole order. Order your books from Lion Weirs, The Paleontological Society, Carnegie Museum of Natural History, 4400 Forbes Avenue, Pittsburgh PA 15213-4080.

The volumes are:

The Evolution-Creation Controversy II: Perspectives on Science, Religion, and Geological Education, edited by PH Kelley, JR Bryan, and TA Hansen. *Paleontological Society Papers* Vol. 5, 1999.

Evolution: Investigating the Evidence, edited by Judy Scotchmoor and Dale A Springer. *Paleontological Society Special Papers* Vol 9, 1999.

New Book by NCSE Member

Life, Temperature, and the Earth: The Self-Organizing Biosphere by David Schwartzman.

Published November 1999.
Columbia University Press.
Cloth, 304 pages, $50.00.
ISBN: 0231102127.

Life, Temperature, and the Earth: The Self-Organizing Biosphere explores the Gaia concept — the idea that living things and the atmosphere, oceans, and soils comprise an interactive, self-regulating system. David Schwartzman adds a new dimension to our understanding of the Gaia concept through his examination of long-term geologic trends in the behavior of the biosphere and presents and elucidates his model of biospheric evolution.

Schwartzman argues for a strong role for biological regulation of the earth's temperature even under extreme environmental conditions. The book explores strong evidence for much higher temperatures prior to about 2 billion years ago and their effect on evolving microbes and on the timing of the emergence of complex multicellular life.

Schwartzman integrates knowledge of the weathering process with explorations of the habitability of the earth through geologic time and the role of abiotic factors (such as tectonics and the carbon geodynamic cycle) in climatic evolution. The book ends with a discussion of the implications of the emergence of terrestrial life under high temperature for evolutionary biology and bioastronomy.

David Schwartzman is a professor in the Department of Biology at Howard University and a member of NCSE. His research focuses on biogeochemistry, exobiology, and environmental science.

For more information, email <sw426@columbia.edu>.

BOOKREVIEW

Believing Science

Michael Ruse
University of Guelph

A Review Essay of* Genes, Genesis and God: Values and their Origins in Natural and Human History *by Holmes Rolston, III. Cambridge (UK): Cambridge University Press, 1999, 400 pages.

Holmes Rolston III is a well-known philosopher who has written extensively both on the philosophy of religion and on philosophical issues having to do with the environment. *Genes, Genesis and God: Values and Their Origins in Natural and Human History* started life as the Gifford Lectures given at the University of Edinburgh in November 1997. According to Lord Gifford's will, which endowed the lectures, the topic is supposed to be some aspect of natural theology, and recent years have seen a great deal of squirming as successive lecturers try, not always successfully, to bring their topics within the intended boundaries.

Rolston, however, has no such trouble. His work is a full and fair natural theological attempt to understand modern biology and its relevance for social, ethical, and religious thought. Although I shall have things critical to say about this book in the course of this review, let me start by saying that the author came through as a learned and humane man who has taken seriously his project, and who exhibits intelligence and sensitivity in everything that he writes. There are 6 chapters to the work, and it is convenient to start this review by running through each chapter in turn.

Chapter 1: Genetic Values: Diversity and Complexity in Natural History

This chapter deals with the whole question of whether there is some kind of value inherent in nature and in particular in biological nature. The crucial part of the argumentation here is the claim that, in some sense, evolution is progressive and therefore produces entities that are of increasing value, moving up from the most simple to the most complex, from the blob up to the superorganism, from "monad to man", as they used to say in the 19th century. While appreciating that I myself am an object of criticism in this lecture (Ruse 1996) — something always deeply satisfying to a person with an ego such as mine — in many respects I found this the least satisfactory of all of Rolston's chapters. Although I do not subscribe to the view that evolution is in some sense progressive, it seems to me at least a defensible position to take. However, my disquiet comes because of the chapter's position in the context of the whole book. In this chapter Rolston is rehearsing and repeating arguments that he has given in other of his writings. No doubt he felt it necessary to start a whole work on values by covering some of this material; but, in fact, it seems to me that Rolston has a whole new perspective to offer us in *Genes, Genesis and God*. Therefore, it is somewhat of a paradox that, though Rolston is on very familiar territory, the first chapter sits a little bit uneasily with what is to come.

Chapter 2: Genetic Identity: Conserved and Integrated Values

The second chapter is in many respects far more satisfactory than its predecessor. In this chapter, Rolston offers us some of the latest thinking about the evolution of social behavior, in particular about so-called "sociobiology". He covers important topics such as the nature of natural selection, and he is careful to show the reader the way in which today's evolutionists think that selection focuses on the individual as opposed to the group. Even if one does not always agree with what Rolston has to say, he gives a fair and full exposition.

One thing that especially pleased me was his sensitivity to metaphor. Although it is clear that in some respects Rolston is extremely uncomfortable about talk of organisms' always working for their own "self-interest" or — to use the flamboyant metaphor of Richard Dawkins (1989) — to speak of the genes as being "selfish", he is far from condemning such language outright. Some commentators, notoriously Mary Midgley (1979), argue that one should not in any circumstances speak of things like "selfish" genes. Rolston is fully aware that metaphors have an important place to play in science and in particular in evolutionary biology. Unless one is prepared to use metaphors, one is never going to be able to stretch one's thinking out from the known to the unknown. Rolston has much to say that is critical about the ways in which some metaphors (including the selfish gene metaphor) are sometimes extended. But, to his great credit, he appreciates the strength, as well as the weaknesses, of thinking metaphorically.

Chapter 3: Culture: Genes and the Genesis of Human Culture

Chapter 3 is a good overview of recent thought on this subject. In the past 10 to 15 years, several people have put forward models of "gene-culture co-evolution", as it is generally called (Durham 1991; Boyd and Richerson 1985). Rolston deals fairly and impartially with all of these positions. I doubt that he is as strongly in favor of a biological underpinning to human culture as are some enthusiasts (myself included). But, whether his stance is based strictly on the evidence or more on prior convictions, Rolston is surely right in thinking that thus far no one has put forward a fully adequate picture of gene-culture co-evolution. Indeed, he is right in thinking that some of those who do lean towards the biological and

away from the cultural, notably Charles Lumsden and Edward O Wilson (1981, 1983), have with reason been severely criticized for their efforts in this direction. My own feeling is that the failures thus far are only to be expected from people who are trying to come to grips with some incredibly difficult issues. But I cannot say that Rolston is unfair in his rather negative assessment of the present state of the art.

Chapter 4: Science: Naturalized, Socialized, Evaluated

The next chapter takes us right into the heart of the book. Now, Rolston is interested in the whole question of whether or not one can give a naturalistic explanation of human knowledge — in particular, of human *scientific* knowledge. The possibility of such an explanation has been claimed by a number of people, including myself (Ruse 1998). The point is that if we can offer a naturalized account of science, then we can look forward confidently to trying to provide a naturalized account of ethics and perhaps also of religion. If we fail at this first post, however, then our overall program looks a lot more dubious. Rolston and his opponents see that much is at stake here.

I should say that Rolston's critical argument is straightforward and, without detracting from its force, familiar. Rolston concedes that elementary pieces of science (including arithmetic) may well have survival value. But, he denies absolutely that — as science matures and gets more interesting — those key biological factors of survival and reproduction can play any significant role at all. Hence, science transcends or moves us beyond the purely naturalistic, particularly the naturalistic-rooted-in-evolutionary-biology. Rolston writes:

> Meanwhile, the successes of science are impressive. They are quite valuable, and today no one is able to evaluate the world, to form a worldview, adequately without scientific knowledge. A significant part of what must be evaluated is the human mind, capable of such science. The operations of the mind, indeed useful in the jungle, on the savannah, and in the pragmatic world of culture, carry us much further. Rationality works not simply for middle-world, native-range living, in country and town; it works for building microscopes and studying *Stentor*, for decoding atoms and quarks, for doing calculus and statistical regression analysis, for solving equations that run time backward to the big bang and then philosophizing about cosmology, for postulating and trying to simulate the chemical origin of life in ancient seas. These activities were no part of the survival routines in the hunter-gatherer cultures in which the mind was formed; skills here are not complex mechanisms of an adapted mind, and so how did humans obtain these capacities that transcend any relevance to the environments in which they evolved? (205–6).

Clearly, to answer his question Rolston has to move himself and us beyond the scientific to the intellectual, and even to the spiritual. It is these areas that start to predominate, as we move to the final chapters of *Genes, Genesis and God.*

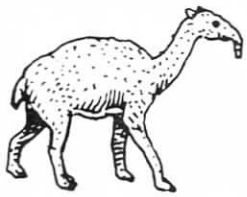
Chapter 5: Ethics: Naturalized, Socialized, Evaluated

Chapter 5 is a full frontal attack on modern attempts at an "evolutionary ethics", that is, a moral system based in some sense on modern evolutionary thinking. Until 25 years ago, no one would have thought it necessary to write such a chapter as this (Bradie 1994). Until then, the very thought that one might derive ethics in some sense from the processes and results of evolution was considered at best absurd, and at worst a disclosure of one's total ignorance of important philosophical conclusions. However, in the past quarter century or so, evolutionary ethics has made a really quite stunning comeback. Now one finds many biologists, and not a few philosophers, who argue that, far from biology's being irrelevant to ethics, it leads to crucial insights (Ruse 1994). Evolution provides us with the key-to the understanding both of questions about what we ought to do (traditionally known as "substantive" or "normative" ethics) and of questions about the foundations (or lack thereof) of morality: *why* we should do what we ought to do (the area of study traditionally known as "foundational ethics" or "metaethics"). Rolston, however, will have none of our evolutionary ethicizing. He thinks that, at the substantival level, the best that we evolutionary ethicists can produce is thin and unconvincing. Moreover, at the foundational level, he thinks that we evolutionary ethicists have either failed entirely to provide any justification for substantive ethics or have provided only justifications that are riddled with fallacies.

Chapter 6: Religion: Naturalized, Socialized, Evaluated

This concluding chapter, which deals with God and religion generally, will in many respects be of greatest interest to the general reader. First, Rolston offers in a clear and succinct manner some of the latest biological thinking about the nature of religion. He pays particular attention to the stimulating hypotheses of Vernon Reynolds (a primatologist) and Ralph Tanner (a student of religion), who apply biological principles to understand the differences between religions. (Briefly, Reynolds and Tanner [1983] argue that some religions, like Islam, promote fertility and reproduction, whereas others, like Protestant Christianity, promote abstinence and small families. The authors relate these differences to alternative reproductive strategies. If one lives in climates of fluctuating famine and plenty, then large families make sense. But if one lives in fairly stable climates of predictable resources, then smaller families make more sense.)

Second, Rolston offers a critique of sociobiological accounts of religion, offering more than mere exposition of these accounts. At the center of his remarks are those who would go beyond science, those who argue that in some sense sociobiology can explain and perhaps even replace religion. The particular focus of attention here is Edward O Wilson, who in a number of books — notoriously in *On Human Nature* and more recently (although too late



for Rolston to consider) in *Consilience* — argues that evolution is a "myth" (Wilson's terminology) that can replace the myth of Christianity. Thus, Wilson argues, evolutionary science provides us with an adequate secular religion for our day, replacing the outmoded spiritual religions of Christianity and the like. It would not be fair to say that Rolston is scathing about these views — he has always too much respect for his opponents to show contempt — but as he comes to the end of his long and detailed book, he makes it very clear that he feels that here, as with ethics, a naturalized approach (particularly a naturalized approach relying on modern evolutionary biology) simply is not adequate to the task.

A Critical Commentary

My exposition now finished, let me make 3 critical comments about *Genes, Genesis and God*. In particular, let me begin by defending my oft-stated claim that one can find no objective foundation for ethics; that, in some sense, ethics (in the sense of *substantive* ethics) has to be considered an "illusion" put in place by natural selection working through the genes in order to promote reproductive success (Ruse 1994, 1998). Now, whether or not I am correct in saying this is one matter. But, in fairness to myself, I must say that I have provided arguments to show that the position I take has a long tradition in philosophical thought (Ruse 1990). Rolston, however, altogether misses or downplays this and lumps this view together with other biological accounts of ethics, including that of Richard Dawkins — whose formulations are almost arrogant in their happy ignorance of all philosophy, arguing indeed that as a subject it is totally worthless or unnecessary. Rolston picks on this point — the arrogance and philosophical ignorance of Dawkins and company — to tar all evolutionary ethicists. He suggests therefore that anyone who would provide a biological account of ethics necessarily shows an ignorance of the nature of philosophy.

I protest that, whatever may be the case with Dawkins, this is not true generally of evolutionary ethicists and not true specifically of me. My own writings arguing against foundations, for example, put my work very firmly in a well-established philosophical tradition that includes both Immanuel Kant and David Hume. I see ethics as being more of a natural phenomenon than a Kantian could ever allow — a vision which a Humean nevertheless readily welcomes. But, the point I do stress is that, foundations or not, neither Hume nor Kant thinks that (substantive) ethics is something that is purely a subjective phenomenon that we can choose to accept or not. In describing ethics as an "illusion", I am talking about foundations, agreeing with both Hume and Kant in their denial that there is some external thing like a Platonic Form that justifies substantive ethics. I am not saying that rules of right and wrong do not exist, nor am I saying that adopting them is a matter of personal preference.

My position, shared by many philosophers (most of whom are *not* evolutionary ethicists), is known technically as "ethical skepticism" (Mackie 1977). It is skeptical about foundations, not about substantive ethics. And in being skeptical about foundations, the skepticism is about external entities that are substance-like, and thus supposedly capable of conferring validity on ethics. Hence, in refusing to "justify" ethics, we skeptics avoid all of the supposed fallacies (such as the notorious "naturalistic fallacy"), which tradition claims bedevil any naturalistic approach to morality. We are not justifying illicitly, because we are not justifying at all! What we are happy with is the conclusion that ethics has to be considered a human phenomenon. In this sense, we are part of a longer tradition that goes far beyond Hume and Kant. Ultimately, we go back to Aristotle. If Rolston is to write a work of great length criticizing people like me, then I would beg only that he try to understand our premises as well as our conclusions. And, please do not lump us with the philosophical philistines on the other side of the campus.

Turning now to defense of others, let me say that Rolston is rather less than fully fair toward EO Wilson. I refer especially to his final chapter, where Rolston criticizes Wilson's (1978) views on religion. Now I do not want to defend Wilson's views as such, but it does seem to me that when Wilson offers a critique of religion — arguing that it should be explained by an evolutionary account — he is doing more than simply saying that since evolution accounts for the way that we think, evolution must be the foundation of everything including religion. This, as Rolston and many others have pointed out, is clearly a fallacious argument. If indeed this is all that Wilson is saying, then he is not really furthering our understanding of religion — whether or not he appeals to biology.

But Wilson is doing more than this. He is appealing in the first place to the great differences among modern religions — an indisputable point that, in my opinion, Rolston altogether glosses over. Wilson's basic argument is that there are such contradictory things claimed in the name of religion, that the only way that we can explain people's adherence to these religions is in nonrational terms. Here, reason or appeal to objective fact fails us. Consider for instance the differences between Christianity (which posits a personal God, which denies the transmigration of souls, and which offers us hope of eternal salvation) and various forms of Buddhism (which can be considered atheistic at best, which make central the transmigrations of souls, and which offer no salvation but an eventual release from consciousness of any kind). *Prima facie* it is not at all obvious that these religions share any common themes. Wilson's point is that, nevertheless, different peoples believe passionately in each. Since they cannot both be true, one at least must be false, and so one must find some explanation for this passionate commitment. And it is at this point that Wilson puts forward a sociobiological explanation, in terms of group identity and so forth.

The secondary explanation that follows from this line of reasoning (which does not seem to me to be entirely unwarranted) is that sauce for the Buddhist goose is also sauce for the Christian gander. If one has to offer a sociobiological explanation for Buddhist belief, why then should one hesitate at offering such an argument for Christianity? My feeling is not that Wilson is necessarily right in his whole line of argument. I am not convinced by his biological speculations, but I think his line of argument is at least plausible. If one wants to argue, for instance, that Christianity is a superior religion to all others and therefore a potential candidate for objective truth, one must at least provide these arguments and show that Wilson's

position is lacking. This, for all his opposition, I do not find Rolston to have done.

My third objection is the most fundamental of all. It is not based on simple opposition to Rolston's position. This objection captures my main worry about the whole book that Rolston has offered us. It focuses on Rolston's appeal to science. Now, at one level, Rolston has done his homework and has looked very carefully at much that has been written about modern evolutionary biology, particularly that pertaining to social behavior (sociobiology). However, what I find singularly missing in Rolston's work, and indeed in his consciousness generally, is an appreciation of the extent to which this very significant empirical theory has taken evolutionary biologists by storm in the past 30 or 40 years. Rolston offers us but a bare minimum of empirical studies showing us how things like kin selection work in practice. He shows us nothing, for instance, of the work done by people like Geoff Parker (1978) on the mating behavior of dung flies, or Nicholas Davies (1992) on the sexual patterns to found in dunnocks (hedge sparrows), or Tim Clutton-Brock (1982) on the harem-building strategies of red deer on Scottish Islands — or any of these sorts of things. Now I am not saying that Rolston should spend all his time in this book just discussing these studies — he is a philosopher rather than a scientist — the point is that this is the empirical work on which everything else stands. It is the base from which stem all the claims that people like me and EO Wilson and others want to make. They cannot and should not be ignored.

I am cautious to the point of being uncomfortable in making this claim. I do want to stress that Rolston goes far beyond just looking at popularizers, or even those who sit on the boundary between the popular and the professional — people like Richard Dawkins (1986) and Stephen Jay Gould (1989, 1996). But my sense of unease remains nevertheless because Rolston never truly gets to grips with the actual hands-on science. Again, one might defend Rolston by saying that he is hardly a scientist and so it is not his job to look at the science as such. But while I would agree in part with this defense, I do argue that it is Rolston's job to offer more than theoretical discussions. Unless one has a really strong feeling about the science itself — an overwhelming sensation of how new and exciting sociobiology truly is (something that has made absolutely cutting-edge science out of something that stagnated for the hundred years after the *Origin of Species*) — one is going to miss a huge amount. And this I fear is what has happened to Rolston. Hence, he does not and cannot sense (let alone share) the very strong conviction of people like me and Wilson, that one simply must apply this science to human nature and human understanding. We ourselves may not be right, but we are convinced that the right answers are out there.

An example of such a shortcoming is the lack of an explicit discussion of hymenopteran sterility. The ideas of William Hamilton (1964a, b) are given fairly, but no attempt is made to link the discussion with the real breakthrough that Hamilton's work represented — the solution of the conundrum of the sterility of the workers in the ants, the bees, and the wasps. This was a staggering achievement, and it truly revolutionized thinking about social behavior — not theory but empirical practice. And there has been a torrent of work since, as the massive Pulitzer-Prize-winning work by Bert Hölldobler and EO Wilson (*The Ants*) shows in full detail. But all of this is simply not there in Rolston, and this is the pity. It is a pity not because we think that humans are ants, but because we see how powerful are the tools of sociobiology in explaining the real world, and we simply cannot think that these tools fail to apply to us.

Let me restate my point. The crucial question is not whether or not one should use a metaphor like that of the selfish gene, but that by taking the "selfish gene approach" — that is to say, taking the kind of approach being promoted by people like William Hamilton and John Maynard Smith (1978) — one can produce tough, predictive science that is highly fertile and that leads to hard results, not just results that we knew already, but results that we can infer and confirm. Our conviction is that, finally, evolutionary biology is moving forward. As shown by people like Nicholas Davies with his dunnocks or Geoff Parker with his dung flies, one now has a science that really *works*. It is our conviction that this science simply must be applied to an understanding of human nature.

I am not now saying that EO Wilson or Michael Ruse or any of the others who are trying to provide a sociobiological account of humankind are right. It may well be that every one of Rolston's criticisms made against us is well taken. Yet, even if this be true, at some level I cannot help feeling that Rolston misses the very force that drives us forward. I cannot help feeling that if Rolston had a deeper understanding of the empirical science, then he too would recognize that there is something going on here for which there must be an accounting. As it is, my feeling is that Rolston has gone into this exercise knowing right from the beginning that we were wrong and has failed to engage fully with the work that the opposition finds so inspirational.

What is left when Rolston is finished picking apart other people's positions? How can he account for the fact that we now have a whole new understanding, a whole new exciting understanding, of animal nature and behavior, and yet find that we humans stand virtually apart from it? Obviously, if one says that one is taking a Christian position and that humans are in some sense special, made in the image of God, and that this precludes a biological understanding of humankind, then truly one will want to separate humans from the rest of animal creation. But let us be open about this, if such be our commitment. Let us recognize that this is a premise that one is bringing into the argument, rather than a conclusion to which one is inevitably driven given the inadequacies of others' arguments. For myself, however, until Rolston shows that he has wrestled with and is willing to take seriously the modern science — the modern empirical science of today's evolutionists, about real living, breathing, reproducing organisms — I have to conclude that the kind of book that Rolston offers us in *Genes, Genesis and God* is bound to be less than fully adequate.

If I sound passionate, it is because (like Rolston) I think these are terribly important issues. I do not agree with Rolston, any more than he agrees with me. After reading Rolston's work, I am no more convinced of the falsity of my biologically-based philosophical position than I was before. Yet I

recognize in Rolston a good and full and fair critic. He is a man who has stimulated me to think anew about my position and to offer an impassioned defense. What more can one say of any opponent? I recommend that you read *Genes, Genesis and God* and make the judgment of its overall worth for yourself. Whatever your conclusion, you will not think your time has been wasted. For myself, when next I meet Holmes Rolston, I will buy the first round of beer!

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[A version of this essay first appeared on the META list, an edited and moderated listserver and news service dedicated to promoting the constructive engagement of science and religion. For more information connect to <http://www.meta-list.org>. Readers interesting in purchasing this book can do so through the NCSE web site <http://www.natcenscied.org/bookcat.htm>.]

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BOOKREVIEW

The Beast in You!: Activities and Questions to Explore Evolution

By Marc McCutcheon. Charlotte (VT): Williamson Publishing Co, 1999. 96 pages.

Reviewed by Lisa M Blank, School of Education, University of Montana, Missoula.

Given the recent curriculum deletions by the Kansas State Board of Education, McCutcheon's adventures into the "family album" of humans is a timely and engaging children's activity book. Written largely for middle school children, McCutcheon begins exploring evolution where any right-minded adolescent would — with him- or herself. Young readers are first sent on an elaborate scavenger hunt of their bodies, searching for historical evidence of evolution. While this is an informative and compelling way to learn about our human past, the language McCutcheon uses is unfortunate. The readers are challenged to find the "parts of a beast" buried in their anatomies.

The "beast" in you? While the choice of the term "beast" is undoubtedly more colorful and playful than "animal" would be, its usage may suggest to some that evolution is a move towards perfection or improvement rather than simply the result of differential selection. After all, the term "beast" usually suggests a contemptible creature. Admittedly, this concern is likely lost on readers as they busy themselves in Chapter 1 with the game of "spot the animal", searching in the mirror for canine teeth, smiles, wiggly ears, claws, hair, and other vestigial elements.

Following this body search, McCutcheon begins a discussion of how animals' characteristics can change over time. At times the explanations suffer from Lamarckian overtones. For example, when explaining the seasonal change of a rabbit's fur, McCutcheon remarks, "These animals, then, have made an adjustment to fit more perfectly into their environment." While McCutcheon emphasizes that this would have take place over "many thousands of generations", it is not clear to the reader that the rabbit is not consciously making this decision. Nor is it made clear that evolution is the result of changes in rabbit populations, not just one rabbit.

For example, McCutcheon asks the reader to "Imagine you're a hare.... How would a brown coat protect you in winter? A brown coat would make you much easier to see. And that means you'd be spotted and eaten by hungry predators much faster. Not a good situation, for sure. The evolution solution? Develop a coat of fur that turns brown in the summer and white in the winter." A young reader or even an adult reader not well-versed in evolution could easily interpret this section to mean that all it takes for the species to evolve is for one smart rabbit to identify the predation problem, give it some careful thought, and then

simply change fur color from season to season.

On the other hand, McCutcheon offers some excellent examples of evolution that we can see evidence of in contemporary times such as antibiotic-resistant bacteria and DDT-resistant insects. This helps the reader understand that evolution occurs on both a macro and a micro level and that evolution often occurs more rapidly in microorganisms due to their shorter generation times. What might be even more helpful here is an activity for the reader that helps develop the idea of time. Just how long is "millions and millions of years"? This is a particularly problematic concept for young readers, and though McCutcheon does offer a timeline in the appendix, the scale of this time span is not communicated

Next, McCutcheon introduces us to the fossil history beginning with Lucy and her cast of fellow skeletons. Here, McCutcheon's choice of activities shows that he understands well what interests and motivates an adolescent. The reader is encouraged to compare his or her body stature to that of Lucy and *Gigantopithecus*, take a "knuckle" walk, create plaster footprint casts, and contrast their day to that of prehistoric children. Web sites are also offered for further exploration and humor is sprinkled throughout. This is an excellent chapter to be shared between a parent and a child.

McCutcheon does not skirt the issue of evolution and creationism either. Rather, he recounts the Scopes trial and uses this example to challenge readers to think about how science and religion are different but valuable ways to understand our world and ourselves. He outlines the difference between argument and debate and provides several examples of how scientific understanding changes as new evidence is discovered or developed.

McCutcheon ends with a discussion of modern humans. Here he looks at variations in body fat content, skin color, and body size. He poses a series of "what if" questions about the future that will generate hours of lively discussion and conjecture. It is these kinds of discussions and activities that make this book a good buy for parents and grandparents interested in helping their adolescents to understand evolution better. While there are a few areas that could have been more carefully crafted, the book does an excellent job of combining humor, activities, and explanations to explore a complex scientific concept in an intellectually honest and developmentally appropriate manner. Because many school textbooks fail to provide a comprehensive treatment of evolution, teachers will also find McCutcheon's book a useful addition to their curriculum. If McCutcheon's book had only been required reading for members of the Kansas State Board of Education, perhaps they would have cast their votes differently.

BOOKREVIEW

Mystery of Mysteries: Is Evolution a Social Construction?

by Michael Ruse, 1999. Cambridge (MA): Harvard University Press. 296 pages.

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The philosophy of social constructionism claims that the "nature" that scientists pretend to study is a fiction cooked up by the scientists themselves — that, as Bruno Latour puts it, natural objects are "the *consequence* of scientific work rather than its *cause*". In this view, the ultimate purpose of scientists' theories and experiments is not to understand or control an imagined "nature", but to provide objective-sounding justifications for exerting power over other people. As social constructionists see it, science is an imposing but hollow Trojan horse that conceals some rather nasty storm troopers in its belly.

Over the past decade, this hostile picture of science has become the conventional wisdom in many academic circles. In this book, the Canadian philosopher and historian Michael Ruse offers an empirical test of these doctrines. If social constructionism is true, he argues, then the political and moral content of a science should remain more or less constant throughout its history. If social constructionism is false, then these "cultural values" should be increasingly shouldered aside in favor of what he calls the "epistemic values" of science itself — predictive accuracy, internal coherence, consistency with other scientific theories, fertility, simplicity, and unifying power.

The example that Ruse chooses for his test is evolutionary theory, which is his special province as a historian. After surveying the works of 10 successive writers on evolution, Ruse concludes that epistemic values have advanced markedly at the expense of the cultural values. Back in the 1790s, the evolutionism of Erasmus Darwin (Charles's grandfather) was mainly a rhetorical prop for his Whig politics and Deism. Two centuries later, Ruse has to strain hard to squeeze a few drops of ideological content out of such recent work as Geoffrey Parker's studies of sexual selection in dung flies and Jack Sepkoski's analyses of the statistics of extinction rates.

Does this prove that the social constructionists are mistaken? Well, yes and no. "Science is special," Ruse concludes, "and this is because of its standards; the critics [of science] were wrong in arguing otherwise. But it is also true that science is not special, and this is because of its culture; the defenders were wrong in arguing otherwise." Even though explicit moral and political values gradually get pushed out of a maturing science, Ruse thinks that science remains saturated with other elements drawn from the surrounding culture. Scientific language, he argues, has to make use of metaphors, which drag in cultural themes and assumptions having nothing to do with science as such. For instance, scientists diagram evolutionary relationships as trees: "trees in our culture are associated with upward striving"; our culture associates the direction "up" with improvement — and therefore we tend to think of evolutionary change as progressive, tending always to make living

things higher, better, or more advanced than their ancestors (p 239). And so on.

We can all agree that cultural themes commonly influence scientific thought. But I wasn't persuaded that they always do so, or that metaphors are as pervasive and important in science as Ruse thinks they are. In the particular case mentioned above, I doubt that the tree metaphor prompts us to think of evolution as progressive. After all, we also say that organisms are "descended" from their ancestors, but that metaphor doesn't tempt us to think of evolution as a downhill slide. It seems to me that the historical progressivism of evolutionary thought is just one aspect of a general post-Enlightenment optimism about the future. This optimism has more to do with erosion of belief in the Apocalypse than with the fact that trees grow upward.

Despite the book's subtitle, Ruse doesn't come to grips with the central question here: did evolution really occur? If it did, then there must be something profoundly wrong with social constructionism. I don't see how one can seriously contend that the world is a human construct if we concede that people evolved from nonhuman animals. Unlike the theories of non-historical, experiment-centered sciences like physics and chemistry, evolutionary theory seems fundamentally at odds with social constructionism. This might be why some prominent social-constructionist academics favor bringing creation science into the public schools.

Although Ruse is disappointingly inconclusive about his main topic, anyone who is interested in the "science wars" controversy or in the history of evolutionary thought will find this book fascinating and rewarding. The prose is masterful — relaxed, colloquial, rich in information, and suffused with flashes of malicious wit and delicious historical tidbits. (I will never again think of Erasmus Darwin without recalling Ruse's observation that he had a semicircular notch cut into his dining table, so that he could belly up to his food.) Ruse displays a marvelous gift for capturing the gist and importance of complicated scientific and philosophical arguments in a few words. His first chapter, an even-handed summary and critique of Popper's and Kuhn's conflicting views of science, is surely the best thing ever written on this subject in 24 pages. Taken together, Ruse's sketches of the ideas and careers of his 10 exemplars — the 2 Darwins, Julian Huxley, Dobzhansky, Dawkins, Gould, Lewontin, EO Wilson, Parker, and Sepkoski — provide an entertaining outline of evolutionary thought, which touches on the works of a lot of other leading evolutionists and fits them into their historical and cultural context.

One caveat: Ruse is surprisingly harsh towards authors who wrote books for popular audiences, which he treats as a defect in their work. I can see his point where Julian Huxley is concerned, but I think he is unfair to Stephen Jay Gould. Ruse's disdain for popularizers seems odd in a book that is itself so deft and ingratiating in making all these complicated issues accessible to the general reader.

Letters to the Editor

Some grammatical errors — such as saying "between you and I" — are said to stem from "hypercorrection", an attempt to avoid making an error that in a sense overshoots the mark.

The same thing can mar some writing about science. For example, page 19 of the May/June issue of *RNCSE* says that, in scientific terminology, "'theory' means a logical, tested, well-supported explanation for a great variety of facts." This is meant to address the common misconception that evolution is "just a theory" in the everyday sense of "theory" as "hypothesis".

But the statement overcorrects. Certainly a "theory" in science is a systematic explanation, but it isn't necessarily tested, well-supported, or even true. Some theories certainly are tested and well-supported, such as the germ theory of infectious disease. But others are very speculative (such as superstring theory), and some are now known to be false (including a number of other candidate theories in physics).

It's certainly important to correct the misconception that "theory" means "hypothesis", but let's not replace that with another misconception.

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I write about the heading on page 19 in *RNCSE* 19(3): "What's Wrong with 'Theory not Fact' Policies on Teaching Evolution?" The heading implies that there *is* something wrong with a "theory, not fact" policy. The heading is actually a question and does not *state* that something is wrong, but the implication makes me uneasy.

My personal policy is to try to keep facts and theories separate. I treat the change in a population of bacteria that was observed over the course of 60 generations in a laboratory as a fact, and the idea that a present-day person is linked backward in time by parentage to progenitors that were not human as a theory. It is a theory that I favor and consider very robust, but my policy toward it is a "theory, not fact" policy. What's wrong with *that* policy? *Nothing* is wrong with it.

Well, as a policy, *something* is wrong: it is a policy you have to explain properly; it is a policy that a person could misunderstand or intentionally distort; it is a policy that calls for making a careful distinction, which is something that hasty people don't like to do. It is perhaps a slightly troublesome policy, but it is *the only correct policy*, don't you agree?

It turns out, of course, that what follows the heading is about *legislation* and not about policies. To imply that there is something wrong with a piece of legislation is a fairly safe bet, so in that sense your heading is OK. And in general, I greatly enjoy the *RNCSE*. Part of the reason for enjoying it is that it contains many careful distinctions, nicely made.

Brian Bayly
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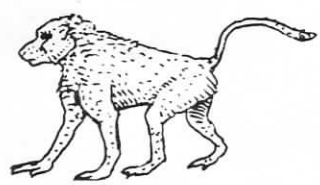
"Bible Code" Re-Examined

According to a September 1999 report by the Associated Press, statistical researchers have thoroughly re-examined the work by proponents of the so-called "Bible Code" who claim that computer analyses can reveal references to 20th-century events hidden in the Hebrew text of the Bible. A 1994 article in the journal *Statistical Science* first reported the use of intensive computer searches to extract references to 20th-century names and events hidden throughout the biblical text. This report was quickly followed by extensive media attention to the claims. Now the AP reports that the same journal, published by the Institute of Mathematical Statistics based in Hayward, California, featured an article in the November 1999 issue challenging the technique and the claims made for it in the original report. [*For more on the Bible Code, see Dave Thomas's article in* RNCSE *1997; 17[4]: 23.*]



Correction

In *RNCSE* 19.4, we erroneously listed our own Kevin Padian as a coauthor of *The Complete Idiot's Guide to Dinosaurs*. Kevin was not involved in the writing or the production of that book, and we apologize for the error.

Creation/Evolution Resource Database

Thomas Moore maintains a database of Creation/Evolution related publications. He wrote recently to tell us that he has added a new search engine.

To access this resources, point your browser to <http://www.baz.com/litm/CERD/>. The site is case-sensitive, so be sure to type CERD in upper-case letters.

WEB LOCATIONS VISITED IN THIS ISSUE

NEWS ITEMS

TOPIC Another View from Kansas
OWNER University of Kansas
LOCATION <http://www.ukans.edu/gateway/chancellor.shtml>
LAST VISIT Dec 1999

TOPIC Emphasis on Teaching Evolution
OWNER National Center for Improving Student Learning & Achievement in Mathematics & Science
LOCATION <http://www.wcer.wisc.edu/ncisla/what's%20new/index.html>
LAST VISIT Dec 1999

TOPIC Poll Finds Majority of Kansans Support Evolution
OWNER *Kansas City Star*
LOCATION <http://www.kcstar.com/item/pages/home.pat.local/3773fc94.b06.html>
LAST VISIT Dec 1999

NCSE NEWS

TOPIC NCSE Names Working Assets Recipient
OWNER Working Assets
LOCATION <http://www.workingassets.com>
LAST VISIT Jan 2000

FEATURES

TOPIC False Prophet of Creationism
OWNER Kent Hovind/Creation Science Evangelism
LOCATION <http://www.drdino.com>
LAST VISIT Jan 2000

RESOURCES

TOPIC *Ken Miller on Life's Design*
OWNER Brown University
LOCATION <http://biomed.brown.edu/Faculty/M/Miller/TR/Lifes-Design.html>
LAST VISIT Dec 1999

TOPIC Hemoglobin's Clue to Biochemical Evolution
OWNER *New York Times*; *Nature* (MacMillan, LTD)
LOCATION < http://www.nytimes.com>; <http://www.nature.com>
LAST VISIT Dec 11, 1999

TOPIC Creation/Evolution Resource Database
OWNER Thomas Moore
LOCATION <http://www.baz.com/litm/CERD/>
LAST VISIT Jan 2000

TOPIC Chinese Fossil Strengthens Evolution
OWNER *Nature* (MacMillan, LTD)
LOCATION <http://www.nature.com>
LAST VISIT Dec 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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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* 2995 Jan-Feb; 1015(1):22-9.

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

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

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