REPORTS OF THE NATIONAL CENTER FOR SCIENCE EDUCATION

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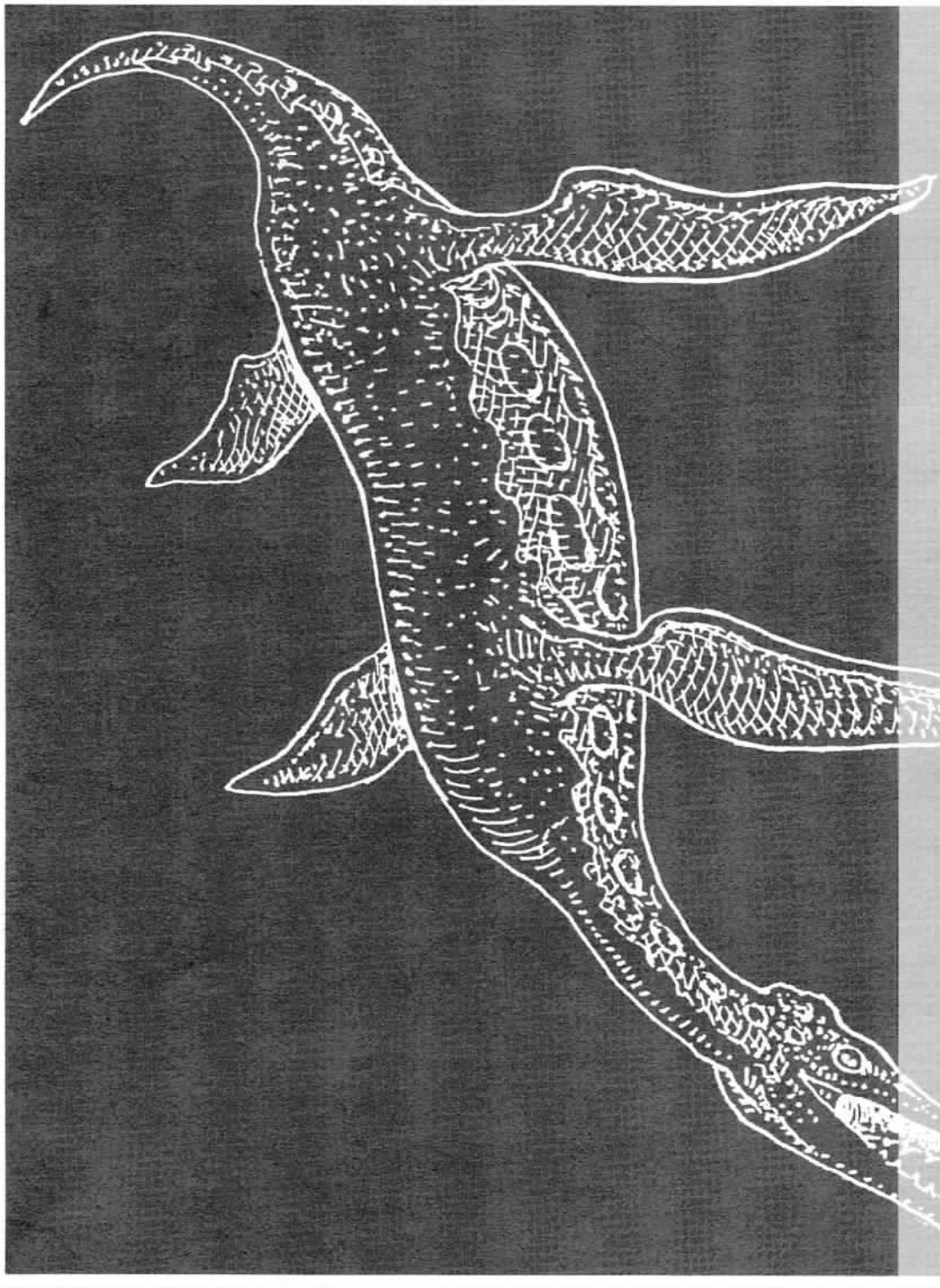

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COVER: SHORT-NECKED PLESIOSAUR *TRINACROMERUM*
©RAY TROLL, 1992
(STORY P 17)

FROM THE EDITOR'S DESK

Our third issue of *RNCSE* marks several new milestones. The most important for us in the editorial office is that Assistant Editor Laura McMahon will be leaving Madison for a teaching position at Mount Gilead (OH) High School. Laura has been a valued member of the staff since we moved the NCSE publications to Madison and was responsible almost entirely for two of the issues that we produced here while your editor was off teaching in the wilds of suburban Boston. We will miss Laura in Madison, but her move to Ohio is a move "home"—to her family, friends, and fiancé. Please keep Laura and her family in your thoughts as they make this transition in the coming year.

Our second milestone comes from Molleen Matsumura, NCSE's Network Project Director. As a part of increasing our presence on the World-Wide Web, Molleen has begun posting articles from back-issues of NCSE publications on our web site. She has also developed a "teaser" page that tells folks what will be coming along in future issues. We will also print those coming attractions in each issue as space permits.

The special focus of our books offering this issue is children's books. Each issue we will highlight selections from our books program and give readers a reminder of the breadth of materials NCSE has to offer. Our staff is busily preparing an updated list of all the books that we offer. That list, prices, and member discounts will be available by calling NCSE or by connecting to the NCSE web site.

In the News

Creationism lost (again) in the federal courts in Louisiana. This time the US District Court for Eastern Louisiana rejected the "only-a-theory" disclaimer required in a local school district. It is heartening that the federal courts so far have been able to see past the window-dressing that anti-evolutionists have put on their appeal to biblical authority in the curriculum under all the euphemisms that they have used. The state framework for science education further consolidates the central role of evolution in the curriculum in Louisiana, but the news is not as good elsewhere. There is still much to do in Illinois, Texas, Virginia, Ohio, Florida, and Wisconsin.

Evolution is also emerging as an issue in social studies standards and curricula. Molleen Matsumura reviews trends in teaching and learning standards around the country that address issues related to human evolution and prehistory in history and social science courses. We will be following events in several states over the next few issues.

The University of North Carolina Mathematics and Science Education Network issued its position on the theory of evolution. We include a copy of their statement and the URL of their web site. Given our reports out of North Carolina in the last issue, this is welcomed support.

We also report on two conferences. John Cole recaps the proceedings at the geochronology conference sponsored by the Institute for Creation Research. We also report on an upcoming conference sponsored by the American Association for the Advancement of Science's Program of Dialogue Between Science and Religion. The conference on "The Epic of Evolution" takes place from November 12-14, 1997, in Chicago. As an added benefit, AAAS has supported the publication of NCSE's *Voices for Evolution* on the web site related to the conference.

Featuring...

If you missed the big splash made by flood theorist John Baumgardner in is interview with *US News and World Report*, you will find Molleen Matsumura's report informative. Molleen excerpted important claims about Baumgardner's work from the article and asked researchers in the geological sciences to comment on and respond to the claims attributed to Baumgardner in this article. Needless to say, his work is not considered mainstream.

We are also pleased to print a thoughtful letter from Dr Hugh Ross in response to a feature by Ken Nahigian in the first issue of *RNCSE*. Nahigian also replies to Ross's comments in this issue. In future issues look for a similar exchange between readers and Dr Brian Alters, whose article in the premier issue of *RNCSE* suggested that we *should* teach students to "believe in" evolution.

How does *your* representative in Congress stand on evolution? Watching Congressional hearings or reading their transcripts may be a way to find out. Molleen Matsumura reports on a creationist congressman's confrontation with life on Mars.

And, "Lost World", the sequel to "Jurassic Park" has raised the hackles of Answers in Genesis. Because characters in the film explicitly endorse evolution and reject creationism, AIG Executive Director Ken Ham called the film "another major attack on Christianity" in the AIG April Newsletter.

The Genuine Articles

Where is the research program that supports "intelligent design" theory? George Gilchrist looks for research articles based on this "alternative" theory of origins since it was first outlined in *Of Pandas and People: The Central Question of Biological Origins*. In the years since the book was first published, Gilchrist asserts, a viable scientific theory ought to generate some research reports in the primary scientific literature.

Lisa Blank and Hans Andersen take a closer look at how university students understand evolution. As a follow-up to studies previously published in *Creation/Evolution*, they focused on the attitudes and understanding of undergraduates who were planning to become *teachers*. Their sample included future elementary school teachers and secondary science educators.

Glen Kuban reprises the grand old tradition of *NCSE* with his article on the recovery by a Japanese fishing trawler of a decomposed carcass originally (mis)identified as a plesiosaur. These marine reptiles were last seen at the end of the Cretaceous, 65 million years ago. Kuban tells us why this is *not* a plesiosaur and what anti-evolutionists are saying about its recovery.

Leslie Chan reviews *SciCentral*, a web-based "meta-directory" for the sciences. Sometimes just having lots of links isn't enough to recommend a site. And don't miss John Cole's review of Howard Bloom's *The Lucifer Principle*. Just when you thought it was safe to discuss evolution, here is another, ostensibly secular book that tells us how evolution is the root of the evil in the world.

And An Offer You Shouldn't Refuse

NCSE members will be receiving a special solicitation from MBNA® for a members-only credit card. NCSE Executive Director Eugenie C Scott tells us that NCSE will benefit financially *both* when members enroll and then *each time* any of our members uses the card for a purchase. Check it out.

Anj Petto and Laura McMahon

NEWS

Texas Board of Education Approves Evolution in Science Curriculum

Molleen Matsumura
Network Project Director

The state of Texas has just adopted a revised science curriculum as part of the process of updating curriculum in all subject areas. Texas Board of Education discussions of the TEKS (Texas Essential Knowledge and Skills) have been highly politicized, with some board members writing alternative versions of the social studies curriculum (San Antonio *Express News*, June 30, 1997, p 8A). The controversy has pitted "religious conservatives" against Republican Governor George W Bush and others who support the TEKS substantially as written. While the TEKS are not a mandated curriculum, former US Assistant Secretary of Education Diane Ravitch points out that other states' reliance on Texas curriculum and textbook decisions "...gives Texas more importance than any other state in the country" (San Antonio *Express News*, June 30, 1997, p 13A). Texas is the largest single purchaser of textbooks in the nation, so decisions made by the Texas Board of Education affect the choices available to other states (see "Texas Textbook Adoptions", *NCSE Reports*, 1996 Winter; 16 [4]:6).

While press coverage has concentrated on English and social studies standards, the evolution/creation controversy has also affected the Board of Education's deliberations. NCSE members attending public hearings about TEKS report that some board members were openly sympathetic to speakers like Don Patton, a young-earth creationist who has promoted the Paluxy "man tracks". These board members proposed substituting explicit references to evolution and evolutionary processes with more "neutral" language — for example, changing "adaptation" to "characteristic diversity".

NCSE members attending the meeting responded both by refuting pseudoscientific claims and emphasizing the importance of full coverage of evolution and accurate scientific terminology in the curriculum. After the hearing more time was allowed for written comments from the public, and many NCSE members wrote to say that they had urged their representatives on the board to resist attempts to dilute the science curriculum.

On July 12, in a 9-6 vote, the Board of Education adopted the TEKS without any changes. This decision not only provides important support for Texas teachers when they present evolution in the classroom, but makes it more likely that textbooks providing solid coverage of evolution will be approved in November 1997. Because textbook adoptions in Texas affect the quality of education nationwide, NCSE will monitor the process closely and keep members informed.

[*NCSE thanks Catherine Fabringer, Robert Pennock, and Bassett Maguire for information used in this article. We also thank those members (too many to name) who sent copies of their correspondence with Board of Education members.*]

Evolution in history curricula: New "Hot Spot" On The Horizon?

Molleen Matsumura
Network Project Director

In many states in recent years, attacks on the inclusion of evolution in science education have occurred in the context of adoption of statewide science curriculum standards. For example, Alabama's Board of Education eliminated evolution from newly-drafted science curriculum standards in November, 1995 (see *NCSE Reports*, 15[4]:10), and New Mexico's Board of Education sparked an ongoing controversy when they eliminated evolution from science content standards in August, 1996 (see *NCSE Reports* 16[2]:18) Not only do many states have legislative requirements to periodically revise curriculum content standards, but there is a strong national movement to use content standards as a means of improving education in a number of disciplines. In "MAKING STANDARDS MATTER 1997: An Annual Fifty-State Report on Efforts to Raise Academic Standards," the American Federation of Teachers reports that "49 states are developing common academic standards for their students," and "39 states have developed new or revised standards since last year's report" (AFT, p 11). The report, which studies states' efforts to develop standards in the areas of mathematics, social studies, English, and science, adds that twenty states are using exit examinations at various grade levels to assure that students have met the standards (AFT, p 23).

Even when science standards including the teaching of evolution have been adopted, textbook adoptions, and complaints by parents or

students at the local level, can also pose challenges. Problems may also occur in an entirely different discipline: social studies. Both content standards in some states, and model standards developed by various educational organizations, call for teaching about evolution as part of human prehistory. For example:

California's Challenge Initiative program has developed draft interim standards in History-Social Science, based on the state's "History-Social Science Framework for California Public Schools". These standards call for sixth-grade students to, "demonstrate an understanding of some of the known developments of early humankind...[including]

- •Identify[ing] the tools of archaeology that unlock the mysteries of prehistory and...
- •Identify[ing] the paleontological discoveries of Louis, Mary and Richard Leakey and those of Donald Johanson as evidence of what daily life was like [and]...
- •Explain[ing] the development of language as a means of acquiring knowledge and transmitting ideas..."

Revised *National Standards for World History: Exploring Paths to the Present*, released in April, 1996 by the National Center for History in the Schools at the University of California, Los Angeles, and distributed to more than 16 000 school districts and education leaders by the American Association of School Administrators, call for elementary students to learn about human evolution as a prelude to world history. (The standards specifically refer to, "The biological and cultural processes that gave rise to the earliest human communities," National Center for History in the Schools). They continue, "So far as we know, humanity's story began in Africa. For millions of years it was mainly a story of biological change. Then some hundreds of thousands of years ago [*sic*] our early ancestors began to form and manipulate useful tools. Eventually they mastered speech. Unlike most other species, early humans gained the capacity to learn from one another and transmit knowledge from one generation to the next. The first great experiments in creating culture were underway.... Why Study This Era? To understand how the human species fully emerged out of biological evolution and cultural development is to understand in some measure what it means to be human..... Students should be able to... demonstrate understanding of early hominid development in Africa by:

- •...describing types of evidence and methods of investigation that...scholars have used to reconstruct early human evolution... [and]
- •tracing the approximate chronology, sequence, and territorial range of early hominid evolution in Africa from the Australopithecines to *Homo erectus*"(National Center for History in the Schools).

The Mid-continent Regional Educational Laboratory (McREL), one of 10 regional educational laboratories sponsored by the US Department of Education, has proposed world history standards that call for upper elementary students to,"understand(s) scientific evidence regarding early hominid evolution in Africa...[and]...how scientists use archaeological evidence to reconstruct early human evolution..." (McREL).

NCSE has already been asked to review some curriculum materials designed for teaching about human evolution in social studies classes. We have not yet heard of any opposition to adoption of social studies curriculum materials including human evolution, or of any complaints about classroom use of such materials, but we recognize that this may happen in the future. NCSE members concerned about protecting evolution education should watch for news of state or local adoptions of social studies curriculum and texts, as well as science standards. You may also need to watch for news of curriculum challenges in your community, like the recent complaint about a science textbook in Fairfax County, Virginia (see p 10). If you hear of opportunities to support inclusion of evolution in social studies curricula, please inform NCSE—don't wait to hear from NCSE first!

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Louisiana court rejects evolution disclaimer

Molleen Matsumura
Network Project Director

On August 8, 1997, the US District Court for Eastern Louisiana ruled against a resolution of the Tangipahoa Parish School Board requiring teachers to read a disclaimer whenever teaching about evolution ("School District Requires 'Evolution Only a Theory' Disclaimer", *NCSE Reports* 1994 Summer; 14[2]:8).The disclaimer said in part:

> Whenever, in classes of elementary or high school, the scientific theory of evolution is to be presented, whether from...written material, or oral presentation, the following statement shall be quoted immediately before the unit of study begins as a disclaimer

from endorsement of such theory.

> [T]he Tangipahoa Parish Board of Education [recognizes] that the lesson to be presented regarding the origin of life and matter is known as the Scientific Theory of Evolution and should be presented to inform students of the scientific concept and not intended to influence or dissuade the Biblical version of Creation or any other concept.
>
> [I]t is the basic right and privilege of each student to form his/her own opinion or maintain beliefs taught by parents on this very important matter.... Students are urged to...closely examine each alternative.

Parents living in the parish brought suit against the disclaimer, represented by Marjorie Esman, an attorney acting on behalf of the American Civil Liberties Union.

The ruling by Judge Marcel Livaudais found that the disclaimer violated not only the Louisiana constitution, but the First and Fourteenth Amendments of the US Constitution, and enjoined the district from "implementing the disclaimer resolution and requiring the teachers of the Tangipahoa Parish public schools to read the disclaimer" (*Freiler et al. v. Tangipahoa Parish* 1997, p 2).

In his written decision, Judge Livaudais noted the history of religious motivation for the disclaimer, writing that prior to introduction of the disclaimer resolution, the board had "considered adopting an official written document entitled *Policy on the Inclusion of Religious Materials and Discussions on Religion in the Curriculum and in Student Activities* and a *Revised Draft of Policy*. These documents...do not mandate the teaching of alternative theories to the origin of mankind, but do allow the teaching of creation science."

Livaudais' next remarks are significant because they represent official recognition by a Federal court that references to "intelligent design" are simply a euphemism for "creation science". Livaudais wrote: "Creation science", as the term shall be used herein, is the theory that the universe, including all forms of life, was created literally in the manner described in the Bible by a higher Being, or, as alternately described, the theory of intelligent design or creation by a Divine Creator" (*Freiler et al. v. Tangipahoa Parish* 1997, p 4).

The ruling quotes extensively from transcripts of the meetings in which the Board of Education considered the resolution, including a long passage in which board member EF Bailey makes the same fallacious "fact vs. theory" distinction often used to justify anti-evolution policies. Bailey's remarks appear in the ruling:

> We would like that it not be taught as fact. That youngster, when that material is presented to him, and he reads it out of a textbook, it is—it is thought to be fact when there is nothing disclaiming it, or there is not another lesson given to explain other concepts (*Freiler et al. v. Tangipahoa Parish* 1997, p 9).

In fact, the ruling continues, "[N]o member of the school board listed any non-religious theory... which the school board members intended 'not to dissuade'" (*Freiler et al. v. Tangipahoa Parish* 1997, p 10), and "[N]o board member stated that the reason the disclaimer was being introduced was to urge students to exercise their critical thinking skills or to examine all alternative...purposes later embraced...in trial testimony. The discussions...centered on the strong belief...that schoolchildren should not be taught evolution as fact" (*Freiler et al. v. Tangipahoa Parish* 1997, p 11).

After a detailed discussion of the facts of the case, Judge Livaudais gave an extensive explanation of the legal principles underlying his decision, including the US Supreme Court's requirement that a law must have a genuinely *secular* purpose, and concluded, "As hard as it tries to, this Court cannot glean any secular purpose to this disclaimer.... In mandating this disclaimer, the school board is endorsing religion by disclaiming the teaching of evolution in such a manner as to convey the message that evolution is a religious viewpoint that runs counter to... other religious views" (*Freiler et al. v. Tangipahoa Parish* 1997, p 24-6).

The closing comments of the decision carefully distinguish *hostility* toward religion from *neutrality* toward religion. Judge Livaudais's remarks are also significant because attacks on evolution are often justified by a stated need to prevent classroom instruction from conflicting with ideas children learn at home or in church.

> The Court...in no way intends to disparage those deeply-held convictions which support the desire to encourage schoolchildren to maintain the religious or spiritual beliefs they are taught at home or in church. While encouraging students to maintain their belief in the Bible, or in God, may be a noble aim, it cannot be one in which the public schools participate, no matter how important this goal may be to its supporters. (*Freiler et al. v. Tangipahoa Parish* 1997, p 27).

In a telephone interview, the plaintiffs' attorney, Marjorie Esman, pointed out that the Court recognized that, though the policy didn't mandate teaching "creation science", the religiously-motivated effort to undermine science education was just as much a violation of the First Amendment, "no matter how cleverly disguised." This sort of "disguise" has evolved since the time of the Supreme Court's 1987 *Edwards v. Aguillard* decision.

That decision overturned a Louisiana state law requiring that evolution could not be taught except when accompanied by instruction in "creation science". The statute was found unconstitutional because its underlying purpose (much like that of the Tangipahoa disclaimer) was to promote religion. Besides, the justices stated, "Louisiana public school teachers already possessed the flexibility 'to supplant the presentation of theories, besides evolution, about the origin of life'" (*Freiler et al. v. Tangipahoa Parish* 1997, p 17). In the years following the Edwards decision, anti-evolution proponents tried to take advantage of this apparent loophole by studiously avoiding explicit mention of religious motivations in written policies

(see *NCSE Reports* 1989; 9[2]:14-6); instead, they call for teaching "criticisms of" or "alternatives to" evolution rather than "creation science", or argue that evolution should be taught as "only a theory" or only when accompanied by a disclaimer.

Another approach is to present "critical thinking" as a justification for teaching "evidence against evolution". Judge Livaudais saw through this ploy when he commented that, "While the school board intelligently suggests that the purpose of the disclaimer is to urge students to exercise their critical thinking skills, there can be little doubt that the students already had that right...." (*Freiler et al. v. Tangipahoa Parish* 1997, p 24). However, he noted, "All of the 'other concepts' which the school board members intended 'not to influence or dissuade' were religious" (*Freiler et al. v. Tangipahoa Parish* 1997, p 10), and therefore the disclaimer's intent was religious.

On August 19, the school board voted to appeal the decision. The board is not represented by its own attorney, who had advised against adoption of the disclaimer, but by an outside firm which is donating its services. An appeals court decision could be highly significant because other districts have adopted disclaimers (*NCSE Reports* 1995 Winter; 15[4]:10; 1996 Summer; 16[2]:19). An appeals court decision in one circuit is often taken as precedent in other circuits; however, since not all disclaimers have specifically religious language like the one in Tangiapahoa, it is unclear what the impact would be. While board president Bailey expresses confidence that the appeal will be won, some board members have suggested an interest in pursuing the case to the US Supreme Court.

Since 1987, the Supreme Court has refused two opportunities to review cases involving evolution/creation issues (*Webster v. New Lenox School District #122*, 917 F.2d 1004 and *John E Peloza v. Capistrano Unified School District* 37 F.3rd 517). NCSE will keep members informed; meanwhile, if an evolution disclaimer is proposed in your district, be sure to call on NCSE for information about this issue.

References

Legal citations are from the decision in the case of Herb Freiler, Sam Smith and John Jones versus Tangipahoa Parish Board of Education, EF Bailey, Robert Caves, Maxine Dixon, Leroy Hart, Ruth Watson, Donnie Williams, Sr, Art Zieske, and Ted Cason, Civil Action Nr 94-3577, Section E/5, heard in the United States District Court Eastern District of Louisiana, issued August 8, 1997 and cited here as *Freiler et al. v. Tangipahoa Parish 1997*.

[*With thanks to Barbara Forrest, Paul Heinrich, and Robert Okazaki.*]

ICR Sponsors Young-Earth Geochronology Conference

John R Cole
Contributing Editor

On July 5, ten scientists came together at Institute for Creation Research (ICR) to initiate a research program designed to remove radioisotope dating from its throne," writes ICR President John Morris in his August cover letter accompanying *Acts & Facts* and the *Impact* Nr 290, "The First Young-Earth Conference on Radioisotopes," by Larry Vardiman. The conference was called to address weaknesses in the ICR's arguments based on radioisotope data and the age of the earth (see *RNCSE* 1997 Mar/Apr; 17[2]:26).

Participants noted as "researchers" were the ICR's geology chair Steve Austin, Los Alamos National Lab physicist John Baumgardner, Russell Humphries, a physicist at Los Alamos, Australian geologist (and editor of *Creation Ex Nihilo)* Andrëw Snelling, Bluefield College (VA) physics professor Eugene Chaffin, and Donald DeYoung, physics professor at Grace College, IN. "In addition to the research scientists," writes Vardiman, John Morris, Henry Morris and Kenneth Cumming of the ICR also attended. All hold doctorates in fields outside the scope of the conference.

This conference had a few other unusual twists. All but one of the participants were said to already be in San Diego at the ICR where they were teaching in July. This is unusual for a "conference" which normally brings together people from different locations with diverse viewpoints. It is also notable that none of the participants is known as an expert on geochronology or radioisotope dating, and all are committed to a foregone conclusion—that the earth is geologically young.

The conference set out research goals and the group plans to announce conclusions by 2005. In the meantime, they will hold additional meetings to try to resolve issues such as where all the heat went if all those isotope tracks in stone were zapped in during a one-year Flood rather than over billions of years. In his *Impact* article Vardiman suggests that the best explanation for these observations may be a divine miracle.

AAAS Sponsors "Epic of Evolution" Conference

Eugenie C Scott
NCSE Executive Director

The American Association for the Advancement of Science's Program of Dialogue Between Science and Religion is sponsoring a conference on "The Epic of Evolution" from November 12-14, 1997, in Chicago. The conference will be a collaboration among the Chicago Academy of Sciences, the Field Museum of Natural History, and the Chicago Center for the Study of Religion and Science.

According to a press release, "The goal of the conference is to provide a more accurate account of the interaction between the evolutionary sciences and religious thought by offering presentations on contemporary evolutionary science, the history of religious responses to evolution, and contemporary religious and philosophical reflections on the findings of the evolutionary sciences."

The three-day conference includes sessions on current knowledge of evolution ranging from the Big Bang to the evolution of mammals and human culture. Scientists are often paired with scholars of religion to discuss the religious implications of evolutionary discoveries and interpretations. Speakers include Joel Primack, Brian Swimme, Niles Eldredge, Ronald Numbers, Ursula Goodenough, John Haught, Ian Tattersall, Terrence Deacon, Nancey Murphy, Solomon Katz, Mary Evelyn Tucker, Francisco Ayala, Loyal Rue, Stephen Pope, Mary Barber, N Scott Momaday, and Thomas Berry. Information on the conference can be obtained from the AAAS web site: <http://www.aaas.org/spp/dspp/dbsr/news.htm> or from the Program of DBSR, AAAS, 1200 New York Avenue NW, Washington DC 20005

World's Oldest Geological Society Honors Anti-Creationist Campaigner

Barry Williams
Australian Skeptics Society

Professor Ian Rutherford Plimer has been made an Honorary Fellow of the Geological Society. The Society bestowed this honor upon Professor Plimer, of the University of Melbourne, Australia for his courageous stand against "creation science" (see "Australian Geologist Loses Lawsuit" *RNCSE* 1997 Mar/Apr; 17[2]:4-5). Plimer is Professor of Geology and Head of the School of Earth Sciences in the University of Melbourne, Australia. He is the author of over 100 learned papers and was the 1994 winner of the Michael Daley Award for Science, Technology and Engineering Journalism. In 1995 he won the ABC Eureka Prize for the Promotion of Science. He is the author of a book on creationism in Australia, *Telling Lies for God* (Random House, 1994).

The Geological Society is the UK organization representing the interests of professional earth scientists and is the UK's premier forum for debate in the geosciences. It is the oldest geological society in the world, and was founded in 1807. It has over 8600 members worldwide. Professor Plimer was nominated for the honor by Dr Richard Fortey FRS of the Natural History Museum, London, Dr Bryan Lovell of the University of Cambridge, and Professor Bruce Sellwood of the University of Reading. Professor Dick Selley of Imperial College and acting chairman of the Society's External Affairs Committee said: "Most geologists ignore creationists and do not believe that it is worth joining them in serious debate. This is an extremely dangerous attitude and we are already seeing the price that must be paid by adopting it both in the USA and Australia. Professor Plimer is a man of enormous courage who has put his money where his mouth is. We salute his courage."

[*To learn more about the Geological Society, connect to <http//www.geolsoc.org.uk>. To learn more about creationism and the Skeptics Society in Australia, connect to <http://www.skeptics.com.au> or email <skeptics@spot.tt.sw.oz>. Article reprinted from* The Skeptic *with permission.*]

UPDATES

Illinois: On July 25 Illinois' Board of Education voted to accept proposed Science Learning Standards from which explicit references to evolution had been deleted, upon the recommendation of an "External Review Team" appointed by the Superintendent of Education ("Evolution 'Too Controversial' for Illinois Schools," *RNCSE* 1997 Mar/Apr 17[2]: 6-7). This omission does not ban teaching evolution, and concepts such as adaptation and "change over time" are included in the standards; however, individual school districts are given the option of down-playing or avoiding explicit coverage of evolution.

Louisiana: On May 22, 1997, Louisiana's Board of Elementary and Secondary Education approved a new *Louisiana Science Framework*. The framework had been developed by the Louisiana Systemic Initiatives Program with the help of a grant from the National Science Foundation, and no revisions of standards (including addition of evolutionary concepts) were challenged during public review. The framework covers evolutionary concepts in several subject areas (for example, Benchmarks for Earth and Space Science include "investigating how fossils show the development of life over time"), and refers to "change" in K-8 life science. The new state framework is likely to make a difference at the local level. For example, a Livingston Parish School Board resolution, adopted when the board rejected a proposed curriculum including "evidence against evolution" ("Louisiana: Teachers Scrap Recycled Curriculum" *NCSE Reports* 1995 Fall; 15[3]:1,7), says "Students may initiate discussion in the classroom about evolution based upon historical interpretations" and adds, "This motion does mandate the scientific acceptance of the Theory of Evolution...*within the guidelines of the state curriculum guides*" (emphasis added). A recent Lousiana court decision lends further protection to evolution education (see "Louisiana Court Rejects Evolution Disclaimer", p 6).

Ohio, Louisville: This school district has been involved for several years in evolution/creation controversies including a policy of requiring equal coverage for both evolution and "evidence against evolution", and efforts to bring "intelligent design" textbooks into classrooms ("Creationism Trial Headed Off", *NCSE Reports* 1993 Fall; 13[3]:1, 5; *NCSE Reports* 1996 Winter; 16[4]:10; *RNCSE* 1997;17[2]: 9). In June 1997 district teachers submitted a proposed science curriculum based on the state's "Model Competency-Based Program", which includes "patterns of change [such as] evolution" among "major scientific ideas" Ohio students should learn. Some board members objected, questioning the scientific validity of evolution. At the July 25 meeting, the board voted 3-2 to accept the science curriculum. However, according to NCSE member Lee M Gray, who attended the meeting to explain why scientists support evolution education, continued controversy seems likely. Despite the presence of local supporters of evolution education, many community

members strongly opposed evolution, and one board member proposed several changes in the curriculum.

Texas: The State Board of Education will meet in September, 1997 to consider textbook recommendations. The Board recently adopted curriculum standards that call for teaching evolution, over strong opposition (see "Texas Board of Education Approves Evolution in Science Curriculum" p 5), and textbook hearings represent a new opportunity for efforts to weaken evolution education. Comments submitted to the Texas Education Agency call for teaching both evolution and "creation science"; some of them specifically call for teaching Flood Geology, claiming that recent research at the Los Alamos National Laboratories supports their views (see "Miracles In, Creationism Out, p 30).

Virginia: The State Board of Education will soon be voting on whether to adopt "Standards of Learning" in all subjects, including science standards that call for students in life science courses to "investigate and understand...the relationships of mutation, adaptation, natural selection, and extinction; [and] evidence of evolution of different species in the fossil record." While board members with conservative Christian perspectives may oppose evolution, observers believe that they may more actively oppose other aspects of the curriculum.

Virginia, Fairfax County—After parents of a Thomas Jefferson High School student complained that a biology textbook "disparaged" their religious views, the local chapter of the American Family Association pressed for adoption of an evolution disclaimer to be inserted in textbooks (*NCSE Reports* 1996 Fall; 16[3]:16, *RNCSE* 1997 Jan/Feb 17[1]:5). When the school board voted down the disclaimer proposal, other parents in the district stepped in and filed suit demanding the disclaimer (*RNCSE* 1997 Mar/Apr; 17[2]:9).The attorney for the school district has filed papers calling for dismissal of the suit, on grounds that the plaintiffs lack standing to sue because they attend other high schools in the Fairfax County district and the book is not in use at those schools. NCSE will continue monitoring developments.

Florida, Lee County: In the wake of school-board elections that provided a majority of members to promote a conservative Christian platform, Lee County is in line to become Florida's first county to institute in its public high schools a Bible Studies curriculum, if it survives legal challenges. Among other items, the curriculum will present the story of Adam and Eve as history. A superintendent of schools who opposed the curriculum was dismissed by the school board for noncooperation, and the board's attorney resigned after he concluded that the new curriculum was clearly unconstitutional. The board is pressing ahead with its plans to institute the curriculum while the case makes its way through the courts.

[*With thanks to David Bloomberg, John R Cole, Barbara Forrest, Lee M Gray, Cynthia Wieland, John Koonz, ME Sikes, and Douglas McNeil.*]

NCSE's Eugenie Scott To Appear On Firing Line

On December 19, 1997, the well-known PBS program *Firing Line* will air a two-hour special on the evolution-creation controversy. The program will be a debate, taking place on a college campus before a student audience.

Host William Buckley has once again invited Michael Kinsley, editor of the online magazine *Slate* to moderate. Buckley will join other debaters arguing in favor of the resolution, Resolved: The evolutionists should acknowledge creation.

At press time, all but one guest had been chosen from the best-known anti-evolutionists, and the leading defenders of evolution. Dr Eugenie C Scott, Executive Director of the National Center for Science Education; Rev Barry Lynn, Executive Director of Americans United for Separation of Church and State; philosopher Michael Ruse, author of *But Is It Science?* and *Monad to Man* and biologist Ken Miller will argue for evolution. Buckley will be joined by law professor Phillip Johnson, author of *Darwin on Trial*; biochemist Michael Behe, author of *Darwin's Black Box*; and David Berlinski, whose anti-evolution article in *Commentary* drew considerable attention last year.

As additional information becomes available, NCSE will update the announcement at our World Wide Web site at <http://www.natcenscied.org>. The live broadcast of *Firing Line* will be at 8:00 PM Eastern time on December 19; be sure to check your local listings for broadcast times in your area.

Teaching Evolution: Coming to a Classroom Near You?

Lisa M Blank and Hans O Andersen

In March 1996 the Tennessee Senate considered legislation that would have allowed school districts to release a teacher who presented evolution as fact within his or her classroom. Once again, the public's opinion of the evolution/creation controversy received front row media seats, revealing the persistent communication gap between the scientific community and the public.

Contrast these events with the newly published *National Science Education Standards* (NRC 1996). Advocating scientific literacy for all, the standards charge all students will learn *all* science in the content standards (p 20). Included in these content standards as fundamental knowledge is the "origin and evolution of the Earth system" (p 187). Also outlined by the NRC is the central role teachers play in student understanding of the content standards: "The choice of content and activities that teachers make, their interactions with students, the habits of mind that teachers demonstrate and nurture among their students, and attitudes (conveyed wittingly and unwittingly) all affect the understanding, reasoning, and attitudes that students develop" (p 28).

The survey first asked students if they believed in Darwin's theory of evolution. Seventy-nine percent of preservice secondary-science teachers and only 43% of preservice elementary teachers responded yes.

Given that teachers are recognized as such potent agents within the classroom, their view of science content, such as the theory of evolution, could govern whether the goals of the NRC are met. Consequently, the following questions are of interest: How does the scientific community's understanding of evolution compare to that of science teachers? Is there a difference between the way elementary and secondary teachers view evolution?

This study considered these questions by assessing the views of preservice secondary-science teachers and preservice elementary teachers. Previous studies by Fuerst (1984), Zimmerman (1986) and Hodgson and Hodgson (1994) have explored the communication gap between university students and the scientific community using a questionnaire developed by Fuerst; but, none has focused specifically on educators. Earlier research indicates a communication gap does indeed exist; yet, the gap is less when considering those students who have both an increased interest in science and a greater number of courses in the biological or geological sciences. However, this gap is smaller only in a greater acceptance of evolutionary theory, not necessarily a greater understanding of evolutionary theory.

Materials and Methods

We surveyed a sample of 218 preservice teachers attending a Midwestern university of approximately 36 000 students. Students in four classes of Methods for Secondary Science (n = 89) and four classes of Methods for Elementary Science (n = 129) were polled during the 1995/1996 academic calendar, using Hodgson and Hodgson's (1994) survey format. All surveys were completed anonymously and participation was voluntary. The composition of the sample is shown in Table 1. The survey results appear in Table 2.

TABLE 1

Composition of the Survey Sample

Preservice Major	N	Male	Female
Elementary	129	12	117
Secondary	89	46	43
Total	218	58	160

The results highlight any differences or similarities between preservice elementary and secondary teacher populations and between preservice teacher populations and the general university student population. The general university student

Lisa Blank is Assistant Professor of Education at SUNY-Cortland, Cortland, New York. Hans Andersen is Professor of Science and Environmental Education at Indiana University

population results are from previous studies outlined earlier which used the same survey with a general university student population, rather than a preservice teacher population.

This study retained the use of the term *individual* in question six of Hodgson and Hodgson's survey, although it may be misleading. Changing this item to indicate clearly that evolution may also be the result of differential selection among populations, and not just individuals, would have been preferable; but, for purposes of comparing the results of this survey with previous research done at other large midwestern universities, the revision was not incorporated. We report these comparisons in the Results section.

Results

The survey first asked students if they believed in Darwin's theory of evolution. Seventy-nine percent of preservice secondary-science teachers and only 43% of preservice elementary teachers responded yes. The preservice secondary-science teachers results are higher than the percentages reported by Fuerst at Ohio State University, (67%) and Hodgson and Hodgson at Central Michigan University (62%); whereas the preservice elementary teachers' results are lower. Fifty-seven percent of preservice elementary teachers polled stated they did not believe in Darwin's theory of evolution, as compared to 21% of preservice secondary-science teachers.

When asked if other views besides Darwin's theory should be given equal time in class, 88% of preservice elementary teachers declared yes. Only 63% of preservice secondary-science teachers responded similarly (OSU 80%; CMU 81%).

Question three probed whether students viewed creationism as religion. Seventy-one percent of preservice elementary teachers said no, the teaching of creationism did not represent allowing religion in the schools. In contrast, only forty-seven percent of preservice secondary-science teachers felt the same way (OSU 58%; CMU 61%).

Question four asked students what the best way was to teach creationism. Sixty-four percent of preservice elementary teachers and 45% of preservice secondary-science teachers felt textbooks should be changed (OSU 62%; CMU 60%).

For question five, students revealed whether they received instruction about evolution in high school. It is interesting that 67% of preservice secondary-science teachers and 70% of preservice elementary teachers said they had received such instruction—nearly identical results.

Question six required students to record which statement best agreed with their understanding of evolution. As Hodgson and Hodgson indicated, the best answer is B (different individuals leave different numbers of offspring) with both A (survival of the fittest) and E (strong eventually eliminating the weak) as partially correct. Neither C (man evolved from...the gorilla or chimp) or D (purposeful striving) supports evolutionary theory. In both sample sets, only 8% chose B (OSU 8%; CMU 7%). Fifty-one percent of preservice secondary-science teachers and 50% of preservice elementary teachers chose answer A. Thirty-seven percent of preservice secondary-science students, and 24% of preservice elementary teachers chose answer D. Here, it is intriguing to see that similar percentages of respondents chose A, but the two groups differed in their tendencies to pick incorrect answers.

Question seven asked if students thought the theory of evolution was scientifically valid. Similar to previous studies, 58% of preservice secondary-science majors agreed that evolution has a valid scientific foundation. Yet, only 34% (almost half the proportion of secondary-education students) of preservice elementary teachers concurred.

Question eight examined if students believed scientists accepted the theory of evolution as scientifically valid. Twelve percent of preservice secondary-science teachers and 29% of preservice elementary teachers agreed (CMU 21%). This paralleled Hodgson and Hodgson's results when they broke down the percentages between science and non-science majors: 25% of non-science majors and 12% of science majors agreed.

58% of preservice secondary-science majors agreed that evolution has a valid scientific foundation. Yet, only 34%...of preservice elementary teachers concurred.

Question nine probed whether students thought the teaching of evolution would eventually lead to a breakdown of American society. Sixty-one percent of preservice elementary teachers believed this was indeed the case, whereas only 12% of preservice secondary-science teachers felt this way (OSU 22%; CMU 24%). As Hodgson and Hodgson found, there is a correlation between responses to question nine and one.

Questions ten and eleven asked if students had taken or are currently taking courses in biology or geology. Eighty-nine percent of preservice secondary-science teachers had taken or were taking a biology course compared to only 30% of preservice elementary teachers. Sixty-three percent of preservice secondary-science teachers had or were taking a geology course compared to 31% of preservice elementary teachers.

Discussion

The survey results suggest that preservice secondary-science teachers are more supportive of the theory of evolution than either preservice elementary teachers or the general student population. Further, preservice elementary teachers are decidedly less supportive of the theory of evolution than either preservice secondary science teachers or the general populations of previous studies.

Besides being less supportive of evolution, another interpretation suggested by the survey results is that preservice secondary science teachers hold a very different understanding of the concepts of "evolution", "creationism", "Darwin's theory", and "the modern theory of evolution" than preservice

Table 2

Responses to Survey Questions

1. Do you believe in Darwin's theory of evolution?

	Elementary (%)	Secondary (%)
Yes	43	79
No	57	21

2. If Darwin's theory of evolution is taught in public schools, should other views (including the divine origin of life through special creation) be taught too?

	Elementary (%)	Secondary (%)
Yes	88	63
No	12	37

3. Do you think that scientists are right in their argument that by giving creationism equal time they are allowing religion into the public schools?

	Elementary (%)	Secondary (%)
Yes	29	53
No	71	47

4. If you think that Darwinism and creationism are both valid theories, what is the best way to teach them?

A. Require all students to take courses in biology and religion.
B. Teach creationism at home.
C. Change textbooks or school curricula to present both theories.
D Other.

	Elementary (%)	Secondary (%)
A.	9	13
B.	10	18
C.	64	45
D.	17	24

5. Were you taught about evolution in your high school biology course?

	Elementary (%)	Secondary (%)
Yes	70	67
No	30	33

6. Which of the following best agrees with your impression of the Modern Theory of Evolution?

A. The phrase "survival of the fittest".
B. Evolution occurred because different individuals left different numbers of offspring.
C. Man evolved from either the gorilla or the chimpanzee in Africa.
D Evolution involved a purposeful striving toward "higher" forms (that is, a steady progress from microbes to Man).
E. Evolution occurred because the strong eventually eliminated the weak.

	Elementary (%)	Secondary (%)
A.	50	51
B.	8	8
C.	12	2
D.	24	37
E.	6	2

7. Do you think that the Modern Theory of Evolution has a sound scientific foundation?

A. Yes, because it is possible to test many "predictions" of evolutionary science.
B. Yes, even though we can never test predications about events in the past.
C. No, because we can never be sure about the past.
D No, because evolutionary science is principally based on speculation and not on "hard" scientific facts.
E. No, for other reasons.

	Elementary (%)	Secondary (%)
A.	34	58
B.	12	26
C.	18	2
D.	16	7
E.	20	7

8. Is it your impression that most scientists now believe that the Modern Theory of Evolution is NOT a valid scientific theory?

	Elementary (%)	Secondary (%)
Yes	29	12
No	71	88

9. Do you believe that the teaching of concepts which rely on a purely naturalistic explanation of the world, such as that used in the Modern Theory of Evolution, might eventually lead to a decay of American society?

	Elementary (%)	Secondary (%)
Yes	61	12
No	39	88

10. Have you or are you now taking a course in biology at the college/university level?

	Elementary (%)	Secondary (%)
Yes	30	89
No	70	11

11. Have you or are you now taking a course in geology at the college/university level?

	Elementary (%)	Secondary (%)
Yes	31	63
No	69	37

elementary teachers do.

While this study admits limitations in delineating the ultimate reasons for the discrepancy, the presence of such a wide range of responses between preservice elementary and secondary science teachers' perceptions of the theory of evolution warrants attention. As elementary teachers strive to fulfill the NRC goal of increasing the degree of science education in our elementary schools, the question of evolution must be considered. Will evolution be coming to a classroom near you when, at least for this sample, a majority of preservice elementary teachers do not appear to accept evolution as a valid theory or to understand its basic tenets? Students could be receiving very different presentations of evolution as they travel along the academic pipeline. Could the groundwork elementary teachers lay early in a student's academic experience affect the student's perceptions and understanding of evolution enough that science instruction in secondary schools is dismissed? Could intervention in preservice education programs mitigate the situation? If this is the case, should the intervention focus on changing preservice elementary teachers' beliefs about evolution, or just concentrate on improving their understanding of the theory, or both? Answers to these questions could determine how realistic the NRC goal of "scientific literacy for all" really is.

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AUTHORS' ADDRESSES:

Lisa Blank
Department of Education
State University of New York
PO BOX 2000
CORTLAND NY 13045-0900
lblank@indiana.edu

Hans Andersen
School of Education
WW Wright Education Building
Indiana University
BLOOMINGTON IN 47405-1006
andersen@indiana.edu

Our "EvolutionARTy" Look

Molleen Matsumura
Network Project Director

NCSE's long-time members may have wondered about it, new subscribers may have just enjoyed it: What's the story on the fossily, fishy art adorning the pages of our re-designed *Reports of the National Center for Science Education (RNCSE)*?

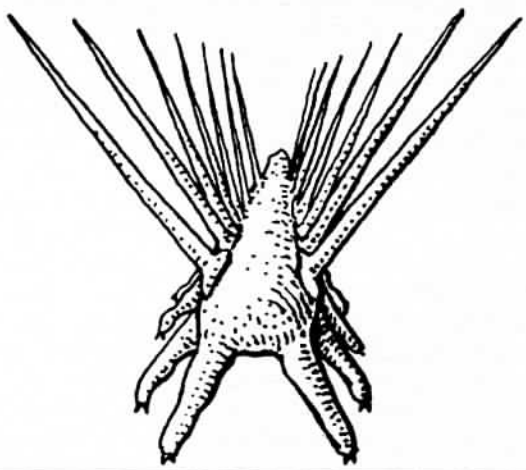
These drawings may be the most creative donation any member has ever made to NCSE. They're the work of artist Ray Troll, whose art is based on his lifelong fascination with the evolution of life and all manner of sea creatures. Some of his paintings have been collected in *Planet Ocean* and in a children's book, *Raptors, Fossils, Fins, and Fangs. Planet Ocean* a book written with Brad Matsen, is also a traveling museum exhibit which you may have seen at your local natural history museum.

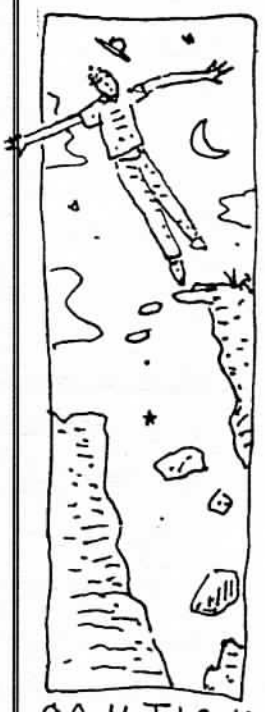
When Executive Director Eugenie Scott asked Troll whether he could donate a few drawings for use in *RNCSE*, he generously responded with literally hundreds of images.

NCSE members who have access to the World Wide Web and want to see Troll's art in color should visit <http://www.trollart.com>. Be sure to click on the TV screen (you'll see what that means), and while you're there, send an email to Ray. Please join us in telling him (in the words of science fiction author Douglas Adams):

THANKS FOR ALL THE FISH.

[*Ed:* Planet Ocean *and* Raptors, Fossils, Fins, and Fangs *can be ordered by members at a discount from NCSE.*]





ARTICLE

The Elusive Scientific Basis of Intelligent Design Theory

George W Gilchrist

The book *Of Pandas and People: The Central Question of Origins* by Percival Davis and Dean Kenyon is a high-school level text book designed to supplement traditional biology texts. The authors repeatedly refer to intelligent design as an alternative theory to neodarwinian evolution (Davis & Kenyon 1993, pp. 25, 26, 41, 78, 85). Because the adoption of this book is being considered in some public schools, it is worth asking about the status of this theory: Is intelligent design theory actually used by scientists? The question is a fundamental one because scientific theories are not just ideas or hypotheses outlined in a textbook, but are the basic research tools of professional scientists. A theory represents a collection of explanations, hypotheses, tests, and applications, including anomalies and failures (Kuhn 1962). Not all aspects of any theory are directly testable. For example, any theory explaining organismal diversity cannot be directly tested, since the plants, animals, and microbes that make up the living world are the result of a historical process not readily replicated in the laboratory. However, evolutionary theory (and, presumably, intelligent design theory) contains corollaries that make non-obvious predictions about patterns within the existing biota that can be tested.

[S]cientific theories are not just ideas or hypotheses outlined in a textbook, but are the basic research tools of professional scientists.

If intelligent design theory is a viable alternative to evolutionary theory, then scientists must be using it to devise tests and to interpret patterns in the data they collect. What sense would there be in presenting an idea as a scientific theory if the idea were not actually used by working scientists? The importance of a scientific theory is not related to its popularity among the general public, but to its utility in directing research and explaining observations within a particular field of study (Kuhn 1962). For example, millions of people read their horoscopes each day, but astrology plays no role in directing research by astronomers or psychologists. Astrology, therefore, is not discussed in science textbooks except in a historical context. Because professional scientists must publish their work to retain their jobs and to obtain funding, the relative status of intelligent design theory and evolutionary theory can be assessed by comparing their frequency of usage in the professional scientific literature.

To compare the scientific literature on evolution and intelligent design, I used five different computerized databases that catalog scientific periodicals, books, and reports. I searched each database for the keywords "intelligent design" and "evolution". BIOSIS (1997, Biological Abstracts, Inc.) is the online version of Biological Abstracts and covers approximately 6000 journals in the life sciences. The Expanded Academic Index (1997 Information Access Co.) indexes and abstracts 1500 scholarly and general interest periodicals, covering all major fields of study in the humanities, social sciences, and science and technology. The Life Sciences Collection (1997, Cambridge Scientific Abstracts) indexes 200 journals in all fields of biology. Medline (1997, National Library of Medicine) indexes over 3700 journals in the health and life sciences. Finally, the Science Citation Index (1996, Institute for Scientific Information) covers over 5000 journals in all fields of science. The Expanded Academic Index covers a broader range of subjects and lists more general publications; the other four indices list primarily professional science publications and feature more technical journals. The results of the searches are shown in Table 1.

Table 1. Summary of literature search results for the terms "intelligent AND design" and "evolution" in five computerized indices.

Index	Years	Intelligent Design	Evolution
BIOSIS	1991-97	1	68 832
Expanded Academic Index	1989-97	30	14 298
Life Sciences Collection	1982-97	1	45 963
Medline	1990-97	1	29 228
Science Citation Index	1992-95	4	10 333

Although Davis and Kenyon may claim that intelligent design represents a viable alternative to neodarwinian evolution, the scientific literature does not support that claim. Compared with several thousand papers on evolution, the combined searches produced only 37 citations containing the keyword "intelligent design." A closer look at those

37 references suggests that none reports scientific research using intelligent design as a biological theory. "Intelligent design" popped up most frequently in the index with the broadest range of topics, the Expanded Academic Index. Of the 30 articles, 12 were articles on computer software or hardware, eight were on architectural or engineering design, two were on advertising art, and one was on literature. The remaining seven were about biology; five were discussions of the debate over using *Pandas* by various school boards, and two were comments on Michael Behe's (1996) book in a Christian magazine.

The four papers in the Science Citation Index were all about engineering or welding technology. The single paper in the Life Sciences Collection was about computer methods used to analyze particulate air pollution. The single paper in Medline was about bioengineering drugs with high thermal stability. The single paper in BIOSIS was about a computer-controlled system for manufacturing fertilizer. This search of several hundred thousand scientific reports published over several years failed to discover a single instance of biological research using intelligent design theory to explain life's diversity. It is worth noting that although Davis and Kenyon are both professional scientists, neither has apparently published anything in the professional literature about their theory.

In all fairness, the number of references found using "evolution" surely overestimates the number of papers about biological evolution since the word "evolution" is widely used among academics to describe directional change. This is especially a problem in a diverse database, such as the Expanded Academic Index, which lists popular periodicals as well as research publications. For this index, I narrowed the search by specifying "evolution AND research" as subjects. This eliminated most of the non-scientific entries and brought the number of citations down from over 14 000 to 6935. This index, however, lists far fewer primary research publications than the other, more specialized professional indices referenced here.

Indices such as BIOSIS limit their citations to those in the science literature and so should provide a better estimate of the frequency of studies on evolution. BIOSIS applies a code to each reference indicating its intellectual scope. The code "CC01500" is applied to articles on "...philosophical, theoretical, and experimental studies on the origins of life, natural selection, phylogeny, speciation, and divergence." Thus, articles categorized by this code deal in some way with biological evolution. Of the 68 832 articles found in BIOSIS (1991-1996) using the keyword "evolution", 46 749 of them were assigned "CC01500" as their major code. Most of these papers were written by professional scientists to communicate their research efforts. Although popular authors such as Michael Denton (1986) and Phillip Johnson (1991) have published books declaring Darwinism to be dead, the data above suggest that the message apparently has not reached professionals doing the actual science.

Davis and Kenyon have baptized their concept of external design of living organisms as "intelligent design theory", but where is the research using this theory? The first edition of their book appeared in 1989; surely by 1997 there should be some evidence of intelligent design theory in the scientific literature if it is a bona fide piece of science. Scott and Cole (1985) searched the literature in the mid 1980's for published evidence of "scientific creationism" and found no articles dealing with empirical, experimental, or theoretical treatments of the creationist "model" in over 4000 professional and technical journals. During the course of this search, I also looked for scientific research articles containing the words "creation science" in the above indices; like Scott and Cole, I found none.

Why should we reserve a place in the science curriculum for science that apparently does not exist?

Creationists and proponents of "alternative" theories of organic diversity claim that the science supporting their views is not given a place in the classroom; if any science supporting these views has been done, it is quite well hidden. Why should we reserve a place in the science curriculum for science that apparently does not exist? Teachers wanting to give an exercise in frustration should send their students to the library to glean the latest scientific research on intelligent design theory or creation science, admonishing the students that papers on welding technology do not count. Any school board considering adoption of the *Pandas* text needs to question why science teachers should be expected to bear false witness in the classroom. Until intelligent design theory can be shown to have any status as a scientific theory of biological organization, it has no place in a biology curriculum.

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Author's Address

George W Gilchrist
Department of Zoology
Box 351800
University of Washington
SEATTLE WA 98195-1800
gilchgw@u.washington.edu

ARTICLE

Sea-monster or Shark? An Analysis of a Supposed Plesiosaur Carcass Netted in 1977

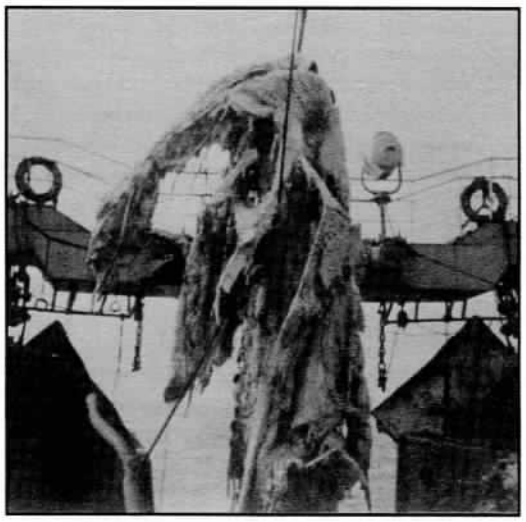
Glen J Kuban

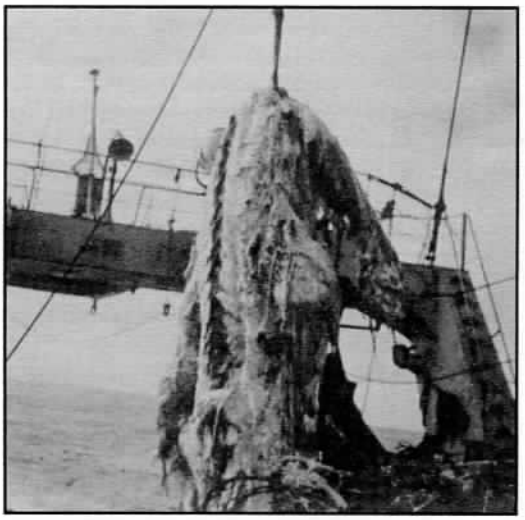
Plesiosaurs were a group of long-necked, predatory marine reptiles with four paddle-like limbs thought to have gone extinct with the dinosaurs about 65 million years ago. A decayed carcass accidentally netted by a Japanese trawler near New Zealand in 1977 has often been claimed by creationists and others to be a likely plesiosaur or prehistoric "sea-monster". However, several lines of evidence, including lab results from tissue samples taken from the carcass before it was discarded, strongly point to the specimen's being a shark, and most likely a basking shark. This should not be surprising, since basking sharks are known to decompose into "pseudoplesiosaur" forms, and their carcasses have been mistaken for "sea-monsters" many times in the past. Unfortunately, the results of scientific studies on the carcass data received less media attention than the early sensational reports, allowing widespread misconceptions about this case to continue circulating. Therefore, a thorough review of its history and the pertinent evidence is warranted.

On April 25, 1977, a fishing vessel named the Zuiyo-maru...was trawling for mackerel..., when a large animal carcass became entangled in its nets.

A Mystery At Sea

On April 25, 1977, a fishing vessel named the Zuiyo-maru of the Taiyo Fishery Company Ltd was trawling for mackerel about 30 miles east of Christchurch, New Zealand, when a large animal carcass became entangled in its nets at a depth of about 300 meters (almost 1000 feet). As the massive creature, weighing about 4000 pounds, was drawn toward the ship and then hoisted above the deck,





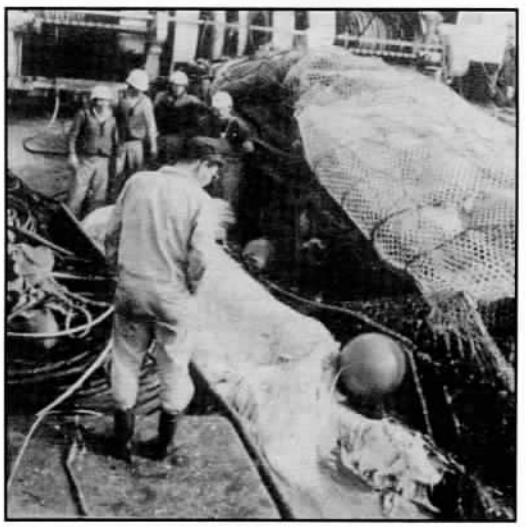


Figure 1.

Three of the photographs taken by Michihiko Yano aboard the Zuiyo-maru on April 25, 1977.

A. Front view of the carcass. This view inspired many to view the carcass as plesiosaur-like.

B. The only clear photograph of the back of the carcass, showing an apparent dorsal fin and myocommata along the spine (see Figure 5).

C. The carcass on the deck, with the anterior end toward the right.

Glen J. Kuban is a computer programmer and active amateur paleontologist. He has worked and written extensively on dinosaur tracks and the Paluxy "man track" controversy.

assistant production manager Michihiko Yano announced to the captain, "It's a rotten whale!" However, as Yano got a better look at the creature, he became less sure. About 17 other crew members also saw the carcass, some of whom speculated that it might be a giant turtle with the shell peeled off. However, no one on board could say for sure what it was (Aldrich 1977; Koster 1977).

Despite the possible scientific significance of the find, the captain and crew agreed that the foul-smelling corpse should be thrown overboard to avoid spoiling the fish catch. However, as the slimy carcass was being maneuvered over the ship in preparation for disposal, it slipped from its ropes and fell suddenly onto the deck. This allowed the 39 year-old Yano, a graduate of Yamaguchi Oceanological High School, to examine the creature more closely. Although he was still unable to identify the animal, Yano felt it was definitely unusual, prompting him to take a set of measurements, along with five photographs using a camera borrowed from a shipmate (see Figure 1). The carcass measured 10 meters (about 33 feet) in length. Yano also removed 42 pieces of "horny fiber" from an anterior fin, in hopes of aiding future identification efforts. The creature was then released over the side and sank back into its watery grave. All of this took place within about an hour (Koster 1977). About two months later Yano made a sketch of the carcass, which unfortunately conflicts with some of his own measurements, photographs, and earlier statements (see Figure 2).

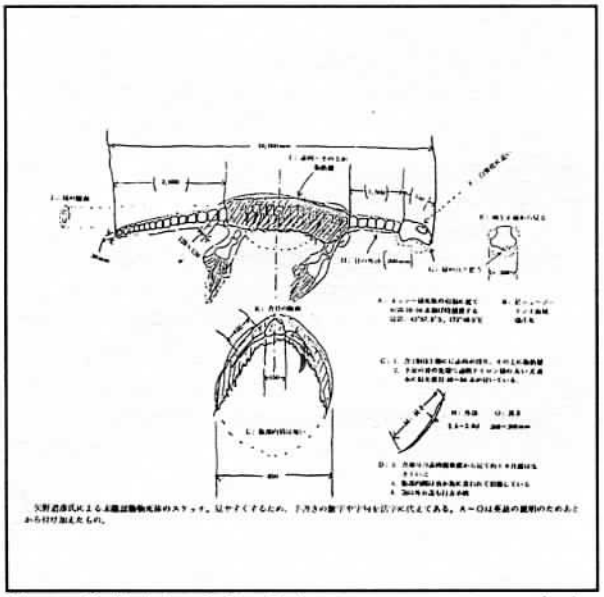


Figure 2. Sketch of the Zuiyo-maru carcass, made by Michihiko Yano two months after carcass was examined and thrown overboard. Sketch and translations appeared in the Collected papers on the carcass of an unidentified animal trawled off New Zealand by the Zuiyo-maru. *Major body segment measurements in the drawing: Overall length: 10 000 mm; head length: 450 mm; neck length: 1500 mm; tail length: 2000 m. Also available at <http://members.aol.com/paluxy2/plesios.htm>.*

When Yano returned to Japan on a different boat on June 10th, 1977, he promptly had his photos developed in the fishery's darkroom. Company executives were fascinated with the photos, some of which did appear to show an unusual animal with a long neck and small head. Local scientists looked over the photos and remarked that they had never seen anything like it (Koster 1977). Some speculated that it might be some kind of prehistoric creature such as a plesiosaur.

On July 20, 1977, as excitement and speculation about the find began to spread, officials from the fish company held a press conference to announce their mysterious discovery. Although scientific analysis of the tissue samples and other data had not yet been completed, company representatives played up the sea-monster angle. The same day several Japanese newspapers published sensational front-page accounts of the find, soon followed by many other radio and television stories throughout Japan (Sasaki 1978).

Preliminary Interpretations

Although some Japanese scientists remained cautious, others encouraged the plesiosaur idea. Professor Yoshinori Imaizumi, director of animal research at Tokyo National Science Museum, was quoted in the *Asahi Shimbun* newspaper as saying, "It's not a fish, whale, or any other mammal.... It's a reptile, and the sketch looks very like a plesiosaur. This is a precious and important discovery for human beings. It seems to show these animals are not extinct after all" (Koster 1977). Tokio Shikama of the Yokohama National University also supported the monster theme, "It has to be a plesiosaurus. These creatures must still roam the seas off New Zealand feeding on fish." (Wire service reports, 7/25/77, reported in Aldrich 1977).

Even if a living plesiosaur were confirmed, it would not threaten the theory of evolution.

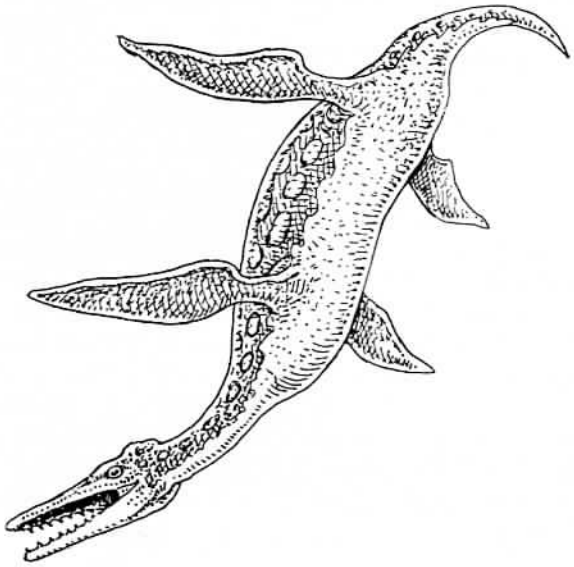
Meanwhile, American and European scientists interviewed about the carcass mystery generally downplayed the sea-monster theory, as reported by a number of newspapers and wire services (*Denver Post*, 7/21/77; *Washington Post*, 7/22/77; *Boston Globe*, 7/22/77); *New York Times*, 7/24/77; UPI, 7/24/77; *New Scientist* 7/28/77). Paleontologist Bob Schaeffer at the American Museum in New York noted that every ten years or so a carcass is claimed to be a "dinosaur" but always turns out to be a basking shark or adolescent whale. Alwyne Wheeler of the British Museum of Natural History agreed that the body was probably a shark. Explaining that sharks tend to decompose in an unusual manner, Wheeler added, "Greater experts than the Japanese fishermen have been foiled by the similarity of shark remains to a plesiosaur."

Other western scientists offered their own interpretations. Zoologist Alan Fraser-Brunner, aquarium curator at the Edinburgh Zoo in Scotland, suggested the body was a dead sea lion (Koster 1977), despite the creature's immense size. Carl Hubbs, of the Scripps Institute of Oceanography in La Jolla, California, felt it was "probably a small whale...so rotten that most of the flesh was sloughed off." George Zug, curator of reptiles and amphibians at the Smithsonian Institute, proposed that the creature was a decayed leatherback turtle (Aldrich 1977). The divergence among early scientific opinions in this case might be partly due to the fact that many biologists and zoologists are used to working with complete, fresh specimens rather than badly decomposed carcasses (or worse, photos of such), in which both external and internal organs can be quite different from their appearance in living animals (Obata and Tomoda, p 46).

The combined anatomical evidence thus strongly indicates a shark and effectively rules out a plesiosaur.

On July 25, 1977, Taiyo Fish Company issued a preliminary report on biochemical tests (using ion-exchange chromatography) on the tissue samples. The report stated that the horny fiber sampled from the carcass was "similar in nature to the fin-rays, a group of living animals". The "living animals" referred to were sharks; however, the report failed to state this plainly, leading to further confusion by the Japanese media (Sasaki 1978) and the continued spread of monster mania.

Toy manufacturers began gearing up to make wind-up models of the beast, while the company which made Yano's borrowed camera developed a whole advertising campaign around his "sea-monster" photos. Dozens of fishing vessels from Japan, Russia, and Korea were reportedly streaming toward New Zealand in hopes of resnagging the hastily discarded creature. Bubbling with excitement, one Japanese citizen confided that he thought sea-monsters were imaginary creatures but "danced when I read in the newspaper that it was still alive!" (Koster 1977). The Japanese government even issued a new postage stamp featuring a picture of a plesiosaur. Not since Godzilla had a monster so overtaken Japan.



The carcass controversy continued to make appearances in the popular press in America, but with less sensationalism. On July 26, 1977, *The New York Times* reported that professor Fujio Yasuda, who initially promoted the idea that the carcass resembled a plesiosaur, acknowledged that initial chromatography tests showed a profile of amino acids closely resembling a control sample from a blue shark. Meanwhile, Dr. Zug of the Smithsonian Institution had changed his interpretation from a turtle to a basking shark after further examining the carcass photos (*INFO Journal* Nov/Dec 1977). An August 1, 1977 *Newsweek* article briefly discussed the "South Pacific Monster" without taking sides. A few months later a more detailed article by John Koster (1977) appeared in *Oceans* magazine. This account was evidently the basis for many subsequent reports, many of which embellished or oversimplified various aspects of the story. Koster mentioned the preliminary tissue results and comments by western scientists supporting the shark interpretation, but also quoted Yano and others suggesting that the issue was not yet settled. Koster himself suggested that the small size of the creature's head, well-defined spinal column, and the lack of dorsal fin, did not fit the shark identification.

Creationists Seize the Monster

Soon news of the controversial carcass also came to the attention of some strict creationists, who suggested that the "likely plesiosaur" supported their young-earth position (Swanson 1978; Taylor 1984; Peterson 1988). After all, they seemed to imply, if a creature supposedly extinct for millions of years can turn up in a fishing net, how can we trust anything geologists tell us?

However, even if a living plesiosaur were confirmed, it would not threaten the theory of evolution. After all, many other animal groups represented by modern species co-existed with the dinosaurs during the Mesozoic Era, such as crocodiles, lizards, snakes, and various fishes. Most of these groups are well represented in the fossil record leading to the present time, but some creatures, such as the Coelacanth and Tautara, were once thought to have been extinct for tens of millions of years, only to be later found alive and little changed in modern times. These cases emphasize the incompleteness of the fossil record and the remarkable stasis of some animal groups, but are not grounds for upheavals in evolutionary thought. Nevertheless, the discovery

of a modern plesiosaur would certainly be a stupendous scientific find in its own right, confirming that long-necked "sea serpents" were not just long-extinct creatures or the stuff of sailors' myths, but real "living fossils". Unfortunately, a more thorough examination of the evidence would convincingly refute the plesiosaur interpretation.

Monstrous Tendencies of Basking Sharks

A number of scientists thought it likely from the start that the carcass in question was probably a shark, based on their knowledge of basking shark decay, and similar "sea serpent" carcass incidents of the past. The basking shark, *Cetorhinus maximus*, is the second largest fish in the sea (surpassed only by the whale shark). It can grow to more than 10 meters in length, and longer specimens have been reported (Soule 1981; Freedman 1985; Dingerkus 1985). However, this gentle giant is harmless to humans. It feeds by filtering plankton (mostly tiny crustaceans) through its large gill rakers as it swims lazily just under the water's surface with huge mouth agape.

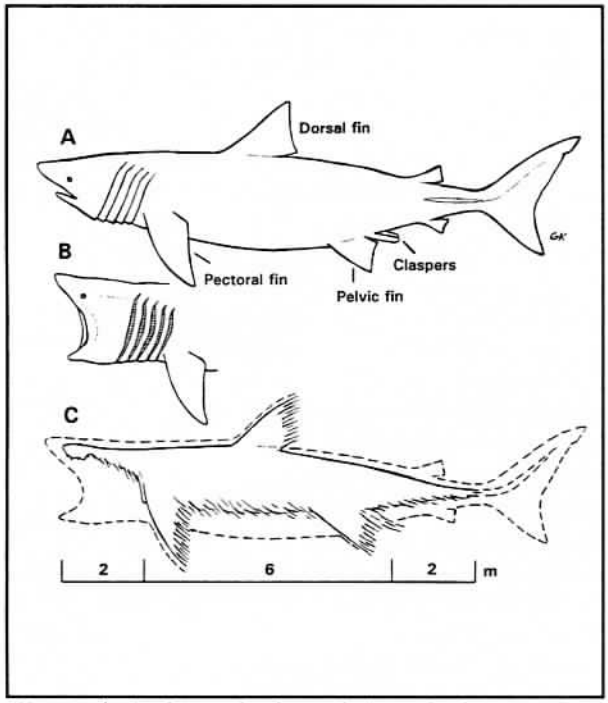


Figure 4. Basking shark and "pseudoplesiosaur" A. Basking shark in closed-mouth profile. B. Basking shark while feeding. C. Decomposed basking shark presenting a plesiosaur-like shape. Scale bar shows that a 10-meter basking shark carcass with tail lost would have essentially the same body proportions as those indicated in the Zuiyo-maru carcass (Figure 2). The carcass head and neck combined were measured at 1.95 m long and the tail 2.0 m, making the unmeasured torso (mid section) 6.05 m by calculation.

When the basking shark decays, the jaws and loosely attached gill arches often fall away first, leaving the appearance of a long neck and small head (see Figure 4). All or part of the tail (especially the lower half which lacks vertebral support) and/or the dorsal fin may also slough away before the better-supported pectoral and pelvic fins. This results in a form that superficially resembles a plesiosaur (Huevelmans 1968; Burton and Burton 1969; Cohen 1982; Bright 1989; Ellis 1989). Some have called such remains "pseudoplesiosaurs" (Cohen 1982), although one might also dub them "plesiosharks".

According to renowned cryptozoologist Bernard Heuvelmans (1968), over a dozen supposed "sea serpent" carcasses of years past were later shown to be definite or probable shark carcasses–in most cases basking sharks. These include (but are not limited to), the famous "Stronsa Beast" of Orkney Islands, England (1808), the Raritan Bay carcass of New Jersey (1822), the Henry Island, British Columbia carcass (1934) and the Querqueville monster, France, also in 1934. These were followed by the Hendaye carcass in France (1951), the New South Wales carcass (1959), and two more cases in 1961 (Vendee, France, and Northumberland, England). In 1970 another supposed "monster" washed up at Scituate, Massachusetts. This 30-foot beast was said to look remarkably like a plesiosaur; however, it also turned out to be a decayed basking shark (Cohen 1982; Bright 1989). In 1996 yet another supposed sea serpent was stranded on Block Island, RI. Nicknamed the "Block Ness Monster", it too has been evaluated as a probable basking shark (Roesch 1996).

Unfortunately, the 1978 scientific reports received less public attention than the original "sea-monster" stories.

Interestingly, basking sharks seem to have a propensity to mimic sea serpents while alive as well as dead. Often they feed in groups floating at or near the surface (hence the name "basking" sharks) and sometimes line up two or more in a row. When they do this, the dorsal and tail fins protruding from the water can be (and sometimes are) mistaken for the multiple "humps" and head of a long-bodied sea-monster (Sweeney 1972; Bright 1989; Ellis 1989; Perrine 1995).

Scientific Study of the Carcass

By the time the *Oceans* article was going to press, scientists in Japan had already formed a research team to study the Zuiyo-maru case more closely. Copies of the carcass photographs had reached scientists at the Tokyo University of Fisheries, including its president Dr. Tadayoshi Sasaki who proposed a meeting of scientists to study the available data. Initial meetings were held on September 1 and September 19, 1977, and attended by over a dozen scientists, including specialists in biochemistry, ichthyology, paleontology, comparative anatomy, and other fields. The workers agreed to avoid publicizing their individual conclusions until the study was completed (Sasaki 1978). In July 1978 a collection of nine papers presenting the team's

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Alan Charig, 1927-1997

John R Cole
Contributing Editor

Alan J Charig, British Museum paleontologist and dinosaur researcher, died July 15, 1997 in Oxford, England at age 70. Charig was a widely renowned field paleontologist who excavated—and popularized—dinosaurs on four continents. He also discovered one of the oldest known mammal fossils in Lesotho and the earliest herring fossils (the latter in Australia). NCSE members may know him best as the author of the *Science* article in 1986 which overwhelmingly refuted the claim that *Archaeopteryx* fossils were 19th-century forgeries. His 4000 word article was a masterpiece of debunking and dissection of the claim advanced by astronomers Fred Hoyle and Chandra Wickramasinghe, two anti-Darwinists (although not anti-evolutionists) who have continued to be cited occasionally by "scientific" creationists as offering "proof" that the famous transitional fossils were fakes. Charig's critique was devastating enough that most creationists have long since reverted to the claim that the fossil is "just a bird"—that is, unimportant and uninteresting except to benighted evolutionists. The hoax claim was laid to rest so thoroughly that Charig apologized for "using a sledgehammer to crack a rather trivial nut." The hammer was important and appreciated, however.

Ralph Wendell Burhoe Dies at 85

John Cole
Contributing Editor

Ralph Wendell Burhoe died May 8, 1997, after an amazing career in science and theology. Largely self-educated, Burhoe first made his name in meteorology in the 30s, but soon his attention turned to issues of the 20th-century state of science, religion and technology. As executive officer of the American Academy of Arts and Sciences from 1947 to 1964, he was instrumental in founding their journal *Daedalus*. He then taught at Meadville Theological Seminary in Chicago until retiring in 1974. He co-founded the Chicago Center for Religion and Science in 1988, in collaboration with the Lutheran School of Theology. For many years he was editor of *Zygon: Journal of Religion and Science*, and in 1989, Burhoe, a Unitarian, became the first American winner of the new Templeton Prize for Progress in Religion. Friends and critics alike considered him the foremost 20th-century mover in efforts to reconcile religion and science, and evolution was one of his longtime favorite interests. The Templeton citation said that the pro-science "reformation" he led may be far more profound and revolutionary than the Reformation led by Martin Luther.

findings was published in a report by the Société Franco-Japonaise d'Océanographie. Despite some disagreements over specific items of evidence and the view of some workers that the identification was still uncertain, the majority opinion was that the carcass was a badly decomposed shark—most likely a basking shark (Sasaki 1978). This conclusion was strongly supported by several lines of evidence, including studies on the microscopic appearance, chemical composition and physical properties of the tissue samples, as well as a number of anatomical considerations, elucidated below.

Tissue Sample Evidence

The horny fibers sampled from the carcass were rigid, needle-like structures that tapered toward both ends and had a translucent light-brown color (Kimura and others 1978, p 68). Such features are characteristic of ceratotrichia—the cartilaginous fibers of shark fin rays. Abe (1978) found that the carcass fibers and known ceratotrichia from a basking shark "resembled each other remarkably".

Gross amino acid analysis of the carcass samples gave results that closely matched elastoidin from a known basking shark. Elastoidin is a collagenous protein known only from sharks and rays (not reptiles or even other fish). The match was especially impressive when known basking shark elastoidin was treated with an antiseptic sodium hypochlorite

Abundance of Specific Amino Acid Residues per 1000 in "Plesiosaur" and Basking Shark

Amino Acid	1977 Carcass Sample	Known Sample of Basking Shark Elastoidin
4-Hydroxyproline	45	45
Aspartic/acid	54	55
Threonine	25	25
Serine	39	40
Glutamic acid	80	80
Proline	130	125
Glycine	291	290
Alanine	109	110
Cystine (1/2)	7	6
Valine	25	24
Methionine	10	10
Isoleucine	20	20
Leucine	19	19
Tyrosine	43	41
Phenylalanine	12	12
Hydroxylysine	5	6
Lysine	25	26
Histidine	11	13
Arginine	51	53
(Amide-N)	(57)	(62)

Table 1. Results of gross amino acid analysis on the horny fiber from the 1977 Zuiyo-maru carcass and known elastoidin of a basking shark (residues/1000 residues). Composition was determined by JLC-3BC liquid chromatography (JEOL Co. Ltd.). Both samples had been treated with NaClO. (Kimura, Fujii, and others 1978).

(NaClO) solution, as were the Zuiyo-maru samples (Obata and Tomoda 1978, p 52; Omura, Mochizuki, and Kamiya 1978, p 58). The correspondence was virtually identical on all 20 amino acids tested (Table 1). In discussing this "striking similarity," Kimura and colleagues (1978, p 72) noted that a statistical test called the "difference index (DI)" gave an extremely low value indicating a tight match. They also noted that the high tyrosine content (43 and 41 residues for the samples, respectively) is especially characteristic of shark elastoidin as compared with collagens from other species which typically have 5 or fewer tyrosine residues.

Furthermore, the horny fibers from the fin showed a distinctive shrinking to about 1/3 the original size when heated in water to 63° C, and gradually re-elongated upon cooling. This unique hydrothermal behavior is characteristic of elastoidin (Kimura and others 1978, p 68).

Electron micrographs of the tissue showed numerous parallel protofibrils, along with a particular banding pattern that is characteristic of shark elastoidin. Micrographs also revealed a major periodic striation pattern of 450-500 angstroms, which is shorter than typical collagens, but which was previously observed in basking shark elastoidin (Kimura and others 1978).

Earlier gas chromatography analysis on the horny fibers gave results consistent with shark tissue (Sasaki 1978). Kimura and colleagues (1978) concluded that the composite tissue sample studies indicated that the horny fiber was essentially identical to known basking shark elastoidin in both its morphology and amino acid composition. They remarked, "If the horny fiber was pulled out from an animal belonging to other classes except Chondrichthyes [sharks and relatives], it should be significantly different.... These results strongly suggest that this unidentified creature is a basking shark or closely related species" (Kimura and others 1978, p 73).

ANATOMY

Yano's sketch of the carcass (Figure 2) showed six neck vertebrae, viewed as "seven or so" by Obata and Tomoda (1978), which is reasonably consistent with Yano's measurements of neck length (150 cm) and individual vertebral size (20 cm). It is also consistent with the number of neck vertebrae in sharks. However, 6 to 7 cervical vertebrae are too few for plesiosaurs and other marine reptiles. Even the pliosaurs, also known as "short-necked" plesiosaurs, have at least 13 neck vertebrae; the "long necked" plesiosaurs have far more. (Obata and Tomoda 1978, p 46).

The head of the creature was reported to be turtle-like (Obata and Tomoda 1978, p 48). This is consistent with the known cranial remains of basking sharks which have been specifically described as resembling a turtle head (Omura, Mochizuki, and Kamiya 1978, p 59). In contrast, plesiosaurs had more triangular-shaped heads that were not particularly turtle-like (Hasegawa and Uyeno 1978, p 64).

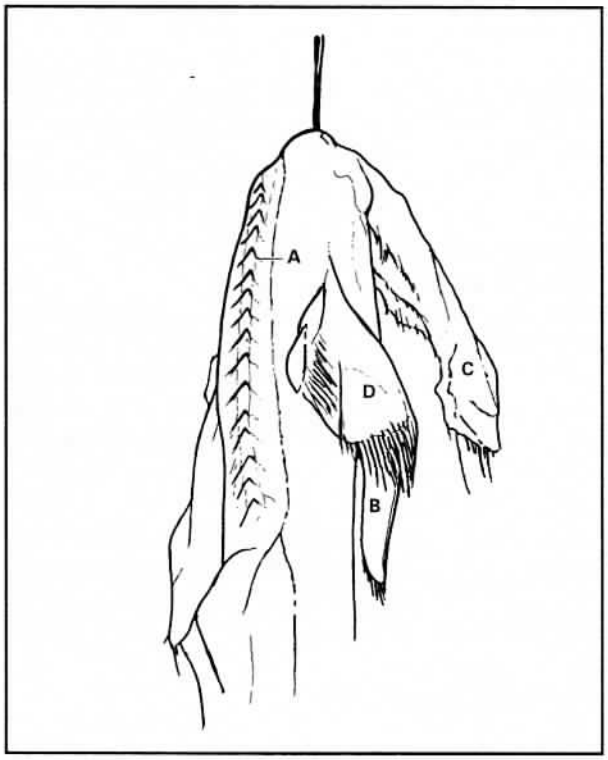

Figure 5. Interpretive drawing of the photograph in Figure 1b. A. Myocommata. B. Right forelimb. C. Cranium D. Dorsal fin. Compare to Figure 1b.

Gross amino acid analysis of the carcass samples gave results that closely matched [cartilage] from a known basking shark.

Photographs and witnesses confirm the presence of fin rays, which are possessed by most fish, including sharks. In contrast, plesiosaurs had bony phalanges as flipper supports, and no bones were seen in the carcass's fins (Obata and Tomoda 1978, p 51). The limb bones shown in Yano's drawing were evidently based largely on presumption or pro-plesiosaur bias rather than observation (Omura and others 1978, p 56; Obata and Tomoda 1978, p 49). One of the photos (Figure 1b) shows an apparent dorsal fin (see Figure 5). Dorsal fins are possessed by most fish including sharks, but are thought to have been lacking in plesiosaurs.

The V-shaped structures along the vertebral column (Figures 1b and 5) and near the pectoral girdle (Figure 1a) were identified as myocommata by Omura and colleagues (1978, p 56-7). Myocommata are composed of strong connective tissues between muscle segments known as myomeres, which are found in sharks but not reptiles. Yano measured the ribs as 40 cm (about 16 inches) long, which is far too short for plesiosaurs or other marine vertebrates except sharks (Hasegawa and Uyeno, p 65).

be too long for a shark, which typically have very small ribs. But this was an exceptionally large specimen and was probably even larger before decomposition. Also, it is not certain that Yano accurately identified or measured the ribs, which do not appear in the photos. Perhaps he mistakenly measured remnant gill arches, myocommata, or muscle furrows, under the assumption that they corresponded to ribs.

In Yano's photos the anterior fins appears to join the shoulder at a right angle, consistent with sharks but not plesiosaurs (Obata and Tomoda 1978, p 46; Hasegawa and Uyeno 1978, p 65). The pectoral girdle is visible between the front fins in Figure 1a and appears broken, but shark-like in shape (Compagno 1997; Phelps 1997; Roesch 1997b).

For more information on Basking Sharks, see: The Basking Shark Project <http://www.isle-of-man.com/interests/shark/>.

Fact Sheet: The Basking Shark <http://www.mbl.edu/html/MISC/basking.html>.

For web sites and internet mailing lists on sharks, Ben Roesch's Shark Links <http://www.ncf.carleton.ca/~bz050/HomePage.sharklinks.html>.

If the carcass were a plesiosaur, the body would be unlikely to bend in the posture shown in some of the photographs, since the breast bone would be large and flat. Likewise, the other ventral (belly-side) bones of plesiosaurs, which should have remained if the anterior fins were preserved, are not seen in the carcass (Hasegawa and Uyeno 1978, p 64). In plesiosaurs, bones of all limbs connect to their girdles on the ventral portion of the body; therefore, if the creature were a decayed plesiosaur, it is likely the limbs would have already been detached from the body (Hasegawa and Uyeno 1978, p 63).

At the existing degree of decomposition, a plesiosaur would probably have retained its upper jaws and teeth (Hasegawa and Uyeno 1978, p 63), but no teeth were reported in the specimen carcass (Obata and Tomoda 1978, p 48). A basking shark, however, is known to lose both jaws easily, and even if it retained the upper jaw, its extremely tiny teeth could be easily overlooked.

Yano reported the total carcass length as 10 meters (33 feet). Basking sharks commonly grow to 30 feet (Dingerkus 1985; Freedman 1985), and longer specimens have been reported (Heuvelmans 1968; Herald 1975; Soule 1981; Steel 1985). Some authors indicate they may even grow to 50 or more feet (Springer and Gold 1989; Perrine 1995; Allen 1996). Although the size of this carcass would be compatible with a small plesiosaur, the body *proportions* are not.

Although some of Yano's measurements seem surprisingly round (for example, 2 000 mm for the tail and 10 000 mm total length), they may be taken as reasonably accurate, since they appear compatible with the photos. Indeed, both the photos and measurements indicate a torso much longer than that indicated in the sketch. Although the 1978 authors demonstrated that the reported carcass proportions do not fit a plesiosaur, they surprisingly neglected the key question of whether the proportions are more compatible with a basking shark. As it turns out, they are, especially if the shark had lost its tail through decay (see Figures 2 and 5). Loss of the tail would be likely, since the wide tail would tend to snap at the narrow juncture between the tail fin and the rest of the body due to decay and buffeting in the water. This would explain the blunt rather than tapering tail end in Yano's sketch. The rostrum (nose tip) may also have been lost, but would not appreciably affect the overall body length or proportions. Adding a tail would mean the shark was closer to 12.5 meters (41 feet) in life, which would be exceptionally large, but still within the generally accepted size range of basking sharks. After all, this poor basker may have died of old age.

The combined anatomical evidence thus strongly indicates a shark and effectively rules out a plesiosaur. Obata and Tomoda (1978, p 52) conclude, "there are no known fossil reptilian species that agree with the animal under consideration." Likewise, Hasegawa and Uyeno (1978, p 64) write, "From the osteological point of view, we conclude that this creature does not belong to the plesiosaurian reptiles."

Miscellaneous Observations

Japanese shark-fin processors, who are thoroughly familiar with shark carcasses, identified the animal in Yano's photographs as a shark (Abe 1978). In September 1977 a positively-identified basking shark carcass was stranded at Nemuro, Hokkaido, and showed a remarkable resemblance to the Zuiyo-maru carcass found only five months earlier. Describing the September stranding Omura, Mochizuki, and Kamiya (1978, p 59-60) wrote, "The jaws and gill-arches were missing, and the cranium had a somewhat turtle-like appearance...the pectoral and pelvic fins were damaged at their apexes but still remained. The results of this experiment undertaken by nature support the view that the Zuiyo-maru carcass was a giant shark that has lost its jaws and gill arches." Summarizing their findings, Hasegawa and Uyeno (1978) state, "Based on available evidence, we are convinced that this New Zealand creature is not the "New Nessie" that much of the world was hoping for, but more than likely a carcass belonging to a large size shark."

Alleged Inconsistencies

Despite all the evidence pointing to a shark, some purported inconsistencies with the shark

identification were raised in the 1978 report and elsewhere and should be reviewed as well. The carcass reportedly smelled like a dead marine mammal compared to the ammonia smell characteristic of shark carcasses (Hasegawa and Uyeno 1978, p 65). However, it is not known whether all sharks give off the ammonia smell while decaying or for how long. The same authors noted that the lack of ammonia smell could be due to the extent of skin loss and decomposition, so that the ammonia from the carcass was diluted or washed out by seawater (Hasegawa and Uyeno 1978, p 65). Furthermore, even when alive basking sharks are known to emit a unique, highly offensive odor of their own (Steel 1985; Ellis 1989) which could have overpowered any ammonia smell.

A white, sticky, fat-like substance covered much of the carcass (Obata and Tomoda 1978, p 49). Although Niermann (1994, p 103) and a few others (Hasegawa and Uyeno 1978) considered this the strongest argument against the shark theory, it is actually consistent with it. Basking sharks have large deposits of fat in the white muscle and liver. According to some authorities they increase fat reserves during the summer for winter use (Steel 1985; Sims 1997). The animal in question likely died in late March or early April, which is late summer in New Zealand. Moreover, one of the Japanese workers (Seta 1978) explained the phenomenon of adipocere (post-mortem fat) formation in decaying carcasses of sharks and other animals, whereby new fatty material can be generated during the decay process. Seta indicated that the whitish, putrid-smelling viscous substance on the carcass was consistent with adipocere formation. Some of the whitish, stringy material also probably consisted of ligaments and connective tissue (Omura, Mochizuki, and Kamiya 1978, p 56). Such fibrous tissues on other basking shark carcasses evidently prompted some reports of "sea monster" corpses with white manes of hair (Heuvelmans 1968; Sweeney 1972).

The photographs reportedly show the presence of reddish muscle under the white material, which Obata and Tomoda (1978, p 49) suggest is compatible with a tetrapod (four-limbed animal). However, the presence of reddish muscle is also compatible with a shark. Like other fishes sharks have both white and red muscle (Fowler 1997; King 1997; Sims 1997). The former predominates, but fishes that swim slowly and steadily like basking sharks generally have more red muscle than other sharks (Tullis 1997). Some of the reddish color also could be due to blood residue.

The concerns of some authors about the "small head" or "long neck" (Koster 1977, Yasuda and Taki 1978) are eliminated once one understands the process of decay in basking sharks. Summarizing this process, Omura, Mochizuki, and Kamiya (1978, p 59) wrote, "...a disproportionately small skull and long, slender neck can be accounted for by the loss of the jaws and gill-arches in the course of decomposition of the carcass."

Obata and Tomoda (1978, p 48) also suggest that unlike sharks, in which the nares (nostrils) are situated in the lower surface of the skull, the carcass had holes that Yano called "probably nares" at the front end of the cranium. However, the rostrum or anterior most structure may have been missing, so that the nares could have been on the lower side and also the "front" of what remained of the skull, eliminating any inconsistency. Alternatively, what Yano thought to be nares could have been any of several other fenestral openings that exist in shark skulls, or new ones created during decay.

Some witnesses denied the presence of a dorsal fin (Obata and Tomoda 1978). However, even if a dorsal fin were absent, it could have been rotted away. Second, as mentioned, one photo does show an apparent dorsal fin (see Figures 1b and 5) which was evidently overlooked by Yano and others. Omura, Mochizuki, and Kamiya (1978, p 56) wrote, "...by a close examination of the photograph we can clearly distinguish the base of a dorsal fin, though it had slipped from the mid-dorsal line."

The divergence among early scientific opinions in this case might be partly due to the fact that many biologists... are used to working with complete, fresh specimens rather than badly decomposed carcasses.

Obata and Tomoda (1978, p 49) suggest that the "long, cylindrical ribs" in the carcass are not found in selachians. However, as explained earlier, it is not certain that Yano accurately identified or measured the ribs. Even if he did, the rib length (40 cm) is more compatible with a large shark than a plesiosaur. If the creature were a plesiosaur, it would have had to be a short-necked plesiosaur whose ribs would be at least triple the reported length (Martin 1997).

The head was said to be quite hard, whereas sharks contain no bones, only cartilaginous skeletons. However, cartilage in shark skulls can be quite hard and dense, and basking sharks have especially well-calcified skeletons (Steel 1985). As a shark ages, its skull becomes harder and denser. The size of the carcass clearly indicates an older specimen.

The pelvic (hind) fins were said by some of the crewmen to be similar in size to the pectoral fins, as in a plesiosaur (Obata and Tomoda 1978, p 49). However, this cannot be confirmed, since no measurements or photos were taken of the pelvic fins. Yano and others may have mistaken the large, draping and dislocated dorsal fin for one of the other fins (Hasegawa and Uyeno 1978, p 62); or, the combination of the pelvic fins and rear genital claspers may have created the illusion of a sizable rear fin

(Hasegawa and Uyeno 1978, p 63). This might explain Yano's comment that the rear fins had an unusual appearance like that of a seal (Koster 1977).

It is also possible that the pectoral fins decayed somewhat more than the pelvic fins, reducing their size disparity. Yano himself acknowledged that to the best of his recollection the front fins were somewhat larger than the rear (Koster 1977). His sketch suggests otherwise, but it is known to contain a number of other inaccuracies, such as bones in the fins that were not really seen. Noting such problems, Yasuda and Taki (1978) considered the sketch inherently unreliable, and Obata and Tomoda (1978) suggest it was influenced by bias. Indeed, by the time Yano drew the sketch (two months after the netting) the plesiosaur idea had become popular, and Yano had become something of a celebrity over it (Koster 1977).

Although scientific analysis of the tissue samples and other data had not yet been completed, company representatives played up the sea-monster angle.

Some readers may be wondering if the location of the find was a problem for the basking shark identification (as hinted in Yasuda and Taki 1978). However, basking sharks are known from many temperate parts of the world, including the waters around New Zealand (Burton and Burton 1969; Springer and Gold 1989; Francis 1997). The carcass was thought to have died in an area somewhat south of the capture site, well within the known range of basking sharks (Nasu 1978).

Monsters Don't Die Easily

Overall, the 1978 reports provided strong evidence favoring the shark identification and no substantial objections to it. Even authors such as Obata and Tomoda, who initially supported the plesiosaur idea and emphasized potential problems for the shark interpretation, acknowledged that most evidence pointed to a shark and ruled out a plesiosaur. They concluded "There are no known fossil reptilian species which agree with the animal in question" (Obata and Tomoda 1978). Most of the other authors in the 1978 reports more plainly stated that the evidence strongly indicated a basking shark or closely related species (Abe, 1978; Hasegawa and Uyeno 1978; Omura and others 1978; Kimura and others 1978).

Unfortunately, the 1978 scientific reports received less public attention than the original "sea-monster" stories. Most popular media seemed content simply to let the matter drop rather than helping to set the matter straight with follow-up articles. Likewise, several monster/mystery writers continued to depict the case as largely unresolved, including Welfare and Fairley (1980), Soule (1981), and Bord and Bord (1989). However, some good summaries of the 1978 research were provided by Cohen (1982), Cave (1988), Bright (1989), LeBlond (1992), and Ellis (1994) who put aside any hopes that the beast was a plesiosaur, and properly explained that the specimen evidently represented one of several basking shark carcasses mistaken as a sea-monster.

Even more disappointing, many creationists continued to promote the plesiosaur interpretation long after 1978, including Ian Taylor (1987, 1989, 1996), Paul Taylor (1985, 1987), Peterson (1988), Baker (1988), Dye (1989), Bartz (1990, 1992), Buckna (1993), Morris (1993, 1997), and Brown (1995). Most seemed unaware of the 1978 research and reports. Some flatly called the beast a plesiosaur (Scoggan 1996; Hovind 1996), or "sea-monster" (Doolan 1994), or "dinosaur" (Hovind 1996); plesiosaurs are *not* dinosaurs. Some creationists also included a redrawn and significantly altered version of Yano's drawing, making an already inaccurate sketch even less reliable and more plesiosaur like (Taylor 1987; Doolan 1991).

Still more perplexing were the comments of creationists who did seem aware of the 1978 work and tissue tests, and yet suggested they supported the plesiosaur identification. Among the most troubling statements are the following:

- From photographs, sketches with careful measurements, and flipper samples for tissue analysis, it had every appearance of being a plesiosaur or sea-dwelling dinosaur... (Ian Taylor 1984, 1978).
- Photographs, measurements, and tissue samples all show that it was probably a plesiosaur (Paul Taylor 1987).
- Photographs, tissue examinations, and measurements were made by the Japanese scientists. Their findings point to a descendant of the plesiosaur (Baker 1988).

Some creationists even complained that the press was suppressing the plesiosaur story (Doolan 1991; Bartz 1992; Scoggan 1996; Taylor 1996), despite its coverage in dozens of popular books and articles, and the fact that it was often presented in a way more favorable to the plesiosaur interpretation than the evidence warranted.

Recently two creationists have written more accurate but still incomplete summaries of the case. Niermann (1994) noted that the 1978 studies pointed to a shark and that basking sharks tend to decay into plesiosaur-like shapes. Unfortunately, he tucked these comments into footnotes, while the body of the text encouraged the plesiosaur interpretation. Todd Wood recently provided an excellent summary of the evidence favoring a shark, and cautioned

fellow creationists about citing the carcass as a likely plesiosaur, but listed several "inconsistencies" with the shark ID—none of which is valid when closely examined.

As expected, the New Zealand monster story has also drifted onto the Internet, in both mangled and accurate forms. Creationists Kent Hovind (1996), Walter Brown (1996), Bernard Northrup (1997), Paul Smithson (1996), and Don Patton (1995) all encourage the plesiosaur interpretation. Brown matter-of-factly calls the creature a plesiosaur, which he incorrectly calls a sea-going "dinosaur." He also notes that the carcass had vertebrae, asserting these are "something not present in many fish, including sharks." (Of course fish, including sharks, do have vertebrae). In contrast, *Strange Magazine*'s "globsters" web site provides fairly accurate summaries of the Zuiyo-maru carcass and several other carcass strandings. An even better summary is provided by Roesch (1997a).

Recommendations to Future Monster Finders

Before closing, a word of friendly advice is offered to anyone who might come upon an unidentified sea creature in the future. Although it is fortunate that Yano thought to take tissue samples, had he or others on board saved the animal's head or even a vertebra (which could have been sealed in a bucket or other container to avoid fish contamination), much time, effort, and speculation could have been avoided. In most cases even a single skeletal element would allow scientists to readily identify an unknown creature. It also would have been wise to take more photos, including close-ups of the head and other body parts, rather than just a few distant shots. That these things were not done suggests that the crew did not even suspect the creature could be a plesiosaur until others later suggested this. After all, even among a group of fishermen someone should have realized that a prehistoric "sea-monster" would be worth incalculably more both financially and scientifically than a load of mackerel.

As it turned out, there is little doubt that they actually caught a decomposed shark. Nevertheless, it is possible that unknown creatures do still lurk in the ocean depths. As evidence, only five months before the Zuiyo-maru incident a naval research vessel near Hawaii accidentally snagged a bizarre, 4.5-meter-long shark in its parachute-like sea-anchor. The curious fish had an unusually large head and wide, bowl-shaped jaws—features which soon earned it the nickname "megamouth." Its jaws were filled with hundreds of tiny teeth, and opened at the top rather than at the bottom as in most other sharks. Even stranger, the inside of the mouth seemed to glow with a silvery light. Apparently megamouth uses its reflective mouth tissue to attract tiny crustaceans while feeding in deep water, where little sunlight penetrates. Eventually the odd selachian was given the scientific name *Megachasma pelagios* and was determined to represent a new species, genus, and family of shark (Welfare and Fairley 1980; Soule 1981). Coincidentally, the megamouth is now considered a close relative of the basking shark.

Conclusions

Several lines of evidence strongly indicate that the Zuiyo-maru carcass was a large shark, and most likely a basking shark, rather than a plesiosaur. Those giving the opposite impression have done so by telling only part of the whole story, or mischaracterizing portions of the evidence. To help set the record straight, such authors should correct any past misleading statements on this issue and refrain from any further suggestions that the carcass was a likely plesiosaur.

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Author's Address

Glen J Kuban
P.O. Box 33232
North Royalton OH 44133
email: paleo@ix.netcom.com
<http://members.aol.com/paluxy2/paluxy.htm>

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FEATURE

Miracles In, Creationism Out: "The Geophysics of God"

Molleen Matsumura
Network Project Director

On June 16, 1997, a major weekly magazine, *US News & World Report*, published "The Geophysics of God" reporting claims that a sophisticated computer program written at the Los Alamos National Laboratory (LANL) and "used by geophysicists around the world...proves the Bible is correct" (Chandler 1997). By mid-July NCSE had received copies of letters submitted to a large state textbook commission making similar claims. One letter said that textbooks should include "Flood geology as a theory for mass extinction...[since] this idea is currently being studied in some of the national laboratories in New Mexico"; another letter cited a sophisticated-sounding argument used by geophysicist John Baumgardner, the scientist profiled in the article, claiming that different methods for dating ancient rocks yield different results.

NCSE members need to know the flaws in these arguments because this "evidence against evolution" may appear in an opinion piece in your local newspaper, or, worse, a proposal to your local board of education. NCSE has consulted several geologists for detailed comments on the *US News* article. Excerpts from the article are presented in italics followed by responses from scientists working in the relevant fields.

Terra [a computer program for modeling the flowing movement of the earth's mantle]...exists because its creator, John Baumgardner, is a fundamentalist Christian who believes, in accordance with the Bible, that the Earth was created by God less than 10 000 years ago...[and] created Terra expressly to prove that the story of Noah and the flood...happened as the Bible tells it".

There are good scientific reasons for developing a computer model of mantle flow, independent of Baumgardner's motivation. His views do *not* represent those of LANL. According to Dr Jerry M Boak, another geologist at LANL, "Creationist modeling was distinctly not part of the work scope. Scientific publications of research using the Terra program have nothing to do with 'flood geology'" (For the history and the results of this research, readers should examine Baumgardner 1985, Bunge and Baumgardner 1995, or Bunge, Richards, and Baumgardner 1996).

Boak requested further information from Dr Chick Keller, Director of the Institute for Geophysics and Planetary Physics at LANL, who explained that Baumgardner had originally written Terra as a part of his doctoral dissertation. According to Keller "...[Terra] fell into disfavor when it could not adequately reproduce results [derived] from other 3-D spherical mantle convection codes." Keller told NCSE that Peter Bunge and other workers later "improved it considerably, to the point that the community now accepts it as [reasonable]....[However], [Baumgardner 's] version is somewhat different from [Bunge's] and still needs benchmarking—that is, testing against other codes to assure that it gives reasonable answers to well-defined problems."

Not only did he come up with a tool used by geophysicists around the world but his "numerical code" actually proves the Bible is correct. Or at least in Baumgardner's view it does.... Terra proves that this is true—or, more precisely, that it could be true, provided one accepts certain assumptions.

Computer models do not *prove* anything; they can help work out the consequences of certain assumptions. One can feed a computer program data about cheese and rats and find out how large a rat must be in order to take crater-sized bites out of a moon made of green cheese, then illustrate the process with realistic graphics. This would not *prove* that the moon is made of cheese or that there are giant, space-going rats. The article's author admits that Baumgardner's explanation of the flood "*contradicts almost every existing piece of evidence*" (emphasis added). For example, accepting Baumgardner's assumptions would include changing the values of known physical constants such as rates of radioactive decay.

Keller commented that it was unfortunate that "The article gave the impression that one need only change a few numbers like viscosity and you can get anything from mantle convection to continents' zooming around." He added that there are important questions about other variables that Baumgardner' model does not consider. As for the computer program itself, Baumgardner's "Terra" is not the only mantle modeling program in use and, Keller commented, while Bunge and possibly some other scientists have gained "considerable respect and support" for their use of some versions, "I don't think it's very widely used."

Baumgardner believes that around 6 000 years ago,...[God] caused an enormous blob of hot mantle material to come rushing up at incredible velocity through

the underwater midocean ridges. The material ballooned, displacing a tidal wave of sea water over the continents.... Then, after 150 days (Genesis 7:24), the bubble retreated with equal speed into the Earth.

According to University of Mexico geologist John W Geissman, this series of events would create "an enormous volcanic province in a single region". If this event had occurred just 6000 years ago, a region of numerous volcanoes associated with very thick layers of lava and ash should be found in a girdle near the edges of the subducting plates. "So," Geissman asks, "where is it???" Chick Keller added, "Blobs don't just emerge and retreat... one needs a source mechanism.... Current blobs which emerge, for example, out of a volcano or midocean ridge, are rather local and short lived...."

[A]nd the continents began re-emerging above the water, sending the runoff back to the oceans at around 100 miles an hour.... Baumgardner says that this runoff would have been sufficient to create the Grand Canyon and other massive geologic features and to deposit the various sedimentary layers in about one week.

The phrase "various sedimentary layers" glosses over a great variety of geological formations, many of which could not possibly have been deposited in one week, least of all by currents traveling one hundred miles per hour. Examples of these include sediments that settled in still water, those transported by wind, and those formed by evaporation or precipitation of dissolved chemicals (Strahler, p 61, 170). Not only does one week provide too little time for sediments to be deposited, Baumgardner does not explain interbedding of sediments clearly formed by different processes; for example, a layer formed of windborne particles sandwiched between layers of sediment that had settled from still water.

The *US News* article also does not say what kind of land surface was being eroded. Arthur Strahler's comments on erosion by forty days and forty nights of rain apply to Baumgardner's model of streams rushing back to the ocean: "Fully lithified, hard, dense rock—such as... [various] kinds of igneous and metamorphic rock...—could withstand forty days and nights of torrential rainfall with scarcely a measurable quantity of erosional removal.... Even on the assumption that a thick (100-meter) layer of decayed rock (saprolite) was available... it would be woefully inadequate to supply the quantity needed to form all existing Proterozoic and younger sedimentary and metasedimentary rocks" (Strahler, p 201). Simply put, sudden erosion cannot explain the sheer volume of material in the earth's "sedimentary layers".

Almost all physicists calculate the age of the planet at 4.6 billion years because they assume that mantle viscosity...has been consistent throughout time and so use the value that applies today. They add other ingredients like the speed of the tectonic plates... and arrive at the conclusion that one full deformation cycle of the mantle occurs about every hundred million years, giving the 4.6 billion figure. But Baumgardner says scientists wrongly assume that geology happens consistently,... "If you look at the geological record," he insists, "there are fingerprints of catastrophe everywhere one looks."

G Brent Dalrymple, author of *The Age of the Earth*, told NCSE, "The viscosity of the planet does not enter into calculations of the age of the earth. There is no way to calculate the age of Earth from plate tectonics or from mantle convection." Boak added, "Certainly there are catastrophes in the geologic record, but they aren't the catastrophes Baumgardner describes, and they don't represent the fingerprints of God spinning up a planet last week."

Baumgardner...notes, first, that different radiometric dating methods give vastly different ages. To date rock, geologists commonly use three types of unstable (radioactive) 'parent' isotopes—samarium, rubidium, and potassium—which decay into stable 'daughter' elements...But different isotopes yield different dates for the same rocks. As an example, Baumgardner points to the Cardenes [sic] *basalt, a Precambrian volcanic rock found in the Grand Canyon's inner gorge.*

In fact not three, but at least seven isotopes are used for dating rocks (Dalrymple 1991, p 80). More significantly, Baumgardner simply misinterprets what is to be learned by comparing different isotopic dates.

Boak pointed out that in the Cardenas rock "The sequence of these dates [found by the different dating methods] is exactly what would be expected for such old rock." Rocks can be altered by heating or melting, and Dalrymple commented, "Alteration is readily visible in thin sections of the [Cardenas] rock." The different dating methods date different events in the history of the rock and Dalrymple added, "The results tell us that this particular rock is not a reliable chronometer, but say nothing about the dating methods themselves.... There are many more instances of agreement than disagreement; if Baumgardner finds a wristwatch that doesn't work would he conclude that all watches and clocks are unreliable?"

When rocks are altered by heating, the geological clock is reset so that, as Boak put it, "The Cardenas rocks...may be more like modern stopwatches, which may record several laptimes. Because the degree of heating required to reset the various geochemical clocks is different, we may be able to identify several different events."

The science Baumgardner uses to account for these extraordinary happenings is a sort of niche physics called runaway subduction... [which] posits that the potential energy in the cold, heavy crust of the Earth is like the potential energy in a rock held above the ground. Drop the rock, and its potential energy is turned by gravity

into kinetic energy, and into heat when it hits the ground. As gravity pulls the rock, so it pulls the gigantic, heavy plates of ocean floor under the continents into the hotter, lighter mantle, which is silicate rock.

As the plates deform the surrounding rock, the mechanical energy of deformation is converted into heat, creating a superheated 'envelope' of silicate around the sinking ocean floor. Silicate is very sensitive to heat, so it becomes weaker, allowing the plates to sink faster and heating the envelope still further, and so on, faster and faster. As the plates pull apart, the gap between them grows into a broadening seam in the planet. This sends a gigantic bubble of mantle shooting up through these ridges; [w]hich displaces the oceans; [w]hich creates a huge flood.

"Fringe" physics might be a better description. The article does go on to quote another geophysicist who pointed out that one would have "to believe that by some miracle the diffusivity [rate of heat transfer] of the Earth was different before we learned to measure it;" in fact, the miracle would have to increase thermal diffusivity by a factor of 10 000. Boak commented, "The problem with his work on 'runaway subduction' is that the frictional heating he requires to accelerate subduction may not continue, given the reduced viscosity of the subducting materials as they are heated. To my knowledge, this aspect of his model has never survived a peer review by others in...mantle modeling."

[Baumgardner] cites the common geological feature of erosional channels, like the sunken rivers running through Zion National Park. The walls of these channels, created by rainwater eroding uplifted terrain, show the cross sections of sedimentary layers laid down over millenniums [sic]. But while the evidence of erosion and sedimentation is all around (the Mississippi Delta, the Ganges taking soil from the Himalayas), surprisingly few erosional channels can be seen in the sedimentary layers themselves.

Just as it is erroneous for Baumgardner to state that sediments clearly formed by different processes could have been deposited in a single flood, it is erroneous to lump together many types of channels. Besides, as Dalrymple points out, the article does not state that there were no such channels, but that there were "too few". Yet we are not told how many would be "enough", or why.

Another piece of evidence [Baumgardner] points to is the fact that coal—fossilized plant matter—is found in concentrated seams rather than spread out, as forests generally are. This indicates to Baumgardner that a huge mass of water—a flood—swept floating trees together, depositing them in thick layers.

Baumgardner's argument is a red herring. There are many types of forest environment, not all of them conducive to the initial steps of coal formation. Coal seams originated in swamps in deltas, and their boundaries are those of the deltas. Besides, layers of marine and non-marine sediments can be found between layers of coal, and Baumgardner neither asks how this alternation of layers could occur nor offers an explanation. While the standard geological explanation accounts for these alternating layers, Baumgardner's flood does not. The flood currents bearing trees would have had to alternate quickly with currents moving in a different direction, carrying different materials. Currents moving as swiftly as 200 km/hr would have to alternate approximately every half hour, not allowing enough time for rafts of water-borne trees to settle between the other strata (Strahler, p 218-221). Furthermore, according to Dr Steven M Getty of the University of New Mexico, fast-moving water currents pick up large quantities of sand and gravel, and mix them with organic matter, while many large coal seams are almost purely organic, often preserving details of plant structure too well to be consistent with Baumgardner's model.

Baumgardner himself says, 'The only way to square the radiometric data with a flood that caused all these changes is to conclude that one aspect of the catastrophe was rapid radioactive decay.' ...This is not impossible."

As the article itself comments, this is only possible in "a Through-the-Looking-Glass world where nothing is as it seems and no scientific principle—from gravity and electromagnetism on down—exists as it exists today." Moreover, this objection can't be met by calling on miracles, not if one considers *other* events that would have occurred in Baumgardner's scenario—something the article does not do.

For example, Dalrymple points out that "If one 'speeded up' 4.5 billion years of radioactive decay into just a few years, then the heat released over such a short time would melt and probably vaporize the Earth." In effect, readers are being told that it is "not impossible" for Noah's Ark and its inhabitants to have withstood the melting of a planet. Was the "ocean" on which the ark floated one of molten lava (which should have burned the Ark to a cinder), or is the earth supposed to have recondensed and generated new plant life while the Ark's passengers waited?

[T]here is universal agreement that Terra, created to prove the Bible literally true, is one of the most useful and powerful geological tools in existence. 'Baumgardner is seen as one of the world leaders in numerical models of mantle convection,' says Hager. Agrees Gerald Schubert of the University of California—Los Angeles Department of Earth and Space Sciences: 'As far as the code goes, Baumgardner is a world-class scientist."

NCSE wrote to Hager and Schubert to ask about the remarks

FEATURE

Offer from NCSE On The Way

Eugenie C Scott, NCSE Executive Director

Let me tell you why you will receive some mail in the early months of 1998 that you should not throw away—regardless of your conditioned response!

Like you, I receive two or three offers from credit card companies almost every week. When over a year ago I received an offer from my college alma mater, I stopped to look at it a little more carefully. The more I read, the better it sounded. This wasn't an ordinary credit card, but an MBNA® Platinum Plus credit card that offered a number of services (for example, extra rental car collision insurance is especially valuable for someone who travels a lot.). There were no yearly fee (one of my requirements!), a good rate of interest, and a number of other features that together made me decide to accept *this* card offer out of all the others I receive. What I especially liked was that for every purchase I made, my alma mater got a percentage. I could support my old college at no additional cost to me.

The monthly statements I received were far more informative than those of my other cards, clearly spelling out the place and type of purchase, and I liked that. Then, I was bowled over at the end of the year when I received an itemized summary of all the different kinds of charges I had made: how much for air travel, how much for gas, how much for groceries, etc. Sure made taxes easier. None of my other cards had this. I was sold! So naturally I decided to look into this to see if it could benefit NCSE!

I discussed an affinity relationship with MBNA® with the result that a mailing will be made to all NCSE members in January or February 1998. For each member who accepts the card, NCSE will receive a one-time payment, and in addition, every time a member uses the card for a purchase, NCSE receives a percentage. This could add up; if 1000 NCSE members charged only $5000 per year, MBNA would rebate to NCSE over $10 000—and believe me, we can put it to good use.

Please read over the MBNA® materials when they arrive, and consider applying for the card. Just by using a card that gives you more than the others, you can make a contribution and be a big help to NCSE. (And yes, of course NCSE's cool logo will be on the card!) If I were in marketing, I'd say something like, "be among the small number of people carrying the exclusive NCSE card!"

Thanks! As always, your support of NCSE is much appreciated.

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attributed to them. Schubert replied, "I did *not* agree with what Hager [reportedly] said. I simply stated that John Baumgardner had written a state-of-the-art numerical code to study mantle convection.... In *no* way can John's numerical code say anything about the possible validity of a literal biblical view of creation." Hager, too, told NCSE that he had only been commenting on the computer code and had not in any way endorsed Baumgardner's opinions.

It is Baumgardner's "scientific" claims that are most likely to be repeated by advocates of "creation science", especially now that coverage in a national weekly has given Baumgardner a much larger audience than the Institute for Creation Research Graduate School where he is an adjunct faculty member. However, the article also underplays the manner in which Baumgardner "takes issue with the teaching of evolution in public schools". He is not just a local "rabble-rouser"; he has been appointed to the committee that is working to develop "performance standards" measuring what New Mexico's school-children have learned about science. These standards are supposed to redress the omission of evolution from New Mexico's content standards (*RNCSE*, 17[1] p 4, 17[2] p 8-9), but Baumgardner's participation in the committee might prevent that from happening.

The *US News* article concludes, "Belief does not need the blessing of science. But to John Baumgardner...apparently it does." That, of course, is a personal choice. But as a matter of public policy, public school science education should not be required to receive the blessing of unscientific beliefs.

[*With thanks (in alphabetical order) to Jerry M Boak, Lorence Collins, G Brent Dalrymple, John W Geissman, Stephen R Getty, Chick Keller, Brad Hager, and Neil Wells for their comments and, in some cases, detailed explanations.*]

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RECAPITULATIONS

Reply to Kenneth Nahigian

Hugh Ross, Reasons to Believe

While I appreciated the compliments lavished upon me by Kenneth Nahigian in his article, "Impressions: An Evening with Hugh Ross" (*RNCSE* 1997 Winter; 17[1]: 27-9), I would have been even more grateful for accurate quotation and representation of my views. The accolades perhaps blunted the tip, but Nahigian's arrow flew: "Here's another theist/creationist who twists—or misunderstands—the facts to fit his message."

The scientific "howlers" Nahigian "exposed" came from faulty notes, faulty hearing, or the assumption that my science is out of date. For example, I did not say that life originated five million years ago. I said that life was relatively abundant on Earth as far back as 3.86 billion years ago, and based on the frequency and intensity of asteroid bombardment at that time (roughly 4.25 to 3.5 billion years ago), at least one of life's origins must have occurred in a window as brief as about five million years (between blasts). As another example, Nahigian's response to my moon formation theory is based on tenuous hypotheses recently eclipsed by data supporting the collision model.

Nahigian's attempts to expose illogical reasoning were themselves illogical. A monkey will not know which letters in Hamlet's soliloquy are correctly typed and should be retained. Even humans who have not already read or heard those words would not know which letters to preserve and which to reject. By what mechanism could nature know, ahead of time, before natural selection is even possible, which amino acids or nucleotides are correct for each position in the biomolecular chains?

I received a copy of Nahigian's notes about two weeks after the talk he attended. They came with no indication, however, that they would become part of a published piece. If I had been told, I might have been more specific in my response, which simply directed the note-taker to my three published works for a more thoroughly documented and more completely stated presentation of my views. Apparently, he neglected to check his notes against these printed materials, as scholarly standards require, and the result is unfortunate.

Still, I am grateful for Nahigian's article. I learn much more from criticism than from compliments. I see where I made some points too hastily or "begged the question." I see a need to give a more thorough account of my assertions, my reasoning processes, and my application of probability theory. And I certainly need to correct my apparently insulting tone when speaking of Muslims, Hindus, Mormons, and others.

As a subscriber to the *RNCSE*, I applaud your efforts to expose sloppy scholarship and to call for higher academic standards. I do receive your exhortation, but I would find it easier to receive, as I'm sure others would, if your writers would avoid the kind of errors you are seeking to correct.

Not so incidentally, I do believe (and I said so, though Nahigian missed it) that true theology must—and always will—conform to true science. And though the God-of-the-gaps argument is not one on which I rely, it does have some validity if we can demonstrate that all natural causation paths violate the established laws of physics. Just as good circumstantial evidence is considered adequate to convict (or acquit) someone in court, so can good circumstantial evidence help determine which models, theistic or non-theistic, more plausibly explain the reality we see, the reality we're still learning about.

Ken Nahigian Responds

Thanks to Dr Ross for his considered rejoinder, which corrected me on several points. First, I am persuaded that I was wrong to ascribe to him a claim that life originated only 5 million years ago. About then, his whirlwind critique of Darwinism had outstripped my note-taking skills; two or three talking points in arrears, scribbling frantically, I was—understandably I hope—prone to error. (In fact, of all the attributed claims, this one most astounded me, seemed most jaw-dropping, and the least consistent with Ross's other views.)

Likewise I now stand enlightened on the Mars-sized-object collision theory of lunar origin. The theory is in good favor, though co-accretion and multiple-impact fission models are not out of the running. As a non-astronomer, I had simply used an obsolete resource here; my error.

I did send a copy of my notes to the liaison for Dr Ross's lecture, who obviously shared them with Ross, but did not explicitly correct me on these points, alas. But then, I had no publication plans at the time. If I had been a bit clearer on academic protocol, I would have resubmitted the finished piece.

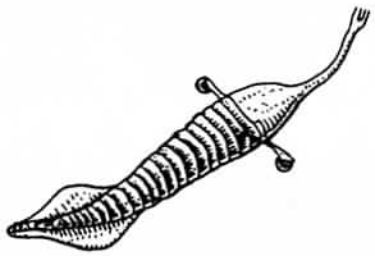
For these mistake, and others, I apologize.

On his part, I wish Ross had addressed some of his errors of fact which seem more critical to his progressive creationist model. For example, did he really say we have never seen a case of speciation, or that all known hominid fossils could be fit into an average-sized coffin? Or were these more instances of faulty hearing, faulty notes? Ross also mistook my comment about cumulative natural selection. Why must we assume that nature knows ahead of time which amino acids are correct for each portion of complex polymers? In fact, biochemists now know that considerable variation in the nucleotide "spelling" is permissible, and natural formation of weakly reactive enzymes, even weakly self-replicating structures, is well within the limits of probability. So it would seem that natural selection enters the picture right at the start.

Beyond that, Ross nicely shows how our views of science differ. I disagree emphatically that if one eliminates all natural causal paths for the origin of life, the sole alternative is the God of the gaps. If we must allow supernatural explanations, for example, why limit them prejudicially to theistic miracles? How about non-theistic miracles, or other unnatural/unknown processes that might have produced the first life, then vanished without trace? No deity required. Using Occam's Razor, such scenarios "save an assumption" and are thereby better. I'd feel better if Ross had at least raised and dismissed such possibilities in his talk. I think the fact that he didn't may reveal an agenda.

But the clearest answer to Ross comes from his own field—astrophysics. Early in this century, astronomers were at a loss to explain an observed precession in the orbit of Mercury (about 41 seconds of arc per century). Some hypothesized the gravitational influence of an innermost planet, but all efforts to find this sun-skimming body failed. When known natural causal paths were eliminated, did scientists resort to supernatural explanations? No, they kept looking, thinking. Sure enough, in 1915 Einstein published the General Theory of Relativity which explained the orbital distortion as the result of gravitational field variance. By contrast, if Ross's point of view had prevailed, perhaps we would still think angels were nudging the planets about, and modern physics would be barren.

Finally, Ross's belief that true theology must conform to true science cheers me greatly; somehow I had heard it the other way around. As we know, a shepherd-sheep relationship between religion and science was tried once with poor results. Now Dr Ross seems more in league with British evangelicals of the 1830s who wrote that "If sound science appears to contradict the Bible, we may be sure that it is our interpretation of the Bible that is at fault" (*Christian Observer*, 1832, p 437). Am I correct? If so, may Dr. Ross make statements like that in his next lecture. It would clear up much muddiness.



CORRECTION

In our previous issue we inadvertently shortened the WWW location of a review of Michael Behe's *Darwin's Black Box*. The complete address is <http://www.spacelab.net/~catalj/box/behe.html>.

Creationism in the Congress?

Molleen Matsumura, Network Project Coordinator

Early in May 1997 NCSE member Ranse Traxler phoned NCSE sounding amazed and a bit concerned. He had just turned on a television program about the discovery of possible Martian fossils. He said, "There was a clip of what seemed to be a congressional hearing with the NASA scientists. I didn't catch it all, but one of the legislators asked a question about the scientists' dating of the meteorite being in conflict with the age of the universe according to the Bible. Do you know anything about this?"

The NCSE obtained transcripts of meetings of relevant House and Senate committees. The Subcommittee on Space and Aeronautics of the House Committee on Science had met on September 12, 1996 to hear testimony by NASA scientists concerning recent discoveries and proposals for further exploration of Mars. A major concern expressed by legislators was whether the cost of proposed expeditions to Mars could be justified; there was also some discussion of recent concerns about the risks of asteroid collisions with the earth. As the hearing drew to a close, Rep Ralph M Hall of Texas, after expressing his own concerns about asteroid impacts, continued:

> But I have some concern about all of these figures that we use—a 4-1/2 billion-year-old rock on Mars, a huge impact about 16-million years ago. We have a lot of people who are pretty satisfied with the Bible's reflection of the creation and of time. I have a hard time pulling those together. I know the Bible says Methusala, I think, lived to be 869 years and he died. I doubt that anybody lived that long. They probably figured time a little bit different then. But the Bible tells us that God created the earth and on the seventh day, He rested. And here, we're 16 million years and 4-1/2 billion-year-old rocks and things. How do we know whether life developed independently on Earth and Mars?...Does anybody want to touch that?" (Superintendent of Documents. Hearing before the Subcommittee on Space and Aeronautics of the Committee on Science, September 12, 1996. Washington: US Government Printing Office; 1996).

According to the transcript, there was laughter in the room, and then Hall said, "Or to be continued, maybe."

Dr Wesley T Huntress, administrative assistant in the Space Science Program at NASA Headquarters, chose to answer the questions about whether life had originated independently on Earth and Mars, or could have originated on one planet and then been "seeded" on the other by falling meteorites. Hall's remaining questions were about technical details of the analysis of the meteorite. No further reference was made to Hall's remarks about an apparent conflict between scientific findings and biblical texts.

It is difficult to know, based on the transcript, whether Hall's question reflected his own concerns or his desire to articulate the concerns of some of his constituents—those "who are pretty satisfied with the Bible's reflection of creation." In either case, it is sobering that these concerns were expressed by an elected official charged with setting priorities for funding basic scientific research and equally worrisome that similar views could affect policies and funding for educational programs.

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WEB REVIEW

SciCentral

Reviewed by Leslie Chan, University of Toronto

SciCentral is a metadirectory of science and engineering resources conceived and created by professional scientists that "opened" for business in June 1997 at <http://www.scicentral.com>. According to the publicity release, "The aim of SciCentral is two-fold:

- to aid the science community by enabling direct and efficient access to only the most valuable Internet resources, and
- to prepare a platform for communication between scientists and engineers so that they may work together to solve the complex research problems confronting us today.

I spent about thirty minutes at the site and found nothing particularly useful there. The first thing I tried to ascertain, as with any sites I visit, was to find out who was responsible for putting up the site. After fifteen minutes without success, I have to conclude that either the people putting up the site are not entirely forthcoming, or that they commit the first error of any form of publishing—not establishing their credibility by telling the readers who they are.

This metaguide mostly contains pointers to other metaguides produced by other professional organizations or scientists. There are neither annotations nor assessment of various resources, further diminishing the value of this site. It is also not clear what classification system of the sciences the site operator was using. It is not the Library of Congress system, and the scope of the site appears so broad that there is no clear focus. As someone who can attest to the process from experience, putting a directory or metadirectory together is the easy part. Making it a coherent guide with value-added commentary is the hard part.

There are now a number of highly informative sites that combine commercial interests with original science news and resources. The best example is the HMS Beagle published by Biomednet <http://biomednet.com/hmsbeagle/>. The site is clearly focused in the area of biomedical news and research with primary contributions from scientists and science writers as well as an annotated guide to secondary resources in biomedicine. The site is easy to navigate, but most of all, you can quickly find out what Biomednet is about. The user thus has a higher degree of assurance about the information provided at the site. It is a good example of how to combine science reporting with commercial support without compromising the former.

Now—Urine Isotope Dating?

A mainstay of the argument against creationism relies on the consistency and similarity among a number of methods (tree rings, carbon-14 dating, other radioactive processes, and so on) for estimating the ages of fossils or geological events. They might not give exactly the same ages (like, to the day), but they predict similar orders of magnitude. Well, there's another one to add to the list.

In a recent issue of *Science*, there's an article entitled "Chlorine-36 in Fossil Rat Urine: An Archive of Cosmogenic Nuclide Deposition During the Past 40 000 Years" detailing the use of rat urine (apparently used in the mortar to hold nests together) and the isotopic chlorine content as a dating tool. The article (*Science* 1997 Jul 25; 277: 538-41) documents a parallel between chlorine isotope ratios and carbon isotopic ratios, indicating that chlorine ratios can also be used as a dating tool.

I'm not sure whether to feel emboldened at this new argument or to laugh out loud. Can you imagine citing this in a debate? ("Yes, Dr. Gish, but how do you explain the rat pee?") Ah, the wonders of Science.

[*Contributed by David Ball, Associate Professor of Chemistry, Cleveland State University.*]

NCSE Executive Director Honored

We have been notified that NCSE Executive Director Dr Eugenie C Scott will be the first recipient of the Isaac Asimov Award. The award will be presented by the American Humanist Association at its annual meeting in San Diego in May 1998. We are all delighted that Genie and her work in support of science education have been recognized in the spirit of the late Isaac Asimov.

Letters to the Editor

Creationism in Pennsylvania

The latest issue of *Reports* arrived just as our local creationists made the papers again in Lancaster Country, Pennsylvania. Our public schools, while diverse in enrollment, have many students from conservative, fundamental Christian families. Several of the districts in the county have already experienced pressure from conservative school boards to alter the teaching of evolution. One district asks pointed questions in interview[ing]...teaching candidates. ... One science teacher in the county refers to evolution as the "E" word and refuses to discuss it in class for fear of repercussions.

[W]ith the recent building of the Creation Resource and Education Center in Willow Street, PA, the "movement" has gained new momentum. Several local school boards have elected religious right members, and I think it is only a matter of time until one of us [will feel]...their pressures.

I have suggested that this [issue] become an agenda item at one of our upcoming Intermediate Unit Science meetings. We meet regularly to discuss matters of mutual concern to science education, and each district is represented by a science curriculum coordinator, department supervisor, chair or head.

Robert Hertzler
Science Supervisor
Hempfield School District
Landisville, PA

Natural, not Mechanical

I concur in Robert Pennock's view that it is important to try to understand the motivations that underlie the curious thought patterns of creationists. His excellent article "Naturalism, creationism, and the meaning of life:..." in the final issue of *Creation/Evolution* is a valuable contribution to that effort.

Modern science has replaced the clockwork determinism of classical physics with quantum mechanics. Unlike the former, the latter provides a way for God to intervene in the world without violating the laws of physics—by influencing certain microscopic events in purposeful ways that, as Pennock notes, would still appear random to us. One wonders why, when this was pointed out to Johnson (by me), he did not rush to embrace it. Perhaps [Johnson] wants science to say not just that there *could* be, but that there *must* be a God.

John Fletcher
Livermore CA

Robert Pennock's recent article "Naturalism, creationism, and the meaning of life:..." is one of the most intelligent articles of its type that I have read. In my opinion, it is head and shoulders above the usual piece on this subject and I think that my saying so is not entirely because I agree with [him]. I will look for [his] new book.

Robert J. O'Donnell
San Rafael CA

I found Robert Pennock's article on creationists' existential angst extremely interesting and useful. So much so, that I sent a copy to my wife's cousin and [cousin's] husband who are both Protestant ministers, thinking the insights into creationists' fears would be valuable to them in their work.

I believe Pennock makes abundantly clear the deplorable quality [often] associated with persons of Phillip Johnson's persuasion: Although perhaps doing so initially in good faith (but mistakenly), such persons willfully continue to employ erroneous arguments—establishing false dichotomies and conflating different philosophical arguments, as Pennock illustrated repeatedly—even *after* those arguments are shown to be in error by others unquestionably more competent in the field.

Blatantly religious charlatans can accept along with the other crooks of this world. But, it is truly deplorable that sincerely religious people should countenance [intellectual] dishonesty in the furtherance of their beliefs.

Kennan Herrick
Oakland CA

Creationist Confusion in Tennessee

As you[r readers] no doubt know, the state legislature of Tennessee recently tried to undermine science education by playing upon people's misunderstanding of three things: evolution, theory, and fact. The sad state of science education almost allowed them to succeed.

Science is the most successful of human endeavors. Its intent is to provide useful knowledge about the world, and it is definitely doing that. It is not an automatic means to knowledge. It requires work and dedication.... I often hear people attacking science as not providing all the answers at once. These people [ignore] the fact that science is a continuing human endeavor, with no end in sight.

Others decry that science does not provide any of the "important" answers, such as why we are here, what is the purpose of the universe, what is consciousness, etc. They do not understand that before we can have answers to these questions, we must be able to ask them in meaningful ways.

Still others insist that science is just another form of superstition. In the past the forces of nature were animated by unseen magical forces, Now we have scientific names for these unseen forces, so they claim that only the names have been changed. They [ignore] the fact that science yields repeatable, consistent, applicable practices, allowing us to cure disease, travel the world, and communicate across large distances. The previous approaches did not. They [ignore] the fact that science increases our understanding of the world, while the previous approaches ascribed the phenomena to entities whose purpose and nature where beyond our comprehension. Anyone who would deny...access [to knowledge] is working against...the interests of all people.

Stacy Prowell
Clinton, TN

BOOKREVIEW

The Lucifer Principle: A Scientific Expedition into the Forces of History

by Howard K Bloom, 1995. The Atlantic Monthly Press, NY, Xii + 466 p, incl index, bibliography, and 75 p of endnotes.

Reviewed by John R Cole Contributing Editor

Bloom has written an idiosyncratic book about, well, everything that has ever happened. In brief, he treats "evil" as a definable force, much as scholars would have two centuries ago, and he applies this approach to history (and evolution) as seen in the evidence known to scholars today. The "Lucifer" of the title is more or less literally Satan (he does hedge a bit and fits scientific jargon into his definition), although he tries to define the Devil broadly enough to incorporate a multi-religious Prince of Darkness, not just the Satan of Puritan evangelist Jonathan Edwards.

The book has dustjacket blurbs from medical doctors, novelist Leon Uris, psychologists, ethnologist Allen Johnson, and ethologist/anthropologist Robin Fox. It has been panned as racist by several Arab-American reviewers understandably appalled at Bloom's treatment of Islam as a force of evil. I have not seen comments on it by experts in the fields he addresses—no evolution or biology researchers (except Fox, perhaps) nor professional historians. This could be because it falls between disciplinary cracks, but it is also because the book seems rather wrong-headed. I find it difficult to critique because it comes out of a galaxy, far, far away!

The author himself is a widely published popular writer whose actual profession is popular music public relations (a biographical note says he "helped shape the careers" of Simon and Garfunkel, Prince, Bette Midler, ZZ Topp, The Jackson Five, Bob Marley and others). While nothing I have just written need apply to the value of this book, it helps illustrate its oddity. Even though he is listed in *Who's Who in Science and Engineering*, here is not a standard scholar at work. So—what does a rock-and-roll publicist have to say about the nature of evil and how it controls history? In copiously but selectively footnoted detail (75 pages of notes plus bibliography!), Bloom advocates about three basic ideas: that the group, not the individual, is the locus of selection in both culture and biology, that a Lucifer Principle is the prime mover of evolution, and that "memes" (idea sets that are culturally transmitted) are major units on which selection acts.

The concept of culture's being "superorganic" is as old as anthropology. To Alfred Kroeber and others who advanced the concept almost a century ago, "superorganic" meant "greater than or above the organic" or, in other words, *non*biological. Their case, now fairly dominant in anthropology, was that culture was beyond the individual and more than just coded biological rules. Today, of course, sociobiology has renewed the argument (oversimplified as nature versus nurture), and a few biologists—notably Richard Dawkins—have promoted the "meme" concept, but most scholars of culture consider this reductionistic and simplistic. Virtually no one would now argue that humans are exempt from biological rules, but most researchers note that all animals have some degree of learned behavior, and humans perhaps most of all are not hard-wired for particular *ideas* such as monotheism or whatever. And Bloom's favorite topic—Evil (with a capital E)—is left to theologians even by Dawkins and others who have argued that religiosity is an evolutionarily *maladaptive* meme!

Group selection is itself a viable concept, but it seems to hang on in biological theory by varying numbers of slim threads, with Dawkins's "selfish gene" idea at the opposite extreme of the range of ideas about where selective forces act to produce evolution. After embracing some legitimate if controversial evolutionary concepts, Bloom goes far off on a tangent of his own, using supposed cultural concepts to reinforce his biology and vice versa.

Normal science is non-judgmental. Bloom, on the other hand, is nothing else. Not only good and evil are identified here; civilizations and biological organisms alike are ranked according to their quality. For some examples, he finds Islam lacking, and he spends much of his time and effort evaluating how and why the US has "declined". He more or less accepts a 19th-century concept of progress in history and evolution—ideas long-discarded by modern scholars, but still cherished by many anti-evolutionists as convenient straw men for their attacks.

In an age of multi-culturalism, he is explicitly Americentric and anthropocentric. He writes of Jesus as a "backcountry preacher of peace and humility" crucified by the "evil beast" that was Rome. "Yet Rome was part of the world's inexorable march to higher levels of form", and later Chinese "Red Guard wolfpacks" obeyed the impulses of their "animal brain" (p 324). A few lines here do not summarize his thesis, but they exemplify his maddening method: historians and anthropologists have not written in this unselfconsciously ethnocentric and judgmental way in many decades. Rome and Maoism are not explained by such language but simply demonized. Unlike most authors, Bloom *literally* sets out to demonize them!

Bloom is somewhat aware of his anachronistic approach and apparently wants to get scholars back on track with an overlay of modernist jargon ("memes" sound up-to-date!), but the overall effect is simplistic and warmed-over when it is not overtly and offensively ethnocentric. Bloom obviously longs for the time, two or so generations ago, when historians such as Will and Ariel Durant could tackle and judge all of history and culture from a Euroamerican catbird

continued on p 40

continued from p 39

seat. However, this strikes me as no new Grand Synthesis but more of an extremely extended, factoid-loaded term paper.

Bloom's thesis is an excellent literary refuge for anti-evolutionists who will embrace his belief that "the Devil made us do it." Of course, they will reject his evolutionism and embrace his advocacy of evil as the main force of evolution; will they be able to accept half of his thesis and not the other one with straight faces, though?

Scientific Automotive Advice?

In their "Car Talk" column (*Wisconsin State Journal*, Sept 30 1997) the tappet brothers (Tom and Ray Magliozzi) advised a reader to use the scientific method to locate a front-end problem. At the end of the column, Tom wrote:

"And if it's not a bad axle, then either we or the scientific method has failed you. So try writing to an automotive creationist and see how that goes."

(used with permission)

Science Instruction and the Theory of Evolution—A Position Statement

University of North Carolina Mathematics and Science Education Network

Introduction The UNC Mathematics and Science Education Network's (UNC-MSEN) position on the theory of evolution is that it is indeed a valid scientific theory substantiated by irrefutable evidence. The theory of evolution should therefore be supported and taught as a major unifying concept of science within all North Carolina K-12 science frameworks and curricula.

Scientific Theory Human beings are engaged in a constant search for explanations as to the nature of the universe and their place within it. Out of this quest for reason and order the process of science was developed—a set of controlled, replicable guidelines allowing for the accumulation of hard data as evidence to support or reject a hypothesis. Hypotheses are proposed and tested repeatedly over time by numbers of scientists. When evidence in support of a hypothesis has accumulated, hypotheses are then elevated to scientific theories. Scientific theories are then logical constructs widely accepted as factual among the scientific community. As were the theories of gravity and the atom, the theory of evolution has been formulated in the described manner. The overall consensus of the scientific community is that evolution is indeed a valid theory.

Evidence for Evolution Science as we know it today is a dynamic process...a body of knowledge based on observable, testable, pragmatic evidence. Scientific theories are therefore never irrevocably proven; they are only increasingly or decreasingly supported by evidence. The theory of evolution is continuously subject to further experimentation, investigation and question, much like any other scientific theory. Yet, it remains the responsibility of scientific endeavor to continue to rely on what is now known as scientific method to construct, test, support or debunk all scientific theories or hypotheses.

While today's scientists may utilize the scientific method to debate the pace and patterns of evolution, they do not debate evolution's occurrence. The fossil record and the diversity of existing organisms, combined with modern techniques of molecular biology, taxonomy and geology, provide exhaustive examples and powerful evidence for the well established components of current evolutionary theory.

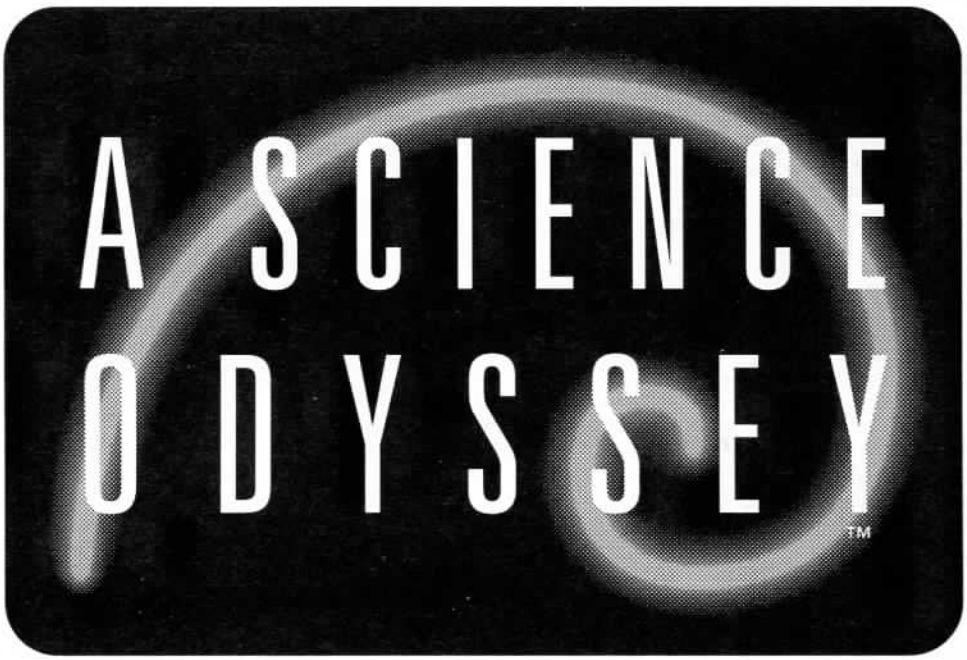
Evolution and the Science Curriculum The primary goal of science teaching is to produce a scientifically competent citizenry—one which knows how to distinguish between theories substantiated with sound evidence and theories which cannot be substantiated through evidence. Evolution is identified as being the central unifying role in the biological sciences. If we teach our students that the theory of evolution is not accepted fact, we also put in to question scientific advancement in chemistry, physics, astronomy, and all other related fields, as all of these disciplines are built according to similar intellectual stratagems.

School curricula should therefore be determined, not by the political mood of the moment, but by scholarly and academic consensus. North Carolina students deserve an engaging, enriching science curriculum based on the process of the scientific method. Any action opposing the tenets which honor the methodologies of scientific investigation should be viewed as a disservice to North Carolina students and science educators.

Adopted 4/30/97

For more information, please refer to our website: <http://www.unc.edu/depts/msen>.

[*Reprinted with permission. We remind readers that the NCSE publication* Voices for Evolution *contains statements by government agencies, religious bodies, and educational and professional organizations in support of evolution in the science curriculum. Information about this book and other NCSE publications is available at 1-800-290-6006 or at the NCSE web site <http://www.natcenscied.org>.*]



Beginning January 11, 1998 join PBS for a new series, *A Science Odyssey*—a multimedia look at the people, discoveries, and social forces that revolutionized our lives and our thinking in the 20th century. At the center of this ambitious project are five two-hour programs focusing on technology, physics and astronomy, earth and life sciences, medicine, and human behavior. These programs reveal how people, politics and cultural beliefs influence the questions we ask and the answers we get.

RESOURCES FOR TEACHERS

These programs have *three-year* off-air taping rights for educators. *A Science Odyssey* also offers a wide range of resources for use inside and outside the classroom:

- **FREE** Teacher's Guide with hands-on activities and an oversized poster featuring a unique timeline of remarkable moments in science since 1900. For middle and high school science and social studies classes.
- Web site loaded with valuable resources, activities, and series information, including the full text of the teacher's guide and Matters of the Heart, a short play; Life Beyond Earth, an interactive science demonstration; Sending Messages, an activity program for 11-14-year olds. Accessible at <http://www.pbs.org> beginning December 1997.
- Museum Activities—Check your local science center to see if it will host a Science Odyssey camp-in or offer public performances of the play and science demonstration.
- Short Educational Videos —Six short videos highlighting gripping stories from the series. The set is accompanied by an activity guide. For ages 11-14.
- Science-By-Mail—Hands-on activity kits pair youth with scientist pen-pals, ages 9-14.
- *A Science Odyssey* companion book written by Charles Flowers. Available in bookstores and libraries in January 1998.
- Science Odyssey Partners —Organizations nationwide are offering special activities and events related to *A Science Odyssey*.

To order a FREE teacher's guide and poster, call (617) 492-2777, ext. 3848; email: <Thelma_Medina@wgbh.org>, or write to A Science Odyssey Guide, WGBH, Educational Print and Outreach, 125 Western Avenue, Boston, MA 02134. Visit the temporary website at <http:// www.wgbh.org>. Look for *A Science Odyssey* under Learn.

Major funding for *A Science Odyssey* provided by the National Science Foundation. Corporate sponsorship is provided by IBM. Additional funding for the series and educational outreach comes from public television viewers, the Corporation for Public Broadcasting, The Arthur Vining Davis Foundations, the Carnegie Corporation of New York, and Becton Dickinson and Company.

New Resources on the World Wide Web

Molleen Matsumura
Network Project Coordinator

In 1995 NCSE published the second edition of *Voices for Evolution*, expanding the first edition's collection of position statements by educational, religious, and scientific organizations supporting evolution education, and adding sections with statements from civil liberties organizations, and excerpts from significant legal documents.

Available at a discount to all NCSE members, *Voices* has been a useful resource for people coping with attacks on evolution education. Now it is even more useful. With the help of the Program of Dialog between Science and Religion of the American Association for the Advancement of Science (AAAS), the complete text of *Voices for Evolution* is on the World Wide Web. Here you can select authoritative statements to quote without retyping or simply have a chance to "browse before buying". You may also enjoy reading about the AAAS's efforts to improve public understanding of issues addressed by both science and religion, such as bioethics. To enjoy *Voices for Evolution* on the Web, just point your browser to: <http://www.aaas.org/spp/dspp/dbsr/evol.htm>.

Meanwhile, hard-working volunteers Frank L Fire, Jr and Clark Dorman have made the texts of major legal decisions available on the World Wide Web. Each has posted on his home page the following decisions concerning the legality of teaching "creation science" in public schools: *McLean v. Arkansas, Edwards v. Aguillard, Peloza v. Capistrano, Epperson v. Arkansas, and Webster v. New Lenox.* In addition, Frank Fire has posted another creation-evolution decision, *Segraves v. California* at <http://www.geocities.com/Athens/1618/Supreme_Court_Decisions.html>. Clark Dorman's site at <http://cns-web.bu.edu/pub/dorman/dorman.html> includes *Lemon v. Kurtzman*, a Supreme Court decision on separation of church and state that applies to evolution-creation controversies. We encourage members who visit these sites to join NCSE in thanking Fire and Dorman for their efforts.

INTERNET LOCATIONS VISITED IN THIS ISSUE

TOPIC:	AAAS EVOLUTION CONFERENCE
LOCATION	HTTP://WWW.AAAS.ORG/SPP/DSPP/DBSR/EPIC.HTM HTTP://WWW.AAAS.ORG/SPP/DSPP/DBSR/EVOL.HTM
OWNER:	AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE
LAST VISIT:	JUNE 1997
TOPIC:	EVOLUTION AND SCIENCE EDUCATION
OWNER:	UNC-MATH & SCIENCE EDUCATION NETWORK
LOCATION:	HTTP://WWW.UNC.EDU/DEPTS/MSEN/PUBS/EVOLVE.HTM
LAST VISIT:	SEPT 1997
TOPIC:	VOICES FOR EVOUTION ON-LINE
OWNER:	AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE
LOCATION:	HTTP://WWW.AAAS.ORG/SPP/DSPP/DBSR/EVOL.HTM
LAST VISIT:	SEPT 1997
TOPIC:	COURT DECISIONS FORBIDDING "CREATION SCIENCE" IN PUBLIC EDUCATION:
LOCATION:	HTTP://WWW.GEOCITIES.COM/ATHENS/1618/Supreme_Court_Decisions.HTML
OWNER:	FRANK FIRE JR
LAST VISIT:	SEPT 1997
TOPIC:	COURT DECISIONS FORBIDDING "CREATION SCIENCE" IN PUBLIC EDUCATION:
OWNER:	CLARK DORMAN
LOCATION:	HTTP://CNS-WEB.BU.EDU/PUB/DORMAN/DORMAN.HTML
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TOPIC:	PBS SCIENCE ODYSSEY PROGRAM
OWNER:	WGBH, BOSTON
LOCATION:	HTTP://WWW.BOSTON.COM/WGBH/LEARN/
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TOPIC:	GEOLOGICAL SOCIETY (UK)
OWNER:	GEOLOGICAL SOCIETY (UK)
LOCATION:	HTTP://WWW.GEOLSOC.ORG.UK
LAST VISIT:	SEPT 1997
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TOPIC:	EVOLUTION IN SOCIAL STUDIES CURRICULUM DRAFT STANDARDS
OWNER:	CALIFORNIA DEPARTMENT OF EDUCATION
LOCATION:	HTTP://WWW.CDE.CA.GOV/CHALLENGE/CONTENTS.HTML
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TOPIC:	EVOLUTION IN SOCIAL STUDIES CURRICULUM DRAFT STANDARDS
OWNER:	MID-CONTINENT REGIONAL EDUCATIONAL LABORATORY
LOCATION:	HTTP://WWW.MCREL.ORG/STANDARDS-BENCHMARKS/STANDARDS/WORLD/S1.HTML
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TOPIC:	WORLD HISTORY DRAFT STANDARDS
OWNER:	NATIONAL CENTER FOR HISTORY IN THE SCHOOLS
LOCATION:	HTTP://WWW.SSCNET.UCLA.EDU/NCHS/WRLD3TOC.HTML (CHAPTER 3 OVERVIEW) HTTP://WWW.SSCNET.UCLA.EDU/NCHS/WRLD3-1.HTML (CHAPTER 3 FULL TEXT)
LAST VISIT:	SEPT 1997
TOPIC:	SCICENTRAL, SCIENCE WWW METAGUIDE
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LOCATION:	HTTP://WWW.SCICENTRAL.COM
LAST VISIT:	AUGUST 1997
TOPIC:	HMS BEAGLE, WWW METAGUIDE
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LAST VISIT:	AUGUST 1997
TOPIC:	PACIFIC "PLESIOSAUR" INFORMATION
OWNER:	GLEN KUBAN
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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 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.

STYLE AND FORMAT

1. Manuscripts must be typed double-spaced, including inset quotations and references. Margins must be adequate for editorial notation.

2. Manuscripts should not exceed 20 double-spaced typewritten pages and must be accompanied by a brief biographical statement identifying the author and an address where interested readers may contact the author(s).

3. A printed original and two copies should be supplied by the author. Names of the author(s) should appear only on the cover page, if blind review is desired. All submissions will be sent to referees for evaluation. Manuscripts submitted on computer diskette will greatly expedite the editing and publication process. Acceptable diskette formats include (standard or high density 3.5-inch) WordPerfect 5.1, MS-Word, or ASCII formats in DOS/Windows versions and MS-Word 6.0, Claris Works 5.0, or plain text for the Macintosh. Manuscripts and other notes submitted by electronic mail should be in plain text format. Please contact the editorial office for information about other word processing and diskette formats that might be acceptable.

4. Citations within text referring to reference section should be limited to author, date and (when appropriate) page, for example (Smith 1982, p 21). Multiple references within text appear in chronological order, for example (Thomas, Peters, and others 1925; Smith 1943, 1947; Smith and Jones 1983a, 1983b, 1984). Citations of electronic resources should include author(s) and date accessed. When appropriate to include internet locations, these should be enclosed in angle brackets, for example <http://www.natcenscied.org>.

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

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 1997 Mar 28.

- 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.

6. Material formatted as footnotes or endnotes should be incorporated into the text or deleted.

7. Text abbreviations based on non-English terms should be translated into the appropriate English equivalent. For example, *e.g.* should be rendered as *for example*.

8. All measurements reported in scholarly and scientific articles are to be expressed in SI or "metric" units.

9. Figures, plates, or diagrams should be submitted in camera-ready form or provided in that form upon acceptance. Submission of these materials and of quotations by writers presumes that authors have obtained permission to use these potentially copyrighted materials. Photographs should be glossy prints and should be accompanied by "permissions" when appropriate.

10. Authors should retain copies of all manuscripts, photographs, and figures submitted; NCSE assumes no responsibility for materials submitted.

11. All submissions are subject to editorial correction of grammar, spelling, punctuation, and consistency as per *Scientific Style and Format: The CBE Manual for Authors, Editors, and Publishers*.

12. Manuscripts cannot be returned unless accompanied by stamped, return-addressed envelopes.

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