

# REPORTS

OF THE  
NATIONAL CENTER FOR SCIENCE EDUCATION



Volume 19, Number 2

MARCH/APRIL, 1999

CONTINUES  
NCSE REPORTS &  
CREATION/EVOLUTION



National  
Academy of Sciences  
Re-releases *Science*  
& *Creationism*

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Trivializing  
Creationist  
Scholarship: Austin  
Replies to Elders

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Equal Time for the  
Origin of Granite

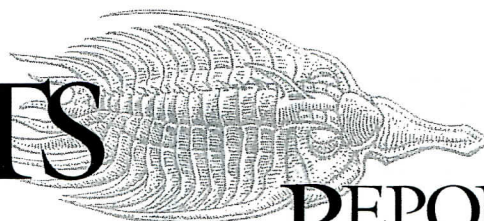
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Thwaites Checks  
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William Dembski's  
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## REPORTS

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

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Fictitious Fossil Feeding Frenzy:  
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Our readers and members are a talented and funny crowd. One of the joys of being your editor is seeing all the cartoons, jokes, parodies, and other humorous treatments of science, anti-science, and the "stars" of the evolution/creation engagements. Since *RNCSE* 19(2) is officially our April issue, we have included 2 features in observance of that day that commemorates us all from time to time — All Fool's Day. Molleen Matsumura reports on NCSE members who have given us new urban legends — the introduction of legislation to mandate teaching that that ( $\pi = 3$ , and the conspiracy to cover up the "anomalous" finds of *Onyate Man* in New Mexico. And in Kansas, the activities of Families for Learning Accurate Theories (FLAT) have caused a stir. Enjoy these special features, but please don't be fooled; they are only in jest.

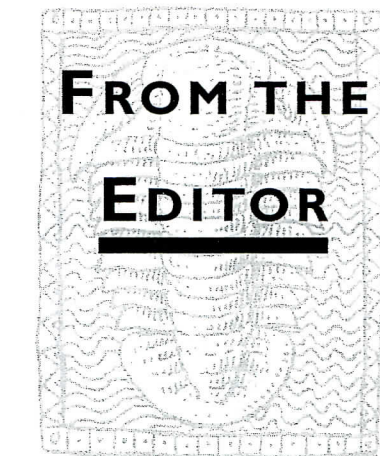
#### BACK TO THE GRAND CANYON

In this issue we also revisit the questions raised by Wilfred Elders in his review essay of Steve Austin's *The Grand Canyon: Monument to Catastrophe*. In response to Elders' essay, Austin wrote to clarify and expand on some issues. We carry that response and Elders' reply.

In a related article, Lorence Collins tells us what geologists know about the formation of granite (or rather *granites*). Collins shows how geologists extract information from laboratory experiments and from field observations. One thing is sure, says Collins, the earth's granite was *not* all formed at the same time — neither within a few days (during Creation Week) nor a few months (after a global flood). The evidence is that there were not 2, but many times when the different granites on earth were formed.

#### NEWS AND REVIEWS

One of the recent books receiving a lot of attention from anti-evolutionists is William Dembski's *The Design Inference (TDI)*. Dembski contends that he has a method for inferring when patterns in the natural world are caused by chance, by laws of nature, or by design. *TDI* claims that this method can detect design without regard to a specific designer using principles of deduction used by people everywhere to make sense out of patterns around



us. Wesley Elsberry explores the claims in *TDI* and suggests a few alternatives to Dembski's method and conclusions.

The National Academy of Sciences has issued a new edition of its book *Science and Creationism: A View from the National Academy of Sciences*. This edition is more than a reprinting of the original volume. It contains significant new information and especially considers more recent developments. We have both a report by Molleen Matsumura on the release and a short item with some of the highlights.

Bill Thwaites reviews a recent *Acts & Facts*, the monthly publication from the Institute for Creation Research. This month's topics are "philosophical naturalism", the improbability of useful mutations, and the "problem" of the source and origin of disease-causing microorganisms.

#### RESOURCES

Frank Sonleitner has provided another extensive bibliography of articles in various journals and magazines about evolution and how it has shaped the history and variation of life on the planet. In Research News we report new studies of DNA and proteins in various reptile lineages which challenge the idea that the turtles were the first to branch off the reptile evolutionary tree. Anti-evolutionists should take no comfort from this study, however, because all the participants in the "controversy" and all the "alternative hypotheses" are in strong agreement that descent with modification from a common ancestor (that is, evolution) produced the patterns in the data.

New in this issue, Dave Longtin and Duane Kraemer have issued a challenge and started a contest. In what we hope will be an ongoing project, these NCSE members have picked up on Bob Siegfried's challenge in *RNCSE* 18(4). In "Evolution as a Heuristic", Bob challenged us to "develop and present a series of specific examples of how evolutionary thought has led directly to the discovery of valuable knowledge in the biological sciences." Dave and Duane are challenging readers to identify and submit to NCSE their examples of research which "both provided strong evidence for evolution and also yielded tangible benefits for the average citizen."

#### ON THE HOME FRONT

We've been busy at NCSE over the past few months. The NCSE Board of Directors has produced a model policy statement to be used as a foundation for policies on science and evolution adopted by school boards and other educational institutions. In this issue we report on and reprint a copy of that model statement.

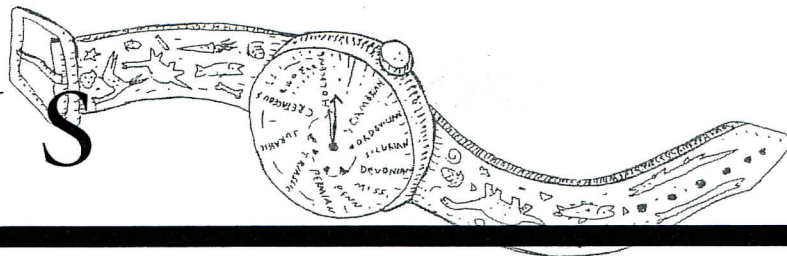
We also pay tribute to the donors who have contributed over \$100 to NCSE this year. We greatly appreciate the generous and ongoing support from these donors. In a related feature, Molleen Matsumura tells readers about many *other* types of contributions which help support NCSE's mission. *All* our members and supporters are extremely generous with their time, talents, and resource and make NCSE as successful as it is.

And, speaking of our great members, we learned this month that 2 of the 3 recipients of the Crawford Prize from the Royal Swedish Academy of Sciences had an NCSE connection. Ernst Mayr (Harvard) and George C Williams (SUNY) who were honored for their "pioneering contributions to broadening, deepening and refining our understanding of biological evolution and related phenomena" are both NCSE members.

Don't miss the 4-page Members' Section in the centerfold. You'll find lots of information and special offers for members only.

Anj Petto

*RNCSE* 19(2) was printed in June 1999.



## National Academy of Sciences Releases *Science & Creationism: A View from the National Academy of Sciences*

Molleen Matsumura  
NCSE Network  
Project Director

In 1984 the National Academy of Science published the first edition of *Science and Creationism* in response to a national epidemic of anti-evolution legislation. The booklet, conceived as a definitive resource for people coping with attacks on evolution education in their communities, and NCSE alone distributed hundreds of copies over the years.

*Science and Creationism* went through 3 printings and finally went out of print a few years ago, just as the beginning of a new wave of anti-evolutionism began in state legislatures and boards of

education. The Academy decided to produce a new edition, updated to reflect advances in evolution research and a changed legal climate and to respond to new anti-evolution strategies. The booklet was written by a steering committee of distinguished scientists and educators which included NCSE Executive Director Eugenie C Scott and NCSE supporters Francisco J Ayala, G Brent Dalrymple, Richard E Dickerson, and Stephen Jay Gould. It is "an authoritative source of information for those seeking an accurate presentation of the science of evolution," according to Academy President Bruce Alberts.

On April 22, 1999, the Academy announced the release of the booklet and the first phase of its distribution to over 10 000 members and scientists. In a letter accompanying the booklet, Alberts urged Academy members to "make use of this valuable resource in discussions with members of your community, including state and

local school board members, curriculum committees, and science teachers." He added, "It is only through eternal vigilance by scientists that we can ensure the teaching of accurate science ... to the next generation of informed scientists and citizens."

At the same time, the Academy provided NCSE with enough copies to distribute to every one of our members and with additional copies to provide to concerned citizens and educators who call on us for help. NCSE members will find that this concise, non-technical discussion of the theory of evolution is both enjoyable and useful, and we encourage you to contact us if you need more copies to educate people in your community.

The Academy has also posted the complete contents of this booklet on the World Wide Web, making it an even more flexible resource. Be sure to add <<http://www.nap.edu/readingroom/books/creationism>> to your browser's favorites.

## PREVIEW: SCIENCE & CREATIONISM

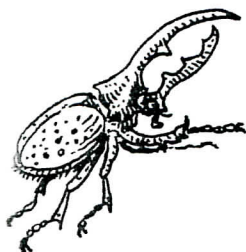
This "View from the National Academy" opens with an introduction explaining that "Science is a particular way of knowing about the world.... Progress in science consists of the development of better explanations for the causes of natural phenomena.... The theory of evolution is one of these well-established explanations." It goes on to offer definitions of the crucial terms *fact*, *hypothesis*, *law*, and *theory*, then discusses three categories of scientific evidence that support the theory of evolution: evidence concerning the origins of the universe, Earth, and life; multidisciplinary evidence for biological evolution; evidence for human evolution. The conclusion is an eloquent defense of the integrity of science education that uses "scientific observation, interpretation, and experimentation" and not "doctrinal material".

Recommended readings groups books by topic:

Evolution, Books for Children and Young Adults, Origin of the Universe and the Earth and the Evolution and Creationism Controversy.

An appendix equips readers with straightforward answers to the most *Frequently Asked Questions* about evolution and the evolution/creation controversy:

- What is evolution?
- Isn't evolution just an inference?
- Is evolution a fact or a theory?
- Don't many famous scientists reject evolution?
- If humans evolved from apes, why are there still apes?
- Why can't we teach creation science in my school?
- If evolution is taught in schools, shouldn't creationism be given equal time?



# UPDATES

**Kansas, Douglas County:** In April 1999 elections for Board of Education, all but one of the candidates endorsed by "Parents for Objectivity in Science and History" (POSH) were defeated; that candidate had clearly repudiated their support before the election (see *RNCSE 19(1):7*). POSH had been founded by a couple who objected when their son was taught that dinosaurs lived millions of years ago. POSH had been opposed by FLAT (Families for Learning Accurate Theories), which among other activities staged a rally during which they "proved" that  $\pi = 3$ . On April 8, the British journal *Nature* revealed that FLAT's activities were intended as parody. *Nature* reported University of Kansas cosmologist (and NCSE member) Adrian Melott's explanation that his group resorted to parody because "reasoned argument with creationists has failed".

**Kansas:** Heated controversy over the role of evolution in the state's science standards continued as the Board of Education prepared to hear public testimony at its May 11 meeting. Although the writing committee that produced the standards is nearly unanimous in its support for teaching evolution, the board is split. In a front-page story, the *Leawood Sun* reported on May 8 that, "Unless a compromise can be reached by the board, which has often split 5-5 between moderate and conservative members, the issue could reach another stalemate." While writing committee member Ken Biggman attributed opposition to the standards to "some people that have a political and religious agenda to get the concept of evolution out of education," Presbyterian minister Bob Meneilly wrote to the board explaining that evolution is not in conflict with religion. Rev Meneilly, Pastor Emeritus of Village Presbyterian Church and chair of the Mainstream Coalition, said in his May 7 letter, "Genesis was never intended to be a science book explaining 'how,' but a reli-

gious book explaining 'who.'... To demand good curriculum science standards in the public school is not to question or deny that God is the Creator.... [T]he best of science must be taught in the public school, not a particular religion." NCSE members continue to press for good science education, and the outcome will be reported in the next issue of *RNCSE*.

**Kentucky, Boone County:** On May 6, the Boone County Fiscal Court voted to grant a zoning variance so that the creationist ministry Answers in Genesis (AIG) could construct a 95 000-square-foot building to house a museum, headquarters and distribution center. This was the second site at which AIG sought to build a museum. In 1996 AIG was denied permission to build near Big Bone Lick State Park, a well-known fossil site. Earlier opposition to the museum was based both on residents' concerns about the impact such a large facility would have on their rural environment and fears that a creationist museum near the fossil site would generate bad publicity. Controversy about the new location seems to be focussed on zoning issues. The Fiscal Court denied the original request for a zoning variance on the new site, but AIG filed suit. After elections changed the composition of the court, AIG submitted a revised application, which was accepted by newly-elected officials. The May 7 issue of the *Kentucky Post* reports that residents opposed to the museum may file a lawsuit in Boone Circuit Court to appeal the Fiscal Court's decision.

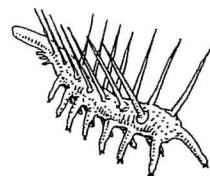
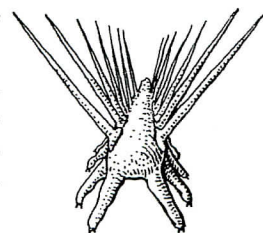
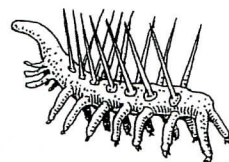
**New Jersey, Piscataway:** After saying that he felt the local Board of Education "should look more deeply" at "teaching creation in science class, religious liberty, opposing homosexuality...", board candidate Robert Moran resigned as communications director of the Piscataway Republican Organization. According to a March 17 article in the *Courier News*, Moran, a Christian Coalition member, said that his opinions were personal and that his resignation was prompted by a belief that,

"The citizens of Piscataway are best served... by a school board that is non-partisan." However, another member of the Republican group told the newspaper that Moran had been asked to resign from the position so that his views would not reflect on the organization.

**Nebraska:** The state Board of Education has revised the sections of newly adopted science content standards that deal with evolution in response to a letter from Deputy Attorney General Steve Grasz. In the February 9 letter, Grasz wrote: "[T]he proposed standards appear to interfere with the constitutional rights of students... [because the standard] 'The goal is for students to recognize that the present arises from materials and forms of the past'... is phrased in terms of objective fact rather than theory." While evolution has not been deleted from the standards, the letter's misinterpretation of Constitutional law could be used to discourage the teaching of evolution. NCSE is monitoring the situation and helping local activists who are urging the board not to make further revisions.

**North Carolina:** State Representative Russell Capps, whose 1997 anti-evolution bill passed the House but was defeated in the NC Senate, introduced a bill calling on the Board of Education to "encourage teachers to... distinguish between philosophical materialism and authentic science...." He was quoted in the April 15 *News and Observer* as believing that the bill's chances of passage are "Slim to none", and within a week the bill had failed in committee. When NCSE member Byrd Humphreys called Capps's office and asked why he had introduced a bill he didn't believe could pass, a staff member explained that Capps wanted to keep the issue before the public. NCSE will continue monitoring North Carolina.

[NCSE thanks Roger Furbee, Byrd Humphreys, Adrian Melott, Dan Phelps, John van Keppel for information used in this article.]



# Jack Sepkoski Dies

*Kevin Padian  
Museum of Paleontology  
University of California, Berkeley*



It is with great sadness that we report the death of Jack Sepkoski in Chicago on May 1, 1999. In addition to being an ardent supporter of NCSE, Jack was one of the most important and influential paleobiologists of the century. Jack deeply understood and loved field geology and paleontology and made his reputation by asking questions of the basic data of paleontology — the placement of the fossils themselves in their stratigraphic context.

The science of paleontology had a theoretical renaissance in the late 1960s and early 1970s when a number of workers, including Dave Raup, Tom Schopf, Steve Gould, and Jim Valentine, decided to ask questions about the broader patterns of the fossil record. Some of the first compilations of data, and the models to explain them, helped to elucidate the question of *diversity through time*; that is, what is the pace of the evolution of life, and what can we say about the events that have influenced biodiversity?

One of Jack's most enduring efforts is his analysis of the patterns of diversity in the fossil record. He took an immense amount of data from the fossil record, including all records of animal taxa from the Cambrian to the Pleistocene and used statistical techniques to explore how the variation could be explained at any given time in the history of life. His answer was astonishing but simple: there were 3 basic "faunas" that characterized animal diversity. The first fauna, which dominated in the Cambrian Period and early Paleozoic Era, consisted largely of trilobites and related organisms. The second, later Paleozoic fauna consisted of brachiopods and types of corals now largely extinct. The third fauna emerged in the Mesozoic and Cenozoic areas and comprised mostly clams and snails and other associated animals.

Needless to say, the kind of meticulous and all-encompassing analysis of the fossil record which made up most of Jack's professional labor completely stymies any but a standard evolutionary interpretation. To our knowledge no creationist has dared to challenge this body of work, and it is inconceivable that any could do so successfully. Jack knew the patterns of the fossil record as few other scientists ever have. Every new report of an invertebrate taxon in a new formation or location drew his interest; all new geophysical data that helped determine the time and place of these animals in the constantly changing context of tectonic history were grist for his mill. He was constantly re-examining the patterns that he had elucidated, always searching for new ways to analyze, falsify, re-order, and test them.

Beyond the incalculable contributions that Jack Sepkoski made to the study of macroevolution, his friends and colleagues will remember him as the most congenial of maniacs, as intense about his recreational pursuits as about his science. His — our — generation was the first to bring rock'n'roll to paleontology — an attitude more than a research program, to be sure, but one that unified many younger scientists in their search for new ideas and approaches to revitalize the most "backward-looking" of the sciences. Jack served with distinction as President of the Paleontological Society and was a Paleontology Society Councilor for years; his forward-looking approach helped the Society to anticipate the challenges of a new era. Whether he was cheerfully bashing the credos and excesses of pattern cladists or debating the relative merits of Lou Reed and Elvis Costello, Jack's restless intellect was a delight to everyone who knew him, and his contributions to the field were equally respected. We mourn a great colleague and great friend. Please hoist one in his honor; he'll be there with you in spirit.



# Texas State Board of Education Honors Mel and Norma Gabler

*Molleen Matsumura  
NCSE Network Project Director*

On May 7, the Texas Board of Education passed a resolution to "honor and commend Mel and Norma Gabler of Longview, Texas for 38 years of sacrificial service, both in textbook review and in the textbook adoption process..."

Long time members of NCSE are familiar with the Gablers, whose Texas-based organization Educational Research Analysts (ERA) has for nearly 40 years been a major influence on textbook adoptions in Texas (*see for example* RNCSE 11[3]:1,5). They have regularly appeared before the State Board of Education, offering the "conservative, Christian perspective" on content standards and textbook selections for every subject in the K-12 curriculum. Their lobbying activities have influenced other states as well: first, because other organizations — such as the Eagle Forum — rely on their textbook analyses; and second, because Texas is one of the nation's largest textbook purchasers, so Texas standards affect the content of textbooks that will be used in other states.

The Gablers have consistently opposed evolution. For example, in 1991, when Texas Proclamation 66 required evolution as a major theme in biology texts, pressure from the Gablers and other anti-evolutionists led to a last minute revision calling for inclusion of "scientific evidence of evolution and other reliable scientific theories, if any" (RNCSE 10[6]:10). In 1998, ERA rated textbooks according to how much they "harp on" evolution (RNCSE 19[1]:10). In a section of their website titled "God-given victories", they claim credit for a drop in sales of the book which had received their lowest rating. To see this web

page, go to <<http://members.aol.com/TxtbkRevws/index.html>>, click on "God-given Victories!"; go to subhead "credibility with classroom teachers". The same document claims credit for "detection of subtle subversion" in social studies texts.

Given the Gablers' long history of activism and their notoriety in their home state, a public comment about them by even one member of the Board of Education is a significant statement about the political climate and future educational policy. The May 7 resolution honoring the Gablers is not a good sign. Though the resolution does not refer directly to science education, it notes that "textbook decisions made in Texas greatly affect textbook selections elsewhere..." and praises the Gablers for "critiqu[ing] textbooks and ... alert[ing] parents ... concerning textbook errors, omissions, contradictions, and detours...". Since the Gablers have frequently claimed that evolution is erroneous, there is a real question whether the hard-fought battle to include evolution in Texas standards and textbooks, won in 1997, would have ended differently if it had taken place after the 1998 elections. Certainly we will need to be alert for attempts to introduce new antievolution policies.



# NCSE NEWS

## NCSE and Policy Statements on Teaching Evolution

Many times in recent years, concerned citizens have called upon NCSE for advice concerning policy statements on evolution and science education that state and local boards of education consider for adoption. For example, one board of education that has decided not to use "creation science" curriculum materials may issue a policy statement to "acknowledge" various viewpoints within the community and hope to head off controversy. In another case, citizens may ask a school board to adopt a policy statement that the school district's attorney says is illegal.

What all these requests had in common was a set of legal, scientific, and educational issues which NCSE addresses repeatedly in individual cases all over the country. Therefore, NCSE's staff and Board of Directors worked together to develop a draft position statement that concisely addresses all the relevant issues for public school boards considering such policy statements. The NCSE model drew on the best-written policies of state boards and departments of education and the position statements of numerous professional organizations.

On February 27, 1999, NCSE's board adopted a "Recommended Policy Statement on Science and Evolution" that can be used in any school district in the nation. Members are welcome to obtain copies from NCSE, or to make copies of the statement printed in this issue, to use in your own community or to share with anyone whose school district is coping with an evolution/creation controversy.

The text of the NCSE recommended policy statement is found on page 23.

## Contest: Describe Evolution's Tangible Benefits, Win A Prize

*Dave Longtin and  
Duane Kraemer*

NCSE Director Eugenie Scott has announced the official start of the first "Tangible Benefits of Evolution" contest on the pages of *RNCSE*. We encourage readers to send in observations of the natural world that have both provided strong evidence for evolution and also yielded tangible benefits for the average citizen. Any scientific research that has improved human health, helped to put food on our tables, or otherwise made life better for society will qualify. Submissions should not exceed 750 words and must reach NCSE's editorial office by September 1, 1999.

The 6 best entries will be published in *RNCSE* (all entries subject to editing for length, style, format, and clarity). The NCSE Board of Directors will select a winner from among them. The winner will receive a free book from NCSE's book list and a free 1-year membership in NCSE — a prize one might keep or give to a friend. As the authors of this little competition, we are not in the running, but we will kick things off by offering an example of our own — a story about how mating between Old World monkeys from species in 2 related genera sparked a medical revolution.

As Darwin pointed out, the line between closely related species often blurs, causing hybrids to exhibit many different levels of fertility and viability. When domestic cattle interbreed with American bison, for instance, they produce sterile hybrid males but fertile hybrid females (Basrur 1968). Baboons and rhesus monkeys have an even more ambiguous reproductive relationship, yet the difficulties they encountered in hybridizing inspired one of the most significant advances in neonatal care since World War II.

*continued on bottom of page 8*



# NCSE Thanks You for Your Generous Support

The NCSE Board of Directors and staff would like to acknowledge and extend a warm thank-you to all the individuals, organizations, and firms that donated to NCSE during 1998. We also extend a special thanks for their much-appreciated support to the following people who donated \$100 or more. Thank you to all donors!



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John J Flynn  
Richard A Fox, Jr  
Barbara Friedberg  
Jack B Friedman  
Lawrence & Emmy Friedman  
Richard and Susan Friedman  
Eugene S Gaffney  
David J Galas  
James & Sylvia Gallagher  
Michael E Garvey  
Marie S Geise  
John R Gibson  
Deborah and Amy Goldsmith  
Richard Golz  
Richard L Grant  
Wade C Greene, Jr  
William T Greenough  
Edgar A Gregersen  
Kenneth M Gregory  
William C Guss  
Pembroke J Hart  
Bret C Harvey  
Hugh B Haskell  
Gordon Hazen  
Raymond Heithaus  
Harold M Henderson  
John H Hessel  
Diana K Hews  
John G Hildebrand  
Cliff W Hill  
Dean J Himmelreich  
Mahlon Hoagland  
William P Holcombe  
Robert J Holman  
N H Horowitz  
Dexter H Howard  
WW Howells  
Lyle T Hubbard, Jr  
Stuart W Hughes  
Alan G Humphrey

Three decades ago, most premature babies died soon after birth. But in the 1970s, scientists at the Southwest Foundation for Biomedical Research in San Antonio unexpectedly discovered that when captive rhesus monkeys and baboons interbred, their offspring, called rheboons, were always born prematurely. Like human preemies, moreover, most of these hybrids contracted hyaline membrane disease, a condition that causes an infant's lungs to collapse (Harris and Kuehl 1995). Back then, reproductive physiologists already knew that many mammals, such as rabbits, sheep, and even rhesus monkeys, also developed hyaline membrane disease when delivered early by Caesarian section. But all of these creatures would die shortly after birth (Escobedo and others 1982: 331).

Rheboons were the only animals other than people known to acquire this condition naturally. Like human preemies, moreover, rheboons occasionally survived their untimely arrivals (Harris and Kuehl 1995). As a result of these observations, scientists learned that ordinary baboons delivered prematurely by Caesarian section could outlive hyaline membrane disease when placed on an old-style breathing apparatus (Escobedo and others 1982).

In the early 1980s, scientists used these premature baboons as a model to develop a new type of high frequency oscillating ventilator to help preterm babies breathe. Unlike conventional ventilators which breathe for the infant at normal rates, the high frequency oscillator pumps several hundred tiny breaths into the new-

born each minute. Doctors found that the oscillator was better than conventional ventilators at treating pulmonary interstitial emphysema, a condition in which inhaled air leaks out of the lung's air sacs, where oxygen exchange occurs, and into the surrounding tissue (Bell and others 1984). Baboons were also used to develop surfactant therapy, which helps to mature the lungs of preterm babies (Vidyasagar and others 1985). Between 1989 and 1990, the year in which surfactant gained widespread popularity in US hospitals, infant mortality dropped by 6.2 percent, the second biggest decline in any single year since 1949 (Wegman 1991).

It is precisely because baboons and rhesus monkeys have such difficulty in producing viable hybrids that their rheboon offspring

Hugh H Iltis	Waldo K Lyon	Olle Pellmyr	Paul A Storey
Mark Isaak	Edward F MacNichol, Jr	David Persuitte	Arthur Strahler
Robert C Jachens	Sharon E Madison	Richard E Petit	Gilbert Stratton
Thomas C Jackson	Janice and Robert Manheimer	Daniel J Phelps	Monroe W Strickberger
Eileen K Jaffe	Thomas J Marlowe, Jr	Evan Picoult	John M Suarez
Duane E Jeffery	Peg Marshburn	Arturo G Porras	Dan Sulzbach
Russell M Jeffords	Anthony John Martin	Wesley Powers	Raphael Susnowitz
Douglas L Johnson	Eugene S Martin	Douglas W Rankin	Ronald G Tabak
James W Johnson	John B Massen	Robert W Rasch	John Taube
Jeff D Johnson	Ernst Mayr	Rudolph S Rasin	Andrew W Taylor
Margret Martin Jonah	E J McConnell	Britt Raubenheimer	Richard H Tedford
Roger A Jones	Mary S McCutcheon	John B Ray	Tom & Barb Thwaites
William T Kabisch	Michael McIlwrath	Donald G Rea	William L Tietjen
Peter C Kahn	Priscilla & Malcolm McKenna	Albert J Read	Thomas K Toyama
Judith A Kapp	Ruth McLean Bowers	Stephen P Robb	Richard Trott
Daryl R Karns	Wendell W Mendell	Steve A Rocchi	Katherine Troyer
Mark Kendrick	Barbara S Miller	Carl Rosenfeld	Barbara C Turner
Charles King	Daniel E Moerman	Donald C Ross	Frances S Vandervoort
Daniel R Knighton	David Molea	Barry Roth	Janos Varga
RN Kohman	Eugene C Montgomery	Rodolfo Ruibal	Stephen A Wainwright
Michael S Koller	John A Moore	Carol Ann Ryder	C Rodger Waldman
John H Kramer	Lloyd & Mary Morain	Patricia Sager	Bettine & Lawrence Wallin
Bruce H Krause	James W Morrell	Bonnie Sampsell	Samuel Ward
Michael La Barbera	David Morrison	Hunter L Scales, III	TJR Weakley
Caroline Lambert	John L Mulder	Tom Seldon	Charles W Webb
Eugene R Larkin	CJ Munson	J John Sepkoski, Jr	Arnold D Welch
Gordon L Larsen	Richard C Neavel	Max D Shaffrath	Paul Wessel
RL Latterell	Stuart E Neff	James A Shapiro	Harold B White
Don A Lenkeit	Donald F Neidig	Jeff L Shelton	Thomas J White
Lawrence Lerner	Norman D Newell	Charles G Sibley	George C Williams
Joseph R Levee	D J Nichols	Robert Siegfried	Joe Willis
Jack G Levine	Robert B Nicklas	Sydel Silverman	Howard Winet
Joseph S Levine	Allen D Nickol	Maxine F Singer	Elizabeth A Wood
Leonard Lieberman	Robert M Norris	James E Skeen, Jr	Irving Yablon
Donald R Lindsay	Harry W O'Brien	Norman H Sleep	Charles Yanofsky
Jim Lippard	William R Oliver	George S Smith	
Ernest L Lippert, Jr	Alan E Orcutt	Frank J Sonleitner	
Jeffrey L Lloyd-Jones	Kevin Padian	Elizabeth K Stage	
James R Logan	Betty Ann Paterson	Ivan Stanko	
Thomas Lutgens	Edgar Pearlstein	Terrell E Stewart	
Barry W Lynn	Scott and Elizabeth Pector	Don E Storey	



proved so useful as a model of premature birth. At the same time, these animals have given us yet another snapshot of speciation in action. We know of no other biomedical experiments that have had such Darwinian overtones, but we hope some of you will point out more examples like the one mentioned here.

Remember, the research you cite may come from any field of science, as long as it clearly relates to evolutionary biology and has a practical application. Good luck with your entries.

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Vidyasagar D, Maeta H, Raju TNK, John E, Bhat R, Go M, Dahiya U, Roberson Y, Yamin A, Narula A, Evans M. Bovine

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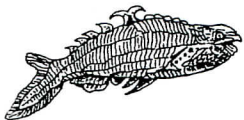
David Longtin is a Washington-based writer. Duane C Kraemer is a senior professor of reproductive physiology at Texas A&M University. From 1966 to 1975, he worked at the Southwest Foundation and was one of many scientists who participated in the rhesus study.

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# The Art of Giving Molleen Matsumura, NCSE Network Project Director



Occasionally members ask, "Is there some way I can donate to NCSE besides responding to a fund-raising letter? Could I include you in my will or in estate planning?" This is an important issue. According to one agency that advises charitable and educational organizations, only 50% of Americans leave a will of any kind, and fewer than 6% of American households include nonprofit organizations in an estate plan. Yet NCSE members have found a number of variations on these methods of giving:

- You can specify dollar amounts or percentages of assets you would like to donate to NCSE. These can be *included in your will* or as part of *planned giving*. You can discuss this issue with your own financial advisor or ask NCSE to refer you to a financial advisor who can discuss these and other methods, such as naming NCSE as the beneficiary of a pension plan, IRA, or life insurance policy. NCSE has a brochure on planned giving that is available upon request. You can write to us, or send email to <ncse@natcensci.org>.
- Several NCSE members have taken advantage of *company programs* to match employee donations to qualified organizations. If your company has such a program, the program's administrators can tell you what they need to know to add NCSE to the program, and NCSE can supply you with the information.
- Some NCSE members have asked whether they can *make gifts of corporate stocks*. When stocks or other assets such as bonds, real estate, jewelry and collectibles have appreciated in value, you may realize a tax savings by making a donation. This is a good way to help NCSE and an approach your tax advisor may recommend.
- Some inventive members have made *donations in honor* of special occasions such as anniversaries and birthdays of friends who are evolution enthusiasts. We will not only notify your friends of these gifts in their names, but include these donations in our annual listing of donations in honor and in memory of friends of evolution education.
- Finally, several members have taken advantage of a special program created by NCSE Board member and past-president *Jack Friedman*. You can make a *memorial donation* to NCSE, and we will notify the person's family of the gift. This is an especially appropriate memorial to individuals with a strong amateur or professional interest in evolution or science education. If you wish to make such a donation, all you need to do is enclose a note with your check or credit-card authorization, telling us in whose memory you are making the gift and the name and address of anyone who should be notified.

Your support is vital to NCSE, and donations of any size are much appreciated. NCSE members are creative about finding many ways to support our goals, giving their time when their ability to make financial contributions is limited; watch for some of their ideas in our next issue.



## Two Out of Three Prizes by Royal Swedish Academy of Sciences Have NCSE Connections

The Royal Swedish Academy awarded its Crafoord Prize to 3 prominent biologists — John Maynard Smith (Sussex), Ernst Mayr (Harvard), and George C. Williams (SUNY). Mayr and Williams are NCSE members. The Crafoord Prize recognizes pioneering contributions to broadening, deepening and refining our understanding of biological evolution and related phenomena such as the formation of species and their adaptation to changes in their environment. The prize will be formally awarded in September 1999.

### CONTRIBUTIONS TO EVOLUTIONARY THEORY

According to the Academy's press release:

*Ernst Mayr is a leading figure in the creation of the modern version of the theory of evolution now termed "the modern synthesis". [K]nowledge gained from genetic, systematic, paleontological and ecological research has been integrated to form a coherent theory of evolution. Mayr ... is perhaps best known for refining the biological concept of species, thus clarifying what is meant by a species and the conditions under which it may be formed. John Maynard Smith and George C. Williams have been interested chiefly in the evolutionary processes leading to the fact that species continually change — with adaptation to environmental factors — or sometimes do not*

*change. George Williams was among the first to establish that adaptations normally come about through natural selection favoring those individuals in a population who possess such characteristics that they have more offspring than others. In this way he put paid to the idea that adaptations arise "for the good of the species" an idea that has been current since Darwin exposed a lack of clarity in his thinking on this point.*

[For more information about the Crafoord Prize or about the Swedish Academy, connect to <<http://www.kva.se/eng/pg/prize/s/crafoord/pressr99.html>>.]

# RECAPITULATIONS



## TRIVIALIZING CREATIONIST SCHOLARSHIP: A REPLY TO DR WILFRED ELDERS

[In the Jul/Aug 1998 issue of RNCSE Wilfred Elders wrote an extended review essay based on the ideas about the Grand Canyon found in Steven Austin's book, *Grand Canyon: Monument to Catastrophe*. In this issue, Austin responds to that review with the following critique. Elders replies below.]

STEVEN A AUSTIN

CHAIRMAN, GEOLOGY DEPARTMENT, INSTITUTE FOR CREATION RESEARCH

Wilfred Elders' article "Bibliolatry in the Grand Canyon" (*RNCSE* 1998; 18[4]: 8-15) is an 8-page review of my book *Grand Canyon: Monument to Catastrophe* (Austin 1994). This article is the most extensive critical review of *Grand Canyon: Monument to Catastrophe* to appear in print. "There is perhaps no better place in all the world to appreciate the grandeur of geologic time....," writes Elders (1998: 8), "However, bibliolatry has come to the Grand Canyon." The accusation of "bibliolatry" might suggest a theological discussion of biblical literalism. However, Elders admits that literalism is not the book's thrust. "The book presents a more detailed argument than any previous creationist publication on geology. The crux of the book is a lengthy and detailed, but ultimately failed, attempt to rebut published accounts of the geology, paleontology, and dating of the strata of Grand Canyon and to present re-interpretations consistent with the Genesis story. Such re-interpretations are buttressed by some original creationist research" (Elders 1998:14).

Most unusual is the fact that Elders' book review also promotes the National Center for Science Education's "Creation/Evolution Grand Canyon Raft Trip" scheduled for August 7-14, 1999. The stated purpose of the upcoming raft trip is to rebut the "young-earth creationist" view of Grand Canyon offered by the Institute for Creation Research and promote "critical thinking" (Scott 1998). My response to Elders' book review is directed at helping the NCSE develop a better understanding and appreciation of creationist materials, especially creationist research, so that the

upcoming raft trip in August 1999 can better characterize creationist research and interpretations at Grand Canyon. Elders (1998:9) writes, "Austin has taken on the daunting task of using the spectacular geology of the Grand Canyon as an exemplar of a creationist world-view, despite numerous compelling arguments to the contrary."

The most pointed criticism from Elders is directed at creationist research (3 pages of the 8-page review). Elders (1998:12) writes, "But what of original creationist research? The appendix of *MTC* lists 18 'Questions for Discussion and Study'. The last of these reads, 'What are four research projects creationists have conducted on Grand Canyon?' A careful reading of *MTC* reveals that the author of this question expects students to be diligent. In fact, I was able to find *only* four examples of creationist research which could be cited, plus one which the authors of *MTC* admit is dubious."

After Elders assesses the quantity of creationist research, he goes on to trivialize creationist research with what I believe to be the most objectionable statement of the book review. He writes: "However, a case of contamination of pollen samples, 12 oriented nautiloids, the tale of 94 squirrel skins, some experiments with tracks made by newts in an aquarium, and willful misinterpretation of radiometric dates based on five Rb/Sr isotopic ratios scarcely constitute a deluge of new compelling evidence for the flood of Noah." I will respond by noting severe scholarship problems with Elders' assessment of both the *quantity* and *quality* of creationist research at Grand Canyon.

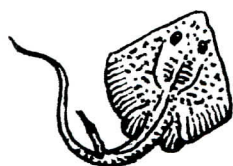
## QUANTITY OF CREATIONIST RESEARCH

What can be said about Elders' assessment of the quantity of creationist research? I was able to find not just 5 creationist research projects described in *Grand Canyon: Monument to Catastrophe*, as asserted by Elders, but at least 8 (I define a research project as involving scientific process of "observation, measuring, interpreting and reporting"). In addition to the 5 examples Elders noticed, I would give "full credit" to a student who offered:

**(6) Survey of boulder beds at the base of the Tapeats Sandstone.** Austin (1994:47,55) cites and summarizes field work by Arthur V Chadwick (1978), a noteworthy creationist, on the size of boulders and topographic relief within sedimentary deposits just above the Great Unconformity in Grand Canyon. Chadwick (1978) does not mention Grand Canyon in the title of his paper, but anyone consulting this paper would immediately recognize observation, measuring, interpreting, and reporting within a field project concerning the Tapeats Sandstone of Grand Canyon. Obviously, Elders has not read this cited work, and he remains uninformed of the ongoing work by creationists Kennedy, Kablanow, and Chadwick (1996).

**(7) Remote sensing search for ancient shorelines.** Austin (1994:93,109,110) summarizes research of Edmond W Holroyd, III on ancient shorelines of lakes in the eastern Grand Canyon and central Colorado Plateau. These lakes could have drained catastrophically through the Kaibab and Coconino Plateaus causing significant erosion in Grand Canyon. The cited works of Holroyd (1987, 1990), which are followed by further publication in Holroyd (1994), would satisfy academic standards of research. Elders missed Holroyd's significant work even though it is both cited and pictured (Austin 1994:93).

**(8) Review of ancient alluvial deposits and erosional features as evidence of the possible path of the ancestral Colorado River.** The supposed ancient path of the Colorado River continues to be researched by Emmett Williams and John Meyer, as well as by their creationist coworkers. Austin (1994:109) cited the summary of this work (Williams, Meyer, and Wolfrom 1992a) which is part of a continuing stream of publications (Williams, Meyer, and Wolfrom 1991, 1992a, 1992b; Williams, Goette, and Meyer 1997) containing significant field data and interpretations on the geomorphology of Grand Canyon and vicinity. Elders is oblivious to this work. Is Elders even aware that Meyer and the Creation Research Society have established the "Grand Canyon Experiment Station" in Chinó Valley, Arizona? Not a hint is found in his review.



I come back to Elders' research quantity statement, "A careful reading of *MTC* reveals that the author of this question expects students to be diligent. ..." Is Elders' word "diligent" appropriate for describing his own pursuit of creationist research within the book *Grand Canyon: Monument to Catastrophe*? The word "cursory" seems more appropriate. Only 5 of 28 references are to creationist works beyond the book reviewed. Each of the 5 creationist references cited by Elders had already been cited by Austin. A watchful teacher grading a student's review paper might ask if the student is truly familiar with the sources he has referenced. Had Elders been familiar with these and other creationist sources, he would not have made his noteworthy error of severely minimizing the quantity of creationist research at Grand Canyon.

## QUALITY OF CREATIONIST RESEARCH

What can be said about Elders' evaluation of the *quality* of creationist research in Grand Canyon? Elders is extremely critical in overview, but he is generally nonresponsive to the details. I will give 4 examples of trivializing and nonresponsiveness in the following paragraphs.

What, for example, is Elders' interpretation of the large, abundant, straight-shelled cephalopod fossils called "nautiloids" at Nautiloid Canyon on the Colorado River. How does Elders' interpretation differ from that of a creationist? He criticizes the creationist summary in Austin (1994:27), assuming that only 12 orientations of nautiloids were measured. However, his supposition of only 12 measurements is a big mistake. Another source unknown to Elders reports 71 orientations of nautiloids measured at Nautiloid Canyon (Austin and Wise 1995). Whatever evaluation one may have of the quantity of research and measurements at Nautiloid Canyon, an interpretation of the deposit needs to be offered to the student investigating the creation/evolution issue. Data indicate a sedimentary catastrophe and a nautiloid mass-kill event (Austin and Wise 1995). A critic of quality should portray previous work correctly and promote a better standard.

How does Elders respond to research by creationists concerning the effectiveness of Grand Canyon as a geographic barrier for the distribution of small mammals? Elders (1998:12,14) cites only the study of John R Meyer (1985) on 94 museum specimens of tassel-eared squirrels. This research (publication year cited incorrectly by Elders) was reported in Austin (1994:174-8). The statement, "Animal distribution within Grand Canyon continues to be an important part of creationist studies" (Austin 1994:174) should have alerted Elders to consult the associated reference to further work of Meyer (Meyer and Howe 1988). In their detailed report attempting to quantify the effectiveness of the geographic barrier using field observations at Shiva Temple, Meyer and Howe (1988) record field measurements of air and soil tem-

perature, relative humidity, and plant distributions from a very remote area of the North Rim of Grand Canyon. Elders conveniently overlooks 2 years of field studies by Meyer and Howe and instead implies that the research on geographic isolation concerns only observations on 94 squirrel skins from a museum.

How does Elders respond to peer-reviewed publications by creationist Leonard Brand? Brand's work supports submerged conditions for deposition of the Coconino Sandstone. Elders is strongly opposed in overview to the idea of subaqueous deposition of the Coconino, favoring instead the popular desert environmental model. However, he does not answer the specific evidence cited for the subaqueous model noted by Brand (1978, 1979, 1992, 1996) and Brand and Tang (1991) on the characteristics of fossil footprints as evidence of underwater deposition. He has not responded to the sedimentological argument for water developed by Glen S Visher (Visher and Howard 1974; Freeman and Visher 1975; Visher 1990) as summarized in Austin (1994:32).

Suppose a participant in the NCSE raft trip notices a fossil vertebrate trackway in the Coconino Sandstone (not an uncommon find for Grand Canyon rafters). Also, suppose our hypothetical NCSE participant uses "critical thinking" skills and notices significant dissimilarities between the Coconino vertebrate trackway and a vertebrate trackway from a modern dune above the bank of the Colorado River. Dunes with vertebrate trackways are observed on occasion above the bank of the Colorado River, and these are significantly different than the Coconino examples (see Brand 1996). Then, suppose our participant asks Elders to explain the similarity of the discovered Coconino trackway to trackways made underwater in the fashion of the research conducted by Brand. Is Elders going to respond that the subaqueous idea is unthinkable because somebody once found an extremely rare trackway in the Coconino Sandstone that they proved was made by a scorpion (Elders 1998:13)? Is he going to respond that the trackway makers have been proven to be extinct *desert-dwelling* reptiles or mammal-like reptiles, but *definitely not* extinct *water-dwelling* reptiles or mammal-like reptiles (Elders 1998:13)?

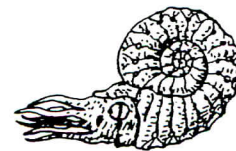
If Elders responds in such a fashion to a rafter's discovered Coconino trackway and its relation to a modern trackway, would that be an adequate and scholarly response? Is not the proper response to deal with the interpretation of the empirical evidence at hand? Even the published responses to Brand's work acknowledge the adequacy of Brand's observations. For example, Loope (1992) wrote: "Although I strongly disagree with Brand and Tang's conclusion, I find their experimental approach very useful, and hope to incorporate it in the testing of my own hypothesis." This may explain why the research of Brand (a noteworthy creationist) has withstood scholarly peer-review from 3 evolutionary science journals. Why should Brand's work be dismissed or trivialized outright by Elders?

Elders' review is longest in his response to the critique of radioisotope dating given in Austin (1994:111-31). I suspect that radioisotopes get special consideration because of his position statement concerning Grand Canyon, "There is perhaps no better place in all the world to appreciate the grandeur of geologic time" (Elders 1998:8). If Elders is correct, radioisotope ages of Grand Canyon should be well verified and especially evident to people employing "critical thinking." He is greatly concerned that creationist researchers have performed only 5 rubidium-strontium isotope analyses on Grand Canyon rocks. However, Austin (1992) reports measurements of other radioisotope ratios in Grand Canyon rocks. The work of Austin (1992) is cited in Austin (1994:128, 131) and should not have escaped Elders' "diligent" attention.

Suppose, for example, the NCSE raft trip stops at the extraordinary exposures of Cardenas Basalt (upper Precambrian) at Tanner Rapids. It is the first igneous formation encountered on the raft trip and would naturally come to the attention of the NCSE group. How would Elders respond to the simple question, "Do the different radioisotope methods give concordant ages for Cardenas Basalt?" Would he reply, "In other locations there are tens of thousands of radiometric dates which are consistent with the relative stratigraphic position of the rocks dated" (Elders 1998:13)? Such a response would be incomplete. Scholarship dictates that he summarize the radioisotope data that is known for Cardenas Basalt.

The publication of Austin and Snelling (1998) concerns the discordance between rubidium-strontium and potassium-argon isochron techniques applied to the Cardenas Basalt and diabase sills within the Precambrian of Grand Canyon. Why are K/Ar "ages" much younger than the accepted Rb/Sr "age" for Cardenas Basalt and diabase sills? Discordance of dates had been previously noted by Austin (1994:120-2) as well as by other researchers. Austin and Snelling (1998) report 13 new K/Ar analyses from Grand Canyon, essentially doubling the number of published K/Ar analyses within the Precambrian of Grand Canyon. Elders can trivialize this creationist work, but he must admit that there are data here needing to be explained.

Elders is convinced very strongly that radioisotopes have successfully dated Grand Canyon rocks at millions or even billions of years. Elders (1998:13) cites 2 kinds of ages he accepts: (1) uranium-lead model ages made on crystals of zircon and monazite from the inner gorge of Grand Canyon, and (2) potassium-argon model ages from lava flows from volcanoes on the rim of Grand Canyon. Suppose, for example, the NCSE raft trip examines some of the monazite-bearing rocks that outcrop within the inner



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**Scholarship  
dictates that he  
summarize the  
radioisotope data  
that is known for  
Cardenas Basalt.**

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gorge of Grand Canyon. Elders might be asked, "Do monazite crystals in Grand Canyon give concordant U/Pb model ages?" The short answer to this question, I believe, is one word: "Rarely." Hawkins and Bowring (1994) studied 65 monazite grains from the inner gorge of Grand Canyon: "In the absence of physical evidence for inheritance, the range of single grain ages remains problematic. However, the discordant behavior can be explained if single monazite grains comprise complex mixtures of domains which have exhibited open system behavior with respect to U, Th, and Pb, including excess  $^{206}\text{Pb}$ , during cooling. Concordant analyses of single grains may represent fortuitous mixtures of these domains." This work generally critical of monazite model-age dating was conducted in conjunction with a PhD dissertation (Hawkins 1996).

Lava Falls Rapids, the largest of the rapids within Grand Canyon, is a routine stop for river boatmen.

## Elders needs to come to grips with the fact that creationists have a continuing research program at Grand Canyon.

They stop their boats for safety purposes so they can scout the changing configuration of the torrent before running it. Because the NCSE raft trip is likely to stop at Lava Falls Rapids, participants will see firsthand the most imposing display of basalt within Grand Canyon. Geologists call the lowest part of this erosional remnant "Toroweap Lava Dam". Basalt at the rapids spilled into Grand Canyon as multiple flows from the rim. A sample of this basalt from Toroweap Lava Dam gave a potassium-argon "whole-rock" model age of 1.16 (0.18 million

years (McKee, Hamblin, and Damon 1968). A NCSE rafter employing "critical thinking" would have opportunity to ask, "Is it possible that the K/Ar age obtained for Toroweap Lava Dam is excessively old because radiogenic argon was incorporated into the basalt as it cooled?" This possibility is admitted by McKee, Hamblin, and Damon (1968:135).

At this point Elders might respond that reliable whole rock K/Ar ages have been obtained from many thousands of rocks *outside* Grand Canyon (for example, Elders 1998:13), but the question has not been answered. Dalrymple and Hamblin (1998) no longer regard the 1.16 million year age as correct, but they believe the Toroweap Lava Dam is significantly younger. Rugg and Austin (1998) reported "excess argon" from 3 mineral concentrates made from the basalt at Lava Falls. At Toroweap Lava Dam, olivine, a mineral known for very low potassium, possesses significant quantity of argon, giving a K/Ar "age" of  $20.7 \pm 1.3$  million years (Rugg and Austin 1998:478). Again, *discordance* is discovered with evidence of "excess argon." A NCSE rafter who is familiar with these data and is "thinking critically" might ask the ultimate question, "Has the basalt been accurately dated by the K/Ar method?" Data seem to challenge the "zero-original-argon" assumption made by the popular K/Ar dating method.

## CONCLUSION

Elders offers a significantly flawed critique of both the quantity and quality of creationist research at Grand Canyon. He consistently trivializes creationist research, demonstrating significant ignorance of the data and interpretations that creationists have published. Good scholarship requires that he obtain this proficiency. The book *Grand Canyon: Monument to Catastrophe* reports at least 8 creationist research projects, not just 5 as claimed by Elders. Creationists measured many more than 12 nautiloid fossils at Nautiloid Canyon. Creationist study of Grand Canyon as a geographic barrier to small mammals involves more than study of 94 squirrel skins. Observations of fossil vertebrate trackways by creationists have a prominent place in peer-reviewed literature that cannot be ignored. Creationists have measured many more than 5 radioisotope ratios in Grand Canyon rocks.

Elders needs to come to grips with the fact that creationists have a continuing research program at Grand Canyon. Compared to government-subsidized research, creationist research may seem modest. However, that is no reason to trivialize it.

Elders, in his overview, strenuously objects to creationist interpretations of geology at Grand Canyon, but in his specifics, he is reticent to give details. What is his interpretation of Nautiloid Canyon, Grand Canyon's most prominent fossil deposit? How does Elders respond to details concerning the character of fossil vertebrate trackways in the Coconino Sandstone? What is his explanation offered to discordance of ages often encountered in the dating of Grand Canyon rocks? Will Elders gain competence in basic creationist literature? Elders will need to acquire proficiency in responding to questions like these if he is going to play a significant part in the NCSE creation/evolution raft trip this August in Grand Canyon. Participants in the NCSE raft trip will be committing a significant amount of their personal resources to this rafting activity. They should be concerned about getting their money's worth.

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# WILFRED ELDERS REPLIES

## CREATIONIST SCHOLARSHIP AND THE GRAND CANYON OF ARIZONA

I thank Dr Steve Austin of the Institute for Creation Research (ICR) for his prompt response to my article "Bibliolatry in the Grand Canyon" and appreciate this opportunity to reply and extend my remarks about the ICR textbook on the Grand Canyon (Austin 1994). Austin indicates that his aim is to help the NCSE develop a better understanding and appreciation of creationist materials, especially creationist research. Better understanding is sorely needed. However, the outcome may not be what Austin hopes; understanding could lead to less appreciation of creationist research.

### BIBLIOLATRY

Austin is concerned that, in using the term "bibliolatry", I accused his book of biblical literalism. It is true that this was the impression I got from reading it. Austin (1994) is replete with quotations from the King James translation of the Christian Bible and has an index with 131 citations to that version of scripture. It is clear that Austin reads Powell's "rock-leaved bible of geology" in the Grand Canyon through the distorting lenses of biblical literalism. This appears to be a requirement of Austin's position on the faculty of the Institute for Creation Research. For example, consider the edict of Dr Henry M Morris, the founder and President Emeritus of the ICR, who posits, "...the main reason for insisting on the universal flood as a fact of history and as a primary vehicle for geological interpretation is that God's Word plainly teaches it! No geologic difficulties, real or imagined, can be allowed to take precedence over the clear statements and necessary inferences of Scripture" (Morris 1970).

Austin faithfully follows this injunction. For example, Austin (1994:3) states, "If the evidence of Grand Canyon fits with Noah's Flood, why have not the majority of scientists recognized it? The answer to this can be found in II Peter 3:5,6 where we read, 'For this they willingly are ignorant of, that by the Word of God the heavens were of old, and the earth standing out of the water and in the water: Whereby the world that then was, being overflowed with water, perished'. The Bible teaches that people are willingly ignorant — that is, they deliberately reject the evidence." The irony of using theological bibliolatry to justify geological bibliolatry seems to be lost on Austin.

### BURDEN OF PROOF

Austin's opinion is that, because I have not read *all* of the publications on creationist research related to the Grand Canyon footnoted in Austin (1994) or published since, I have no right to criticize the quantity and quality of that research. On the count of not having read all that creationist literature, I plead guilty as

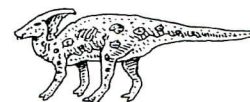
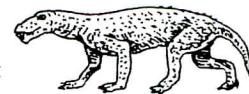
charged. However, I believe that I have read sufficient of it to conclude that this corpus of work falls far short of proving Austin's assertion that Noah's flood formed all Phanerozoic rocks and that the Grand Canyon formed in the aftermath of that deluge.

Certain important concepts are so well established today that they form the bases from which contemporary science proceeds. Examples that come to mind include the periodic table in chemistry, the expanding universe in astronomy, organic evolution in biology, and the geologic time scale in earth sciences. Those seeking to reject these concepts must document startlingly new and convincing observations or experiments to support their iconoclasm. The ICR textbook on the Grand Canyon, in common with other modern creationist effusions, rejects both organic evolution and the geologic time scale.

Today the reaction of most working geologists to such contemporary biblical literalism ranges from indifference to wry amusement. This is despite the fact that bibliolatry had had a respectable history in the western world for 2 millennia. During most of that time biblical literalists also propounded the concepts of the flat earth and the earth-centered universe. In spite of the fact that the intellectual battles against those ideas were fought and won by Magellan's circumnavigation in 1520-22, the publication of the Copernican System in 1540, and Galileo's observations of the heavens by telescope in 1610, flat-earthers and geocentrists persist even today (Scott 1997).

As readers are aware, the story of Noah's flood has been an important icon in the western world (Cohn 1996). However, by the first half of the 19th century the rise of scientific geology played the death knell of the idea that the earth began only in 4004 BCE and that the next most important event in earth history was the worldwide deluge of Noah (Gillispie 1959). More than a hundred years later, the discarded idea of Noah's flood of old suffered a reincarnation with the publication of *The Genesis Flood* by Whitcomb and Morris (1964). This "neocreationism" movement attempted to supply a new "scientific" basis for the Noachian flood to justify biblical literalism. Austin (1994) is firmly in that mold. I have only to remind readers of Austin's astounding claim (Austin 1994:147), "[i]t is not clear whether the order of appearance of organisms in Grand Canyon, or anywhere else on earth, for that matter, is necessarily any different than a random order which a flood might produce", to illustrate the biblical blinkers which Austin wears. In one sentence he discounts the whole science of paleontology.

Given the wealth of information available now, the burden of proof is on Austin as he seeks to use the Grand Canyon to re-establish a once-dominant view that has been overturned consistently by an enormous body of scientific evidence during the last two centuries. Today, for creationist publications such as Austin's (1994) to get sufficient attention from main-



stream geologists to cause a revolution in their fundamental concepts would require credible documentation of abundant new, dramatic, and multidisciplinary findings and interpretations. Such scientific revolutions do happen, as anyone familiar with the rise of the theory of plate tectonics in the 1960s is aware (Hallam 1973).

#### A REVOLUTION IN SCIENCE?

Perhaps an even more relevant example, albeit on a lesser scale, of a revolution in geology is one discussed at length in Austin (1994:46, 94, 104-6) — the flood origin of the Channeled Scabland, a large area near Grand Coulee, in eastern Washington state. Geologists now interpret the dramatic erosional features of that region as having been formed during repeated catastrophic draining of a large periglacial lake, Lake Missoula, in Montana, dammed at the front of the continental ice sheet, during the waning stages of the last Ice Age. However, when Bretz originally proposed the idea in 1923, it was met with skepticism by many geologists (see Bretz 1969). Debate continued for 20 or 30 years until the mounting evidence brought forward by Bretz and his colleagues won the day. The history of this controversy is well documented in Baker (1978).

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ences between the geological formations in the Channeled Scablands and the Grand Canyon. Heaton (1995: 35) states, "The narrow inner gorge of the Grand Canyon and its equilibrium tributaries are the antithesis of the broad flood plain, multiple overflow channels, and gigantic 'ripple marks' of the Channeled Scabland. It would be hard to imagine two canyons more geomorphically dissimilar to one another."

There is a major irony here in using the work of my friend and mentor "Doc" Bretz in support of biblical literalism. It was in discussions with him that I first became interested in the neocreationist movement, shortly after the publication of Whitcomb and Morris (1964). Although the controversy over his work on the Channeled Scabland was protracted, Bretz regarded it as a good example of the self-correcting nature of mainstream science. Creationists subscribing to the views of the President Emeritus of the ICR (Morris 1970) cannot correct the Genesis

story, no matter what scientific evidence is produced. Had "Doc" survived to see the publication of Austin (1994) I am sure that his comments would have been pithy and devastating to the creationists' misuse of his work.

#### CREATIONIST RESEARCH PUBLICATIONS

Austin's main objection to my article is that I overstate the dearth of such new revolutionary findings by creationists in the Grand Canyon. He alleges that my assessment that the quantity and quality of creationist research at Grand Canyon is poor derives from my unfamiliarity with the literature of creationist geology. I am happy to concede that he knows that literature better than I and am therefore grateful to him for pointing out that Austin (1994) mentions 8 examples of "original creationist research" rather than only the 5 discussed in my review.

Publications on creationist research are easily overlooked by mainstream scientists. Creationists publish relatively little and tend not to publish in journals that geologists are likely to read. For example, the library of the University of California, Riverside, has holdings in excess of 1.5 million volumes. However, many of the publications which Austin finds important enough to cite, such as the *Proceedings of the International Conference on Creationism*, *Origins*, and the *Creation Research Society Quarterly (CRSQ)* are not included in these holdings. The *CRSQ* is not even cited in GEOREF, the standard bibliographic search engine for geological literature. Another problem in doing bibliographic searches of the creationist literature is that several leading creationists use aliases. For example, Austin also had published under the name of Stuart E. Nevins, Paul Nelson publishes under the name of Peter Gordon, and the real name of John Woodmorappe is Jan Peczkis.

GEOREF has 11 entries for Steven A. Austin published since 1971, including his Master's thesis and PhD dissertation. Among the remaining 9, 6 are abstracts presented at meetings of professional geological societies, including Austin and Wise (1995). I chose not to mention that interesting abstract in my review for 2 reasons. First, it makes no mention of Noah's flood and so its relevance to the biblical literalism of Austin (1994) was not explicit. Second, the shelf-life of an abstract is very short. After the passage of almost 4 years since the abstract appeared, it seemed reasonable to assume that either the authors or the journal editors have concluded that the material did not warrant further publication.

What is the message here? Does the fact that creationist science tends to be published only in creationist journals, or as abstracts at meetings, mean that there is a conspiracy by the editors of mainstream science publications to prevent dissemination of new, controversial or revolutionary ideas? I think not. Remember that during the plate tectonic "revolution", the key papers appeared in major international scientific journals (Hallam 1973). Similarly

Bretz's controversial work on the Channeled Scablands was published in widely circulated publications (listed in Baker 1978). Good new science, even if controversial, eventually gets published in major journals and, having withstood the rigors of peer-review, thus joins the mainstream. In a similar vein, Austin complains that, "Compared to government-subsidized research programs, creationist research may seem modest". As I made clear, my opinion of creationist geological research is that, in fact, it *is* modest. However, "government-subsidized" research grants and contracts are awarded in a highly competitive funding milieu. Austin and his associates are as free to enter that competition as I have been. Just as good new science eventually gets published in mainstream journals, good new proposals eventually get supported by mainstream funding agencies.

A notable exception to my generalization that creationists tend to publish only in creationist venues are the experiments of Brand on trackways made by newts in an aquarium (Brand and Tang 1991). Some of the publications on this topic are published in widely disseminated journals. The issue here is not the quality of the experiments but rather their applicability to explaining trackways in the Permian Coconino Sandstone in the region of the Grand Canyon. Brand concludes that his work shows that at least part of the Coconino Sandstone was deposited under water. On the other hand, Lockley and Hunt (1995), Loope (1992), and Middleton and others (1990) conclude that the trackways were formed under subaerial conditions, consistent with the nature of the sandstones in which they are found (McKee 1979). In any case, even if could be proved that these sandstones were partially deposited under water, it is a long (and, in my opinion, invalid) extrapolation from Brand's laboratory aquarium to Noah's flood.

Let us examine the publication history and scientific impact of Chadwick (1978), one of the 3 examples of creationist research related to the Grand Canyon which Austin adds to those in my review. It concerns the boulder beds of Precambrian Shinumo Quartzite, locally developed at the base of the Tapeats Sandstone, immediately above the Great Unconformity. The Tapeats Sandstone is the lowest member of the Tonto Group, a sandstone-shale-limestone sequence of Cambrian age. Middleton and Elliot (1990) devote 4 pages to the depositional setting of this formation and cite more than 10 references in mainstream publications in support of their interpretation. The Tapeats Sandstone was deposited above a Precambrian surface that is extensively weathered and had developed considerable relief. They suggest that the basal conglomerate (the megabreccia of Chadwick 1978) was almost certainly deposited by erosion of cliffs of the Precambrian rocks by storm waves, and that the overlying sandstone was formed as beach and tidal flat deposits.

The publication by Chadwick (1978) cited by Austin, on the other hand, interpreted the basal conglomerate in the Tapeats Sandstone as being formed

in much deeper water by catastrophic debris flows, consistent with Noah's flood. Evidently this work has had zero impact on mainstream geology as it receives no mention in the extensive review by Middleton and Elliot (1990). If, as Austin (1994:67-70) asserts, the Tapeats Sandstone was formed as the first deposit of Noah's flood, we might expect it to contain a fauna and flora representing the abundant life he claims existed on earth before that deluge. However, except for trace fossils, the Tapeats Sandstone is poorly fossiliferous, but it contains brachiopods and trilobites sufficient to establish it as being of late Early Cambrian age. More recently Chadwick and Kennedy have returned to promoting the theme of Chadwick (1978). They have presented abstracts which essentially repeat the same material each year at scientific meetings (1995-98). I look forward to evaluating their work, if ever it enters the formal literature. Meanwhile these abstracts can be read at <[www.tag-net.org/gri/w/ekennedy/geology.htm](http://www.tag-net.org/gri/w/ekennedy/geology.htm)>.

### QUALITY OF CREATIONIST RESEARCH

As Austin added 3 more cases of creationist research on the Grand Canyon to my list, I will return the compliment by adding to his. As part of his laudatory reviews of important creationist research since 1965, Austin's colleague at ICR, Dr Duane T Gish (1989) highlighted the research of Waisgerber and others (1987) at the Grand Canyon. For me this work exemplifies the quality of original creationist research; so it is worth examining in detail. These authors studied the supposed contact between the Cambrian Muav Limestone and the overlying Mississippian Redwall Limestone on the North Kaibab trail in the Grand Canyon (*See Figure 1 of Elders RNCSE 1998; 18[4]: 9 for the stratigraphy of the Canyon*). Having decided that these 2 formations are interbedded and grade into each other, the authors concluded that the 200-million-year hiatus between Cambrian and Mississippian strata did not occur at that site and therefore that the whole geologic column is fictitious. This claim, if substantiated, would definitely constitute a revolution in geology and justify numerous publications on the issue. Instead, the next publication on this topic was published 9 years later. It was a letter to the editor of *CRSQ* severely critical of the work (Moore 1996).

How good are the original observations by Waisgerber and others (1987)? They spent two days examining the outcrop, with the aid of 5-power hand lens. Rather than relying on their own examination of the Canyon's walls, they used a National Park Service sign to identify the location and nature of the supposed unconformity between the Cambrian and Mississippian strata. This sign may, or may not, have been correctly sited by the Park staff. Instead of using macro- or micropaleontology, petrology, geochem-

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istry or geophysics, they relied on the color and texture of the rocks to distinguish between Cambrian and Mississippian strata. The color of the Redwall Limestone is actually quite variable. It has acquired a superficial staining produced by oxides of iron washed down from redbeds in the overlying Supai Group (Beus 1990: 119-20). This creationist research appears not to have considered that they misidentified the Cambrian/Mississippian contact or that Mississippian dolomite could be filling channels or karsts, etched into the surface of the Cambrian dolomite.

Suppose 3 creation scientists heard that a good time to view Jupiter's moons is when Jupiter is visible in the western sky, but when they went out with low-power binoculars on 2 different nights they failed to see any of the moons. Suppose too that they published, in a leading creationist journal, a paper which concluded that, because Galileo was wrong, the Copernican system is wrong and we should all return to biblical literalism and geocentrism. I would respond by helping them to recognize Jupiter and lending them a telescope at least as good as Galileo's.

The paper by Waisgerber and others (1987), with its stamp of approval by Gish, is at that level. It is a superficial study of a single outcrop, and concerns a minor problem, which they considered entirely outside of its regional or global context. They then proceeded to extrapolate wildly from their observations. Having exposed geology's dirty secret, they offered it as proof that the entire geologic time scale must be rejected, and be replaced by their version of biblical chronology. Although more sophisticated and detailed, Austin (1994) is another failed attempt to achieve the same end.

#### RADIOACTIVE DATING

Austin pays great attention to radioactive dating because it is the Achilles heel of young-earth creationists. Although he emphasizes any perceived discrepancies in radiometric ages published by different workers, he provides no satisfactory explanation of his willful misuse of radioactive dating in the Grand Canyon. Although he had earlier admitted that the Rb/Sr isotopic data from the Pleistocene basalts yield a false isochron (Austin 1988), he later used the same approach to publish what he knew to be geologically impossible results (Austin 1994: 124-5) and posed the rhetorical question (Austin 1994: 129), "Has any Grand Canyon rock been successfully dated?" Ilg and others (1996) used U/Pb ratios to date the oldest rocks of the Grand Canyon and found that different units had ages ranging from 1750 to 1660 million years. Larson and others (1994) used Rb/Sr data from the Cardenas Basalt to determine an age of 1103 million years. Dalrymple and Hamblin (1998) measured K/Ar ratios to obtain ages in the range 0.684 to 0.443 million years for the Pleistocene basalts. If Dr Austin has credible data which refute the order in which these rocks were formed, or which even change these numbers significantly, I urge him to publish

them in full in a major scientific journal. I would be happy to assist him by reviewing the manuscript.

#### CONCLUSIONS

The gulf between Austin's position and mine is irreconcilable. Austin carefully ignores many of the other important issues raised by my review. For example, his use of uniformitarian strawmen, the robustness of the worldwide geologic column and the geologic time scale, the thermal problem if granites were formed on the third day of creation, the order of occurrence and the space problem of fossils, are ignored in Austin's critique.

Austin asserts that I trivialize creationist research in my review, whereas I protest that he seeks to aggrandize it. I thank him for his input and can now amend the list of original creationist research projects on the Grand Canyon from 5 to 8, or even 9, if we include one or 2 which even some creationists might disavow. My response to his complaint that I trivialize creationist research is that I do not need to do so. Creationist research speaks for itself, in a tiny voice which falls far short of causing a revolution in the paradigms of science.

Finally, Austin is concerned that my lack of proficiency in creationist geology will prevent participants in the NCSE creation/evolution raft trip through Grand Canyon in August 1999 from getting their money's worth. In reply, perhaps I might be allowed to follow Austin's (1994) example and use a selective quotation from the King James Bible: "...many shall run to and fro and knowledge shall be increased" (Daniel 12:4). I am confident that the rafters will get value for their investment from the grandeur of the Grand Canyon itself, rather than from my words, or those of Austin. The Grand Canyon speaks for itself and in its own voice, a voice of colorful canyon walls, of whitewater rapids, and the awesome nature of geologic time.

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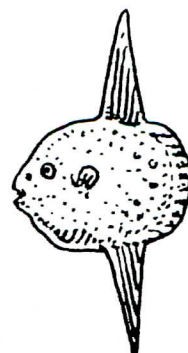
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# Equal Time for the Origin of Granite – A Miracle!

Lorence G Collins

## INTRODUCTION

Creationists continue to push for equal time in science classrooms to teach that the Genesis stories in the Bible are valid scientific interpretations of earth history. Equal time for creationists' interpretations is not likely to occur in secular universities and schools, but if the creationists are serious about equal time, then they should be open to granting equal time in their private Christian schools for presentations of both sides of a scientific issue — a literalist biblical view and the modern science view. The origin, age, and other characteristic features of granite are such issues deserving equal time.

The Bible says that the dry land was created on Day 3 of the Genesis Week (Genesis 1:9-10), and presumably this is the time during which granite in continental masses was formed. However, Gentry (1988, p 129-3, 184-5) says that granite was formed both on Day 1 and Day 3 and that granite from both days can be mixed. He also claims that after Day 3, granite magmas must crystallize as rhyolite (the fine-grained volcanic equivalent of granite), rather than coarse-grained granite, and that granites penetrating the Flood deposits result from upheavals of solids but not magma.

Austin (1994) states that the majority of conservative Christian scholars, including Henry Morris, believe that the earliest rocks formed on Day 1. He interprets these to include the Vishnu schists of the Grand Canyon into which the Proterozoic Zoroaster granites were intruded on Day 3, when land and sea were separated. If I were given equal time in a science classroom at a private, fundamentalist, Christian college or secondary school which advocated young-

earth creationist views, I would provide the following material and information regarding the formation of granite. This would allow students to compare a modern scientific interpretation of granite with the corresponding creationist biblical interpretation of granite being formed primarily in the Genesis Week.

## MODERN SCIENCE'S INTERPRETATION OF GRANITE

**Origin.** Geologists recognize several possible origins for rocks classified as granite(s) which depend upon the processes that operate on the rock systems. However, geologists agree that all granites form *below* the earth's surface. Some granites form (1) by magmatic processes — a crystallization of magma (melted silicate rock) — with the final form dependent upon crystal settling and the order of crystallization of minerals, (2) by melting of sedimentary rocks whose chemical composition is the same as that in granite, (3) by partial melting of rocks in which the first minerals to melt have the composition of granite; and finally, (4) by chemical replacement processes (Hyndman 1985; Clarke 1992; Collins 1988; Hunt and others 1992). Discussion of these different origins could be expanded here, but it is sufficient to say that modern scientific studies show that granite is formed in many different ways, and these ways contrast with the creationists' model in which granite has a single origin, being created nearly instantly by "fiat" (for example, Gentry 1988).

**Mineral and chemical composition.** In a general sense "granitic rocks" range in composition from true granite that is rich in potassium and silica to other coarse-grained igneous rocks, such as granodiorite, quartz monzonite, diorite, tonalite, and even gabbro, which are progressively less rich in potassium and silica and richer in iron, calcium, and magnesium (Hyndman 1985). This range in composition is recognized by Gentry (1988), but his emphasis is on biotite-bearing granite that contains Polonium (Po) halos, and, therefore, the same emphasis will be used in this article. For a discussion of Po halos, see also Collins

*Lorence Collins is a professor of geology (emeritus) at California State University, Northridge and is a practicing Christian. He maintains a web site with additional articles that oppose creationism; see: <<http://www.csun.edu/~vcgeo005/creation.html>>.*

(1988), Hunt and others (1992), and <<http://www.csun.edu/~vcgeo005/revised8.htm>>. Nevertheless, the reader can substitute the broader term "granitic rocks" that include the above compositional range in most places in this article where granite is mentioned without being in conflict with Gentry (1988).

True granite is not a pure substance but a mixture of several different silicate minerals and oxides (Clarke 1992). In the true sense it commonly consists of about one-third quartz, one-third potassium feldspar, one-third plagioclase feldspar, minor amounts of iron- and magnesium-bearing biotite (black mica), and traces of various accessory minerals, including zircon (mentioned later). In addition to biotite, other varieties of true granite may contain small amounts of other iron- and magnesium-bearing silicates or muscovite mica, but biotite granite is the most common variety. In all true granites, however, quartz and feldspars are the dominant mineral species, making the rock white, light cream, or pink, but speckled with one or more of the dark iron-bearing minerals.

**Liquid characteristics.** In the field, granite can be seen to intrude into other rocks and in some places to exhibit flow banding, both of which are characteristic of moving liquids or plastic solids. Furthermore, in many places fragments of older rock along the walls of a granite body are broken off and enclosed in the granite as inclusions of large or small size, adding further evidence for the liquid origin of the granite body when it was first formed. Finally, if a granite body has a liquid origin, it should have the capability of mixing with other liquids, such as basalt magma, and this mixing is evident, for example, in Maine (Wiebe 1996) and in other parts of the world (cited in Wiebe 1996). Gentry (1988, p 185) also allows for mixing of magma but disregards the physical characteristics of magma, such as its heat capacity and cooling rates that are discussed in a later section.

**Order of crystallization.** Experimental work in which natural granites are melted in the laboratory shows that a granite in a liquid state would be a water-bearing silicate melt (magma) at temperatures as high or higher than 900°C (Huang and Wyllie 1981). When this silicate melt is cooled and crystallized to become granite, not all of its various minerals crystallize at the same time, but each forms in a specific range of temperatures and in a definite order. The iron-, magnesium-, and titanium-bearing silicates and oxides crystallize at relatively high temperatures whereas the feldspars form at lower temperatures, and quartz is the last to crystallize near 550-650°C, depending upon pressure and other components. This order of crystallization is consistent world-wide regardless of whether the granite is Precambrian in age or younger or whether the granite is attributed to be formed on Day 1 or Day 3.

**Evidence for high temperatures of natural granites.** Geologists find evidence for the high-temperature crystallization of a granite body by using what are called "geologic thermometers". For exam-

ple, in an experiment, biotite mica and garnet are crystallized simultaneously from melts. The results show that iron and magnesium atoms are partitioned from the melt into these 2 minerals in different ratios and that these ratios will differ depending on temperature and pressure conditions (Ferry and Spear 1978). By measuring these ratios in biotite and garnet found together in natural granites and comparing them with ratios obtained at different temperatures and pressures in the experimental work, geologists find that the temperatures for the final crystallization of these two minerals in natural granites are commonly higher than 700°C — the presence of certain minerals or combinations of minerals provides a standard or scale for measuring temperature, that is, a sort of geological thermometer. Garnet is not common in granite, but "two-feldspar" and "magnetite-ilmenite" are 2 other common "geologic thermometers" used to measure temperatures in granites. These thermometers also have experimental support, and both mineral pairs give similar high temperature values for the crystallization of granite (Bohlen and Lindsley 1987; Hyndman 1985).

Further evidence of the high-temperature origin of granite is the contact metamorphic aureole that occurs in sedimentary rocks where they are intruded by granite magma. The minerals found in sediments are generally stable near 25°C and one atmosphere of pressure and result from weathering processes at the earth's surface. When these minerals are heated to temperatures approaching those of an adjacent hot granite magma, some (such as quartz) will remain as the same mineral but will recrystallize and increase in size while others will form new minerals that are stable at higher temperatures and pressures. For example, fine-grained fossil-bearing limestones that consist of calcite (calcium carbonate), which are intruded by granite magma, commonly recrystallize as coarse-grained calcite marbles; in this process the fossils are destroyed as the tiny calcite crystals in the fossils grow in size.

On the other hand, sedimentary shales, consisting mostly of aluminum-rich clay, are recrystallized to form other aluminum-rich minerals, some of which are stable at the highest temperatures closest to the granite contact; others are stable at intermediate temperatures at greater distances away; and still others are stable at lower temperatures at even farther distances from the contact (for example, Pitcher and Berger 1972; Holtta 1995). Such features of high-temperature contact-metamorphism of sedimentary wall rocks, called aureoles, are found world-wide around most granite bodies of large size and range from a few to a thousand meters wide or more. Their existence supports the concept that these granite bodies were intruded as a very hot magma. If Gentry (1988, p 185) wishes to have the metamorphic aureole be

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**True granite  
is not a pure  
substance, but a  
mixture of several  
different...  
minerals.**

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formed by hot fluids associated with solidified granite, then these hot fluids should also have caused the granite to produce lower-temperature minerals like that found in the aureole, and that is not the case.

**Age of Granites.** The field evidence supports the concept that not all granites are formed at the same time as other rocks with which they may be adjacent and that some granite bodies are younger in age than other granites. The fact that granite bodies intrude other rocks (by filling in cracks, for example, to form dikes) indicates that the other rocks

are older in age than the granite. The intruded rocks have to be there first before the granite can cut through them. In some places granite masses of one type cut across other granite bodies, which also shows that some granites are younger than others. The fact that granites also have several possible different origins, as described earlier, also implies different ages for granite.

For example, if some granites are derived by melting of sediments, erosion of a continental land mass must occur first to produce the sediments.

Then, the sediments must be deeply

buried, and a strong heat source must be found before the granite can be formed from them. Although Gentry (1988, p 133, 184-5) allows for granite to be formed both on Day 1 and Day 3, the field evidence shows that the mixing of granites of 2 different ages is not by faulting or intrusion of solid rock into solid rock during earth upheavals but only by mixing of 2 "granitic" liquids or by penetration of a "granitic" liquid into a solid. As indicated in the previous sections, this liquid must be in the form of hot magma.

Furthermore, additional age and hot-liquid-origin relationships can be seen for granites that are supposedly formed in Day 3 but cut the Noachian Flood deposits and, therefore, are younger than Day 3. For example, Precambrian granite bodies in the bottom of the Grand Canyon in Colorado have an erosion surface on which the horizontal, Paleozoic, fossil-bearing sediments are deposited, with the Cambrian Tapeats sandstone at the bottom and the Permian Kaibab limestone at the top (Elders 1998). The eroded surface indicates that these granites are older than these sediments, the so-called "Noachian Flood" deposits. On the other hand, the Donegal granites in northwest Ireland intrude and enclose inclusions of sedimentary rocks of Cambrian age, illustrating that the granites are younger than the Cambrian deposits, whose contacts with the granites have a high-temperature metamorphic aureole (Pitcher and Berger 1972). This field evidence shows that the sedimentary rocks are not faulted into the solid granites but enclosed in the granites when the granites were hot magma.

The same kinds of metamorphic contact-relationships are found in the granites that intrude fossil-bearing sediments in Maine, Connecticut, and Rhode Island (Harrison and others 1983). The Narragansett

Pier granite in Rhode Island surrounds inclusions of Pennsylvanian metamorphosed sediments containing flora fossils, *Annularia stellata* (Brown and others 1978). The flora fossils are now totally carbonized as graphite, indicating the high temperature of the granite body that metamorphosed the sedimentary inclusions. The fact that the granite contains inclusions of these fossil-bearing sediments makes the granite younger than these supposed "Flood" sediments.

The Sierra Nevada granite intrusions in California also have intruded and metamorphosed supposed "Flood sediments" in roof pendants containing Ordovician graptolite fossils (Frazier and others 1986) and Pennsylvanian brachiopod fossils (Rinehart and Ross 1964; Rinehart and others 1959). In other places, the Sierran granites have intruded and metamorphosed "Flood sediments" containing Triassic ammonites (coiled cephalopods; Smith 1927). A granite in the Mojave desert in California near Cadiz intrudes Cambrian limestone containing stromatolite fossils. At the contact, this limestone is converted to marble with high-temperature metamorphic minerals, but remnants of the stromatolites can still be found (Richard Squires, oral communication 1998). Thus, it is very clear from the above examples that some granite masses are the same age as or even younger than the "Noachian Flood" deposits.

Absolute ages of granite bodies, rather than relative ages, can be obtained by using various radioactive isotopes; that is, uranium-lead (U/Pb), potassium-argon (K/Ar), and rubidium-strontium (Rb/Sr) age-dating techniques (Dalrymple 1991). For example, trace amounts of uranium and lead are dissolved in the granite melts. Uranium and lead ions have entirely different chemical characteristics, and they normally crystallize in entirely different minerals. Because the uranium ion is about the same size as the zirconium ion, uranium will substitute for zirconium and crystallize in zircon, but the lead ion goes elsewhere, commonly in potassium feldspar, as the granite magma crystallizes. But the isotope of uranium ( $^{238}\text{U}$ ) is radioactive and eventually decays to form lead ( $^{206}\text{Pb}$ ). When the granite first crystallizes and the radioactive uranium enters the zircon crystal (devoid of  $^{206}\text{Pb}$ ), the clock is set and "ticking," and the uranium is constantly breaking down, eventually to produce new lead ( $^{206}\text{Pb}$ ) atoms trapped in the zircon crystals.

Because this U/Pb decay-scheme is a constant, the ratio of uranium to lead in zircon populations in granite can be used to determine the age of a granite. World-wide the absolute ages of various granite bodies are consistent with the relative ages described above (Dalrymple 1991). For example, granites in the bottom of the Grand Canyon give Precambrian ages of 1740 - 1710 and 1700 - 1660 billion years, younger than 2 different units of Vishnu schist with ages of 1750 and 1742 billion-years-old (Ilg and others 1996), which the granites intrude, and older than the overlying "Noachian Flood" deposits of about 540 million

*continued on page 27*

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## The fact that granite bodies intrude into other rocks ... indicates that the other rocks are older than the granite.

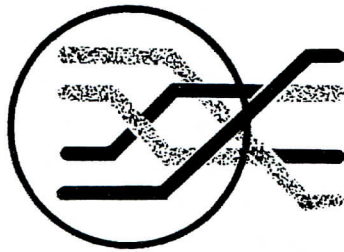
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# NCSE Recommended Policy Statement on Science and Evolution

Science is a way of knowing about the natural world. Scientific understanding depends on observations, hypotheses, and theories. Observations are features and processes in the natural world that we can see, hear, touch, or detect in other ways; hypotheses are questions about the natural world that we can test; theories are explanations of the natural world that are based on observations, tested hypotheses, and logic. Familiar examples are the theory of gravity, the germ theory of disease, the theory that matter is composed of atoms, and the theory of evolution.

Theories are the backbone of science, and are continually tested and refined (and, rarely, replaced) on the basis of new data and new ways of looking at nature. Evolution is a well-accepted theory that explains how the universe — stars, galaxies, the planet earth, and life on earth — has changed over time. It is a cornerstone of much of science today and is critical to a full and complete understanding of the life and earth sciences. Students will not be truly educated and scientifically literate unless they learn about evolution. Tomorrow's scientists, engineers, physicians, farmers and foresters must understand evolution when they are finding ways to explore for minerals, or to manage insect pests, disease epidemics, crops and natural resources.

Religion is also a way of knowing about the world, both the natural world and the supernatural world. Religious beliefs are based, at least in part, on faith, and thus are not subject to the same kinds of tests and refinement as scientific observations and theories are. Beliefs that a supernatural being[s] or forces specially created the Sun, the Earth, and the



plants and animals are found in various of the world's religions, including, for example, many Native American religions, several African religions, and some of the forms of Christianity.

By definition, these explanations of origins are outside of science, since they presuppose supernatural forces, and they cannot be changed by new data. It would be inappropriate for science teachers to analyze these descriptions, however, or subject them to the tests of science. Such views may be discussed in classes such as history and literature, though teachers must maintain religious neutrality in the classroom and cannot advocate any religious explanations as correct, true, or factual.

In every subject, including science, the role of the teacher is to instruct, not to indoctrinate: students are free to accept or reject what they are taught in any subject, but they must learn the subject matter to obtain credit for the course. While it is important to treat students' religious views with sensitivity, information should not be avoided because of possible objections by some students or parents. When students express concern that course content appears to differ from religious views, they should be advised to discuss such issues with parents or clergy.

Therefore, it is the policy of the \_\_\_\_\_ School District that evolution will be taught in the same way as other scientific theories, as the currently accepted view of the scientific community. In science classes, as in all subjects, teachers should maintain appropriate sensitivity to students' religious and philosophical views; evolution should not be singled out for special treatment.

# NCSE EXCLUSIVES

## BOOKS

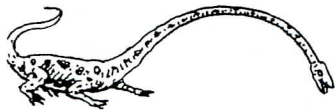
### **Reviews of Creationist Books**

edited by Liz Rank Hughes.  
Authoritative scientific critiques of 40 popular "creation science" books. These are the books that are most often cited as "proof" for scientific creationism or suggested for classroom use. From children's books to the *Handy Dandy Evolution Refuter*, the answers are here. Paper, 147 pages. *List price \$10.00, member price \$8.00.*

### **Voices for Evolution**

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## MAGAZINES

Back issues of the *Creation/Evolution* journal are still available! *C/E* is filled with both scholarly and humorous rebuttals of standard and "emerging" anti-evolutionary arguments. Topics include "flood geology", claims that human and dinosaur tracks are found side by side near the Paluxy River, arguments that the depth of "moon dust" proves the earth is young, a review of "Intelligent Design" theory, and more. Issue 25 indexes the preceding issues. (*The complete table of contents is online at <<http://www.natcen-sci.ed.org/cecont.htm>>.*) A bargain at \$6.00/issue or \$150.00 for the complete set of 39 issues. Quantity discounts are available.

## AUDIOTAPES

### **The New Anti-Evolutionism**

This session of the 1993 annual conference of the American Association for the Advancement of Science was moderated by NCSE's Eugenie C. Scott. Panelist Michael Ruse, a philosopher specializing in philosophy of science, discussed "Non-literalist anti-evolution as in the case of Phillip Johnson". William Thwaites, a biologist who has extensively studied "creation science", presented "'Abrupt appearance theory' replaces creation science". Kenneth Miller, biologist and author of several biology texts, discussed "Evolution and the argument from design". Physicist Howard Van Till, author of *Science Held Hostage*, spoke on "Anti-evolution as a reaction to scientism". Anthropologist Jonathan Marks contrasted "Non-Darwinism and Anti-Darwinism". *3 cassettes, \$15.00.*

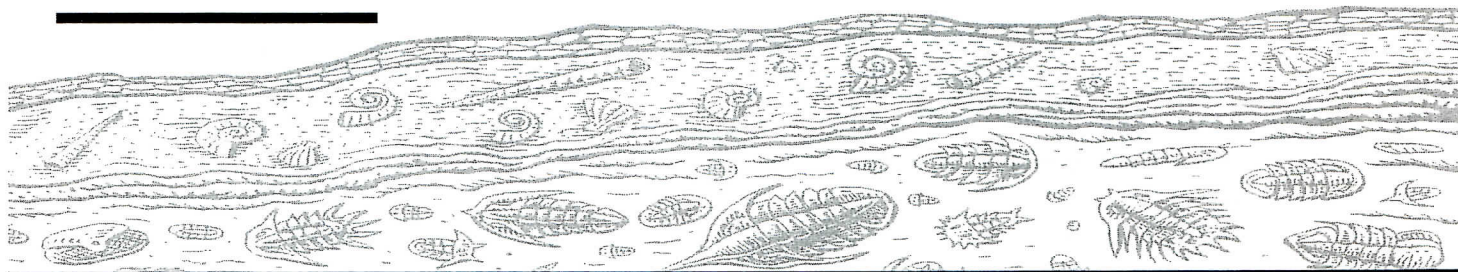
### **Anti-science/Anti-evolution**

In this session of the 1994 annual conference of the American Association for the Advancement of Science, moderated by Eugenie C. Scott, panelists discussed anti-evolution in the context of broader opposition to science. Paleontologist and NCSE Board President Kevin Padian discussed "The triumph of the creationist method". Francisco J. Ayala, drawing on both theological and biological expertise, asked, "Evolution and the Bible: What is the conflict?" Anthropologist Bernard Ortiz de Montellano discussed "Evolution and multiculturalism". Mathematician Norman Levitt described "Bewilderment and hostility in the postmodern attitude toward science". Eugenie Scott placed the other papers in the context of education today in her discussion of "Anti-science and anti-evolution". *1 cassette, \$5.00.*

## A black and white line drawing of a crocodile, shown in profile facing left. It has a long, patterned body, a long tail, and a wide, open mouth showing sharp teeth.

**Are debates the best way to educate the public and assure that evolution will be included in school curricula? No! Are these tapes a rich mine of information about “young earth creationist” arguments and (sometimes) snappy replies? Yes! (For a good explanation of the drawbacks of debates, read Awbrey & Thwaites’ article, “Our last debate: Our very last” in issue 33 of *Creation/Evolution*. Order yours today! )**

- 1977** San Diego State University biologists Frank Awbrey and William Thwaites debate Institute for Creation Research leaders Henry Morris and Duane Gish. *3 cassettes, \$15.00.*
- 1984** Georgia College biologist Kenneth Saladin debates ICR's Duane Gish. *Transcript, \$8.00.*
- 1987** Indiana State University biologist George Bakken debates ICR's Duane Gish. *Transcript, \$5.00.*
- 1988-a** Kenneth Saladin again debates ICR's Duane Gish. *2 cassettes, \$10.00; transcript, \$10.00.*
- 1988-b** The second 1988 Saladin/Gish debate. *Transcript, \$10.00.*
- 1989** William Thwaites debates Duane Gish. *3 cassettes, \$15.00.*
- 1989** Science teacher Frank Zindler and ICR's Henry Morris debate on Noah's Flood. *Transcript, \$4.50.*
- 1990** Science teacher Frank Zindler debates ICR's Duane Gish. *Transcript, \$5.00.*
- 1991** Biologist Fred Parrish debates ICR's Duane Gish. *Transcript, \$7.00.*



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# NCSE on the Road

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

**DATE** July 31, 1999  
**PRESENTER** Eugenie C Scott  
**CITY** San Francisco CA  
**TITLE** TBA  
**HOST** Freedom from Religion Foundation  
**EVENT** FFRF Annual Convention  
**LOCATION** Holiday Inn Civic Center, 8th St  
**TIME** TBA  
**CONTACT** Annie Laurie Gaylor, fttoday@mailbag.com

**DATE** September 14, 1999  
**PRESENTER** Eugenie C Scott  
**CITY** Berkeley CA  
**TITLE** TBA  
**HOST** Alternative Lifelong Learning  
**TIME** 3:00 PM  
**LOCATION** North Berkeley Senior Center  
**CONTACT** Fred Cummings, (510) 540-8368

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

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

**DATE** October 24, 1999  
**CITY** Denver CO  
**PRESENTER** Eugenie C Scott  
**TITLE** Problem Concepts in Evolution  
**HOST** Geological Society of America Annual Meeting  
**EVENT** Paleontological Society Short Course: The Evolution-Creation Controversy II: Perspectives on Science, Religion, and Geological Education  
**LOCATION** Denver Convention Center  
**TIME** 8:00 AM - 5:00 PM (Scott presentation at 3:30 PM)  
**CONTACT** Dr Patricia Kelley, (910) 962-3490

**DATE** October 24, 1999  
**CITY** Denver CO  
**PRESENTER** Kevin Padian  
**TITLE** Transitional Fossils  
**HOST** Geological Society of America Annual Meeting  
**EVENT** Paleontological Society Short Course: The Evolution-Creation Controversy II: Perspectives on Science, Religion, and Geological Education  
**LOCATION** Denver Convention Center  
**TIME** (Padian presentation at 9:15 AM)  
**CONTACT** Dr Patricia Kelley, (910) 962-3490

**DATE** October 26, 1999  
**PRESENTER** Eugenie C Scott  
**CITY** Denver CO  
**HOST** Geological Society of America Annual Meeting  
**EVENT** Symposium sponsored by the National Association of Geology Teachers:  
**TITLE** Teaching Geologic Time  
**LOCATION** Denver Convention Center  
**TIME** TBA  
**CONTACT** Dr. Martin Miller, miller@darkwing.uoregon.edu

**DATE** October 28, 1999  
**CITY** Ft Worth TX  
**PRESENTER** Eugenie C Scott  
**TITLE** Ancestors, Transitional Fossils, and Evolution  
**HOST** National Association of Biology Teachers  
**EVENT** NABT Annual Meeting  
**TIME** 8:30 - 9:45 AM  
**LOCATION** Tarrant County Convention Center, Theater  
**CONTACT** Alton Biggs, altonb@ix.netcom.com

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years for the Cambrian Tapeats sandstone at the bottom to the 225-million-year-old Permian Kaibab limestone at the top. The Narragansett Pier granite that contains 300-million-year-old Pennsylvanian flora fossils (Brown and others 1978) indicates that this granite is younger than the sediments, and this is confirmed by the U/Pb age-date from zircon populations of 273 million years (Zartman and Hermes 1987). And granites in the Sierra Nevada give Jurassic and Cretaceous ages of 66 to 208 million years old that are younger than the rocks (about 230 million years old) containing upper Triassic ammonites, which these granites intrude.

Occasionally, some granites give apparently anomalous isotopic "ages," and some Cenozoic basalts give an age greater than the 4.5-billion-year-age of the earth (Hedge and Noble 1971). These facts are commonly harped on by creationists who are critical of isotopic age-dating methods (for example, Austin 1994). But in these places, logical explanations suggest reasons why the dates are unusual. Close examination generally shows that, where unusual age "dates" are obtained from granite samples, other processes have affected the granite to cause the anomalous dates. For example, the granite may have been deformed and fractured so that fluids have entered and altered the isotopic ratios. Where granites have been dated by the Rb/Sr age-dating method, anomalous measurements are not unusual because of the susceptibility of rubidium and strontium to be added or subtracted by the movement of introduced fluids through fractures and deformed crystals. (Collins 1988; Hunt and others 1992).

The K/Ar age-dating method can also give values that differ from U/Pb age measurements because heat generated from the intrusion of another nearby igneous mass has allowed some of the argon gas to leak. In each of these places, the unusual or unexpected age dates are not a failure of the dating method, but an indication that other events have occurred in the geologic history of these rocks. See also a discussion and explanation of the anomalous age dates of basalts in the Grand Canyon and the reporting of more recent age-dating that gives results consistent with the geologic terrane (Elders 1998, p 13-4).

Geologists realize that *apparently* inconsistent "dates" can occur and seek to find out why they occur, knowing that the isotopic age-dating technique, itself, is not at fault. Should we re-evaluate the usefulness of radiometric dating then? By way of analogy, water-proof wrist watches that can be worn by scuba divers generally keep good time, but occasionally these watches fail and give faulty time. When that happens, an examination of the watch shows that it has been damaged so that a crack in the holding case has occurred, and water has leaked into the clock mechanism. The faulty time is not because the watch is improperly designed but because water has corroded the gears in the clock. On that basis, a person

does not conclude all clocks or watches are worthless, but such a conclusion is analagous to the creationists' suggestion that *all* radiometric be rejected.

Likewise, when isotopic age-dating of granites or other igneous rocks produces unexpected or illogical age dates, one does not throw out the whole system of isotopic age-dating. In some disturbed and deformed rocks, the "clock timing mechanism" has been "upset" by "corrosion" or some other factor, and the faulty date is a clue to the geologist to look for the cause. The primary reason for accepting the isotopic age-dating methods is because, in many places, world-wide, where several different kinds of isotopic age-dating methods have been applied to the same rock, all age determinations were found to be about the same (Dalrymple 1991). This equality of measured dates gives confidence that the isotopic age-dating methods are valid scientific procedures. The vastly different half-lives of the radioactive isotopes in each age-dating method and the completely different chemical characteristics of the isotopes make the arrival at the same age dates *not* a purely coincidental. The age dates must be controlled by physical laws that are *very* dependable.

**Heat capacity of granite.** Measurements can be made to determine the heat capacity of a block of granite at a given temperature and also to determine the rate of heat conduction as such a block cools from a higher to a lower temperature. Such laboratory measurements are commonly done by using a calorimeter, and they show that blocks of granite are very poor conductors of heat. If a body of granite magma had a surface area of 30 to 50 square kilometers and a depth of 20 to 35 kilometers (a typical size of a small granite body), the total amount of heat (calories) stored in such a granite mass at a temperature of 900°C is enormous, and heat conduction experiments show that the rate at which this heat is lost by conduction must be very slow. Calculations show that such a volume of granite magma would take several millions of years to cool down from 900°C to near 550-650°C, where it would totally crystallize, and then finally to cool to the 25°C temperature found at the earth's surface.

Pitcher (1993) estimates that a granite body, depending upon its size and depth of burial, cools no faster than 25 to 250°C per million years. This slow cooling is indicated by deeply buried granite magma still giving off heat in the Coso Range of east-central California, containing rhyolite flows (volcanic equivalent of granite); the residual heat is being utilized for steam generation and electrical energy (Bacon and others 1980). An even better example is the Kakkonda geothermal field in a Quaternary granite (younger than 1.1 million years old) that occurs in Japan. Drilling in this granite reveals temperatures of 500°C (Ikeuchi and others 1996). Finally, because many batholiths consist of multiple intrusions of dif-

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**[W]here unusual age "dates" are obtained, ... other processes have affected the granite to cause anomalous dates.**

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ferent granitic bodies and because many of the earlier-intruded bodies have completely solidified before subsequent intrusions have occurred, their heat capacities and slow cooling rates imply millions of years for such large volumes of igneous rocks to be formed.

Although the heat capacity of granite is emphasized in this section, similar problems for young-earth creationists are created by the heat capacity of basalt and the cooling rates of large masses of basalt in the oceanic basins. If this basalt were all deposited during the Genesis Week and in the supposed subsequent few thousand years until the present, it should not yet be solidified (see Strahler 1987, p 213-4).

#### LITERAL BIBLICAL INTERPRETATION OF GRANITE

When creationists make a literal interpretation of the Genesis accounts for the origin of granite (for example, Gentry 1988), they seek new data to support their views and ignore or explain away information that contradicts their views. The literalists accept the Genesis accounts as being accurate, only requiring "research" to support their interpretation. Again, creationists are selective in choosing only the scientific data that fit their model of creation and discarding everything else. This procedure is not characteristic of the scientific method.

The creationists' interpretation of granite, when applied to Genesis 1:9-10, is that all granite masses were formed on Day 3 and perhaps Day 1 of the Genesis Week (Gentry 1988, p 133, 184-5). Although Gentry suggests the possibility that the granite formed from melts, his suggested rate of crystallization is many, many times faster than natural laws would allow. Gentry (1988, p 130-1) says that after Day 3 granite magma would form rhyolites and not granite and that during the Flood, some of the granites formed in Day 1 and Day 3 were intruded into the Flood deposits by upheavals as solids. These interpretations are not supported by field evidence, microscopic studies, and experimental work, and they are clearly not accurate because some granite bodies must have been produced from magmas at different times later than Day 3 (either during or after the supposed Noachian Flood as indicated by the metamorphosed fossil-bearing enclaves).

Moreover, if Precambrian granite were produced nearly instantaneously during Day 1 or Day 3, all physical laws would have to be abandoned, and this granite must have been created by a miracle. Even if creationists were to acknowledge that some granite was produced during and after the Noachian Flood, and they cannot deny the evidence, then all physical laws for cooling rates and crystallization would also have to be ignored. Such granites could not be emplaced and solidified in less than one year and not even in 6000 to 10 000 years, if the physical laws governing crystallization and cooling rates are obeyed. Furthermore, if all the heat from the world-wide granite magmas that penetrated the supposed Flood sediments were released suddenly in one year's time

to the Noachian Flood waters in order to crystallize the granite masses abruptly, the waters would be heated so hot that the oceans would be boiling and no marine life would survive. *Isn't it odd that the chronicles of Noah never commented on this phenomenon!* One can teach a rapid formation of granite, but it is not teaching science. The literalist interpretation has to be saying that all granite bodies are formed by miracles.

#### CONCLUSION

Equal time, when used to discuss the origin of granite, clearly shows that the creationists' literal interpretation of the Genesis stories in the Bible has no validity for presentation in the science classrooms at secular schools because it is not science. It may have a place in some Christian schools where science is taught as miracles.

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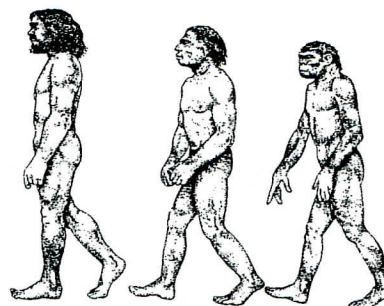


## THE NEW PHYSICS

### Dopeler Effect

The tendency of stupid ideas to seem smarter when they come at you rapidly.

[From a New York Times contest on new terms and definitions. Contestants were to change a single letter in a known word or phrase and create a definition. Contributed by Ed Babinski.]



## NEANDERTHALS ON LINE

In a recent issue of the *New York Times* (*New York Times on the Web*, May 6, 1999; <<http://www.nytimes.com/library/tech/yr/mo/circuits>>), Michael Pollak reviewed the current status of our knowledge concerning Neanderthals, the controversies over their place in human evolutionary history, and several sources of information about Neanderthals on the world wide web. Among the sites suggested in the article:

<<http://www.neanderthal.de>>, the web site of the Neanderthal Museum in the Neander Valley near Dusseldorf, Germany. ...[T]he site is available in both English and German. This site focuses on the museum and its exhibits and includes a photo gallery (Bildarchiv) of reconstructions and simulated habitats.

<<http://thunder.indstate.edu/~ramanank/index.html>>, a web site maintained by Kharlena Ramanan, PhD candidate in paleoanthropology at Indiana State University. This site includes a rich array of images and text, including reference materials and links to a number of other important sites. The site is very extensive and takes a little longer than average to load. Your patience will be rewarded.

<<http://www.talkorigins.org/faqs/fossil-hominids.html>> is brought to you by the folks at Talk.Origins. This page is assembled by Jim Foley and provides links to information about Neanderthals and all other fossils in our taxonomic tribe. Although the particulars about each taxon change nearly daily, this page provides very recent and scientifically sound information.

Of course it is also possible to scan the web for Neanderthal information using a search engine, but at least these sources provide useful and scientifically accurate information about this puzzling branch of our family tree.

To see the original article on the web, connect to <<http://www.nytimes.com/library/tech/99/05/circuits/articles/06nean.html>>.



# NCSE Members Launch A Legend

*Molleen Matsumura, NCSE Network Project Director*

Evolution-creation controversies contribute their fair share of popular misinformation that spreads all the faster with the help of modern communications. Perhaps the best examples are the Darwin "deathbed conversion" story of Darwin's expressing regret for publishing his ideas on evolution (see review of *"The Darwin Legend"* by Kevin Padian in NCSE Reports 1996; 16(1):3, 8) and the "Mantracks" claims that fossilized human and dinosaur footprints are found side by side in Glenrose, Texas (see *"The Paluxy River Footprint Mystery — Solved"*, a special edition of *Creation/ Evolution* nr 25; 1985). Even though leading "creation-science" advocates have disavowed these claims, they're still in circulation, making their way from outdated library books to websites, public lectures, and letters to newspaper editors.

## THE LEGENDS BEGIN

Now several members of NCSE have added another legend, this time from the "evolution" side. It all began on April 1, 1998, when Mark Boslough e-mailed to several friends a satirical "press release" reporting an Alabama legislator's sponsorship of a bill requiring schools in the state to teach that ( $\pi=3$ ). Dave Thomas, NCSE member and also president of New Mexicans for Science and Reason (NMSR), posted the piece on Talk.Origins Archive, the Internet newsgroup whose participants discuss and debate evolution and "creation science". The story was filled with amusing references to key individuals and events in the struggle to have evolution included in New Mexico's science curriculum. (For example, "Alabama legislator Leonard Lee Lawson" was modeled after NM state sena-

tor Leonard Lee Rawson, who argued against evolution by brandishing a stuffed monkey which he declared was "not my uncle".) It also contained several clues that it was in fact a joke, such as a web address of "April/fool/html". Late on the day the spoof was first posted, an explanation was also posted to the same newsgroup.

By then, however, the legend was out of the bag. After 2 weeks had passed, Thomas was able to find hundreds of internet postings of the story, some of them reporting it as a genuine press release — all the easier to believe since the wire service name had mutated.

## ONE GOOD DEED INSPIRES ANOTHER

When 1999 rolled around, the original pranksters decided to try it again, but better. They topped their 1998 performance on April 1, 1999, when they launched <<http://www.darwindisproved.com>>. Complete with photographs of what appeared to be partially unearthed, fossilized bones of an allosaur swallowing a hominid, the site unfolded a tale of excitement and intrigue. In broken English, "Stefan", a graduate student at the University of Heidelberg, describes coming to New Mexico to work with his American mentor, Prof Heinschvigel (resemblance to "hornswoggle" fully intended). And then...

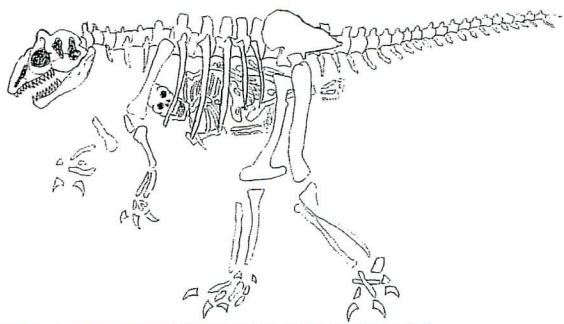
We found a fossil of a hominid, being eaten by an allosaurus dinosaur. Look at the picture.... The dinosaur is apparently trying to eat the cave-man, and then both became killed in some event. Perhaps the allosaurus choked on his food.

Intrigue? Did I mention skullduggery? That's right! A cover-up!

Of course, it is the impossible in Darwin's theory for hominids to have lived 140 million years ago.... All the evidence of this incredible find has been taken away. Except for a few photos which I managed to keep.... [O]ne of the guards came and made me give him all of the film. He said it would be very bad if I did not cooperate... I was so scared and worried that I forgot about the roll that had the 8 shots. When we returned to Albuquerque, I remembered and hid the films till I returned home. Now my friend has been putting them on the internet so everyone can learn what has happened, and how they are covering it all up.

...They told us not to discuss it with anyone, and that no one would believe us, and that our geology careers would be ruined, but mostly that other scientists would rush to publish it first if word of this find was exposed.... It is all being covered up because the scientists think their [*sic*] going to lose their jobs if everyone learns evolution wasn't true after all. Only I can tell the story. I can not reveal my true name, but my wonderful American friend is helping me to reveal the Truth to the whole World.

Other photos on the site included "graduate students" ("conspirators" David E Thomas, Kim Johnson, and their children) making casts of the "fossil" and a car labeled "New Mexico State Resources" (same initials as "New



## Flat Earth Theory Should be Taught in Schools, New Group Says

Mexicans for Science and Reason", of which Thomas is President.)

The site recorded over 1000 hits in the month before a full explanation was posted, ending with the comment: "Disclaimer: This website was created for the sole purpose of fooling any person who might fall for it."

### ANY BITES?

The "darwindisproved" site drew a lot of email and inspired much speculation. David Thomas reports that, while some of his skeptical email was from creationists, it was only evolutionists who succeeded in tracking down the pranksters. (NCSE member Paul Heinrich traced the domain name to Kim Johnson, and NCSE member Skip Evans contacted Johnson asking for details.) Johnson noted that while many people identified the site as a hoax or — more correctly — as a spoof, they didn't always give the "right" reasons. For example, some commented that the site didn't look like part of the Morrison Formation (where the photos were in fact taken), or that black fossils are improbable (while many fossils in the Morrison formation are dark gray or black).

And yes... somebody bit. Thomas has reported that he received email from well-known creationists who demanded more evidence. But there was one who couldn't wait before (in *RNCSE* editor Anj Petto's words) taking the bait "hoax, line, and sinker". NCSE members who attended an anti-evolution lecture on May 7 at Philadelphia's Calgary Chapel report that "Dr Dino" (aka Kent Hovind) urged the audience to see the "evidence against evolution" at <<http://www.darwindisproved.com>>.

**Lawrence KS**, April 1, 1999 — A group of Lawrence citizens concerned that the local public-school curriculum contradicts biblical teachings has formed an organization to promote the teaching of traditional theories in science and history. Adrian Melott, a spokesman for the Families for Learning Accurate Theories (FLAT), said, "We seek honesty, completeness, and accuracy in the teaching of all subjects in our public schools in place of the inaccurate, faddish, non-Bible-based ideas that are currently being fed to our children."

The statement announced a FLAT press conference on Tuesday, March 30, in the Lawrence Community Building and a public rally and demonstration of biblical mathematics on Saturday, April 3. At the press conference spokesman Adrian Melott would outline FLAT's platform and answer questions from the press and public.

The creation of FLAT follows that of POSH (Parents for Objective Science and History). POSH was recently founded in Lawrence to promote the teaching of biblical creationism in the public schools. However, Melott said, POSH did not go far enough in promoting traditional theories in the classroom.

He pointed out, for example, that the Round Earth Theory is being taught in Lawrence, contrary to the biblical position (Revelation 7:1) that the earth has 4 corners. He also noted that Scripture (1 Kings 7:23) clearly declares that the value of  $\pi$  (the ratio of the circumference of a circle to its diameter) is 3, not the secular humanist value of 3.14 taught in every

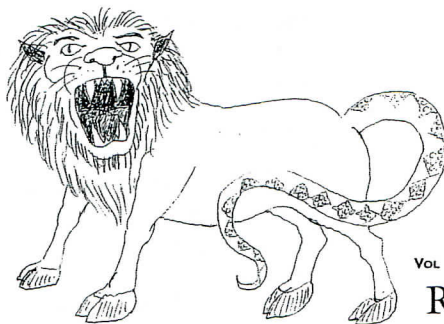
school in Lawrence.

FLAT supports the teaching of the biblical value on an equal footing with the secular value, Melott said. FLAT contends that other curricular revisions will also be necessary in order to have a fair and equal presentation of all ideas in tax-supported public schools. It plans to support candidates for the Lawrence Board of Education who endorse FLAT's positions.

FLAT also announced it would hold a public gathering in South Park, Lawrence on Saturday, April 3, to demonstrate scientifically the biblical value of  $\pi$ .

Melott also said that at the Tower of Babel, God punished the human race for its pride by creating many languages so that peoples could never cooperate in building such a structure again. FLAT believes that the study of foreign languages is therefore unbiblical and seeks the removal of language courses from the curriculum at all levels.

For more information about FLAT, contact Philip Kimball at <[nyskansas@aol.com](mailto:nyskansas@aol.com)>. The FLAT website is at <<http://flat.findhere.com>>. The organizations's email address is <[flat3000@yahoo.com](mailto:flat3000@yahoo.com)>.



# BOOKREVIEW

## THE DESIGN INFERENCE

by William A Dembski.  
Cambridge (UK): Cambridge  
University Press. 243 p.

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In an article appearing in the October 1998 *First Things*, William A Dembski announced the existence of rigorous and reliable means for detecting the action of an intelligent agent. Its description and justification, said Dembski, would be found in the pages of his new book, *The Design Inference (TDI)*. Dembski made a special point of applying a criterion he called *complexity-specification* to biological phenomena, with the claim that biologists must now admit design into their science.

Dembski's *TDI* is a slim and scholarly volume, as one expects from a distinguished academic press. Dembski employs clear writing, illustrative examples, and cogent argumentation. The work, though, is motivated and informed by an anti-evolutionary impulse, and its flaws appear to follow from the need to achieve a particular religious aim. The anti-evolutionary bent is not as overt here, though, as it is in other works by Dembski and his colleagues Phillip Johnson, Michael Behe, Paul Nelson, and Stephen Meyer at the

Discovery Institute Center for the Renewal of Science and Culture. The closest that Dembski comes within the pages of *TDI* to staking out an explicit position on evolutionary issues is in Section 2.3, where a "case study" is made of "the creation-evolution controversy". In it, Dembski accuses evolutionary biologists of rejecting one or more premises of his Design Inference in order to avoid reaching a conclusion of design for biological phenomena. Of course, for "Intelligent Design" creationists, as it was for William Paley, it is not sufficient merely to prove that something was intelligently designed, it is also essential that the agent of design be identified as the God of the Bible. But *TDI* carefully avoids explicit religious referents, even separating "evidence for design" from "evidence of agency".

In my opinion, Dembski's Design Inference fails to identify reliably phenomena due to design by an intelligent agent because of its logic, and because it fails to consider additional mechanisms (like natural selection) that could produce an effect which appears to be designed. In the following review, I shall attempt to explain why this is so.

### CATEGORIES AND DEFINITIONS

Dembski deploys a large number of specialized terms and phrases in making his argument that design must be recognized as a necessary mode of explanation in science. Fortunately, Dembski generally makes clear what each term means, even when it also has a common or casual usage. *Design* is one of those terms, and in Dembski's usage it becomes a category defined by the elimination of events that can be attributed to

regularity or to chance. *Regularity* is equivalent to high probability — an event will that "(almost) always happen" (p 36). *Chance* applies to any event with intermediate or low probability, but for which no specification exists. A *specified* event conforms to a pattern that is determined in advance or can be given independently of the event.

"Specification" needs further description. Dembski illustrates the meaning of specifications which allow us to reject chance explanations by contrasting them to *fabrications* which do not. For an archer to hit 100 bull's-eyes is not chance; we would conclude that the archer had great skill. But if the pattern of 100 bull's-eyes was obtained by the archer's shooting the arrows and then drawing targets around them, we would not make the same conclusion. The pattern of 100 arrows and bull's-eyes would be the same in each situation, but because we had *specified* in advance certain characteristics (like the bull's-eye being on the wall *before* the arrow was shot), we can eliminate chance in the former situation and attribute the performance to skill.

*Complexity-specification* describes how the jointly-held attributes of *complexity* (events of low probability) and *specification* (previously-determined pattern) reveal the presence of *design* in an event. And *design* thus becomes any event with both a low probability and an independently-given pattern. Another way to look at Dembski's Design Inference is that complexity excludes high- and intermediate-probability events, specification excludes chance events, and regularity comprises events marked by high probability. Therefore, *complexity-specification* yields those events that fall into the exclusionary category of *design* as Dembski uses the term — events that are of low probability and not due to chance.

For Dembski, the *Design Inference* is a deductive argument which can lead to the recognition of *complexity-specification*, and thus *design*, for a particular event.

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Since these 3 categories (regularity, chance, and design) embrace all events, and design is established by elimination of the other two categories, design is thus the *set-theoretical complement* of regularity and chance.

### EXPLANATORY FILTERING

Dembski applies what he calls his "Explanatory Filter" to determine design. Complete with flowchart (p 37), the Explanatory Filter has 3 decision nodes. In step 1, if an event is deemed to have high probability, it is classified as *due to a regularity*, or rather that the event can be explained through law-like physical processes. An as-yet unclassified event then moves on to the second decision node. If it has intermediate probability, it is classified as *due to chance*. Thus far unclassified events (which have low probability) then move on to the third decision node. If the event both has a low probability and also conforms to a specification, it is classified as *due to design*; if it has low probability and is unspecified, it is classified as *due to chance*.

It is time to look more closely at Dembski's Design Inference, to find out whether it does allow us to detect design by the elimination of alternative mechanisms. The Design Inference is a deductive argument based on the elimination of alternatives. Such arguments only work if the conclusion is the result of exhausting the available alternatives. Dembski assures us that this is the case by defining *design* as what is left after *regularity* and *chance* have been eliminated. Thus, what "design" means depends upon the way that regularity and chance are eliminated.

### PROCESS OF ELIMINATION

Dembski offers 2 somewhat different methods for eliminating regularity. In the first, regularity is recognized if an event has a high probability of occurrence. This is part of his discussion of the Explanatory Filter. The second method identifies an event that conforms to relevant natural laws, but is not constrained by them,

and thus is not attributable to those laws. This method is discussed in relation to Dembski's Design Inference (p 53). It is not clear that each of these 2 methods would classify the same set of events as not being due to regularity. This ambiguity increases our uncertainty concerning the residue that is left over to be classified as either chance or design.

Dembski throughout *TDI* claims that deduction leads ineluctably and conclusively to certain events' being due to *design*. The catch is that Dembski is using his own definition of *design*, where *design* is simply the residue that remains after *chance* and *regularity* are eliminated. But there are alternative filters that better fit reality. I will illustrate one such alternative with an example filter of my own.

### ALTERNATIVE EXPLANATIONS

My alternative Explanatory Filter has 4, not 3 nodes.

1. First, an event that cannot be statistically distinguished from a random event is classified as due to chance.
2. Next, an event that conforms to properties of known law-like physical processes is classified as being due to regularity.
3. An event that conforms to known properties of similar events that are due to intelligent agents are classified as due to design.
4. Finally, any event which has not yet been classified is now classified as being due to an unknown cause.

My alternative Explanatory Filter differs in several critical ways. First, the ordering of decisions is different. Dembski justifies his choice of order with an explication of *explanatory priority* (p 38-40). But Dembski's arguments for eliminating regularity before eliminating chance are neither convincing nor reflective of how people ordinarily explain things. Random events conform well to the null hypothesis (that is, that the event is due to chance and not to design or regularity) and should

be eliminated first in determination of causation.

Dembski's own example of a pair of loaded dice to show why regularity has explanatory priority over chance demonstrates that his filter has the order reversed. He explains that because the loaded dice yield high probabilities that certain faces will come up, the explanation to be preferred is regularity. However, Dembski ignores the fact that in order to determine that regularity and not chance is at work with the loaded dice, we must compare the rolls of the dice to the expectation for "fair" dice. Only when chance has been eliminated can we then entertain the notion that the results for the

particular loaded dice in question are due to a regularity. In point of fact, with sufficient testing and knowledge of the circumstances, the loaded dice example resolves into an instance of design, not regularity. This does not mean that design then has explanatory priority. Rather, it illustrates the superior explanatory power of my alternative filter in which chance must be considered and rejected before either regularity or design can be concluded.

A second advantage to my Explanatory Filter is its additional classification of *unknown causation*. This alternative recognizes that the set of knowledge used to make a classification can alter the classification. By allowing an event to be classified as having unknown causation, I simultaneously reduce the number of *false* classifications that will later be overturned by additional information and identify those events whose circumstances require further study in order to identify a causative factor. The use of unknown causation as a category is common in such day-to-day operations of humans looking for design in events, such as in forensics. Forcing final classification of

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**[W]hat  
"design"  
means depends  
on the way that  
regularity and  
chance are  
eliminated.**

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events when knowledge is limited ensures that mistakes in classification will be made when Dembski's Explanatory Filter is employed.

A third advantage to my alternative Explanatory Filter is that the common meaning of "design" is retained as a reliable indicator of "agency". We recognize design in our day-to-day life because of prior experience with objects and events designed or caused by intelligent agents. It is important to recognize that

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**One might thus conclude that... natural selection can be recognized as an intelligent agent.**

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there is a difference between a reliable classifier and a design detector. The goal of such an exercise should be to classify

events accurately, not to just single out the designed ones.

Dembski utilizes the Search for Extra-Terrestrial Intelligence (SETI) project as an example of detecting design without particular knowledge of a designer. But SETI can only detect signals that possess certain properties known from prior experience of humans communicating via radio wavelengths. SETI works to find events that conform to our prior experience of how intelligent agents use radio wavelengths to communicate. SETI does not support the notion that *novel* design/designer relationships can be detected. ETI that communicate in ways outside human experience will be invisible to, and undetected by, SETI. The issue of agency, in fact, deserves more attention. Like many "Intelligent Design" creationists, Dembski tries to avoid mentioning the "designer", and in fact, promotes *his* Explanatory Filter as being superior because it supposedly separates agency from design (*TDI* p 8, 36, 226-7).

**DESIGN, AGENCY, AND NATURAL SELECTION**

One may wonder what *TDI* was supposed to accomplish, if design

no longer means what Paley meant by it and the attribution of agency no longer necessarily follows from finding design. When he assures the reader that design does not imply agency, Dembski seems to want things both ways: one can detect design without implying agency, though one is justified in *inferring* agency when one sees design. But is it a secure inference? According to Dembski, because humans identify human agency using reasoning equivalent to the Explanatory Filter, the Explanatory Filter encapsulates our general method for detecting agency. Because *TDI* is equivalent to the Explanatory Filter, if we conclude design through the *TDI*, we also must conclude agency.

The apparent, but unstated, logic behind the move from *design* to *agency* can be given as follows:

1. Some subset of objects known to be designed by an intelligent agent possess a common attribute (*complexity-specification*).
2. This attribute is never found in objects known not to be designed by an intelligent agent.
3. The attribute includes the property of directed contingency (choice).
4. For all objects, if this attribute is found in an object, then we may conclude that the object was designed by an intelligent agent.

This is an inductive argument. Notice that by the second step, one must eliminate from consideration precisely those biological phenomena which Dembski wishes to categorize. In order to conclude intelligent agency for biological examples, the possibility that intelligent agency is not operative is excluded *a priori*. This is stacking the deck.

An intelligent agent reveals itself by making choices, or in Dembski's terms, *directed contingency*. An intelligent agent chooses "from a range of competing possibilities" (p 62), and does so by *actualizing* "one among several

competing possibilities", *excluding* the rest, and *specifying* (ahead of time) what is to be chosen. Dembski claims this triad of criteria — *actualization-exclusion-specification* — is sufficient for establishing that an intelligent agent has been at work and finds that *design* as he defines it is congruent with these criteria.

One large problem is that *directed contingency* or *choice* is not an attribute solely of events that result from the intervention of an intelligent agent. Both directed contingency and the triad itself can be explained quite adequately by natural selection as a cause. Actualization occurs as heritable variation arises. Exclusion results as some heritable variations lead to differential reproductive success. Specification occurs as environmental conditions specify which variations are preferred. One might thus conclude that Dembski's argument establishes that natural selection can be recognized as an intelligent agent. By my reading, Dembski's argument supports a position that biologists can embrace a conclusion of *design* for an event of biological origin and still attribute that event to the *agency* of natural selection.

It is an error to argue from the casual meanings of regularity, chance, and design when discussing causes for events classified by Dembski's Explanatory Filter or by *TDI*. Someone might seek to exclude natural selection from consideration as a source of events that meet the criteria of design by claiming that it is either a regularity or chance. But *TDI* classifies *events*, not *causes*. Dembski points this out himself when he says that using the Explanatory Filter may not always lead to a conclusion of design for an event that we know is due to the action of an intelligent agent, because agents can mimic the results of regularity or chance.

The point is more significant than Dembski admits. A causal class cannot be classified into regularity or chance in advance without begging the question. Specifically, one cannot state in

advance that natural selection is either *regularity* or *chance* because the events which are due to natural selection must be evaluated by their own properties to establish which category best describes those events. Just as intelligent agents can sometimes produce events which appear to be due to regularity or chance rather than design, so too can natural selection be responsible for events in all 3 categories. It is insufficient to show that some examples of natural selection fall into either the "regularity" or "chance" explanatory categories. When arguing that no physical process is the agent producing a designed event, one must show that natural selection is incapable *in principle* of producing events with the attribute of design. Such a demonstration would have to address the application of natural selection in both biology and computer science, where use of the principle of natural selection has been employed in solving very difficult optimization problems.

## CONCLUSIONS

In summary, the process of detecting design, as it is done by humans in day-to-day activities, is not accurately captured by Dembski's Explanatory Filter. The order in which classes of causes are eliminated makes a difference. Humans attempting to explain phenomena can and often do find insufficient evidence to make a final determination of either design or any other explanation. And when humans use the word *design*, they typically mean it to carry a real implication of being due to an agent or designer.

Second, Dembski's Explanatory Filter does not help us to identify the cause or the agent of the "specifications" which it seeks to classify. That there is an agent or that the agent is "intelligent" must be concluded *prior* to applying the Design Inference. Using Dembski's own criteria, we cannot rule out natural selection as a cause for the design found in the events and organisms around us. Somehow, I doubt that natural selection is

what Dembski has in mind for the author of design.

Dembski utilizes the Explanatory Filter and equivalent logical arguments in order to place his criterion of design on a deductive footing. That criterion, complexity-specification, does not help us to identify a cause, or an agent, of an event. Its sole purpose is to detect design as Dembski employs the term. The step from detection of design to inference of an intelligent agent is made by an inductive argument, and shares in the problems of all conclusions drawn from an inductive basis. Dembski argues that a triad of criteria reliably diagnoses the action of an intelligent agent, yet this same triad of criteria fails to exclude natural selection as a possible cause of events that have the attribute of complexity-specification. Again, I doubt that natural selection is what Dembski had in mind for the agent of biological design.

*The Design Inference* is a work with great significance for those anti-evolutionists who have embraced "intelligent design" as their organizing principle and see that Dembski's *TDI* is supposed to establish the theoretical foundation for all the rest of the movement (see, for example, comments posted on the web at <<http://www.discovery.org/fellows/design.html>>). My judgment is that it fails to lay a solid foundation. There are flaws and cracks that can admit the entry of naturalistic causes into the pool of "designed" events. It is unfortunate that Dembski's focus is the establishment of "intelligent design" as an anti-evolutionary alternative, for

his insights into elimination of chance hypotheses would appear to have legitimate application to various outstanding research questions, such as certain issues in animal cognition and intelligence. Despite Dembski's commentary in his *First Things* article, there appears to be no justification for the claim that biologists must now admit design (in its old, agency-laden sense) into biological explanation.

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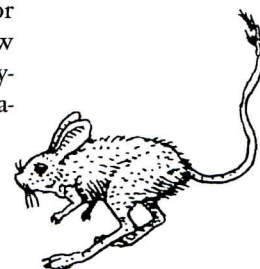
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[Find an expanded version of this review on the web at <<http://inia.cls.org/~welsberr/zgists/wre/papers/dembski7.html>>. Thanks to Bob Schadeewald and others who gave helpful commentary on drafts of this review.]

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## NEW EDITOR'S PHONE/FAX

Beginning June 7, 1999, the editor's office phone and fax convert to a new (and improved?) system. The good news is that the new service includes an automated voicemail feature and several other advanced options we hope will serve you better. The bad news is that you will need to use different numbers to reach us.

**PHONE:** (215) 717-6276

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# The NCSE *Acts & Facts* Checker

William Thwaites

[Long-time NCSE member and activist Bill Thwaites carefully monitors regular publications from the Institute for Creation Research. Bill has offered to provide us with a synopsis and critique of the salient features from the ICR's monthly *Acts & Facts*, which we gladly accepted. Ed.]

## INTRODUCTION

I hope that my writing a review of the February 1999 issue of *Acts and Facts* from the Institute for Creation Research (ICR) will help illuminate some of the issues in the evolution/creation discussion. I have long enjoyed interpreting each month's mailing and sharing my findings and speculations with my good friend, the late Frank Awbrey. Recently NCSE Executive Director Eugenie Scott suggested that I share my thoughts with *RNCSE* readers.

## GENERAL OBSERVATIONS

*Not Pleasing Anyone* - Poor ICR! For purposes of convincing the scientific community that it is wrong about the age of the earth and the existence of biological evolution, the ICR must appear as secular and scientific as possible. The same appearance is handy in selling "scientific creationism" to the public schools and in maintaining ICR's accreditation as a graduate institute of science. On the other hand, for purposes of garnering financial support, ICR must appear to be as religious and evangelical as the "700 Club".

In the February 1999 issue of

*Acts and Facts*, as well as in the accompanying fund-raising letter from the director John Morris, the emphasis is on evangelism. There is also a not-so-subtle appeal for "liberal" creationists to get back on board with regard to the young age of the earth. It would seem that just about everyone is carping at ICR for one thing or another.

*Philosophical Naturalism* - Both the elder and the junior Morrisses of ICR seem to be impressed by Phillip Johnson's tirades against "philosophical naturalism". Morris the elder (Henry) writes that the evil atheistic cosmologists seem to be bent upon explaining the universe without God. Morris the younger (John) complains that naturalistic evolution falsely leads scientists to suppose that they will be able to understand how cells and the genetic code originated.

As a biologist, I hasten to add that I'm gratified to see physical scientists criticized for "naturalism" the way biologists so frequently are. The complaints about cosmology show that creationists are fair-minded when it comes to complaints about "naturalism". They are not out just to get biologists. When the creationists are finished with their crusade, we will have theistic geometry, theistic addition, and so on. And I could happily go along with that if a reliable "theometer" is ever invented.

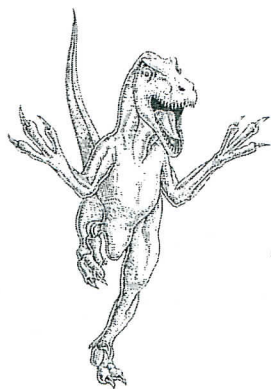
*Taking on the Difficult Questions* - We have read previously that ICR and its friends are going to put radioactive dating to rest once and for all. In this issue

we learn that ICR is going to take on yet another daunting task — to discover the origin of pathogens (micro-organisms that cause disease). Somehow ICR must show that the diabolical mechanisms used to establish and maintain infections were not preprogrammed by a creator who knew in advance that mankind would fail. At the same time, ICR must also show that the more elaborate mechanisms (for example, the ability of many internal parasites to change "protein coats" to avoid recognition by the immune system) did not evolve.

If they admit to either preprogramming or to subsequent evolution, it would seem to weaken their case. On the one hand, an admission of preprogramming would cast doubt on their particular scriptural interpretation. An evolutionary explanation would also be painful. It would undermine the creationist insistence that nothing elaborate could have evolved. I look forward to seeing how they get out of this one almost as much as I anticipate their disproof of radioactive dating.

*Impact #308* — In the February "Impact" article, we read a slightly reworked version of an old creationist claim. It goes something like this: "If evolutionary improvements stem from the selection of good mutations, then we should find many examples of good mutations in a typical species." Then the creationist goes to a list of genetic diseases and shows, wonder of wonders, that all the mutations in the list cause disease.

Of course the "good" mutations that evolution depends on are to be found in the variability that we see in any out-breeding population that has not recently come through a population bottleneck. In our own species, we see this as variations in resistance to infec-



# Letter to the Editor

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tious diseases, longevity, height, ability to succeed at school, resistance to ultraviolet light, resistance to various forms of cancer, and so on. In only a few cases have we been able to identify specific genes responsible for this variability, but the case for the genetic origin of these variations is well established.

And there is another way of looking at the claim that good mutations never happen — with a simple computer program. At San Diego State University we made a program that produced random letter changes that we scored against a target sentence. Those that were the closest to the target sentence were saved as “parents” for the next round of mutation and selection.

Very high mutation rates did not allow the reaching of the target sentence. Very low mutation rates made the achievement of “perfection” extremely slow. But when “perfection” had been achieved, *all* subsequent mutations were harmful. To a limited extent, that is what happens with real species. While “perfection” might be a bit of an exaggeration, any species that thrives is close to its “target” (that is, reasonably well adapted to its environment). Once that state is achieved, therefore, all subsequent single gene mutations are much more likely to be “bad” than good — that is, more likely to move the “sentence” farther from instead of closer to its target. A computer program elaborate enough to save alternative sentences that had the same meaning as the target sentence could be used to demonstrate this process of the accumulation of good mutations. As usual, there is an experiment which could resolve this apparent problem for the incorporation of useful mutations which *could* be done, but won’t be — at least not by the ICR.

I want to comment on the idea of adaptation as an *outcome* — the end result of adaptation as a *process*. As I remember, one of Darwin’s problems was that God’s design was supposed to be perfect. That is, the adaptation of animals and plants to their environment could not be better. As I read the discussion of adaptation in *RNCSE* (1998; 18[2]), the idea at the back of the Anthropic principle and the predestination of all adaptation as put forth by Michael Denton, assume likewise. They believe, with Dr Pangloss, that there could not be a better world. Others have brought up counter-examples, such as why do we have an appendix?

I wish to give another, more important, example from Botany. Lynn Margulis and others, in the original version of the Gaia Hypothesis, claimed that the oxygen content of the air is deliberately maintained for our and other mammals’ benefit. This argument fails because there is no genetic mechanism which could control the activities of so many different organisms. But there is a more profound objection. Oxygen is manufactured by plants in the process of photosynthesis. If adaptation were perfect, the present oxygen content of the air would be optimal for this process. But it is not.

Oxygen and carbon dioxide compete for the same site on the enzyme which brings the latter into metabolism (Rubisco). This has considerable deleterious consequences, which have, in the course of evolution, given rise to at least three slightly different mechanisms to avoid them in different groups of higher plants (called C-4 plants). In those plants

that have not found this complex solution (C-3 plants), photosynthesis works much better if the carbon dioxide concentration is raised to 5%, instead of the present 0.04%, or the oxygen concentration is lowered to 1%, instead of the present 20%.

The fact that different solutions have arisen is complete vindication of the lack of prior planning on the part of some “designer”. That these inventions were necessary in the first place also indicates the failure of the evolutionary processes to perfect the operation of Rubisco. Evolution does NOT proceed toward a preconceived end.

Another similar example is the presence in all aerobic organisms of superoxide dismutase, again in several forms. This enzyme attacks the toxic product of oxidative metabolism (superoxide). Why, if this were a perfect world, would this be necessary? In the course of cogitation on the origin of life, I have found what seem to me further denials of supernatural design. In the origin of the chemical elements in stars, a variety of isotopes were formed. Why, if all this was for our benefit, was more than one isotope formed? Indeed, why were such things as arsenic and uranium made at all? Instead, the amounts of the elements and their isotopes give us clues as to the mechanisms of their formation, entirely spontaneously.

Finally, the best advice is probably still that from Louis Agassiz; “Read Nature, not Books.”

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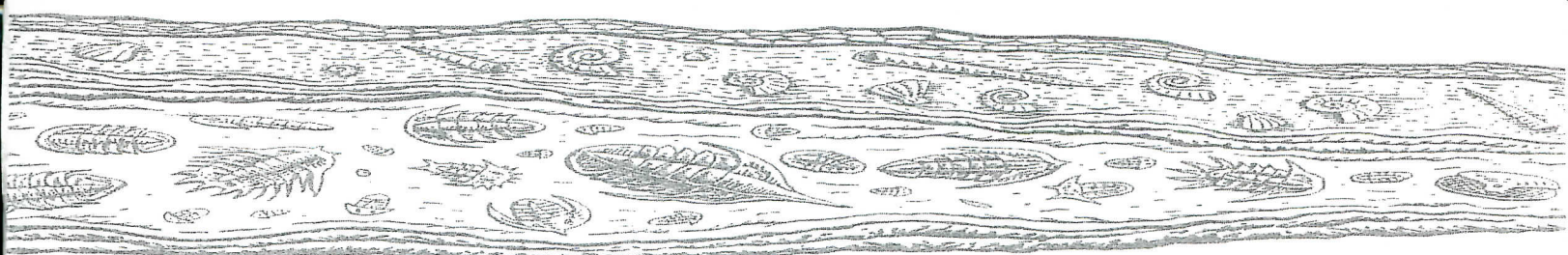
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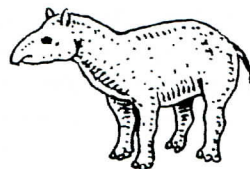
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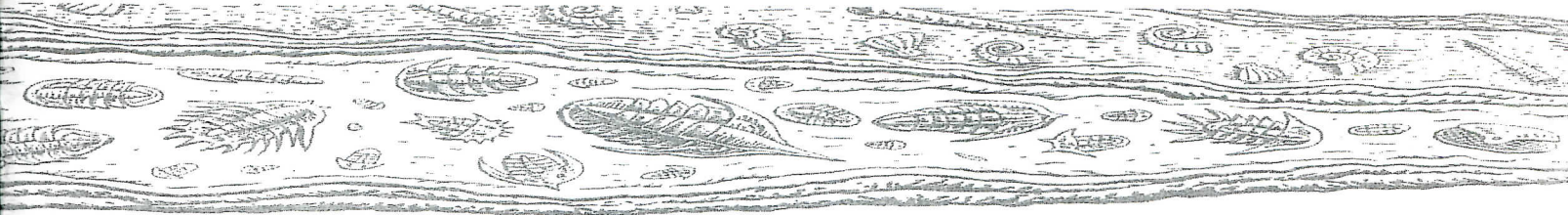
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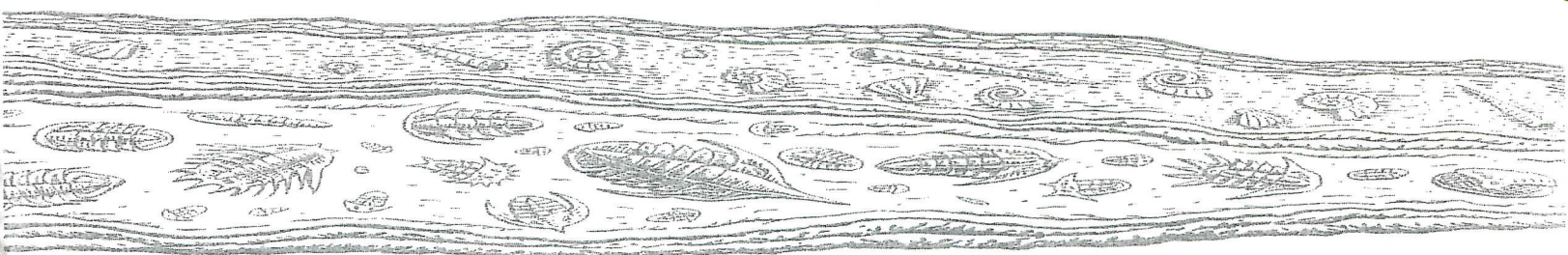
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# Turtles All the Way Up?

Andrew J Petto, NCSE Editor

New molecular research proposes that the closest reptile relatives of turtles are crocodiles! And according to the researchers, the molecular phylogeny shows that turtles and crocodiles appear to be the most recently diverged reptile groups — more recently split than the lineages leading to lizards, snakes, and birds. Blair Hedges and Laura Poling from Pennsylvania State University published these findings in the February 12, 1999 issue of *Science*. Although this paper confirms molecular phylogenies produced in smaller studies with reptilian DNA and protein, it seems to widen the gap between molecular and morphological studies of evolutionary family trees.

This study examined sequences of the same gene in 5 reptile species and compared them with other sequences in their lab and in other published studies. The

researchers also studied protein sequences. All of the analyses led them to the same conclusions that the place of turtles in the family tree of reptiles must be re-evaluated. In the standard evolutionary tree of living reptiles, turtles are the earliest group to diverge, followed by lizards and snakes, then crocodiles and birds. In the new molecular tree, lizards and snakes form the first branch, followed by birds, and then turtles and crocodilians. The new study also estimates that the turtles' lineage goes back only 200-250 million years, compared to morphological trees which put the emergence of turtles at about 300 million years.

Carol Yoon reported in the Feb 23 *New York Times* that (NCSE member) Gene Gaffney, a paleontologist who specializes in turtle morphology at the American Museum of Natural History in New York, was skeptical because the

new phylogeny contradicts so much of the known morphological and paleontological evidence. On the other hand some scientists, such as Olivier Rieppel at Chicago's Field Museum of Natural History, told her that, on morphological grounds, he would conclude that turtles are not primitive reptiles, but would place them in a part of the evolutionary tree that includes lizards, snakes, and crocodilians.

The argument at this point seems to rest on the ability to resolve the patterns shown by completely different data sets. This is not the first time that molecules and morphology have clashed; in fact, there is a long history here. Some previous surprising findings of molecular analyses, such as the grouping of snakes with birds and the discovery that the guinea pig is not a rodent, have fallen by the wayside. But in other cases, such as the relatively recent divergence times of chimps and humans, molecular estimates have been of great value and have been confirmed by later paleontological finds.

Most standard phylogenetic (cladistic analyses) rely to some

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extent on a concept of parsimony — the philosophical premise that the simplest hypotheses should be the ones that are preferred first for further testing. Computer-generated evolutionary trees show the smallest number of steps from the common ancestor to all the descendant branches. If 2 or more branches are equally parsimonious, then the one that loses and then re-evolves the fewest ancestral traits is preferred for further testing. Independent evidence, such as a sequence of fossils that show the order in which traits were acquired and/or lost in descendant taxa, is a good test. Some would argue that these molecular sequence data do constitute the evidence to override strict parsimony in this evolutionary tree, based on paleontological and morphological data. But others are taking a wait-and-see attitude.

Among the traits that would need to be re-evolved are the arrangement of openings in the skull bones, a primitive morphology of the brain case, palate, and lower jaw, and an eggshell made of chemical compounds not found in other reptiles. Some morphologi-

cal changes, just like some molecular changes, are more common than others and occur several times in an evolving lineage. However, the morphological changes in question have never been known to reverse in other lineages, unlike many molecular changes. The question for turtle evolution, as for molecular-morphological data comparisons in other lineages, is which traits are most reliable for constructing the evolutionary trees which describe the history and relatedness of these species?

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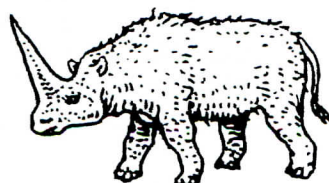
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Waters IC, Rivers HI, and others. Swept away in a flood of enthusiasm [editorial]. *Reports of the National Center for Science Education* 1995 Jan-Feb; 1015(1):22-9.

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