

Setting the Record Straight

A Response to Creationist Misinformation
about the PBS Series *Evolution*

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Introduction

Creationist organizations such as Answers in Genesis (AiG) and the Discovery Institute began publishing criticisms of the landmark PBS series *Evolution* even before it began to air. On August 31, 2001, AiG kicked off their campaign with an article headlined “PBS – Pushing Bad Science.” The DI joined the fray on September 10, issuing the first in a series of press releases criticizing *Evolution*. The creationists’ rhetoric reached a low point on October 14, when the Institute for Creation Research published an article on its web site comparing the series to the terrorist attacks of September 11.

Throughout the misinformation campaign, the National Center for Science Education (NCSE) responded to many of the creationists’ press releases and articles. With their publicity machines at full steam, and the slanders against the series coming from far more angles than just the ones mentioned above, there was simply no way to answer all of them. Nevertheless, the information contained here counters the most important claims made by the creationists. (The Chronology of Events section contains a detailed listing of many of the different creationist and creationist sympathetic organizations that published critiques of the series.)

The DI is currently distributing its own study guide to the series, *Getting the Facts Straight*, (< <http://www.reviewevolution.com/getOurGuide.php>>) which repeats many of the errors and misrepresentations contained in the DI’s press releases and articles, with the purpose of influencing teachers, parents, and students to reject many of the mainstream scientific views presented in the *Evolution* series.

In order to counter that effort, and to survey the overall creationist reaction, NCSE has compiled this document with the goal of *Setting the Record Straight*. Parents, teachers, and students are encouraged to compare the accuracy of the information contained herein with the publications of the various creationist groups.

Also presented in this document is the NCSE Congregational Study Guide, a guide to help congregations discuss ideas presented in the series.

NCSE would like to thank the many scientists and media professionals who aided in this effort:

Geoffrey Clark, Jerry Coyne, Irene Anne Eckstrand, Wesley Elsberry, Barbara Forrest, Henry Gee, Scott Gilbert, James Hankin, Richard Hutton, Stuart Kauffman, Joseph Levine, Kenneth R Miller, James Moore, Norman Pace, Kevin Padian, Ellen Paul, Robert T Pennock, David Wake, Judith Weis, and Anne Zeiser.

Press Releases

This section contains, in chronological order, the press releases issued on the NCSE web site in response to claims made by the Discovery Institute about the PBS series *Evolution*.

Throughout the series, the DI issued press releases accusing *Evolution* of misrepresenting the scientific evidence for evolution, of misconstruing the historical record, and of ignoring certain scientific and religious viewpoints. These releases typically featured quotations not only from DI Fellows, such as Jonathan Wells and Michael Behe, but also often from scientists not affiliated with the DI.

Each time NCSE contacted those scientists without DI affiliation and asked for a response to the DI's use of their work, they answered that either their views were misrepresented or that the science peddled by the DI was simply wrong. In every case, NCSE was given permission to use their response to alert the public to the attempts made by the DI to discredit the series.

Hanken, Pace give Lesson to Behe, Wells

9/17/2001

Once again, the creationists have blundered when it comes to science, this time presenting misinformation about the universality of the genetic code.

The latest creationist attack on the public understanding of science comes in connection with a new 8-hour PBS series that will greatly expand the public's understanding of a fundamental scientific theory, evolution. Two years in the making, *Evolution*, produced by WGBH-Boston and Clear Blue Sky Productions, will be shown nationwide on the PBS network on four consecutive nights beginning September 24, for two hours each evening.

"Although virtually every reputable scientist in the world agrees that evolution is good science," said Eugenie C. Scott, executive director of the National Center for Science Education, "some people still refuse to accept it, mainly because they regard it as incompatible with their religious beliefs. So it is no surprise that there is a creationist backlash against the PBS series."

The first example of bad science came from the Center for the Renewal of Science and Culture, the creationist arm of the Discovery Institute, a policy organization based in Seattle, Washington. On September 10, the CRSC distributed their PBS Press Release #1, quoting two of their Discovery Institute Senior Fellows, biochemist Michael Behe and biologist Jonathan Wells.

Behe stated that, "The supposed 'fact' of the universal genetic code is based on outdated science that has been invalidated by more recent research."

Added Wells, "Back in the early 1970s, evolutionary biologists did think that a given piece of DNA specified the same protein subunit in every living thing, and that the genetic code was thus universal. This was unlikely to have happened by chance, so it was interpreted as evidence that every organism had inherited its genetic code from a single common ancestor. In 1979, however, exceptions to the code were found in mitochondria, the tiny energy factories inside cells. Biologists subsequently found exceptions in bacteria and in the nuclei of algae and single-celled animals. It is now clear that the genetic code is not the same in all living things, and that it does not provide 'powerful evidence' that all living things 'evolved on a single tree of life.'"

Reports of the demise of this particular piece of evidence for evolution, however, are premature. James Hanken, Professor of Zoology and Curator in Herpetology at the Museum of Comparative Zoology at Harvard University, told NCSE that the claims of Behe and Wells that the genetic code does not provide evidence for the tree of life were "so bizarre as to be almost beyond belief," and added that they "fly in the face of well established and accepted facts."

The reason? As explained by Dr. Norman Pace, Professor in the Department of Molecular, Cellular and Developmental Biology at the University of Colorado and member of the National Academy of Sciences:

A few of the 64 code-words can occur as slight variants in a very few organisms. Those exceptions, however, are known to have derived from organisms that had the standard code. *Thus, the code is historically universal.* Even in those organisms with the occasional exceptional code-word, the rest of the code is the same as in all other organisms. More important, even, is the fact that the complex machine that interprets the code and carries out protein synthesis, the ribosome, is fundamentally the same in all life forms. The common heritage of all life on Earth is proven beyond doubt [emphasis added].

As if the CRSC's misinformation were not enough, the Florence, Kentucky young-earth creationist organization, Answers in Genesis, promises to post daily responses to each program on their web site. The responses will be written by AIG staffer Jonathan Sarfati, who in his book *Refuting Evolution* claims that there is strong scientific evidence for Noah's Ark and that geological evidence indicates that the earth is only a few thousand years old.

Eugenie Scott commented, "We anticipate that the Evolution series will help the public understand this fascinating scientific field. Because creationists are planning to assault evolution, evidence, and the integrity of science, NCSE — in collaboration with leading experts in relevant scientific fields — is prepared to help the public to separate accepted scientific fact from creationist fiction."

A "Dying Theory" Fails Again

9/25/2001

The Seattle-based "Discovery Institute" (DI) has minced few words in its efforts to discredit PBS's new *Evolution* series, which premiered during the week of September 24, 2001. According to a DI press release, "*Evolution* distorts the scientific evidence and promotes a biased religious agenda, thereby betraying our expectations and violating PBS's own official policies."

How strong are the DI's objections to the evolution series? Is there a problem with evolution and a strong case to be made for the DI's favorite anti-evolution theory, which they call "Intelligent Design?" These questions were answered when they released their very first "scientific" salvo against the series on September 14, 2001. Here's what they wrote:

SEATTLE--Viewers of PBS's upcoming series EVOLUTION [Sept. 24-27] will be told of the "fact" that all living things share the same genetic code. They also will be assured that the universality of the genetic code provides "powerful evidence" that all living things "evolved on a single tree of life."

What viewers won't be told is that this so-called "fact" is not true.

"The supposed 'fact' of the universal genetic code is based on outdated science that has been invalidated by more recent research," says biochemist Michael Behe a Professor of Biological Sciences at Lehigh University in Pennsylvania and a Discovery Institute Senior Fellow. He is also author of "Darwin's Black Box".

"Back in the early 1970s, evolutionary biologists did think that a given piece of DNA specified the same protein subunit in every living thing, and that the genetic code was

thus universal," explains biologist Jonathan Wells, another Discovery Institute Senior Fellow. "This was unlikely to have happened by chance, so it was interpreted as evidence that every organism had inherited its genetic code from a single common ancestor. In 1979, however, exceptions to the code were found in mitochondria, the tiny energy factories inside cells. Biologists subsequently found exceptions in bacteria and in the nuclei of algae and single-celled animals."

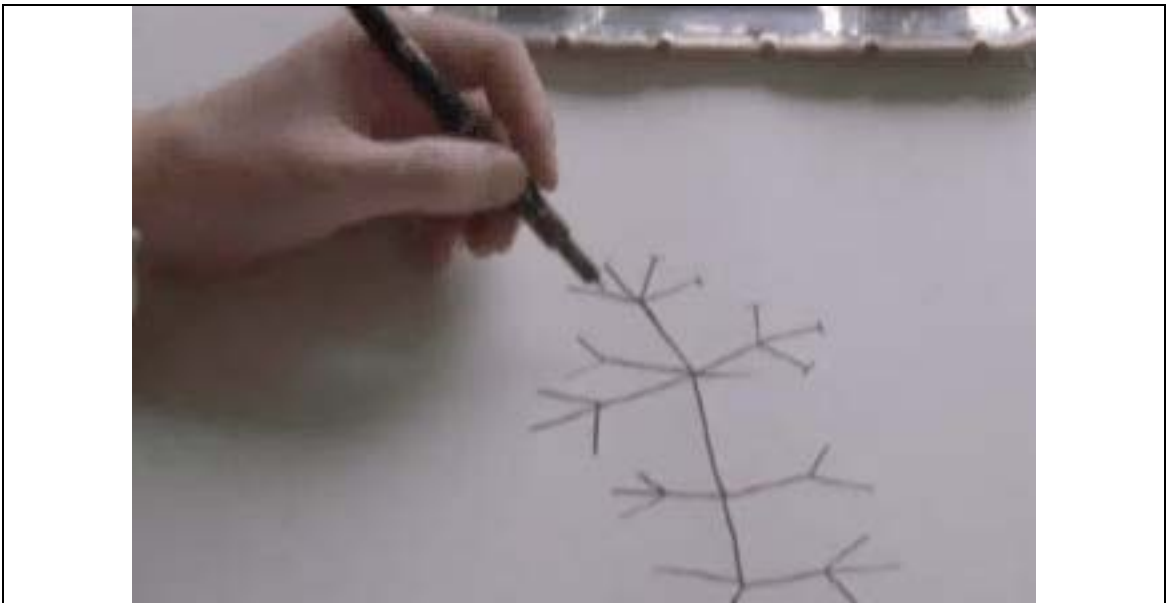
"It is now clear that the genetic code is not the same in all living things, and that it does not provide 'powerful evidence' that all living things 'evolved on a single tree of life,'" concludes Dr. Wells, who holds a Ph.D. in molecular and cell biology from the University of California at Berkeley.

Pouncing upon this supposed error, the Institute's "Viewer's Guide" to *EVOLUTION* crowed triumphantly:

So the first hard evidence that we are given for Darwin's tree of life turns out to be false.

Trying to drive this point home, DI created a website with the deceptive address of **pbsevolution.org**, including a bold graphic heading announcing that the *Evolution* series was, in fact, "The Magnum Opus of a Dying Theory."

I certainly agree that a close examination of the scientific evidence regarding the genetic code does indeed foretell the last gasp of a "dying theory." But theory in trouble isn't evolution.



(Above): The first show of the *Evolution* series, "Darwin's Dangerous Idea," made the point that Darwin's idea of a single tree of life had been supported by the modern discovery, made almost a century after his work, that all organisms share a universal genetic code. The Discovery Institute has charged that this claim is false.

Despite the DI rhetoric, living organisms do indeed share a common mechanism that copies and translates heritable genetic information. All living organisms translate the genetic code using ribosomes, tiny protein-building factories, they all translate it with the aid of small molecules called transfer RNA, they all read it in the same direction, and they all read it in the same way,

translating the code 3 letters at a time into sequences of amino acids, the building blocks of proteins. It is indeed true that in some organisms, a handful of these 3-letter "words" have different meanings. Our own cells, for example, contain little structures known as mitochondria in which 4 of the 64 words have different meanings from the "standard" code. In most organisms, these differences are so slight as to be trivial. In common molds, for example, the sequence "UGA" is translated into the amino acid tryptophan. In the standard code, it's a "stop" signal. The other 63 words, however, are *identical* between humans, elephants, daisies, and molds.

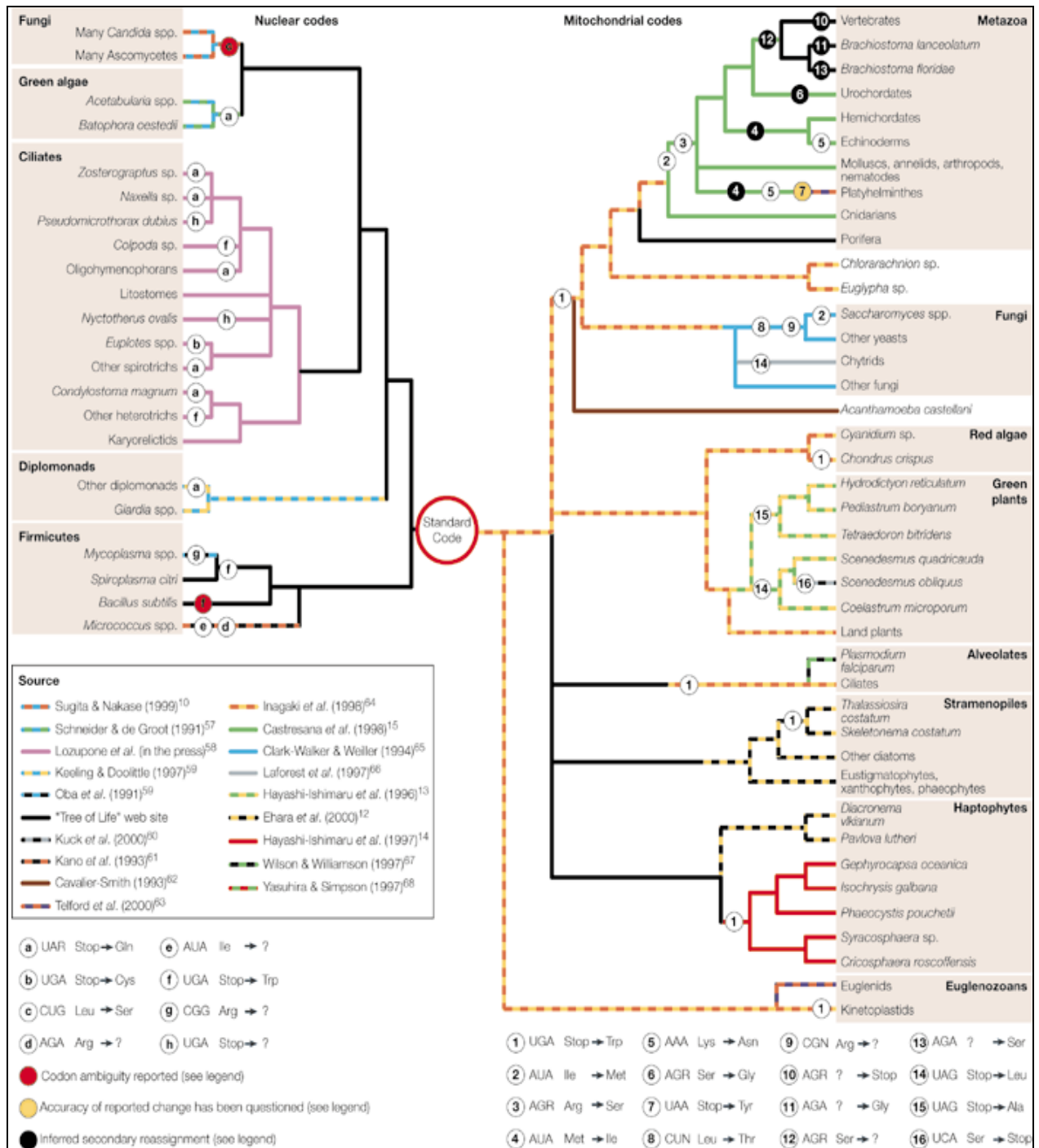
What does all this mean? As evolutionary biologists were quick to realize, slight differences in the genetic code are similar to differences between the dialects of a single spoken language. The differences in spelling and word meanings between the American, Canadian, and British dialects of English reflect a common origin. Exactly the same is true for the universal language of DNA. 48 of the 64 words are identical in all living organisms, and only 16 are known to vary across the enormous diversity of living things.

In fact, the entire biotechnology industry is built upon the universality of the genetic code. Genetically-modified organisms are routinely created in the lab by swapping genes between bacteria, plants, animals, and viruses. If the coded instructions in those genes were truly as different as the critics of evolution would have you believe, none of these manipulations would work. For better or for worse, they do work, and they work brilliantly.

Ironically, one of the sources cited by the DI Viewer's Guide was a 2001 paper in Nature Reviews (Genetics) from the laboratory of Professor Laura Landweber at Princeton University. When she noticed that the Institute had claimed that the genetic code *does not* provide 'powerful evidence' that all living things evolved on a single tree of life, she responded:

That is indeed a horrible misinterpretation, because it is clear, particularly in the tree in our paper and in others, that each nonstandard code is a subtle derivative of the standard genetic code and that all codes are derived from it.

Dr. Landweber's comments refer to the phylogenetic "tree" shown in Figure 2 of her paper, which is reproduced below. As she noted, rather than falsifying Darwin's idea of descent from a common ancestor, these "subtle derivatives" of the "standard" code actually provide powerful evidence for the common descent of all organisms from a single ancestor.



Nature Reviews | Genetics

Above: Composite Phylogeny of Variant Codes. (From Knight, Freeland, and Landweber, 2001, used with permission) The slight variations of the "standard" genetic code are related to each other in a way that can only be explained by common descent from a single ancestor possessing the standard code.

Look closely at the figure from this paper, and you'll see something remarkable. The variations from the standard code occur in regular patterns that can be traced directly back to the standard code, which sits at the center of the diagram. What this means is that these slight

variations of the code provide powerful — and unexpected — confirmation of the evolution of the code from a single common ancestor.

Clearly, the scholars at the Discovery Institute have seen this figure and read this analysis of the genetic code, since they went to the trouble to cite this exact paper. Do they tell their readers, however, that the very discoveries they cite provide elegant and unexpected support for Darwin's theories? Of course not. Rather, they are content to tell readers that these slight differences in the genetic code represent an "awkward—and potentially falsifying—fact," that PBS ignores.

The reality, as any scientist working from the original literature should know, is exactly the opposite of the DI's conclusion. As Landweber has pointed out, these slight variations document the evolution of the code itself from a single common ancestor, a process that Charles Darwin elegantly called "descent with modification."

There is indeed a theory that cannot account for the nature of the genetic code. It is called "Intelligent Design," and is routinely advanced by DI "scholars" who claim that it represents a valid, scientific alternative to evolution. They gloss over the fact that not a single scientific paper has appeared in a peer-reviewed journal to explain what "Intelligent Design" might be, and concentrate instead upon the supposed errors and misrepresentations of the scientific community. Such tactics, clearly, represent the last gasp of the dying theory of Intelligent Design.

If the DI really did have a legitimate scientific case against evolution, one would have thought that their very first press release, their first volley of scientific fact against the evolution series would have hit the mark. Instead, their weapon of choice has backfired in a most telling way. The DI critique is based upon a "horrible misinterpretation" of scientific fact, and a close examination of the actual facts provides dramatic support for one of the linchpins of evolutionary theory, the notion of common descent.

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References:

- The Discovery Institute Press Release charging the *Evolution* series with false statements concerning the genetic code can be found on the web:
http://www.reviewevolution.com/press/pressRelease_FalseClaim.php
- The second Figure in this paper is taken from: Robin D. Knight, Stephen J. Freeland and Laura F. Landweber (2001) "REWIRING THE KEYBOARD: EVOLVABILITY OF THE GENETIC CODE," *Nature Reviews*

Discovery Institute Quotes Clark Out of Context

9/26/2001

In a press release issued September 20, the Discovery Institute (DI) quoted Arizona State University anthropologist Geoffrey Clark as stating “we select among alternative sets of research conclusions in accordance with our biases and preconceptions--a process that is, at once, both political and subjective.” The DI goes on to assert that Clark suggested “that paleoanthropology has the form but not the substance of a science.”

The National Center for Science Education (NCSE) asked Dr. Clark to comment on the DI’s use of his statement. He replied:

In an effort to discredit the PBS Evolution series, the quotes attributed to me and circulated on the creationist Discovery Institute's website were taken completely out of context. I do not believe, nor have I ever argued, that paleoanthropology is not a scientific endeavor. The out-of-context quotes derive from a paper in which I argue a technical point to other scientists in the fields of archaeology and paleoanthropology: I encourage them to pay more attention to collecting data with an explicit conceptual framework firmly in mind, rather than just assembling factual information. As in all good science, anthropologists must regularly re-examine their approaches, and I never intended to imply that paleoanthropology is unscientific.

While there are many views of humans, and of the place of humans in the natural world, there is only one scientific view--that of neo-Darwinian evolutionary theory.

Dr. Clark is the author, co-author, or editor of over 200 articles, notes, and comments, as well as eight monographs and books, on human biological and cultural evolution. He earned his PhD at the University of Chicago in 1971.

“If the Discovery Institute wants to be taken seriously by the scientific community,” concluded Skip Evans, NCSE Network Project Director, “the first step they have to take is to stop lifting pages straight from the playbook of their scientific creationist predecessors. Quoting scientists out of context is one of the anti-evolutionists’ oldest tricks.”

Coyne Exposes Discovery Institute’s “Old Tricks”

10/1/2001

In the Executive Summary for Getting the Facts Straight: A Viewer’s Guide to PBS’s EVOLUTION, the Discovery Institute (DI) charges the show with ignoring the scientific controversy over evolutionary psychology.

Similar censorship of in-house controversies marks episodes five and six, which deal with the role of sex and the evolution of mind. These episodes rely primarily on interviews with proponents of a controversial new field called “evolutionary psychology.” But Jerry Coyne, an evolutionary biologist at the University of Chicago, has written that “evolutionary psychologists routinely confuse theory and speculation”—forget about evidence! Coyne compares evolutionary

psychology to now-discredited Freudian psychology: "By judicious manipulation, every possible observation of human behavior could be (and was) fitted into a Freudian framework. The same trick is now being perpetrated by the evolutionary psychologists. They, too, deal with their own dogmas, and not in propositions of science." (Executive Summary, page 3-4)

However, Coyne charges the DI with misusing his statement in attempt to discredit the series.

The Discovery Institute is up to its old tricks. Given the complete absence of evidence for their own theory of "intelligent design"--a theory that has produced not a single scientific paper in a peer-reviewed journal--they instead seek "confirmation" of their views in controversies about evolutionary biology. Their strategy (transparent to all thinking people) is to sow doubt about the fact of evolution simply because scientists do not know every detail about how evolution occurred.

One of these controversies is about evolutionary psychology: the view that much of modern human behavior was molded by natural selection in our distant ancestors. I have been a strong critic of this enterprise, not because I think it is misguided, but because I feel that its practitioners often hold low standards of evidence and because it is difficult to test theories about behaviors that evolved millions of years ago. There are others who disagree with me. This is simply one of many scientific disputes that are hard to resolve because the evidence is scanty.

But does this controversy show that humans did not evolve? Hardly! The fossil evidence for human evolution is overwhelming, and new details of how it occurred are constantly appearing with new fossil finds and contributions from molecular biology. Only those willfully blinded by adherence to religious dogma would deny that we evolved from apelike ancestors. Evidence for how our behavior evolved is more tenuous for only one reason: unlike bones, behavior does not fossilize.

The Discovery Institute is curiously silent about the fact of human evolution, preferring to concentrate instead on the controversy about the evolution of human behavior. They claim that the PBS series is guilty of "effective censorship" in failing to show the controversial nature of evolutionary psychology, and that criticisms like mine have been deliberately expunged from the show.

I have watched the Evolution series and have examined its companion book, and the Discovery Institute's accusation of censorship is flatly wrong. Evolutionary psychology is clearly characterized as "controversial" in the television show, and the companion book goes into great detail about potential problems with evolutionary psychology, quoting at length from a critique written by Andrew Berry and myself. I am in complete agreement with the statements in the companion book (p. 284): "The debate over evolutionary psychology won't be resolved any time soon. . . . As hard as it may sometimes get, it's important to stay focused on the science, or the lack thereof, in evolutionary psychology. The

weight of the scientific evidence will ultimately determine whether it stands or falls." This is hardly a one-side, "censored" presentation of evolutionary psychology.

Discovery Institute "0 for 3" vs. Miller

10/3/2001

The Discovery Institute's latest attack on the PBS Evolution series provides a remarkable glimpse of the actual caliber of the scientific "evidence" they claim to have developed against Darwin. In a single paragraph in one of their press releases, they accused the series of having made three important "factual errors" in support of Darwin's theories. A close look at their criticisms, however, shows that it's the scholars of Discovery Institute, not PBS, who have just gone 0 for 3.

Strike 1:

"Evolution" . . . makes numerous factual errors that exaggerate the evidential support for Darwinism. The series asserts that the universality of the genetic code establishes that all organisms had a common ancestor. But biologists have known for well over a decade that the genetic code is not universal.

Wrong. The genetic code is indeed universal. If it weren't, genetic engineers would not be able to swap genes between organisms as different as humans, insects, bacteria, and yeast and still have them work. For better or for worse, gene swapping does work and it works brilliantly. So, how did the Discovery Institute decide that the code is "not universal?" It turns out that in some organisms, a few of the 64 possible "words" of the genetic code are different. Do a few different words mean that the code is not universal? Only if you're willing to say that the US and Britain don't share a common language because elevators in the UK are called "lifts" and they spell the word "color" with a "u."

It gets better. These slight differences in the code actually support the Darwinian concept of a universal common ancestor. This was a point made by Princeton University researchers Robin D. Knight, Stephen J. Freeland and Laura F. Landweber in an article earlier this year ("Rewiring the Keyboard: Evolvability of the Genetic Code," , Nature Reviews - Genetics. 2: 49-58 (2001)). Incredibly, the Discovery Institute, which cited this very paper in their "Viewer's Guide" to the PBS series, actually wrote:

It is now clear that the genetic code is not the same in all living things, and that it does not provide 'powerful evidence' that all living things 'evolved on a single tree of life.

When Professor Laura Landweber, the senior author on this paper, read the Discovery Institute's analysis of differences in the genetic code, she minced no words. Prof. Landweber wrote:

That is indeed a horrible misinterpretation, because it is clear, particularly in the tree in our paper and in others, that each nonstandard code is a subtle derivative of the standard genetic code and that all codes are derived from it.

In plain language, when these "subtle" differences in the code are examined, they actually provide powerful evidence in favor of evolution. Not only was PBS right, but, if anything, they understated the extent to which the genetic code supports Darwin's theory. The status of this scientific "evidence" against evolution? According to Prof. Landweber, it's nothing more than a "horrible misinterpretation."

Strike Two:

Brown University biologist Kenneth Miller asserts that the "imperfect" wiring of the vertebrate retina proves that natural selection, not an intelligent designer, produced the eye. God, in Miller's opinion, wouldn't have done it that way. To arrange the retina as Miller thinks best, however, would render it inoperative.

In the first show of the PBS series I pointed out that the light sensitive portions of the photoreceptor cells of the vertebrate retina are not positioned optimally to face the incoming light. Instead, they are placed beneath the neural wiring of the retina. This arrangement cannot be explained in terms of intelligent design, but is perfectly understandable in light of evolution. The vertebrate retina evolved as an outgrowth of the brain, and as a result its neural wiring retains its original arrangement, scattering the incoming light before can be sensed by the photoreceptor cells.

One can argue whether or not "God would have done it that way," but on one point there can be no dispute. The Discovery Institute is dead wrong when it says that the retina would be "inoperative" if it were arranged with the neural wiring beneath a layer of light sensing cells. How can we be so sure? Because that's exactly how the eyes of many mollusks are arranged. It will, no doubt, come as a great surprise to squid everywhere that, according to the Discovery Institute, their eyes don't work!

Strike Three:

Beauty may indeed be in the "eye of the beholder," but is there any excuse for criticizing a statement that was never made? The third charge made by the Institute press release was that PBS had implied that researcher Dan-Eric Nilsson had written a "computer program" that simulated the evolution of the eye:

The series leaves the distinct impression that a computer program has successfully simulated the evolution of the eye. But such a program nowhere exists – a fact recently verified by Professor Dan Nilsson (of Lund University in Sweden), the very expert that PBS interviewed about eye evolution.

It's not at all surprising that Prof. Nilsson "verified" the non-existence of such a program, since the PBS series never claimed that such a program existed in the first place. Here are the exact words from the broadcast:

Narrator: "At the University of Lund in Sweden, zoologist Dan-Eric Nilsson has developed models to show how a primitive eye-spot could evolve through intermediate stages to become a complex human-like eye in less than half a million years."

Nilsson: "I've been interested in eye evolution for a long time, and in particular I've

been interested in the question of how long a time it would take for an eye to evolve."

Narrator: "Nilsson envisioned a sequence of stages by which a flat patch of light-sensitive cells on an animal's skin could evolve into a camera-type eye. As a first step, nature would favor any changes that made the flat patch more cup-like."

Not once does the PBS program refer to or even imply the existence of a "computer program." Where did the "distinct impression" come from? It's impossible to say, and I would hope that at some point our friends in the Discovery Institute would explain the thought process that led them to write a press release complaining about a statement that was never made.

The Discovery Institute's Box Score: 0 for 3

The Discovery Institute has complained repeatedly that PBS, as well as mainstream science, has ignored powerful evidence against Darwin's theory. Unfortunately, when given a chance to say just what that evidence might be, they have consistently struck out. Those three "factual errors" in the PBS series? They actually come from the Discovery Institute's own "horrible misinterpretation" of genetic code data, their lack of knowledge of the mollusk eye, and their comically overactive imagination.

Just like Darwin, and unlike the Discovery Institute, PBS got it right the very first time.

Moore Corrects Discovery Institute's Poor History

10/3/2001

The WGBH-NOVA series *Evolution* has been criticized by the Discovery Institute (DI) in a 150+ page "Viewer's Guide". Program 1 of the series, a mixture of documentary and drama, is characterized repeatedly by DI as distorting historical facts and promoting stereotypes. However, it is noteworthy that the very first two sentences of DI's guide to Program 1 contain two historical errors of their own: Darwin did not attend a "divinity school", but graduated from Cambridge University. And his position aboard *HMS Beagle* was not "ship's naturalist"; he sailed as a private citizen.

Historian James Moore, a Darwin biographer and advisor to the series, responds to some of DI's other claims and criticisms:

Over the last forty years, the study of Charles Darwin and his works has become a specialism not unlike biblical scholarship. The *Origin of Species* now has its own concordance; Darwin's private notebooks are in a definitive edition; his marginalia have been recorded with scribal exactness; and so far has textual criticism progressed on his published works that antiquarian booksellers search out unnoticed errors in late printings as a hedge against inflation.

In such a well-trodden field, there are many pitfalls into which the-blind-leading-the-blind may stumble. (The phenomeon is familiar in the field of biblical studies.) Thus in preparing the drama for program 1, the production team sought expert guidance at every stage and on each draft-script before the shoot. Verisimilitude was not the aim but rather a story-line with character-development that, like other historical drama, would be consonant with

authoritative scholarship.

Nevertheless, some people have found the program historically deficient. They believe they have good grounds for charging it with bias and falsification. (Similar charges arise in biblical studies from those overly reliant on the private interpretation of scripture.) It seems worthwhile, therefore, to comment on aspects of the program which critics have brought to the public's attention.

Science versus religion

The critics of program 1 have yet to exhibit much historical discernment. While this may be consistent with the manner in which some of them read the Bible, it fails to inspire confidence in their ability to score points against evolution. Consider, for example, how members of the Discovery Institute, who bid to be taken seriously in such matters, dismiss the program's opening scene as a "stereotype" setting the stage for the whole *Evolution* series: "Darwin, the enlightened scientist, against Captain Robert FitzRoy, the supposed religious fundamentalist." The statement itself is a silly caricature, created by projecting modern American preoccupations onto the dramatic figures. The Discoverers then object, "Darwin at that time in his life was more religious and FitzRoy was more scientific," an assertion historically as fatuous as it is redolent of the banal way in which many Americans discuss evolution. (1)

The Discoverers want to know: Where are the "scientists" who opposed Darwin? Why present "science" in the program as if it involved "religion"?

Discover history! The word "scientist" was not in ready use until the end of Darwin's life (and even then it was regarded in Britain as "a horrible but handy Americanism").(2) To speak of "science" on the one hand and "religion" on the other in Darwin's time is deeply unhistorical; it transposes post-positivist intellectual boundaries into an age when those boundaries were contested or had yet to emerge. *On the Origin of Species* was itself the last great work in the history of science for which theology was an active ingredient. The word "evolution" does not appear in the text (except once in the sixth edition) but Darwin used "creation" and its cognates over one hundred times. Almost all the opposition to his work in the nineteenth century was religious in origin, inspiration, or sentiment. "Men of science," even non-Christians, professed themselves religious. Religious leaders, Christian or not, took pride in being scientific. The vast majority of them, particularly in Britain, openly acknowledged the political affinities of their beliefs, and natural selection, accordingly, was often judged "dangerous." Reactions to program 1 suggest that Daniel Dennett is right - the theory remains politically and morally dangerous - though many religious and non-religious people believe it is not necessarily so.

"We are given no hint of the great range of religious views between that of the Bible-thumping FitzRoy and the evolution-friendly Miller." "The makers of *Evolution* have ignored this rich and fascinating history."

Alas, more bunk from the Discovery Institute. Program 1 convenes a broad church of witnesses. Daniel Dennett and Stephen Jay Gould are notorious rivals, and Gould has dubbed Dennett's ideas "Darwinian fundamentalism." (3) James Moore is a historian with religious sympathies who, while admiring Dennett's

work, has charged *Darwin's Dangerous Idea* with "epistemological ethnic cleansing." (4) The program represents real historical complexity, situating Darwin between his freethinking brother Erasmus and Thomas Huxley on the one hand, and the Tory-Anglican Owen-Wilberforce axis on the other. Richard Owen receives full credit (from Darwin and Wilberforce alike) as the nation's "most brilliant anatomist" and "leading ... paleontologist," and for the first time on-screen Owen's notion of transcendental design with "continuous ordained becoming" figures as an alternative to natural selection. Not least, Emma Darwin's heart-felt faith is portrayed with dignity and understanding, as it deserves to be; and finally creation and evolution are reconciled in the words of the *Origin of Species* as the church reclaims Darwin's body and buries it in Britain's noblest shrine, Westminster Abbey.

FitzRoy and Darwin

In the opening scene, FitzRoy and Darwin are young men, still in their 20s. Their relationship at this time was volatile, and after the *Beagle* voyage they mercifully drifted apart. What each of them said about the other, as well as himself, in later years must be weighed in the light of contemporaneous evidence. And what we may infer about their relations during the voyage depends, not just on these few "facts," but on seasoned judgments about late-Georgian naval life, personal religion, psycho-sexual development, self-representation, and English-language usage. In other words, the subject is complex.

There are reasons to believe that during the voyage FitzRoy and Darwin saw religiously eye-to-eye, for the most part. Both of them esteemed the Bible, though they also appear to have shared doubts, in 1834, about certain passages concerning the extent of the Flood. But FitzRoy, unlike Darwin, felt uneasy in doubting. "I suffered much anxiety," he wrote in 1839; "wavering between opinions" produced in him "an unsettled, and therefore unhappy, state of mind." (5)

For instance, FitzRoy had read freethinkers who denied the unity of the human races as taught in scripture. "Until I had thought much on the subject, and had seen nearly every variety of the human race" - that is, until the voyage with Darwin was over - "I had no reason to give in opposition to doubts excited by such sceptical works, except a conviction that the Bible was true, that in all ages men had erred, and that sooner or later the truth of every statement contained in that record would be proved." (6) Given the brittleness of his belief in human unity, FitzRoy might well have cracked in a "unhappy" moment, sided with the freethinkers, and assuming blacks to be a separate inferior species, defended the practice of slavery. If so, this would help explain FitzRoy's first and most famous row with Darwin, whose belief in human unity never wavered - he was a passionate abolitionist.

The race row probably occurred in 1832. It was a year later that Darwin discovered the *Toxodon* skull, as shown in the first scene.

Here dramatic licence was used judiciously. FitzRoy did not accompany Darwin on the trip to Mercedes in Uruguay, where the skull was acquired, nor did the find occur within sight of the Andes. However, FitzRoy's suggestion about *Toxodon's* extinction - "perhaps the Ark was too small to allow them entry, and

they perished in the Flood” - was painstakingly crafted. The words are not only consonant with a view he repeated six years later; they also accurately represent his contemporaneous “wavering” faith in scripture. For his suggestion implies either that Noah failed to take two of every “kind” - including the species of *Toxodon* - into the Ark, or that “these creatures” remained outside because the Flood was not in fact universal, contrary to the literal sense of Genesis. FitzRoy, unsure, says, “Perhaps.”

Either way, the remark presupposes something less than a caricatured, knee-jerk orthodoxy. And when Darwin laughs (indefinitely) at the suggestion, rising to the bait (“perhaps”), FitzRoy’s retort is entirely consonant with what is known of his character: “Do you mock me? Or the Bible?” The captain was prickly, authoritarian, a perfectionist with knife-edge moods. His first thought is of insubordination, not heterodoxy. In a “wavering” state of mind, he mixes up his own word with the Word of God, evincing the same rigidity that Darwin encountered in their race row the year before. FitzRoy became “excessively angry,” Darwin recalled, “and he said that as I doubted his word, we could not live any longer together.”(7) Thus in the present scene, when asked by FitzRoy “what kind of clergyman” he would become, Darwin replies, full of ambiguity and portent, “Dreadful.” A dreadful clergyman by FitzRoy’s standards, yes, but equally it was a sneer at the captain for his dreadful impertinence.

PBS and the program-makers cannot be held responsible if individuals mistake themselves or their own beliefs for what the actors portray.

Darwin and divine worship

In the next scene, Darwin is not wholly attentive during divine worship aboard the *Beagle*. He may be contemplating God in His creation rather than His Word - a time-honoured activity among English naturalists - but in any case there is no reason to suppose that Darwin’s religious practice during the voyage was other than gentlemanly and conventional. Neither pious nor negligent, he behaved as the Cambridge-educated son of a wealthy Whig-Unitarian family.

Janet Browne, in her exhaustive account of the voyage, concludes that Darwin “went to church regularly ... attending the shipboard ceremonies conducted by FitzRoy and services on shore whenever possible.” She also explains why the “last and greatest” painting by Darwin’s shipmate, August Earle, “Divine Service as It Is Usually Performed on Board a British Frigate at Sea” (1837), “probably portrays the *Beagle* company, for it is a subtle panorama of the wide range of theological opinion that could be embraced by just such a set of travellers. The captain is seated in a flag-draped chair below decks intent on the Bible before him. Except for his grey sailor’s queue, he looks like FitzRoy. A woman close by, otherwise unusual on a ship, is probably Fuegia Basket in her royal bonnet. Another figure, who must be Darwin, sits to one side hardly looking at his book although following the words for all that, and the junior officers, the young midshipmen, and sailors show varying degrees of intentness.” (8) Even if the painting is not of the *Beagle*, the artist surely composed the panorama drawing on memories of his life at sea with Darwin.

This contemporaneous visual record (in the National Maritime Museum, Greenwich) directly inspired the scene in program 1. And Darwin's own expressions in the scene are based on his known doubts about creationist biogeography during the latter part of the voyage. By this time he had ample reasons to dismiss a reading of Genesis as literal, historical truth.

Erasmus and Charles

The Darwin brothers have never played opposite each other on-screen - until now. Scripting them was entrusted to a English writer acclaimed for his TV adaptation of *Anna Karenina*, Alan Cubitt, and his portrait of Erasmus is a master stroke. Erasmus Alvey Darwin was born in 1804, on the fifth anniversary of his uncle Erasmus's suicide and two years after the death of his paternal grandfather Erasmus. Young "Ras" too was a freethinker - or "free-drinker," he tells FitzRoy in their dockside encounter (but his real weakness was opium) - and as a bachelor he may have indulged a libertine tendency evident in his grandfather's soft-porn poetry. In any case, Emma Darwin feared that Ras had blazed a trail of unbelief for his brother, removing "some of that dread & fear which the feeling of doubting first gives." (9) And Ras was indeed something of a radical. In 1832 he deplored Charles's future prospects in "a "horrid little parsonage," declaring, "My only chance is the Established Church being abolished." (10)

Beyond a few such remarks, we know little about Ras, partly because much of the brothers' communication was face-to-face, partly also because Ras's health failed and he became depressed, writing infrequently. But his quip at the end of the program about being "naturally selected" and his previous playful jab, "if the facts won't fit, well, so much the worse for the facts," neatly sum up his character. Both phrases, from a letter in 1859, evince a man physically and mentally in rut that Charles himself never got in to. (11)

Ras was radical, single, sarcastic and dissipated, with little in life to lose - in short, the perfect foil for a churchgoing brother with a devout wife, a large family, and a growing scientific reputation. Ras was overtly out-of-tune with the same Anglican establishment that Charles was covertly undermining even as he sought recognition from it. No wonder then that, plausibly enough, the program has Ras singing from a different hymn-sheet, as it were, in Down parish church, a dyed-in-the-wool Dissenter.

So why did *Evolution's* religious critics watch a different program? Maybe because they had seen it all beforehand, playing in contemporary America. Now we hope they will discover that history isn't just déjà vu.

NOTES

1. All Discovery Institute quotations are from the 'executive summary' of *Getting the Facts Straight: A Viewer's Guide to PBS's EVOLUTION* (Seattle, WA: Discovery Institute Press, 2001).

2. *The Times*, quoted in J. Moore and A. Desmond, "Transgressing Boundaries," *Journal of Victorian Culture*, vol. 3 (1998), p.151

3. S.J. Gould, "Darwinian Fundamentalism," *New York Review of Books*, 12 June 1997, pp.34-37.
4. J. Moore, "Keeping Faith with Darwin," *Times Higher Education Supplement*, 3 November 1995, p.20.
5. R. FitzRoy, "A Very Few Remarks with Reference to the Deluge," in idem, ed., *Narrative of the Surveying Voyages of His Majesty's Ships "Adventure" and "Beagle"* (1839), vol. 2, reprinted in R.D. Keynes, ed., *The Beagle Record* (1979), p.368.
6. R. FitzRoy, "Remarks on the Early Migration of the Human Race," in idem, ed., *Narrative of the Surveying Voyages of His Majesty's Ships "Adventure" and "Beagle"* (1839), vol. 2, quoted in N. Barlow, "Robert FitzRoy and Charles Darwin," *Cornhill Magazine*, vol. 72 (April 1932), p.506.
7. N. Barlow, ed., *Autobiography of Charles Darwin* (1958), p.74.
8. J. Browne, *Charles Darwin* (1995), pp.326-27.
9. F. Burkhardt et al., eds, *Correspondence of Charles Darwin*, vol. 2 (1986), p.172.
10. F. Burkhardt et al., eds, *Correspondence of Charles Darwin*, vol. 1 (1985), p.259.
11. F. Burkhardt et al., eds, *Correspondence of Charles Darwin*, vol. 7 (1991), p.390.

Gilbert Rebukes Discovery Institute for Use of Quote

10/12/2001

In an article dated Friday, September 28, 2001 by Stephen Meyer, and published on WorldNetDaily.com, the Discovery Institute (DI) criticized the new PBS Series Evolution by stating:

Few biologists dispute that natural selection produces small-scale "micro-evolutionary" changes such as those in the size and shape of Galapagos finch beaks (also featured in the series). But many now doubt that the Darwinian mechanism explains the large-scale "macro-evolutionary" innovations necessary to build new organisms (such as birds) in the first place. Thus, developmental biologist Scott Gilbert of Swarthmore University argues that "natural selection explains the survival, but not the arrival of the fittest."

Skip Evans, NCSE Network Project Director said, "Casting doubt on natural selection to imply that common descent doesn't happen is a familiar creationist ploy. We expect more from an organization that aspires to be taken seriously in the scientific community."

When he learned of the use of his quote in the DI article, Dr. Gilbert told NCSE:

Of course, it is out of context, in that the paragraph mentions that natural selection alone cannot explain the origin of species. One needs natural selection plus developmental genetics. Most natural selection black-boxes the genes that are involved in forming morphological structures during development. However, we now know something about these developmental regulatory genes. Evolutionary developmental biology focuses on these genes (that the Creationists say do not exist and the Intelligent Design people conveniently ignore) to show that changes in gene expression can give one the raw material upon which natural selection can work.

As we have seen in so much of the misinformation from the Intelligent Design group, it is not always what is said as what is left out. Candor requires telling the whole story, and the whole story is that Gilbert and other developmental biologists working on these problems do not doubt

that living things shared common ancestry, or that natural selection is extremely important to the process of evolution.

Kauffman Rejects Intelligent Design

10/14/2001

Some critics of the WGBH series “Evolution” have pointed to differences of opinion among scientists about the relative importance of various evolutionary factors as somehow raising doubts about the common acceptance of evolution as a scientific explanation. For many years creationists have used this tactic in an attempt to imply that debates within evolution reveal crucial scientific weaknesses. Recently, the Discovery Institute (DI) and those associated with it have repeatedly cited the work of various scholars who did not appear in the “Evolution” series as if these scholars share DI’s anti-evolutionary point of view. For example, the following was written by Michael Behe and posted on a DI website.

(http://www.reviewevolution.org/press/fromPress_FatuousFilmmaking.php):

“Evolution” trumpets not just evolution (descent with modification) in general, but Darwinism (random mutation and natural selection) in particular. Yet the show can't even bring itself to mention that some scientists and academics - plus the vast majority of the public - are profoundly skeptical of natural selection as the driver of evolution. For example, consider Stuart Kauffman. Kauffman is one of the leading lights in a group of scientists exploring complexity theory - roughly, the idea that complex systems can organize themselves - explicitly as an alternative to natural selection. His work has been widely discussed both in scientific and popular periodicals. But no mention is made of Kauffman or his colleagues in the seven-hour series.

When contacted in October, 2001 Stuart Kauffman had the following comments on the implications of his research and his views on natural selection and evolution:

While all scholars are free to make what they will of the work of other scholars, I wish to distance myself from use of my own work on self organization plus selection in evolution by both “creation scientists” and “Design theory”. My own work on self organization suggests that spontaneous order in complex systems may offer a second source of order in biology, in addition to natural selection. My argument does not entail that Darwinian descent with modification into the branching “tree of life” is invalid. Nor does it entail that natural selection is not a critical process in evolution. It does argue that some forms of order in complex systems, such as ordered behavior of genetic regulatory networks and the emergence of self reproducing, collectively autocatalytic networks, are much more probable than we have realized. Because these arguments suggest a higher probability of such complex systems than we might have supposed, the arguments tend to run against Design theory, which is based on the argument that such complex systems are so improbable that one must infer Design. If I am right, that is just what one cannot infer. More, there is nothing in my work that I personally take to support “creation science”, if by some stretch of the definition it be science at all.

Earlier in 2001 Dr. Kauffman wrote the following in response to another attempt by anti-evolutionists to cite his work in casting doubt on evolution.

My own books explore self organization in complex systems and the implications for the origins of life and evolution and ontogeny. I am, however, a Darwinian in the broad sense and hold to the view that mutations are random with respect to prospective adaptive significance. Hence I hold no truck with intelligent design.

Gee Responds to Discovery Institute's use of Quotation

10/15/2001

The Discovery Institute's Viewers Guide to the PBS "Evolution" series claims in several places (for example, on page 11) that the series "...leave(s) viewers with the misleading impression that the evidence for human evolution is much stronger than it really is." The Guide attempts to discredit the scientific implications of the human fossil record by quoting (on pages 11, 40, 47, 88, and 111) passages from the 1999 book *In Search of Deep Time* by Dr. Henry Gee, who is also Senior Editor, Biological Sciences, for the journal *Nature*. Dr. Gee has sent us the following comments:

1. The Discovery Institute has used unauthorized, selective quotations from my book *IN SEARCH OF DEEP TIME* to support their outdated, mistaken views.
2. Darwinian evolution by natural selection is taken as a given in *IN SEARCH OF DEEP TIME*, and this is made clear several times e.g. on p5 (paperback edition) I write that "if it is fair to assume that all life on Earth shares a common evolutionary origin..." and then go on to make clear that this is the assumption I am making throughout the book. For the Discovery Institute to quote from my book without reference to this is mischievous.
3. That it is impossible to trace direct lineages of ancestry and descent from the fossil record should be self-evident. Ancestors must exist, of course -- but we can never attribute ancestry to any particular fossil we might find. Just try this thought experiment -- let's say you find a fossil of a hominid, an ancient member of the human family. You can recognize various attributes that suggest kinship to humanity, but you would never know whether this particular fossil represented your lineal ancestor - even if that were actually the case. The reason is that fossils are never buried with their birth certificates. Again, this is a logical constraint that must apply even if evolution were true -- which is not in doubt, because if we didn't have ancestors, then we wouldn't be here. Neither does this mean that fossils exhibiting transitional structures do not exist, nor that it is impossible to reconstruct what happened in evolution. Unfortunately, many paleontologists believe that ancestor/descendent lineages can be traced from the fossil record, and my book is intended to debunk this view. However, this disagreement is hardly evidence of some great scientific coverup -- religious fundamentalists such as the DI -- who live by dictatorial fiat -- fail to understand that scientific disagreement is a mark of health rather than decay. However, the point of *IN SEARCH OF DEEP TIME*, ironically, is that old-style, traditional evolutionary biology

-- the type that feels it must tell a story, and is therefore more appealing to news reporters and makers of documentaries -- is unscientific.

4. I am a religious person and I believe in God. I find the militant atheism of some evolutionary biologists ill-reasoned and childish, and most importantly unscientific -- crucially, faith should not be subject to scientific justification. But the converse also holds true -- science should not need to be validated by the narrow dogma of faith. As such, I regard the opinions of the Discovery Institute as regressive, repressive, divisive, sectarian and probably unrepresentative of views held by people of faith generally. In addition, the use by creationists of selective, unauthorized quotations, possibly with intent to mislead the public undermines their position as self-appointed guardians of public values and morals.
5. The above views are my own and do not necessarily represent those of my colleagues at *NATURE* or any opinion or policy of the *NATURE PUBLISHING GROUP*.

Henry Gee

Discovery Institute Fails Again to “Crack the Code”

*By Kenneth R. Miller
Brown University*

10/18/2001

On October 10, 2001, the folks at the Discovery Institute paid me the unexpected compliment of producing a long press release crafted specifically to reply personally to my defense of comments made in the PBS Evolution series. It's nice to be noticed!

One of the PBS programs had noted that living organisms share a universal genetic code, a claim that the Discovery Institute (DI) immediately labeled as "false" and misleading. Their objections were based on the discovery, over the past 20 years, that a number of genetic systems, especially those in mitochondria, have slight differences from the standard genetic code found in most textbooks. This means that the genetic code, according to the Institute, is not universal, and "does not provide 'powerful evidence' that all living things 'evolved on a single tree of life'" For the Discovery Institute, this was doubtless the opening they had hoped to find in order to make credible charges of scientific inaccuracy against the PBS series. In their viewer's guide they wrote triumphantly:

"So the first hard evidence that we are given for Darwin's tree of life turns out to be false."

Unfortunately for the credibility of the Discovery Institute, a close examination of the evidence indicated that it was their own claims that were false, not those of the evolution series. These errors were detailed in a brief document I released on September 25, 2001. Their new press release, "A Reply to Kenneth Miller on the Genetic Code," is a carefully-crafted response designed to defend DI scholars against my analysis of their original accusations. Once again, however, they've exposed nothing so much as their own shallow understanding of science and

their remarkable abilities to ignore clear and powerful evidence for evolution, no matter where it is found.

I challenged their assertions that the genetic code is not universal by emphasizing how widely the basic molecular elements of the genetic machinery are shared across the kingdoms of life. I wrote that:

Despite the DI rhetoric, living organisms do indeed share a common mechanism that copies and translates heritable genetic information. All living organisms translate the genetic code using ribosomes, tiny protein-building factories, they all translate it with the aid of small molecules called transfer RNA, they all read it in the same direction, and they all read it in the same way, translating the code 3 letters at a time into sequences of amino acids, the building blocks of proteins. [Miller, 9/25/01]

In their rebuttal, did they challenge the accuracy of any of these statements? Absolutely not - because all of these things are true. Instead, they made three very different, subtle, and carefully-targeted assertions of misrepresentation:

The Discovery Institute charges that:

1. Miller completely misrepresents Knight et al.'s composite phylogeny of genetic codes.
2. Variant genetic codes are not analogous to the differences between dialects of the same language.
3. Miller's references to biotechnology do not accurately represent the experimental literature on variant genetic codes.

We'll take them one at a time:

I) "Misrepresentation of Knight *et al.*'s composite phylogeny of genetic codes"

The Discovery Institute challenged my assertion that the slight differences in the codes of certain organisms occur in "regular patterns" that strongly support the notion of common descent. Here's what I had written:

The variations from the standard code occur in regular patterns that can be traced directly back to the standard code, which sits at the center of the diagram. What this means is that these slight variations of the code provide powerful - and unexpected - confirmation of the evolution of the code from a single common ancestor. [Miller, 9/25/01]

According to Mark Edwards, who apparently wrote the DI rebuttal, I made a serious mistake when I said that the code variations supported the notion of common ancestry. In support of their position, they cited a 2001 study from Laura Landweber's lab at Princeton (Knight et al, 2001), and made reference to "Figure 2" of that paper. Figure 2 is a summary of the genetic code differences in various organisms, which I included in my original critique of the DI charges.

In their caption to Figure 2, Knight et al. note explicitly that variant codes have arisen "repeatedly and independently in different taxa." This pattern of convergent variation has generated much discussion in the primary literature. If these are indeed convergent changes, they do not provide evidence of common descent at all, but rather would be misleading similarities that, taken by

themselves, generate a false history of the organisms in question. **[Discovery Institute, 10/10/01]**

This statement is a perfect example of the Discovery Institute's tendency to miss the scientific point in just about any study that provides support for evolution. What Knight *et al* actually wrote in their caption was "Note that the same few changes have taken place repeatedly and independently in different taxa." This statement refers to their observation that the same very slight changes have occurred repeatedly in different groups of organisms. For example, Knight *et al* write that:

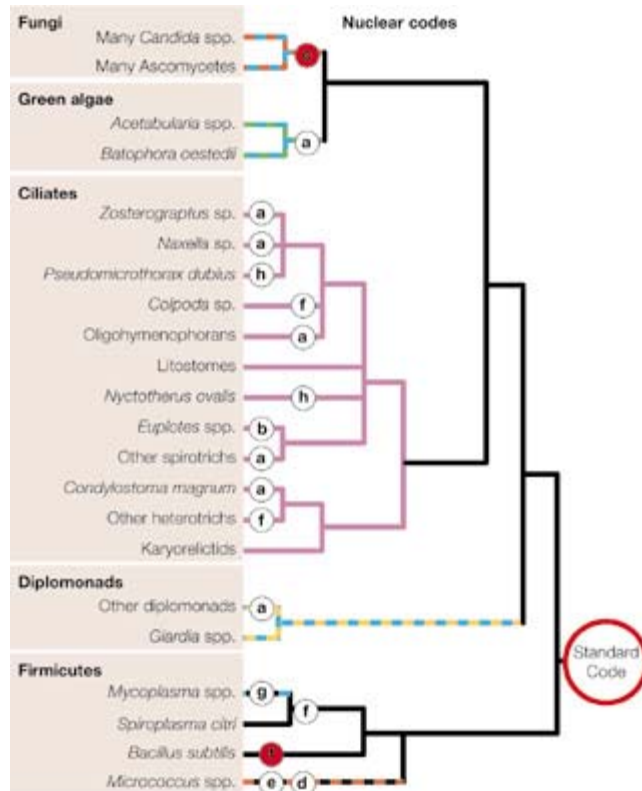
Sometimes the same change recurs in different lineages: for instance, the UAA and UAG codons have been reassigned from Stop to Gln in some diplomonads, in several lineages of ciliates and in the green alga *Acetabularia acetabulum*.
[Knight *et al*, 2001]

A dose of realism is in order here. Noticeably absent from the Discovery Institute's writings on this subject are any hints of the *actual* nature of the variations in the genetic code which they find so interesting. Why? I suspect that reason is simple. It's because the data support Darwin.

In short, Miller completely misrepresents the Knight *et al*. composite phylogeny. There is no "regular pattern" to the variant codes that maps congruently onto phylogenetic trees from other data. Thus, far from providing what Miller calls "unexpected confirmation of the evolution of the code from a single common ancestor," the pattern of variant codes represents a puzzle for a single tree of life.
[Discovery Institute, 10/10/01]

Really? I urge readers to examine Figure 2 from the Knight *et al* paper, which was included in my 9/25/01 critique, and is included at the end of this analysis as well. As you will see, each and every variant code can be traced to the single, ancestral, standard code that sits in the center of the diagram. The interpretation that any reasonable person would draw from these data is that alterations from the standard code do indeed occur in regular patterns that strongly support the idea of descent with modification.

Let's take just one example to see how the evidence supports common descent and how the Institute deals with it. In several groups of organisms the meaning of the codons "UAA" or "UAG" has been changed from "Stop" to "Gln" (glutamine). The other 62 or 63 three-letter codon "words" in the genetic code in these organisms are unchanged from the standard code. These groups are shown in the portion of Figure 2 from the Knight *et al* (2001) paper dealing with the nuclear genetic code. As you will see, they point out seven groups in which such a change has taken place:



Above: Portion of Figure 2 from Knight et al (2001).
Changes from UAA and UAG to "Stop" are marked with the letter "a."

The "pattern" I spoke of is clear. These changes occur in isolated lineages that long ago diverged from the evolutionary lines leading to most organisms, including animals and plants (which use the standard code). Remarkably, the Discovery Institute agrees that this is the case, even going so far as to use the word "lineage," which implies common descent:

Sometimes the same change recurs in different lineages: for instance, the UAA and UAG codons have been reassigned from Stop to Gln in some diplomonads, in several species of ciliates and in the green alga *Acetabularia acetabulum*.

[Discovery Institute, 10/10/01]

So, how do they twist the data to imply that no evidence for descent with modification exists in those "different lineages?" By pretending that the data must be interpreted in a way that no scientist has ever proposed. Remember their assertions of how these data might generate "false" views of biological history:

... If these are indeed convergent changes, they do not provide evidence of common descent at all, but rather would be misleading similarities that, taken by themselves, generate a false history of the organisms in question.

The key phrase in this distortion is the suggestion that the code changes "taken by themselves" would "generate a false history." This is a classic example of the out-of-context reasoning of the Discovery Institute. Neither I nor the authors of the Knight *et al* (2001) paper have ever suggested that these data should be "taken by themselves," as the Institute suggests. Rather, if descent with modification is true, then these changes in the code should fit into a regular pattern consistent with the evolutionary relationships of the organisms in question. And, guess

what? That is exactly what they do.

Have I misinterpreted the meaning of the data in the Knight *et al* (2001) paper? Here's what Prof. Laura Landweber of Princeton wrote when I sent her a copy of the Discovery Institute's analysis of her paper:

That [*the Discovery Institute's argument*] is indeed a horrible misinterpretation, because it is clear, particularly in the tree in our paper and in others, that each nonstandard code is a subtle derivative of the standard genetic code and that all codes are derived from it. **[letter from Laura Landweber to KRM, 9/24/01]**

Steven Freeland, the second author on the paper, now at the University of Maryland, went further:

I would therefore take a more direct line in pointing out how variation in the code, and subsequent adaptation of the code, is an exact molecular simile for the variation in finch beak morphology that Darwin famously drew from in order to derive his theory. The slight coding differences that we see today hint at an evolutionary plasticity that can accumulate over time into significant change, just as slight variation in beak morphology can lead to different species of bird."
[letter from Steven Freeland to KRM, 9/24/01]

The bottom line? The Discovery Institute's desperate attempts to argue that the genetic code provides no evidence in favor of descent with modification amount to a "horrible misinterpretation" of the actual evidence. I was correct in my 9/25/01 analysis, and NOVA's comments on the universality of the code stand up very well under scientific scrutiny.

2) "Variant genetic codes are not analogous to the differences between dialects of the same language."

Sure they are. The Discovery Institute had attacked this analogy (perhaps because it is too easily understood by a layperson) with these words:

This is--at best--a wildly inaccurate analogy. From context and other clues, English speakers can discern that the words "center" and "centre," or "color" and "colour," refer to the same object. Meaning is preserved by context, and the reader moves along without a hitch. **[Discovery Institute, 10/10/01]**

This is not true, however, for other differences between American and British English, and that was my point. If I was to tell someone unfamiliar with British English that "profits from my lift business had enabled me to buy two new lorries," they wouldn't have a clue as to what I did for a living or what I had just purchased. Nonetheless, we regard the two versions of English as part of the same language on the basis of a very simple criterion - the vast majority of the words and the essential rules of grammar are identical.

Exactly the same is true for the different versions of the genetic code. Fully 75% of the codon "words" are identical in all organisms, and even the most dramatic variants themselves differ from the standard code in no more than 5 or 6 codons (meaning that they are actually 90% identical to the standard code).

I also like the "keyboard" analogy used by Knight *et al* (2001), but had the Discovery Institute fully explained that analogy to their readers, once again they would have had to concede the central issue - namely, the principle of common ancestry. Imagine a situation where all of the traveling salesmen for a company were recalled from stations in distant regions of the world.

When we examined the keyboards on their laptop computers, we discovered that all of the keyboards from the home office had the familiar QWERTY arrangement. A few of the salesmen who had been separated from the home office the longest, however, had keyboards in which a few letters had been switched or were missing. When they were analyzed, each and every one of them could be traced back to the ancestral QWERTY arrangement, modified in a variety of ways. We would quickly figure out that QWERTY came first, and the others were slight modifications of it. In other words, we'd conclude that the keyboards were related by descent with modification.

Score another point for Darwin.

3) "Miller's references to biotechnology do not accurately represent the experimental literature on variant genetic codes."

Oh, yes, they do. I wrote:

In fact, the entire biotechnology industry is built upon the universality of the genetic code. Genetically-modified organisms are routinely created in the lab by swapping genes between bacteria, plants, animals, and viruses. If the coded instructions in those genes were truly as different as the critics of evolution would have you believe, none of these manipulations would work. For better or for worse, they do work, and they work brilliantly. **[Miller, 9/25/01]**

What I did was to point out that if the codes were "as different as the critics of evolution would have you believe," then gene-swapping wouldn't be nearly as easy or as successful as it actually is. The Discovery Institute "rebutted" this statement by pretending that I had said something else:

But some manipulations--namely, those involving organisms with variant codes--do not work, unless the researchers themselves intervene to ensure function. Consider, for instance, the release factor from the ciliate *Tetrahymena thermophila*. Release factors (in eukaryotes, these proteins are abbreviated as "eRF" to distinguish them from prokaryotic release factors) catalyze the separation of completed polypeptide chains (nascent proteins) from the ribosomal machinery. Unlike other eukaryotic release factors, however, that recognize all three stop codons (UAA, UGA, and UAG), the *Tetrahymena thermophila* release factor recognizes only the UGA codon as "stop." **[Discovery Institute, 10/10/01]**

Obviously, wherever differences exist, a genetic engineer must pay attention to them, as the Institute points out here. However, I *never* wrote that meaningful differences didn't exist, only that they are slight and fall into patterns that support descent with modification. None of the DI's detailed observations regarding translation in *Tetrahymena* deal with my contentions. The DI's best efforts to pretend that the existence of *any* translational differences between organisms spells trouble for evolution is simply false.

The Design "Alternative"

The explanation favored by the Discovery Institute for the range and diversity of life is something they call "Intelligent Design." In their criticisms of the PBS evolution series they have repeatedly argued that "Design" is an authentic scientific theory that stands on its own merits as a scientific alternative to evolution. One would think, therefore, that they would be ready to explain exactly how design explains the diversity of the genetic code more effectively than the elegant explanation of descent with modification.

I read their press releases in vain looking for details. I had hoped to learn how a designer might have chosen to alter the code in some organisms and not in others, and especially why the patterns of variation come to resemble something that we scientists "misinterpret" as evolution. Naturally, I was disappointed. As usual, the Discovery Institute is silent on this issue. "Intelligent Design," it seems, amounts to little more than saying "Maybe a Designer Did It" for each and every fascinating pattern that appears in living organisms. It is no wonder that the scientific community has rejected "Design" again and again for the simplest of all reason - a lack of evidentiary support.

Kenneth R. Miller
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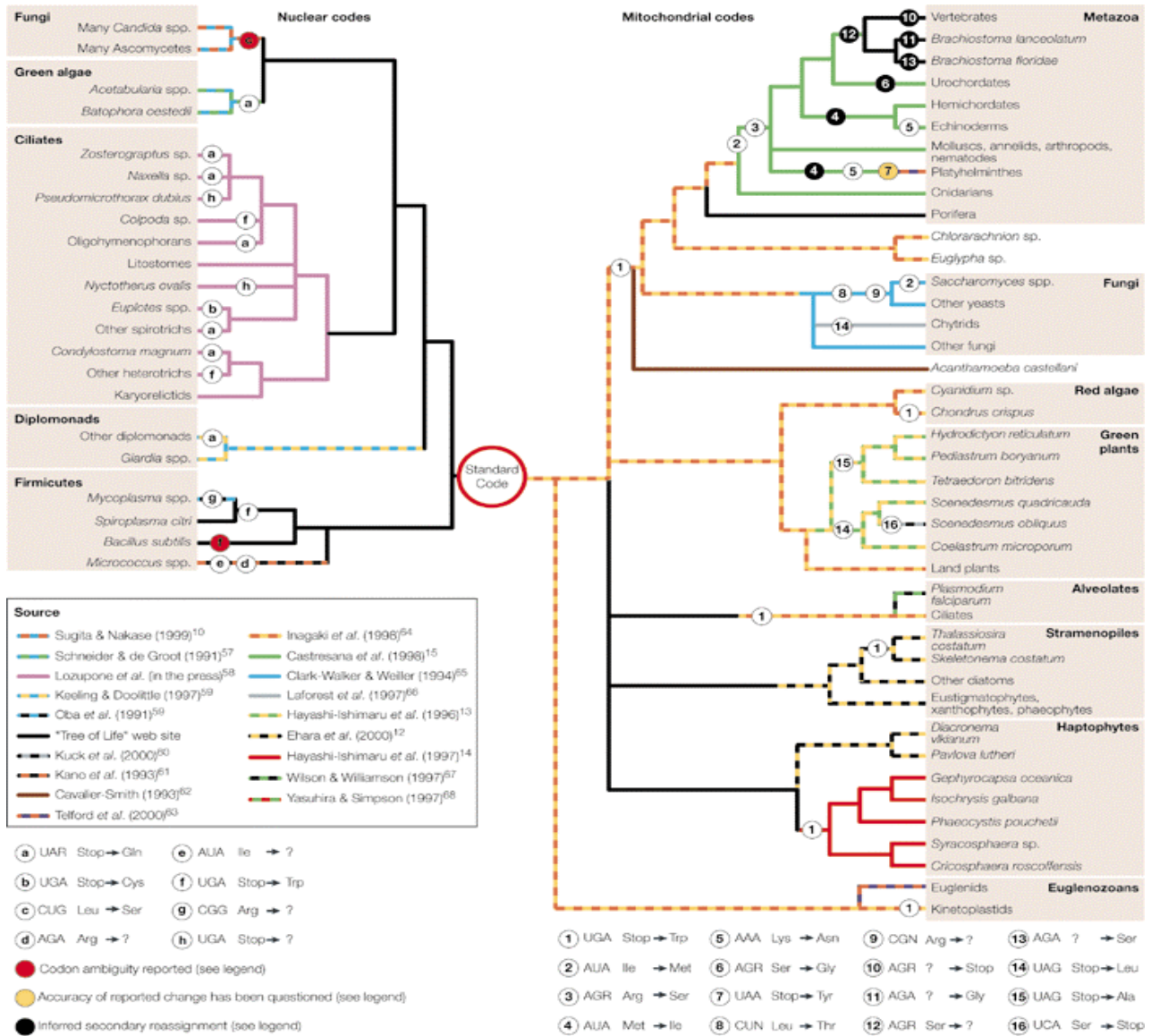
References:

Original Press Release: The Discovery Institute Press Release charging the *Evolution* series with false statements concerning the genetic code can be found on the web:
http://www.reviewevolution.com/press/pressRelease_FalseClaim.php

Robin D. Knight, Stephen J. Freeland and Laura F. Landweber (2001) "REWIRING THE KEYBOARD: EVOLVABILITY OF THE GENETIC CODE," *Nature Reviews - Genetics*. 2: 49-58.

[Miller, 9/25/01] My 9/25/01 critique of the Discovery Institute's charges on the Genetic Code is available on the web at:
http://www.ncseweb.org/resources/articles/3071_km-3.pdf

[Discovery Institute, 10/10/01] The Discovery Institute Press Release responding to my 9/25/01 critique is entitled "Reply To Kenneth Miller On The Genetic Code," and is available on the web:
http://www.reviewevolution.com/press/pressRelease_ReplyMiller.php



Above: Composite Phylogeny of Variant Codes. (From Knight, Freeland, and Landweber, 2001, used with permission) The slight variations of the "standard" genetic code are related to each other in a way that can only be explained by common descent from a single ancestor possessing the standard code.

Articles

The following articles respond to various creationist activities in regarding the *Evolution* series.

Doubting Darwinism Through Creative License

Skip Evans

NCSE Network Project Director

In October and November 2001, the Discovery Institute (DI), a Seattle-based public policy institute, placed advertisements in at least three periodicals, including *The New York Review of Books*, *The New Republic*, and *The Weekly Standard*. The advertisement in *The New York Review of Books* appeared under the headline “A Scientific Dissent from Darwinism” followed by this text:

Public TV programs, educational policy statements, and science textbooks have asserted that Darwin’s theory of evolution fully explains the complexity of living things. The public has been assured, most recently by spokespersons for PBS’s *Evolution* series, that “all known scientific evidence supports [Darwinian] evolution” as does “virtually every reputable scientist in the world.”

The following scientists dispute the first claim and stand as living testimony in contradiction to the second. There is scientific dissent to Darwinism. It deserves to be heard.

After this brief statement is a gray box taking up the majority of the page which contains in small print a list of names followed by the names of the institutions at which the signatories work, previously worked, or attained doctoral degrees. In a cleared space in the middle of this display is an area containing the statement to which the signatories attest:

We are skeptical of the claims for the ability of random mutation and natural selection to account for the complexity of life. Careful examination of the evidence for Darwinian theory should be encouraged.

Under close examination, the text of both the leading paragraphs and the statement attested to appear to be very artfully phrased. The first paragraph tells readers that spokespersons for the PBS series *Evolution* have assured the public that “all known scientific evidence supports [Darwinian] evolution.” But notice that “Darwinian” appears in brackets. That “all known scientific evidence supports evolution” is a different claim than “all known scientific evidence supports [Darwinian] evolution.” Exactly who is equating *Darwinian* evolution and evolution? In the same vein, the signatories to the second declaration are described as dissenting from “Darwinism” — but do they reject *evolution* as well? NCSE decided to go to the source to ask the questions.

The Quote

On October 31, 2001, Mark Edwards of the DI responded to an e-mail request for the source of the quote. He stated that he did not know offhand the source of the quotation in the first paragraph but would make an effort to track it down. As of this writing, he has not supplied that information.

Personnel from public television station WGBH, the coproducer of the PBS *Evolution* series, were unable to find the exact quotation in any of their published literature. An internal memorandum providing background information on the *Evolution* series to PBS stations nationwide contains an almost identical sentence: “All known scientific evidence supports evolution.” — without the word “Darwinian”.

Let us assume that this internal memorandum (described on the DI web page <<http://www.reviewevolution.com/press/LeakedMemo.pdf>>) is the source of the quote used in the advertisement. If the word “Darwinian” does not occur in the original quote, why was it added here? In the rest of the paragraph from which the quote was evidently taken there is a discussion of “new discoveries over the past 150 years”, including much of the fossil record, DNA, and the process of genetic replication. The paragraph goes on to state that any of these discoveries could have potentially discredited evolution, but they did not. In fact, they have provided even more evidence for descent with modification and common ancestry. The paragraph concludes by acknowledging that there certainly are things about evolution we do not yet know, just as with “all comprehensive scientific theories, from the theory of gravity to quantum mechanics.”

We believe that the Discovery Institute intentionally modified the sentence and thereby changed its meaning. The original PBS sentence focused on *evolution* – the thesis that living things have common ancestors. It would *not* be equivalent to say that “all known scientific evidence supports *Darwinian* evolution”; by adding “Darwinian”, the meaning of the quotation is changed. Is there healthy scientific debate about the role natural selection plays in evolution? Absolutely, and this is widely recognized. The discoveries of genetics have led to a better understanding of the sources for variation, and the latter half of the 20th century has witnessed a vigorous debate about the roles of proposed additional mechanisms — including genetic drift, gene flow, and developmental processes. These are some of the most interesting topics in modern evolutionary science. But arguments within the scientific community about *how* evolution occurs should not be confused with arguments — conspicuously absent from the scientific community — about *whether* evolution occurred.

The Statement

The signatories appear to attest to a statement about the ability of natural selection to “account for the complexity of life” — in other words, a statement about *how* evolution takes place. Given the anti-evolutionary tone of the introductory paragraphs, a layperson reading the advertisement might well assume that the signatories objected to evolution itself, rather than to the universality of natural selection as its mechanism. But did the scientists themselves object to evolution? Any of them? All of them? Or were some of them only questioning the importance of natural selection? Many scientists — including many associated with NCSE — could in good

conscience sign a statement attesting to natural selection's not fully explaining the complexity of life!

The Signatories

The list consists of 41 biologists (over half of whom are biochemists), 16 chemists, 4 engineers, 2 geologists/geophysicists, 8 mathematicians, 10 medical professionals, 4 social scientists, 15 from physics or astronomy, and 3 whose specialties we were unable to determine. Few were from biological subfields associated with organismic and population-level biology — the divisions of biology most closely associated with the study of evolution. None was recognizable as a prominent contributor to the scientific literature debating the role of natural selection in evolution. (The list published on the <<http://www.reviewevolution.com>> web site, which we analyzed, originally contained 103 names. The ads published in the print media contained 105 names, with the addition of the Center for Renewal of Science and Culture, the creationist arm of the DI, President Stephen Meyer and Fellow Paul Nelson, both of whom hold PhDs in philosophy.)

NCSE contacted a sample of the signatories and asked them specific questions about their attitudes concerning evolution, namely whether or not they accepted “evidence for common ancestry, meaning that different species today shared common ancestors in the past,” and whether or not they were convinced “that humans and chimps both share a common ancestor.”

We anticipated that signatories working for Christian anti-evolution ministries — especially those who are young-earth creationists, such as David A Dewitt, PhD, an adjunct faculty member at the Institute for Creation Research — would answer in the negative, but responses from some of the other signatories were quite revealing. One signatory responded to each of the two questions with “I don't have a problem with this,” then went on to elaborate that his “dissent mainly concerns the origin of life.” But, of course, evolution is not a theory of the origin of life, nor was “Darwinism” in any of its forms; evolution concerns what happens after life appears.

Although another signatory responded that “the definition of species is very troublesome,” he added that “I certainly do accept that SOME (perhaps most) modern species shared at least a recent common ancestor.” On the question of whether chimps and humans share a common ancestor, he said, “I believe the genetic evidence is overwhelming for the morphology.” Another signatory has elsewhere written, “I am not a creationist and have no reason to doubt common descent.”

Therefore, although the signatories represent a diverse range of opinions about the role of natural selection in evolution, the list is nothing more than careful word play — what is known as “spin.” Should one draw the conclusion from the advertisement that there is a growing movement of scientists who doubt evolution? Hardly; many of the names on the list are not new to anti-evolutionary activity. Ironically, if one were to conduct a survey of scientists who *accepted* evolution, the size of that list would swamp by tens of thousands this list assembled by the Discovery Institute!

It is regrettable that the public is likely to be confused by these advertisements and be misled into thinking that all of these scientists reject *evolution*, or that there is a groundswell of scientists rejecting evolution. Neither is true.

ICR Compares PBS Series to Terrorist Attacks

Skip Evans
NCSE Network Project Director

10/15/2001

After the events of September 11th, many things in life that held so much significance paled against the loss in New York City, Washington D.C., and in a field in Pennsylvania. All Americans felt they had come face to face with an incomprehensible evil, and indeed it seem to have struck at the very heart of each of us.

Events quickly unfolded all over the world. Nations reacted with horror and expressed condolences and support. At home people sought solace in family, friends, houses of worship, wherever the bonds that make us human are greatest. People all over our country expressed the ideals of democracy and fairness, and pledged that no one should be the target of harassment or abuse, simply for following another faith.

It seemed that rising out of the ashes of the vilest destruction any of us had ever seen, all that was good in the human spirit was reasserting itself. But unfortunately, even in our own midst we seem to have some who are incapable of sharing in that spirit. It feels trivial to be writing this now, but I feel a need to report that on Sunday, October 14, 2001, the Institute for Creation Research posted on its web site an article titled:

911 RANG AGAIN - A REVIEW OF THE PBS VIDEO SERIES "EVOLUTION"

Ken Cumming, a man I suppose claims to share the same faith as many of you reading this, actually compared the terrorist bombings of September 11th to the airing of the PBS series *Evolution*.

Cumming writes:

These two "assaults" have similar histories and goals. The public was unaware of the deliberate preparation that was schemed over the past few years leading up to these events. And while the public now understands from President Bush that, "We're at War"² with militant Islamics around the world, they don't have a clue that America is being attacked from within through its public schools by a militant religious movement of philosophical naturalists (i.e., atheists) under the guise of secular Darwinism.

Is the ICR truly drawing parallels between the cold blooded murder of innocents on a massive scale, and the production of a television show? To equate a television program and acts of terrorism is truly appalling. I don't want to spend much time on this. It's really not worth much of anyone's time. But I do urge everyone to go to ICR web site and read the article at <http://www.icr.org/headlines/pbsevolution.html>,

AiG Cries Wolf over NCSE Congregational Study Guide

11/12/201

Note: Since this was posted on November 12, 2001, Answers in Genesis, responding to our citations of their errors, has rewritten the piece we were commenting upon. The quotes in our article were cut and pasted directly from the AiG site to ensure one hundred percent accuracy; they are exactly as they appeared in the original article.

We decided not to rewrite our piece in some "follow the leader" fashion for two reasons. First, since AiG chose to abandon the original version of their article, we feel it is our responsibility to preserve an accurate record of their original errors and accusations. Second, in reading over the revised version, <<http://www.answersingenesis.org/docs2001/1106lead.asp>> we feel that the context of their diatribe remains essentially unchanged, and the following quotations from the first article still accurately reflect their position. Our response remains relevant.

NCSE now has available a Congregational Study Guide, a resource for churches wishing to help their members discuss the new PBS series *Evolution*. In the introduction to the guide, author Phina Borgeson states, "While Darwin's theory of evolution may have challenged religious organizations, especially their sense of authority and control of human activities, it also has, for those open to the possibilities, expanded our notions of God."

On November 6, 2001, Answers in Genesis (AiG) posted an article on its web site with the headline "Atheists Infiltrate Churches!" In the opening of the article, AiG states, "It's interesting to note that the NCSE ... [has] made statements indicating they are not against those who believe in God-yet at the same time they make statements vehemently attacking Christianity."

For the record, NCSE has never made any statements, "vehemently attacking Christianity" or any other religion. AiG may not agree with our position on teaching evolution in public schools, but that hardly justifies these wild accusations.

In the closing of the article, they say, "Who would have thought ... that atheists would be writing a 'Congregational Study Guide' to understand our origins!"

Here, predictably, AiG is simply wrong on the facts. The NCSE Study Guide was not written by an atheist. It was written by a Christian. Borgeson earned a Master of Divinity degree from the Church Divinity School of the Pacific, where she also taught, and served on two Episcopal diocesan staffs, Los Angeles and Nevada.

In truth, NCSE is actually quite a religiously diverse organization, with both nonbelievers and believers on our staff, on our board of directors, and among our members and supporters. Although we come from many different backgrounds, from atheists to evangelical Christians, we respect one another's beliefs. What unites us is our firm belief in the importance of evolution in any sound science education.

Ironically, Borgeson seems to have described the AiG pretty accurately in her introduction. Does evolution challenge AiG's "sense of authority and control" over deciding who is the "right" kind

of Christian?

For information about the Study Guide contact Phina Borgeson at borgeson@ncseweb.org.

See the table of contents for the location of the study guide in this document.

Chronology of Events – The Creationist Backlash

Glenn Branch
NCSE Office Manager

The seven episodes of *Evolution* received glowing reviews not only from scientists (see Timothy H Goldschmidt's review in *Science* 2001 Sep 23; 293: 2209–10, reprinted in *RNCSE* 2001 (Jan–Apr) 21 (1–2): 51–3, and Frans de Waal's review in *Natural History* 2001 Nov; 76–7) but also from the mainstream media. Writing in *The New York Times* (2001 Sep 24; E5), Julie Salamon said that “[a] powerful sense of drama, discovery and intellectual enthusiasm runs through this rich eight-hour series ... The series covers an enormous amount of ground but doesn't leave you feeling swamped.” The Boston *Globe's* reviewer described it as “brilliant television: an enthralling modern adventure story, entertaining and accessible, challenging and even disturbing” (2001 Sep 23; B7). And even *TV Guide* said that *Evolution* was “[a]s grand and multifarious as the system it celebrates” (2001 Sep 22–28; 51).

Creationists, however, were not so enthusiastic, to nobody's surprise. Well before the September 2001 broadcast of *Evolution*, the producers of the series were bracing for the expected creationist backlash. According to an article in the June 11, 2001, issue of *Current*, a newspaper that covers public broadcasting, “Even months before the series airdate, *Evolution* is already on the radar screens of anti-Darwinists, according to [director of national strategic marketing for WGBH Anne] Zeiser” (see <<http://www.current.org/prog/prog0111evol.html>>). What follows, in rough chronological order, is a sampling of the reactions of prominent creationists and other ideological opponents of evolution. Acronyms used are DI for the Discovery Institute, CRSC for the DI's Center for the Renewal of Science and Culture, ARN for the Access Research Network, ICR for the Institute for Creation Research, and AIG for Answers in Genesis; all dates are in 2001.

Before the broadcast

On July 26, as part of its presentation of its fall lineup at the National Press Tour, PBS held a press conference for *Evolution* in Pasadena, California. Among the attendees were Josh Gilder (a Reagan speechwriter, former editor of *The American Spectator*, and a cousin of George Gilder, who is a Senior Fellow of the DI) and John Mark Reynolds (Director of the Torrey Honors

Institute at Biola University and a Fellow of the DI's CRSC). Both were vocal during the press conference, Reynolds asking why the series is (in Gilder's words) "so patently and gratuitously offensive to the religious sensibilities of the majority of the American people" and Gilder intimating that Paul Allen, the funder of the series, exercised undue influence over its content. Gilder also asked James Moore, biographer of Darwin and historical consultant for *Evolution*, about the effect of his study of Darwin on his personal religious views; Moore, finding the question impertinent, explained that he would "as soon talk about my sex life as about my particular religious views in public." Reynolds's report on the press conference, "Come to Darwin", appeared on FreeRepublic.com ("a conservative news forum") at <<http://www.freerepublic.com/forum/a3b621a671921.htm>>. Gilder posted his report at the ARN web site at <<http://www.arn.org/docs/pbsevolution/pbsgilder072601.htm>>.

In a press release issued on August 31, headlined "PBS — pushing bad science", AIG describes *Evolution* as a "blatant propaganda series for evolution" intended "to show, once and for all, that molecules-to-man evolution is true." The press release predicts that AIG will be misrepresented by the series, despite the producers' assurances of a balanced treatment. It also complains that "[a]s is usual for such evolutionary productions, various 'religious leaders' will be used to try to persuade the masses that it is okay to believe in evolution, since they have no problem with it. Of course, the real issue, the authority of the Bible as a trustworthy revelation from God, and hence the integrity of its Gospel message, will be glossed over."

The September 3 issue of *Christianity Today* contained Tom Bethell's review, "Hagiography for moderns" (103–4); Bethell is a senior editor at *The American Spectator* and a long-time anti-evolutionist (his "Darwin's mistake" [*Harper's* 1976 Feb; 252: 70–75] prompted Stephen Jay Gould's "Darwin's untimely burial", reprinted in *Ever Since Darwin*, New York: WW Norton, 1977, p 39–45). Bethell describes the series as "propaganda for Charles Darwin and his cause ... ideology masquerading as science" and castigates it for not revealing "the truth that virtually no scientific evidence for evolution exists." Instead, he says, deniers of evolution "are isolated in the disreputable camp of fundamentalism. Ken Ham's followers *sing* their arguments — with guitars. Those who criticize evolution from a scientific perspective are not included." (AIG took exception at Bethell's characterization of its ministry as unscientific [see <<http://www.answersingenesis.org/docs2001/0830news.asp>>]). Connoisseurs of the anti-evolutionists' habit of quotation out of context will relish the reference to Colin Patterson in the final paragraph of Bethell's review.

On September 8, in Cincinnati, Ohio, AIG's president Ken Ham spoke at a banquet for AIG's "Creation Museum and Family Discovery Center", warning of the "onslaught" of *Evolution*, "the most well-funded evolutionary propaganda piece ever produced." He touted AIG's resources for combating the series, including its web site, Jonathan Sarfati's *Refuting Evolution*, a forthcoming CD-ROM (see below) to be sold at cost, its pamphlets, videotapes, and magazines, and its antiracism initiative (see <<http://www.onehumanrace.com>>)

On September 10, the DI issued the first in a series of press releases criticizing *Evolution*, headlined "PBS charged with 'false claim' on 'universal genetic code'". The press release accuses *Evolution* of asserting that all living creatures share the same genetic code and adducing the universality of the genetic code as evidence for their common ancestry. Michael Behe (author of *Darwin's Black Box*) and Jonathan Wells (author of *Icons of Evolution*, reviewed by Jerry Coyne in *RNCSE* 2000 Nov–Dec; 20 [6]: 15–7), both Senior Fellows of the DI's CRSC, note the existence of exceptions to the universality of the genetic code, Wells adding that the exceptions undercut the evidence for common ancestry. The press release concludes with the announcement by the director of the DI's CRSC, Stephen Meyer, of a special web site devoted to

criticizing the “scientific shortcomings” of *Evolution*. Shortly thereafter, the web site opened as <<http://www.pbsevolution.org>>, easily confused with <<http://www.pbs.org/evolution>>, the official PBS web site for *Evolution*. The DI eventually renamed its web site <<http://www.reviewevolution.org>>, removed the tag line “the magnum opus of a dying theory”, and redesigned it to make it clear that it was not associated with *Evolution* or with PBS. The press release may be found at <http://www.reviewevolution.org/press/pressRelease_FalseClaim.php>. In response to the DI’s press release about the universal genetic code, NCSE issued a press release on September 17, in which Harvard’s James Hankin and the University of Colorado’s Norman Pace debunked Behe’s and Wells’s claims, and another press release on September 25, in which Brown University’s Kenneth R Miller explained in extensive detail the DI’s errors (all of NCSE’s press releases are listed, in reverse chronological order, at <<http://www.ncseweb.org/article.asp?category=12>>).

On or about September 18, ARN began to devote a section of its web site to its “Response to the PBS *Evolution* Project” (<http://www.arn.org/pbs_evolution0901.htm>). For the most part, the contents of ARN’s Response are links to the DI’s critique and to articles by Fellows of the DI’s CRSC, perhaps unsurprisingly in light of the “research partnership” between ARN and CRSC. One interesting claim, which suggests that ARN envisions its audience as including teachers, appears in the introduction to ARN’s Response: “As with the Carl Sagan’s [*sic*] *Cosmos* series two decades ago, the PBS *Evolution* Project comes across more as evangelism for the Darwinian worldview, then as rigorous, undebatable science. We think this program offers a great opportunity to teach your students critical thinking skills.” In announcing the Response, Dennis Wagner, ARN’s executive director, described the series (with a nod to the Beatles) as “The PBS Evolution Propaganda Band” (<<http://www.arn.org/announce/announce0901no17.htm>>). Curiously, although Phillip Johnson contributes a weekly column (“The Weekly Wedge Update”) to ARN’s web page (see <<http://www.arn.org/johnson/wedge.htm>>), he failed to comment there on the series.

On September 20, AIG posted “Ken Ham exposes PBS’s *Evolution* deception” on its web site as its daily news piece (<<http://www.answersingenesis.org/docs2001/0920news.asp>>); it summarizes Ham’s September 8 speech and provides a link to a video file of it.

On September 20, the DI issued a flurry of press releases. Perhaps the most important was headlined “*Evolution* spokesperson tries to tar scientific critics” (available at <http://www.reviewevolution.org/press/pressRelease_ScientistsTar.php>), which took NCSE Executive Director Eugenie C Scott to task for her comment in NCSE’s September 17 press release that “virtually every reputable scientist in the world agrees that evolution is good science”. Bruce Chapman, president of the DI, describes her comment as “tautological thinking”; Stephen Meyer accuses *Evolution* of hiding the existence of scientific dissent about evolution. NCSE itself is described as “an interest group that exists to promote the teaching of Darwinism and which routinely opposes criticism of Darwinian theory, including scientific criticism.” The press release also announced the release of the DI’s 154-page critique of the series, *Getting the Facts Straight: A Viewer’s Guide for PBS’s Evolution*, available at <<http://www.reviewevolution.org/getOurGuide.php>>, where it is explained that “*Evolution*’s biased content ... makes it inappropriate for classroom use without supplementary materials. This Viewer’s Guide has been prepared to help teachers, parents, students, and interested citizens ensure that discussions of evolution in the classroom fairly represent the evidence and the full range of scientific viewpoints about Darwin’s controversial theory.” Many of the DI’s press releases summarize criticisms that are to be found in the Viewer’s Guide.

Also on September 20, the DI issued a press release criticizing *Evolution* for ignoring scientific disagreement over the origins of humanity (<http://www.reviewevolution.org/press/pressRelease_HumanOrig.php>). Jonathan Wells was quoted as remarking “The truth is that committed evolutionists disagree sharply over how to interpret the meager evidence for human origins, and many of them admit that the entire field of paleoanthropology suffers from a tendency toward myth-making.” In support of his claim, the press release quoted passages from paleoanthropologist Misia Landau, anthropologist Geoffrey Clark, and science writer Henry Gee. It ended with Stephen Meyer’s complaint that “*Evolution’s* one-sided approach fails to meet even the most basic standard of professionalism.” On September 26, NCSE issued a press release in which Geoffrey Clark stated that “In an effort to discredit the PBS *Evolution* series, the quotes attributed to me and circulated on the creationist Discovery Institute’s website were taken completely out of context. I do not believe, nor have I ever argued, that paleoanthropology is not a scientific endeavor.” (The DI responded [<http://www.reviewevolution.org/press/pressRelease_NCSEFalseCharg.php>] by insisting that Clark was correctly quoted, apparently oblivious to the fact that NCSE and Clark accused the DI not of misquoting Clark but of quoting him out of context.) And in an NCSE press release issued on October 15, Henry Gee, responding to the DI’s misrepresentation of his views in its Viewer’s Guide, wrote, “I regard the opinions of the Discovery Institute as regressive, repressive, divisive, sectarian and probably unrepresentative of views held by people of faith generally. In addition, the use by creationists of selective, unauthorized quotations, possibly with intent to mislead the public undermines their position as self-appointed guardians of public values and morals.”

Also on September 20, the DI issued a press release complaining that *Evolution* misrepresented the Swedish zoologist Dan-Erik Nilsson’s simulations of the evolution of the eye as the results of computer modeling (<http://www.reviewevolution.org/press/pressRelease_EyeEvolution.php>). David Berlinski (author of several popular books on mathematics) and Jay Wesley Richards, both Senior Fellows of the DI’s CRSC, are quoted. In an NCSE press release issued October 3, Brown University’s Kenneth R Miller notes that in its discussion of Nilsson’s work, “[n]ot once does the PBS program refer to or even imply the existence of a ‘computer program’” (see <*Miller piece*>, xx).

Also on September 20, the DI issued a press release criticizing *Evolution* for its “uncritical — and un rebutted — presentation of some of evolutionary psychology’s wildest and most speculative claims” (<http://www.reviewevolution.org/press/pressRelease_Infomercial.php>). John West, an assistant professor of Political Science at Seattle Pacific University as well as a Senior Fellow of the DI and associate director of its CRSC, is quoted as describing the discussion as “about as educational as an infomercial”; Jeffrey Schloss, chair of the Biology Department at Westmont College as well as a Senior Fellow of the DI’s CRSC, is also quoted. The press release also parades Steven Pinker’s comments about infanticide and Randy Thornhill and Craig Palmer’s book on rape as examples of the worst excesses of evolutionary psychology, and quotes comments critical of evolutionary psychology from Jerry Coyne and Richard Lewontin. On October 1, NCSE issued a press release in which Coyne not only scathingly discusses the DI’s tactics but also describes *Evolution’s* treatment of evolutionary psychology as appropriate.

On September 21, the DI issued a press release charging *Evolution* with distorting the historical record in order to portray all opposition to evolution as motivated by biblical literalism (<http://www.reviewevolution.org/press/pressRelease_RewriteHistory.php>). John West comments, “Since *Evolution* purports to be about science, not religion, it is strange that it virtually ignores the scientific controversy sparked by Darwin and replaces it with a hackneyed

story of fundamentalists battling science.” Stephen Meyers agrees, and goes further to complain about aspects of the dramatization in episode 1: “For example, the first episode shows Charles Darwin’s brother Erasmus lampooning the classic hymn ‘Rock of Ages’ during a church service. But the scene is a complete fabrication, supported by no evidence whatsoever. The same is true of some of the scenes between Darwin and Capt. Robert Fitzroy during the famous voyage of the *Beagle*. PBS should have to explain its resort to fictionalized history.” In an NCSE press release issued October 3, Darwin biographer James Moore, reacting to the historical errors and distortions in the Executive Summary of the DI’s Viewer’s Guide, sets the record straight (*see the article by James Moore in the section above*).

AIG posted a slightly revised version of its August 31 press release on its web site on September 22 (<<http://www.answersingenesis.org/docs2001/0922news.asp>>).

Jonathan Wells’s “Evolution for the masses” appeared in the *Washington Times* on September 23, the day before *Evolution* began to air. Wells asserts that “the miniseries distorts scientific evidence to make it look like support for Darwin’s theory”, adding that *Evolution* “also presents uncritically some of the theory’s more disreputable manifestations”, adducing the segment in which Geoffrey Miller expounded his views on evolutionary psychology. He also complains about the presentation of religion in the series, claiming that *Evolution* presents all opponents to “Darwinian evolution” as “ignorant biblical fundamentalists” despite the existence of scientific critics (he cites Michael Behe) and of religious critics who are not fundamentalists (he cites Huston Smith). “Instead of being an educational documentary”, Wells writes, *Evolution* is “a work of pro-Darwin propaganda that is out of place on public television.” His article is reposted at <http://www.reviewevolution.org/press/fromPress_EvolutionFrMasses.php>.

Also on September 23, Pamela R Winnick’s review of *Evolution* appeared in the *Pittsburgh Post-Gazette* (<<http://www.post-gazette.com/tv/20010923evolution0923fnp3.asp>>; subsequently posted on the DI’s anti-*Evolution* web site at <http://www.reviewevolution.org/press/fromPress_SeriesIgnores.php>). Winnick is critical of the series, describing episode 1 as melodramatic and banal and faulting its producers for not discussing Darwin’s racism and for neglecting the intelligent design movement. To be sure, the fact that she was critical of the series in no way entails that she accepts creationism (a view she explicitly rejects in the review); however, the fact that she received a fellowship from the Phillips Foundation to analyze “why there seems to be little tolerance for teaching creationism in America” (<<http://www.thePhillipsFoundation.org/fellowshipprofiles.htm>>) is suggestive.

During the broadcast

On September 24, the first day of the broadcast of *Evolution*, AIG announced the release of its CD-ROM *Creation: A Shattering Critique of the PBS/NOVA Evolution Series* (<<http://www.answersingenesis.org/docs2001/0924news.asp>>). “While lacking scientific weight, *Evolution* is the most well-funded and well-promoted evolutionary propaganda piece ever produced”, AIG writes; the CD-ROM is intended to demonstrate that “real science supports the Biblical account of origins as recorded in Genesis, the first book of the Bible.” Its contents, according to the AIG web site, are:

- Articles by Dr Jonathan Sarfati [author of AIG’s *Refuting Evolution*] responding to each of the seven programs ...
- Other scientifically relevant articles

- The complete video *From a Frog to a Prince ...*
- Select clips from other videos
- The complete book *Refuting Evolution* by Dr Jonathan Sarfati ...
- Special audio interviews and messages by creationist scientists & speakers

AIG is offering the CD-ROM for \$5.00 apiece; \$2.00 apiece for bulk orders of ten or more. (See sidebar for a summary of Sarfati's responses.)

Charles "Chuck" Colson's BreakPoint, a production of the Wilberforce Forum, itself a division of the Prison Fellowship Ministry, posted three articles on *Evolution* on September 24; these are apparently transcripts of radio commentaries broadcast in the previous week. The first two end with a reference to the DI's Viewer's Guide, on which Colson appears to have relied. "Why falsify history?"

(<<http://www.christianity.com/CC/article/0,,PTID2228|CHID100546|CIID852910,00.html>> claims that *Evolution* distorts the historical record; "Looking for the real evidence"

(<<http://www.christianity.com/CC/article/0,,PTID2228|CHID100546|CIID859398,00.html>> contends that "no one knows how macroevolution would occur — or, of course, if it ever does"; and "Upholding accuracy in science journalism"

(<<http://www.christianity.com/CC/article/0,,PTID2228|CHID100546|CIID868530,00.html>> complains that *Evolution* failed to discuss the intelligent design movement.

Josh Gilder's review of *Evolution* was posted by WorldNetDaily on September 24 at <www.worldnetdaily.com/news/article.asp?24640>. According to a note from the editor, the review was originally commissioned by *The Weekly Standard*, which, however, declined to print it. Gilder complains that the series was boring ("[e]xcept for a brief lesbian lovemaking scene"). The cause of its tediousness, he conjectures, was that it neglected "the growing body of evidence against Darwinism", which he takes to be documented in Jonathan Wells's *Icons of Evolution*, which he summarizes. Citing the DI's Viewer's Guide (and in passing disclosing that he is "connected" with the DI), he accuses the series of being rife with error. He concludes by complaining of *Evolution*'s neglect of the intelligent design movement: "At a recent PBS press conference I asked the overall series producer, Richard Hutton, why Intelligent Design's scientific critique of evolution was completely ignored. He answered that he'd looked into it and decided there was nothing there. That's one way to decide important scientific disputes — let a TV producer decide." Excerpts from Gilder's review were reprinted in the *Washington Times* on September 26.

Also on September 24, Mark Hartwig's commentary on *Evolution* appeared on Family News in Focus, a web site associated with James Dobson's organization Focus on the Family (<<http://www.family.org/cforum/fnif/commentary/a0017777.html>>); Hartwig is not only science and worldview editor for Focus on the Family but also a former managing editor of *Origins Research*, the predecessor of the ARN's journal *Origin & Design*. In his commentary, Hartwig explains that "Darwinism" is unappealing both because it entails that life is without meaning and because its adherents "uncritically recycle the same ineffective arguments — some of which are demonstrably false ... then compound the problem by depicting doubters ... as religiously motivated yahoos." He follows the DI in accusing *Evolution* of misrepresenting the universality of the genetic code and of omitting "the many scientific arguments raised against Darwinism" by Michael Behe, Jonathan Wells, and William Dembski, among others. He also echoes the DI's complaint about the historical accuracy of episode 1's portrayal of the conflict between Darwin and FitzRoy.

Also on September 24, the DI issued a press release with the headline “100 scientists, national poll challenge Darwinism” (<http://www.reviewevolution.org/press/pressRelease_100Scientists.php>). The press release described the DI-sponsored “A scientific dissent from Darwinism”, which Skip Evans analyzes in “Doubting Darwinism through creative license” (see *Doubting Darwinism through Creative License* under Articles) and a DI-sponsored poll conducted by Zogby America. The poll asked the following questions:

1. Which of the following two statements comes closest to your own opinion?

A: Biology teachers should teach only Darwin’s theory of evolution and the scientific evidence that supports it. 15%

B: Biology teachers should teach Darwin’s theory of evolution, but also the scientific evidence against it. 71%

Neither/Not sure 14%

2. Do you strongly agree, somewhat agree, somewhat disagree, or strongly disagree with the following statement: “When Darwin’s theory of evolution is taught in school, students should also be able to learn about scientific evidence that points to an intelligent design of life.”

Agree 78%

Strongly agree 53%

Somewhat agree 25%

Disagree 13%

Somewhat disagree 5%

Strongly disagree 8%

Not sure 9%

3. Which of the following two statements comes closest to your own opinion?

A: When Public Broadcasting networks discuss Darwin’s theory of evolution, they should present only the scientific evidence that supports it. 10%

B: When Public Broadcasting networks discuss Darwin’s theory of evolution, they should present the scientific evidence that supports it, but also the scientific evidence against it. 81%

Neither/Not sure 10%

4. Do you strongly agree, somewhat agree, somewhat disagree, or strongly disagree with the following statement: “The universe and life are the product of purely natural processes that are in no way influenced by God or any intelligent design.”

Agree 24%

Strongly agree 12%

Somewhat agree 12%

Disagree 69%

Somewhat disagree 13%

Strongly disagree 56%

Not sure 7%

The results of the poll may reflect the popularity of the “fairness” approach. Moreover, insofar as the wording of the poll’s questions incorrectly assumes that the theory of evolution is exhausted by Darwin’s contributions to it and that there is any scientific evidence against the theory of evolution, it is doubtful that its results are significant.

On September 26, the Pleasanton, California, *Tri-Valley Herald* published an article about the DI's "A scientific dissent from Darwinism" (the article is not available at the newspaper's web site; it is available at http://www.reviewevolution.org/press/fromPress_SciChalDarwin.php). As far as NCSE is aware, the article, entitled "Lab scientists challenging Darwin", is the only notice taken of the DI's "A scientific dissent" in the mainstream media; the *Herald's* interest apparently stemmed from the fact that two of the signatories of the DI-sponsored statement work at the local Lawrence Livermore National Laboratory. In the article, the DI's spokesperson Mark Edwards commented on the DI's exclusion from *Evolution*: "The final episode paints a picture that the only critics of Darwinian theory are these guitar-strumming hillbillies in Kentucky who are creationists, and that's just not true. We're glad we're not part of that stereotype." NCSE's executive director Eugenie C Scott was quoted as saying, "These guys don't have a scientific model ... All they have is a bunch of assertions that evolution didn't happen. Because they don't produce anything that's of scientific value, they're not taken seriously."

Also on September 26, the Culture and Family Institute — "an affiliate of Concerned Women for America, the nation's largest public policy women's organization ... [which] focuses on cutting-edge social issues with particular emphasis on the homosexual activist movement and other forces that threaten to undermine marriage, family and religious freedom" — posted a discussion of *Evolution* by Martha Kleder on its web site at http://cultureandfamily.org/report/2001-09-26/m_darwin.shtml. Kleder's discussion relies heavily on the DI's press releases and its Viewer's Guide, but concludes with a link to a dialogue between Concerned Women for America's Beverly LaHaye and AIG president Ken Ham.

On September 27, the DI issued a press release citing an internal PBS memorandum as evidence for the existence of "an improper political agenda behind WGBH/Clear Blue Sky's ongoing series *Evolution*" (http://www.reviewevolution.org/press/pressRelease_LeakedPBSMemo.php). "Public television is funded in part by American taxpayers, and it should be held to high standards of fairness. It is inappropriate for public broadcasting to engage in activities designed to directly influence the political process by promoting one viewpoint at the expense of others", said the DI's president, Bruce Chapman. The evidence for the supposed political agenda of the series apparently consists of the memorandum's two allusions to "government officials" and "government leaders" as a niche audience and its hope that the series will inspire citizens to work with their local school boards on issues of scientific literacy. The press release also quoted John West's characterization of NCSE as "a single-issue group that takes only one side in the political debate over evolution in public education."

Across the country, several public broadcasting stations succumbed to anti-evolutionary pressure and broadcast creationist shows to "balance" the *Evolution* series. According to an article in the September 10 issue of *Current* (<http://www.current.org/prog/prog0116evol.html>), at least fourteen public television stations were planning to broadcast "Voices for Creation", a 1992 documentary produced by WNMU in Marquette, Michigan. "Voices for Creation" features the ICR's Duane Gish and Richard Lumsden; it is described by its distributor as "a point-of-view documentary produced in response to increasing criticism of public television for its perceived pro-evolution stance." At least three public television stations, Idaho Public Television, Arkansas Educational Television Network, and North Dakota's Prairie Public Broadcasting, aired documentaries produced by Earth Sciences Associates, run by Robert Gentry, the young-earth creationist known for his work on polonium halos and his *Creation's Tiny Mystery* (Knoxville TN: Earth Science Associates, 1992 [third edition]); information on the documentaries is available at <http://www.halos.com/videos.htm>. In Idaho, the pressure to

present the creationist point of view was not particularly subtle: state senator Stan Hawkins, who cochairs the legislature's joint budget committee, handed a videotape of Gentry's "The Young Age of the Earth" to Idaho Public Television officials at the committee's February meeting and urged them to air it, according to a report in the Spokane *Spokesman-Review* (2001 Sep 20).

After the broadcast

On September 28, WorldNetDaily posted "Darwin's public defenders" (<http://www.worldnetdaily.com/news/article.asp?ARTICLE_ID=24710>, by Stephen Meyer. Meyer accused *Evolution* of making "a very selective presentation of the scientific evidence", saying that it presented "micro-evolutionary" changes as evidence of "macro-evolutionary" innovations, quoting Swarthmore University's Scott Gilbert's dictum that "natural selection explains the survival, but not the arrival, of the fittest." Meyer also complains that *Evolution* ignored the "other scientists who could have provided informed dissenting opinion", citing the DI's "A scientific dissent from Darwinism". He concludes by criticizing what he takes to be *Evolution's* message about religion: "good religion accommodates Darwinism, bad religion rejects it. But that implies, of course, that the real religion of this series is Darwinism." In an NCSE press release issued on October 12, Scott Gilbert commented on the DI's use of his dictum: "Of course, it is out of context, in that the paragraph mentions that natural selection alone cannot explain the origin of species. One needs natural selection plus developmental genetics."

Michael Behe's "Fatuous filmmaking" was also posted on WorldNetDaily on September 28 (<http://www.worldnetdaily.com/news/article.asp?ARTICLE_ID=24713>). In his article, Behe complains that *Evolution* "trumpets not just evolution (descent with modification) in general, but Darwinism (random mutation and natural selection) in particular. Yet the show can't even bring itself to mention that some scientists and academics — plus the vast majority of the public — are profoundly skeptical of natural selection as the driver of evolution", citing Stuart Kauffman. In words strongly reminiscent of Meyer's article, he claims that *Evolution's* message about religion is that "[g]ood religion cheerfully accommodates Darwinism. Bad religion doesn't." In an NCSE press release issued on October 14, Stuart Kauffman reiterated that "I wish to distance myself from use of my own work on self-organization plus selection in evolution by both 'creation scientists' and 'Design theory'. My own work on self-organization suggests that spontaneous order in complex systems may offer a second source of order in biology, in addition to natural selection. My argument does not entail that Darwinian descent with modification into the branching "tree of life" is invalid" (see also his statement quoted in *RNCSE* 2000 Sep–Oct; 20 [6]: 12–13).

The DI's "A scientific dissent from Darwinism" appeared as a paid advertisement in the October 1 issue of *The Weekly Standard*, the October 8 issue of *The New Republic*, and in the November 1 issue of *The New York Review of Books*. Its appearance in the last of these was perhaps in reaction to Frederick Crews's two-part essay "Saving us from Darwin" (*The New York Review of Books* 2001 Oct 4; 48 [15]: 24–27 and Oct 15; 48 [16]: 51–55), in which he savaged Phillip Johnson, Jonathan Wells, Michael Behe, and William Dembski, writing that "intelligent design — the theory that cells, organs, and organisms betray unmistakable signs of having been fashioned by a divine hand — bears only a parodic relationship to a research-based scientific movement." Judging from the rate cards of the magazines, the combined cost of the advertisements was in the neighborhood of \$50 000.

Jonathan Wells's "PBS's *Evolution*: The broadcast of an ideology" appeared in *Human Events* ("The National Conservative Weekly ... the conscience of the conservative movement and the antidote to liberal media bias") on October 1 (<<http://www.humanevents.org/articles/10-01-01/wells.html>>). Wells complains that "some of the 'evidence' presented in *Evolution* is known to be false, and the remaining evidence provides surprisingly little support for Darwin's theory. In place of scientific evidence, *Evolution* relies on a parade of experts to assure us that Darwin had it right, and that the only people who disagree are ignorant Biblical literalists." On the contrary, he asserts, "[i]t turns out that belief in Darwinian evolution is not so much a matter of scientific evidence as a matter of personal philosophical commitment. The oft-repeated claim that Darwinism is supported by 'overwhelming evidence' is not a scientific statement, but an advertising slogan."

On or about October 7, Timothy Wallace, the proprietor of the True.Origin web site ("A rational alternative to — but not affiliated with — the 'Talk.Origins Archive'"), posted "The dogma of PBS", a three-paragraph-long introduction to links to Gilder's, Behe's, and Meyer's critiques of *Evolution* in WorldNetDaily and to the DI's Viewer's Guide. Unlike the other creationist criticisms of *Evolution* listed here, Wallace's specifically attacks PBS, insisting that *Evolution* is only the latest in a series of nefarious PBS projects: "American taxpayers have long subsidized the indoctrination efforts of the 'Public Broadcasting Service' (PBS) via various combinations of historical revisionism, moral relativism, anti-Christian humanism, and pseudo-scientific evolutionism. The Fall of 2001 should be remembered as the season when taxpayers assisted PBS in their greatest propaganda effort to date: the broadcast[ing] of the series entitled 'Evolution'" (<<http://www.trueorigins.org/pbsevolution.asp>>).

The DI issued another press release about the universality of the genetic code on October 10 (<http://www.reviewevolution.org/press/pressRelease_ReplyMiller.php>), responding to Kenneth R Miller's "A 'dying theory' fails again", an NCSE press release issued on September 25, itself a response to the DI's original press release of September 10. The press release accused Miller of misunderstanding a paper on the phylogeny of genetic codes that he cited, of relying upon a specious analogy between variant genetic codes and variant dialects of a language, and of misrepresenting the experimental literature on variant genetic codes. Miller, in an NCSE press release issued on October 18, rebutted its accusations; he went on to comment, "I read their press releases in vain looking for details. I had hoped to learn how a designer might have chosen to alter the code in some organisms and not in others, and especially why the patterns of variation come to resemble something that we scientists 'misinterpret' as evolution. Naturally, I was disappointed. As usual, the Discovery Institute is silent on this issue. 'Intelligent Design', it seems, amounts to little more than saying 'Maybe a Designer Did It' for each and every fascinating pattern that appears in living organisms. It is no wonder that the scientific community has rejected 'Design' again and again for the simplest of all reasons — a lack of evidentiary support."

On October 16, a parody of NCSE's previous press releases, written by a person who wished to remain anonymous, was communicated to NCSE's Network Project Director Skip Evans by David Buckna, a creationist active in British Columbia:

In a stunning, unprecedented move this week, the National Center for Science Education (NCSE), a pro-science organization based in Berkeley, contacted every living scientist on Earth to warn them that the Discovery Institute had quoted them out of context, or would soon do so.

The Discovery Institute is a Seattle-based “intelligent design” think-tank that recently criticized programs such as the PBS *Evolution* series.

“It took us a while to phone or e-mail every living scientist”, said NCSE Executive Director Eugenie Scott, “but we did it. We’ve needed this sort of comprehensive response for some time. Now absolutely every scientist, anywhere on the planet, knows that anything the Discovery Institute writes, in the past, present, or future, is out of context.”

NCSE staffer Skip Evans added that the organization was still trying to contact deceased, still-unborn, and extraterrestrial scientists to obtain their condemnations as well. “We’re making every effort to contact Charles Darwin, TH Huxley, and George Gaylord Simpson”, Evans said. “Yes, these dead guys are kind of hard to reach, but it’s important that we try. We have to protect science.” The NCSE would not elaborate on their plans to contact fetal or extraterrestrial scientists.

NCSE posted the parody, with a grin and the permission of its author, on its web site on October 22.

On October 22, the Discovery Institute issued what, for now, is the final salvo in the press release battle between it and NCSE: “National Center for Science Education’s shrill campaign in defense of *Evolution*” (<http://www.reviewevolution.org/press/pressRelease_NCSECampaign.php>). Both Stephen Meyer and Bruce Chapman criticize NCSE for engaging in “red herrings and ad hominem” in the style of a political campaign. Alluding to the statements of Henry Gee, Jerry Coyne, and Geoffrey Clark in various NCSE press releases, Jonathan Wells remarks, “Darwinian biologists themselves frequently acknowledge that there are problems with the evidence for various aspects of evolutionary theory. Dogmatic Darwinists, however, believe in the theory so fervently that they don’t like critics to quote their candid assessments of the evidence. So they claim that they have been misquoted, when in fact they have been quoted correctly.” Of course, NCSE’s charge is not that the DI *misquoted* Gee, Coyne, and Clark, but that it *misrepresented* them, a charge that the DI never adequately rebuts.

On November 10, Benjamin Wiker’s “Do you bonobo? Meet our make-love-not-war primates” appeared on *National Review Online* (“America’s premier conservative website”) at <<http://www.nationalreview.com/weekend/television/television-wiker111001.shtml>>. Wiker is a Fellow of the DI’s CRSC and a lecturer in the history and philosophy of science at the Franciscan University of Steubenville, Ohio; he is also the author of the forthcoming *Moral Darwinism: How We Became Hedonists* (Downers Grove [IL]: InterVarsity Press, 2002). He complains that in episode 5 of *Evolution*, “Why Sex?”, “the conflict between Left and Right was played by bonobos and chimps respectively ... The use of science to forward a particular moral and political agenda could not have been bolder ... ‘Why Sex?’ was carefully crafted to serve the agenda of the leftward leaners.” Wiker also says (incorrectly) that “the scientific consensus of the series seemed to be that ... we really did evolve from the chimp.”

Cornelius Hunter, a PhD student in biophysics at the University of Illinois, a former technology executive, and the author of *Darwin’s God: Evolution and the Problem of Evil* (Grand Rapids MI: Brazos Press 2001), the cover of which features blurbs from Philip Johnson, Michael Behe, William Dembski, and Stephen Meyer, posted a review of Carl Zimmer’s *Evolution: The Triumph of an Idea* (New York: HarperCollins 2001), the companion volume to the series, on the ARN web site at <<http://www.arn.org/docs/pbsevolution/zimmerreview112101.htm>>. Although Hunter praises Zimmer’s book for being “wonderfully written and illustrated”, he regards it as superficial, overoptimistic, and tendentious. His lengthy (about 5000 words) review concludes,

“Instead of unwrapping the evolution story and clarifying the myths that have grown up around it, Zimmer’s work only reinforces those myths. *Evolution: The Triumph of an Idea* is of high quality volume but it adds little in the way of a fresh understanding to this complex story. In promoting evolution, Zimmer has not captured the essence of this important subject.”

On November 15, Casey Luskin of the IDEA (Intelligent Design and Evolution Awareness) Club — a student-run organization at the University of California, San Diego, that seeks to “promote, as a scientific theory, the idea that life was designed by an Intelligence” (<http://www-acs.ucsd.edu/~idea/>) — posted two documents on the ARN web site concerning *Evolution*. “An abridged PBS *Evolution* viewer’s guide & summary” (<http://www.arn.org/docs/pbsevolution/pbssummary111501.htm>) appears to be a summary of the DI’s Viewer’s Guide, which it recommends. “Ten questions to ask your students about the PBS *Evolution* series” (<http://www.arn.org/docs/pbsevolution/tenquestions111501.htm>), apparently intended for the use of teachers, poses questions that either suggest that there are difficulties with the theory of evolution or insinuate that there are credible alternatives to it. These documents, along with links to other materials about *Evolution*, also appear on IDEA’s web site at <http://www-acs.ucsd.edu/~idea/pbsevolution.shtml>.

The December 2001 issue of the ICR’s *Impact* (nr 342; on the ICR’s web site in PDF format at <http://www.icr.org/pubs/imp/pdf/imp-342.pdf>), by Ken Cumming, the Dean of Graduate Studies at ICR, reviews *Evolution*, beginning with a startling comparison: “Only 13 days after the act of terrorism on New York, Public Broadcasting Stations delivered a different, but another event of grave importance that was witnessed by millions of Americans — ... one of the boldest assaults yet upon both our public schools with the millions of innocent school children and the foundational worldview on which are nation was built. These two assaults have similar histories and goals. ... America is being attacked from within through its public schools by a militant religious movement of philosophical naturalists (i.e., atheists) under the guise of secular Darwinism.” Cumming proceeds to characterize evolution as intrinsically atheistic and its adherents as evangelists for a system of religious belief antithetical to Christianity; NCSE member Keith Miller, the geology professor and evangelical Christian who appears in episode 7, is summarily dismissed as “double-minded”. Cumming’s comparison was cited by *The New Republic* in its Idiocy Watch — its “attempt to keep up with all the dumb and outrageous things being said and written about America and the terrorists” — at <http://www.tnr.com/102901/notebook102901.html>.

The morals of the story

The sampling of creationist reactions to the *Evolution* series discussed above is necessarily biased. Only the reactions that were either covered in the mass media or produced by organizations with sufficient resources to publicize them themselves — in particular, AIG and the DI — are represented. It is possible, nevertheless, to reach a few conclusions.

Just as there are three basic themes in the creationist response to evolution — the three pillars of anti-evolutionism, as it were — so there are three corresponding basic themes in the creationist response to *Evolution*. Thus, because evolution is a “theory in crisis”, *Evolution* is criticized for not revealing the “problems” of evolutionary theory; because evolution is “antireligious”, *Evolution* is castigated for suggesting that evolution is compatible with religion; because it is only “fair” to teach “both sides” or to “teach the controversy” about evolution, *Evolution* is condemned for unfairly presenting only one side and portraying the controversy as

scientifically unimportant. These, in various permutations and combinations, are the themes that were labored throughout the creationist reactions to *Evolution* discussed above, whether they originated from the young-earth creationists at AIG or the would-be pioneers of intelligent design at the DI.

The media strategies, however, differ conspicuously. Hugh Ross's old-earth creationist organization Reasons to Believe seems to have taken only minimal notice of the series, and the ICR, which used to be the principal voice of creationism, hardly commented on *Evolution* at all. Although AIG's response to the series was extensive, it was preaching to the choir, so to speak, issuing its response through its own outlets (primarily its web site). The DI, however, evidently regarded *Evolution* as a prime opportunity to make a splash of its own, pouring time and money into its effort to discredit it. Yet the DI's response to the series, although uncritically used by publications and organizations on the political and religious right, went largely ignored by the mainstream media — perhaps because the media were understandably preoccupied with the tragic events of September 11 and their aftermath. But it is entirely possible that the next spate of creationist propaganda will receive more attention. As always, NCSE will be ready to respond.

Congregational Study Guide

by Phina Borgeson, M.Div.
Faith Network Director

Introduction

Why a study guide for congregations on *Evolution*?

In the first episode of [Evolution](#), Erasmus Darwin says to his brother Charles, “People like Owen think that if there were no Church of England, cucumbers wouldn't grow.” While Darwin's theory of evolution may have challenged religious organizations, especially their sense of authority and control of human activities, it also has, for those open to the possibilities, expanded our notions of God.

Still, for some people of faith today, the theory of evolution is rejected outright because of its conflict with the tenets of their faith. For others, like the articulate students shown in Episode Seven, evolution seems to challenge their faith assumptions, but in a way they are willing to engage. For a few people of faith, because they work in sciences grounded in evolutionary concepts and are also active members of worshiping communities, the dialogue between evolution and theology are familiar ground. But for most leaders and members of congregations, evolution and faith occupy different domains in their lives. Both make sense in different departments of life, and nothing has caused them to explore what they might have to say to one another. It is largely for this group that this study guide is offered.

Using the Guides

These guides are written for 45–60-minute sessions of dialogue or study groups, though with enough material they may be lengthened. They are geared toward adults, but could easily include older teenagers as well.

The “Guide to the Series” is intended for use with the congregation for a single discussion session on the entire series. For a more detailed dialogue, the guides for the individual episodes can be used by groups who wish to watch the episodes together.

Leaders should take some time to review the guide before the discussion. Those using the episodes on cassette have the luxury of reviewing the guide and previewing the episode in advance.

Choosing Leaders, Facilitators, and Resource People

Dialogues around themes and issues often work best with plural leadership. For a small group of people with a high interest level, one leader with good facilitation skills should work just fine. For a larger group, consider working as small table groups (six to eight persons) each with a facilitator/time-keeper, and two up-front resource people — one in theology and one in biological sciences — for the group as a whole.

The best place to look for resource people is in your congregation. Members of the clergy and adult education leaders may serve as theological resource people. If you would like to find a theologian with more experience in theology and science dialogues, try nearby colleges and universities — both faculty members and campus ministers could be effective resource people. People who work in the life sciences are probably already in your congregation. High school biology teachers, physicians and others in the medical field can all be helpful. If you are lucky enough to have a professor in the evolutionary sciences in your midst, by all means use that person as a resource. If not, look to the wider community, or to congregations in nearby communities with colleges or universities.

Methods for Reflection and Dialogue

The detailed guides for each session offer a pattern that allows some flexibility. Experienced adult educators may have their own preferred techniques for encouraging conversation and dialogue.

Each guide offers detailed questions which follow these steps:

- Image – recalling an image or images from the episode
- Dig – getting into the image and the thoughts, feelings and connections it evokes
- Dialogue – bringing the teachings of science and the traditions of faith into conversation
- Explore – researching and reflecting beyond the one hour session
- Act – taking steps with your congregation to build on new ideas and insights

Learning What We’ve Learned

Taking a few minutes at the end of each session to evaluate is a good way to sum up what was learned. Sample questions are:

- What was new for you in our conversation today?
- What’s the most important thing you learned today?
- How will what we talked about today affect your life the rest of this week?
- What are you still wondering about as we wrap up today’s discussion?

The last question, or some variation on it, may be particularly important in groups whose members represent both conservative and liberal perspectives.

Evolution and Faith: Conflict? Conversation? Convergence?

“Hasn’t Darwin’s evolutionary science placed in serious doubt the religious sense that we inhabit a meaningful universe? Or is it instead possible that what scientific skeptics often take to be the religiously ruinous consequences of Darwinian thought are in fact fresh openings to mysterious sacred depths of reality previously unfathomed? And in these depths will we find only an abyss of absurdity, or perhaps instead the sustaining presence of a truly living and renewing God, one who can command the fullness of our worship and one to whom we might still pray with love and confidence?”

— John F. Haught, *God after Darwin* (Boulder CO: Westview Press, 2000), 10.

Image

Many images recur and return throughout the series. One motif, which begins in the account of the development of Darwin’s thought in Episode One and runs through the series, is the tree of life. Another is the hand, exemplified by the negative hand stencil from a French cave wall, but supported by all sorts of images of human and animal hands in most of the episodes. Which of these images caught your imagination?

Dig

What insights did these images stimulate? Why do you think the hand and the tree of life (or other recurring motifs you may have identified) are such strong images in the program? Are there persistent questions that they express?

Dialogue

It may be that the tree of life and the hand stencil speak to us of two facets of a basic question that runs through the series. How are humans related to all living things? How are we unique? Many of the comments in the series are questions about the distinctive qualities of human beings.

Daniel Dennett, for example, says, toward the end of Episode One, “For more than a century people have often thought that the conclusion to draw from Darwin’s vision is that *Homo sapiens*, our species, that we’re just animals, too, we’re just mammals, that there is nothing morally special about us. I myself don’t think that follows at all from Darwin’s vision.” If this is an issue for a secular philosopher, how much more is it an issue for people with strong faith convictions about the unique place of humans in God’s plan of salvation?

What evolutionary evidence (from the series) speaks to the uniqueness of humanity?
What from your faith convictions speaks to the uniqueness of humanity?
Where is there common ground between the two? Divergence?
What evolutionary evidence (from the series) speaks to the connectedness of all life?

What from your faith traditions speaks to the connectedness of all life?
Where is there common ground between the two? Divergence?

Explore

1. Perhaps the greatest temptation to which we fall prey in trying to reconcile our faith and our learning about evolution is doing “God of the gaps” theology. In the first episode, Professor Kenneth Miller is in a radio studio in Tennessee. The show host asks “Let me ask you this — as a cellular biologist ...when you are studying something, reading something, doing some research, do you come to a point and go, “That’s God?”” Miller replies, “I don’t find God in the insufficiency of science to explain things.” Miller, who identifies himself as an orthodox Darwinian and an orthodox Catholic Christian, finds a “wonderful consistency” in his work in science and his practice of faith, and has described it in his book *Finding Darwin’s God* (New York: HarperCollins, 1999). Members of your congregation may want to read Miller’s book and discuss it. Or you could interview scientists who are members of your congregation or other nearby communities of faith to find out how they avoid a “God of the gaps” approach to the science–theology dialogue.
2. Episode Two poses the question, what does it mean that we (humans) are the ones telling this story? What evidence can you glean from the series to begin to answer this? Where (including insights from faith traditions) would you look for more ideas to help in answering this question?

Act

There are many possibilities for action steps in the study guides for each of the episodes. A first step might be to research what your denomination or communion has to say about evolution. NCSE’s [Voices of Evolution](#) is a place to start. The study guides for each of the episodes have more ideas for specific actions.

Episode 1: Darwin’s Dangerous Idea

“It is interesting to contemplate an entangled bank, clothed with many plants of many kinds, with birds singing in the bushes, with various insects flitting about, and with worms crawling through the damp earth, and to reflect that these elaborately constructed forms, so different from each other, and dependent on each other in so complex a manner, have all been produced by laws acting around us. These laws, taken in the largest sense, being Growth with Reproduction; Inheritance which is almost implied by reproduction; Variability from the indirect and direct action of the external conditions of life, and from use and disuse; a Ratio of Increase so high as to lead to a Struggle for Life, and as a consequence to Natural Selection, entailing Divergence of Character and the Extinction of less-improved forms. Thus, from the war of nature, from famine and death, the most exalted object which we are capable of conceiving, namely, the production of higher animals, directly follows. There is grandeur in this view of life, with its several powers, having been originally breathed into a few forms or one; and that, whilst this planet has gone cycling on according to the fixed law of gravity, from so simple a beginning endless forms most beautiful and most wonderful have been, and are being,

evolved.”

— Concluding paragraph from [*On the Origin of Species*](#) (first edition) by Charles Darwin

Image

When Emma Darwin is playing the piano and Charles engages her in conversation, she says, “Can your theory account for the way my eyes and ears and hands and heart combine to reproduce the sounds that Chopin heard in his head? Isn’t that a God-given gift?”

Dig

This dialogue helps to point up some of Darwin’s inner struggles about the conventional faith of his culture and what he was coming to understand about evolution. Stephen Jay Gould describes Darwin as “the intellectual radical and the cultural conservative.”* Biographers and historians of science have interpreted the evidence of Darwin’s struggle in various ways, but most do suspect that Emma’s beliefs may have tempered the expression of his growing agnosticism. What other evidence of this tension did you see in the episode?

* Stephen Jay Gould, [*Full House*](#) (New York: Harmony Books, 1996), 144.

Dialogue

Can Darwin’s theory of evolution account for Emma’s gifts as a pianist?

What might it contribute to understanding her abilities?

How does your theology account for Emma’s skills as a pianist?

Can you think of ways in which assumptions of faith and assumptions of evolution might each contribute something to the phenomenon Emma describes?

Some people make the distinction that science answers “how” questions and faith answers “why” questions. How might that apply in this case?

Explore

1. Learn more about the history of the acceptance of Darwin’s theory and the forces that stimulated his detractors. A primer which can help you review the high points of Darwin’s story and thought is [*Darwin for Beginners*](#) by Jonathan Miller and Borin Van Loon (New York: Pantheon Books, 1982). The definitive biography, formidable in size but readable, is [*Darwin: the Life of a Tormented Evolutionist*](#) by Adrian J. Desmond and James Moore (New York: Warner Books, 1991).
2. Why was Darwin’s idea dangerous? The title of this episode is taken from a book by Daniel C. Dennett. Certainly Darwin’s idea was dangerous from the perspective of religious authorities in Darwin’s day, and still seems dangerous to some conservative and fundamentalist people of faith. It also seemed dangerous to the academic establishment of Darwin’s day. And it may still seem dangerous as people extend the concept beyond the life sciences. Consider the implications of this statement by Professor Dennett: “...before Darwin we found meaning coming from above, from the top down. With Darwin’s theory we now see design and purpose coming from the bottom up without any direction at all.”

Act

Do some research. Where in the media you use, in the world around you, in the folk wisdom of people today, do you see this conflict, epitomized by Charles and Emma Darwin, still going on? How might you, as a person of faith interested in the theory of evolution, speak to this?

Episode 2: Great Transformations

“If one small and odd lineage of fishes had not evolved fins capable of bearing weight on land..., terrestrial vertebrates would never have arisen. If a large extraterrestrial object — the ultimate random bolt from the blue — had not triggered the extinction of dinosaurs 65 million years ago, mammals would still be small creatures, confined to the nooks and crannies of a dinosaur’s world, and incapable of evolving the larger size that brains big enough for self-consciousness require. If a small and tenuous population of protohumans had not survived a hundred slings and arrows of outrageous fortune (and potential extinction) on the savannas of Africa, then *Homo sapiens* would never have emerged to spread throughout the globe. We are glorious accidents of an unpredictable process with no drive to complexity, not the expected results of evolutionary principles that yearn to produce a creature capable of understanding the mode of its own necessary construction.”

— Stephen Jay Gould, [*Full House*](#) (New York: Crown Publishers, 1996), 216.

Image

A scientist places the bones from a human hand and arm beside the bones from the fin of a 370-million-year-old fish fossil to show the similarities in structure.

Dig

What feelings did this comparison evoke in you? The major transformations in evolution explored in this episode have left a legacy in persistent forms. Even when we understand evolution, though, we may still want to think of our human existence as inevitable, but, as Donald Johanson points out, “like every other species we are here because of a series of chance coincidences, specific adaptations and chosen opportunities.” How do the themes and images of this episode help to answer the questions posed by the narrator at its beginning: “Who are we? Where do we come from? How did we get here? Why do we look the way we do?”

Dialogue

The question of “why do we look the way we do” may be addressed with answers from evolutionary thinking, from paleontology and genetics. But some of the other questions on the narrator’s list admit to many levels of answers.

- How would you answer the question “Who are we?” from a scientific perspective?
- What would you say? And what would be your evidence for saying it?
- How would you answer the question “Who are we?” from a faith perspective?

- What sources from your faith tradition would you point to in order to support your statements?
- Where do these two sets of answers overlap? Reinforce one another? Challenge one another?

Explore

1. For background reading on two of the great transformations, the emergence of tetrapods and the evolution of whales, dolphins, and porpoises, a volume for the general reader is [*At the Water's Edge: Macroevolution and the Transformation of Life*](#) by Carl Zimmer (New York: The Free Press, 1998).

2. There are many references to chance and purposelessness in this episode. These concepts can be an unsettling notion for people of the Abrahamic faiths, and one not easy to explore in a brief conversation. Evolutionary thinking is not oriented toward the future or endpoint. The writings of [Stephen Jay Gould](#) provide the most readable insights from a scientific perspective, while those by John F. Haught cited in these guides shed the most light from a theological one. Perhaps some members of your group will want to do more reading and thinking in this area.

Act

One of the claims made in the episode is that the evidence for evolution is all around us if we choose to look for it. Where have you seen this evidence? How might you become more attuned to look for it? If you have children or grandchildren, how might you help them see the evidence for evolution in the world around them?

Episode 3: Extinction!

“A theological approach to evolution must come to terms with the costs of evolution. The evolution of life is exuberant, bountiful, and beautiful. It is awe-inspiring. But it can also strike the human observer as destructive and alien. There are aspects of the evolution of life that human beings can find unpleasant, disturbing and frightening. These include the evolutionary dead ends and mass extinctions of uncounted species, as well as predation, pain, and death that are a constant part of the process.”

— Denis Edwards, [*The God of Evolution: A Trinitarian Theology*](#) (Mahwah NJ: Paulist Press, 1999), 34.

Image

Scientists are sitting around a table looking at photos from their camera traps: pictures of crocodiles, tapirs, tigers, leopards, and poachers.

Dig

The scientists’ photos suggest an interesting shift. While extinction is a normal part of the evolutionary process, and while rapid massive extinctions have happened in the history of life on our planet, the current acceleration of extinction (300 times the normal rate) has much to do

with human activity. The poachers are an icon of the whole complex of human impact on diversity. Habitat destruction and human facilitation of biological invaders are the major causes of current extinctions. What evidence of decreasing diversity do you see in the yards, parks, farmlands, or wild places in and near your community?

Dialogue

Dealing with the “red in tooth and claw” (as Tennyson put it) aspects of evolution is a big issue for theologians. Why does a loving God allow such destruction and apparent waste? To address this question involves exploring how one’s faith tradition understands death, transformation, freedom, and the power of God — a program for a life’s work, not one brief study!

To make a beginning, consider in what ways the sacred texts of your tradition speak to bringing forth something new from that which has died, withered, or become exhausted. What insights from these teachings can help you answer the why of extinction and the rise of new species?

Explore

1. For more background on mass extinctions, the title essay in Stephen Jay Gould’s *Dinosaur in a Haystack* (New York: Crown Publishers, 1995, 147–158) offers a good introduction and also gives some insights into the methods of evolutionary scientists. For a full-length treatment, see *Night Comes to the Cretaceous: Comets, Craters, Controversy and the Last Days of the Dinosaurs* by James Lawrence Powell (New York: W. H. Freeman, 1999). *Darwin’s Dreampond: Drama in Lake Victoria* by Tijs Goldschmidt (Cambridge: MIT Press, 1998) offers a contemporary case history of extinction.
2. The importance of diversity in earth’s biota, a theme of this episode, cannot be overrated. Diminishing diversity not only weakens natural habitats and communities, but the chance of human survival. Where does the theme of strength in diversity appear in your faith tradition? How might this illuminate your thinking about the current acceleration of extinction rates?
3. Humans’ evolutionary success — enabling us to spread throughout the globe and reshape the various environments to sustain human lives — may also be our undoing. What are the evolutionary issues in this dilemma? What are the ethical and moral issues? Episode Six provides more background on these issues.

Act

Many activists’ preoccupation with endangered species focuses only on the tip of the iceberg: conspicuous mammals and birds — the “poster species” of our current environmental crisis. We learned in this episode that a focus on the large carnivores is appropriate, in that their demise is a marker for the destruction of whole ecosystems. Yet we need to consider ways in which attention can be brought to bear on a more systemic approach to human impact on habitat destruction and natural diversity. Many denominations have environmental action ministries. The Presbyterian Church USA, for example, passed a resolution at its 2001 General Assembly “On preserving biodiversity and a call to halt the mass extinction.” Many groups have web sites worth exploring. A place to begin with many resources and links is www.earthministry.org.

Episode 4: The Evolutionary Arms Race

“Toward the end of the 20th century biologists began to realize that there is another force, equally important, and responsible for the build up of a great deal of the magnificent superstructure of the earth’s biodiversity, and that is cooperation, what we call symbiosis, and particularly mutualistic symbiosis, that is, intimate living together of different kinds of organisms in which there is a partnership which benefits most of the partners.”

— Edward O. Wilson, from the episode

Image

There are many images in this episode of ways in which species evolve interactively. Which of them impressed you most and stuck with you?

Dig

Take the time to reflect on the images that members of your group have mentioned. Are they examples of predator–prey relationships? Parasitizing? Cooperating? What is new or surprising in what people have learned about how different species evolve together?

Dialogue

Sacred texts of a prophetic or apocalyptic nature, particularly in the Hebrew Bible, often contain images of unlike creatures in intimate association. The lion and the lamb are often depicted, and there are more complex visual representations like “the peaceable kingdom.”

What others can you think of?

How do the images from the episode and the images from scripture enrich one another?

How might the images of symbiosis presented in the episode inform our envisioning of ultimate reality?

Explore

1. Strong words and images in this episode warn us of the dangers of humans separating themselves too much from the rest of the living world. This is an issue that probably could not be envisioned in the times and cultures in which sacred texts of the Abrahamic faiths originated. If prophets were writing today of this danger, how might they speak of it? How is human separation from the rest of life related to human separation from the holy?
2. New developments are happening all the time in the “evolutionary arms race.” Scan current newspapers and magazines, search the web, and pay attention to radio and television news. What’s new? How did what you learned from this episode help your understanding of these developments?

Act

The image from this episode of supermarket aisles filled with antibacterial products is a powerful one. The overuse of such products and the inappropriate use of antibiotics have changed our environment, favoring the evolution of resistant strains of microbes. Draw on the doctors and other health care workers in your congregation for evidence and anecdotes of the dangers involved. What actions might you take in your household, congregation, and community to educate people about antibiotic use and take steps to correct it?

Episode 5: Why Sex?

“Put bluntly, the creationists are committed to finding permanent, intractable mystery in nature. To such minds, even the most perfect being we can imagine still wouldn’t be perfect enough to have fashioned a creation in which life would originate and evolve on its own. The nature they require science to discover is one that is flawed, static, and forever inadequate. Science in general, and evolutionary science in particular, give us something quite different. Through them we see a universe that is dynamic, flexible, and logically complete. They present a vision of life that spreads across the planet with endless variety and intricate beauty. They suggest a world in which our material existence is not an impossible illusion propped up by magic, but the genuine article, a world in which things are exactly what they seem, in which we were formed, as the Creator once cared to tell us, from the dust of the earth itself.”

— Kenneth R. Miller, [*Finding Darwin’s God*](#) (New York: HarperCollins, 1999), 288–289.

Image

Peacocks, peacocks, and more peacocks. They are everywhere in this episode, with their extravagant tail feathers.

Dig

Peacocks were a favorite decorative motif for Victorians, but a stumbling block for Darwin. Why would selection favor something that might actually encumber an animal? What answers to Darwin’s dilemma are offered in the episode?

Dialogue

In Darwin’s day many theologians seemed to feel that the beauties of the natural world were created by God to inspire human reverence. The popular English hymn “All things bright and beautiful” typifies this sentiment. As evolution has expanded our knowledge, we’ve seen the utilitarian role played by much color, ornamentation, and display, and our anthropocentrism has been challenged as well. This is not to say that nature cannot inspire our awe and turn us to God, only that this is a by-product. Consider some of your favorite hymns and prayers that speak of creation. How might they better reflect an understanding that is informed by, not opposed to, evolution?

Explore

1. For more tales of sexual selection, see chapter four, pp. 73–99, of [*Frogs, Flies, and Dandelions*](#) by Menno Schilthuizen (Oxford: Oxford University Press, 2001). You might be inspired to read all of this entertaining book on a topic — speciation — usually intriguing only to evolutionary biologists.
2. The Victorians had a particularly difficult time accepting sexual selection. One of the reasons was the notion of female choice of mates. Because of their social mores around human sex roles, they were blinded to female choice in animals as a vector of evolution. It's still easy today for people to let their feelings about human beings get in the way of seeing clearly what is going on among other animals. Did you have any of these feelings watching the episode? In what ways do religious or societal sexual taboos keep us from taking an objective view of the processes of evolution and the wonders of the world around us?

Act

One of the great questions that will probably never be answered is the balance between biology and culture in determining the roles and life choices of women and men. The best approach is probably to continually pay attention to both. Take stock in your households and your faith community. Where has there been too much dependence on a “biology is destiny” approach? Where has the evidence of human evolution been ignored? (Many of the qualities we look for in pastoral leadership, for example, are those biological evolution would attribute to women, yet many denominations denied these roles to women for centuries.) Where have cultural assumptions gotten in the way not just of seeing the rest of animal life realistically, but of respecting the unique contributions of the people around us?

Episode 6: The Mind's Big Bang

“Human beings are part of the history of the universe. What is most particular to them is that they are part of the universe that has become self-conscious and is therefore able to enter into conscious relationship with the God who holds them in existence and invites them into communion.”

— Denis Edwards, [*The God of Evolution: a Trinitarian Theology*](#) (Mahwah NJ: Paulist Press, 1999), 77.

Image

The visuals of human hands keep running through the series. Prominent in this episode are the hand holding the basic stone tool, the hands unearthing beads at the dig site, people communicating with their hands, the hand stenciled on the cave wall. Are there additional images of hands that you recall?

Dig

Perhaps the hands symbolize our inability to get a handle on the evolution of human symbol-

making and language! Scientists continue to live with many questions and differences of opinion. Did human language abilities evolve suddenly, perhaps around 50,000 years ago, or over a long period in hominid life? If the process was gradual, did the selective value of language drive the evolution of larger brains, or were language and symbol-making a by-product of larger brains which were selected for because of other survival advantages? What evidence did you see to support different views? How are scientists attempting to answer these questions?

Dialogue

The question of what's unique about human beings is in one sense answered in this episode. The narrator says that, "Ours was a routine story of evolution, yet one which produced behaviors never before found on earth." Clearly the ability to create symbols, use language, and reflect consciously is related to our capacity to be religious persons. Believers who do not ascribe to God direct and immediate causality for these traits still recognize their significant use in response to God.

How does the scientific exploration of the development of human mind inform your response to God?

What does your faith tradition say about the use of the human mind in understanding the world?

Explore

1. If you are interested in learning more about the notion of memetic evolution, you can find its genesis in Richard Dawkins's [*The Selfish Gene*](#) (originally published in 1976, available in a 1990 paperback edition from Oxford University Press). Susan Blackmore, featured in the episode, extends the idea in [*The Meme Machine*](#) (Oxford: Oxford University Press, 2000).
2. Resources for learning more about human evolution abound. One very readable volume is [*The Origin of Modern Humans*](#) by Roger Lewin (New York: Scientific American Library, 1998). The last two chapters, on symbolism, images, and language, will be of particular interest.

Act

Toward the end of the episode, illustrations of how human culture and intelligence shape evolution are presented. Medical advances, for example, the use of insulin, have enabled us to conquer and change some biological pressures. What other examples can you think of? Can you identify ones that seem to require ethical reflection by the faith community? Find out if your denomination or faith community has groups organized to work on these issues, and get involved.

Episode 7: What About God?

“Evolution ... does not demand that we give up the idea of God. Rather it asks that we think about God in a fresh way. Such a requirement is nothing new in the history of religion, since each age faces unprecedented crises that may require dramatic shifts in any given generation’s understanding of ultimate reality. Indeed, it is generally by facing severe challenges that religious faith sustains or renews its vitality. Like other living and evolving systems, a religious faith also goes limp if no stumbling blocks at all are ever placed in its path.”

— John F. Haught, [*Science and Religion: From Conflict to Conversation*](#) (Mahwah NJ: Paulist Press, 1995), 63–64.

Image

Ken Ham speaks with certainty on many things. In one shot where he is speaking to the camera, he comments that if you can reject the Bible as true on matters of astronomy, geology, and biology, then it follows that the Bible is not true on matters of morality of salvation.

Dig

Ham’s argument has been a sticking point for creationists for years, at least since William Jennings Bryan at the Scopes trial in 1925. The fear that if the Bible is not an authority in all matters, people will become amoral still holds sway with many religious conservatives. But there are other issues on which disparities between the scriptural accounts of creation and the discoveries of evolutionary scientists cause conflict for people. Recall the things the students from Wheaton focused on. Perhaps the most prominent is the existence of factual persons named Adam and Eve. What are some others you have observed? Take time to explore these.

Dialogue

Peter Sladen, an anthropology major at Wheaton, says it’s a lose–lose situation. If you accept evolution people will accuse you of doing bad theology, and if you don’t accept it, they’ll accuse you of doing bad science. Yet the conclusion of many scientists who are believers and many theologians with an interest in science is that not to accept evolution results in bad science *and* bad theology. In other words, evolution science and theology understood as different but complimentary are definitely a win–win. In what ways do the understandings of evolution you have gained from this series challenge your thinking about faith? In what ways do they enrich it?

Explore

1. Learn more about the history of the conflict between evolution and religion in the United States. [*Summer for the Gods*](#) by Edward J. Larson (Cambridge MA: Harvard University Press, 1997) takes a fresh look at the Scopes trial and the continuing life of the themes raised there.
2. Or learn more about what creationists are saying and teaching. There are a myriad of resources on the [NCSE web site](#) for exploring creationism, creation science, and

intelligent design.

3. Ken Ham asserts that he doesn't interpret the bible, he just reads it. Is it possible to read texts thousands of years old, in translation, and from a different cultural context, without interpreting them? How does your faith community approach its sacred texts? How does this help or hinder dialogue with other ways of knowing, such as science?

Act

Clare McKinney, the science teacher in Lafayette, Indiana, is surprised and disappointed, saying, "we haven't done a very good job with the nature of science if we have this many students who don't understand the difference and why [creationism] can't be addressed in a science classroom." It is forty-four years since the Soviet launch of Sputnik ratcheted up science teaching in this country, yet many of us, and our children, know little about the ways and major themes of science. In communities of faith, even those who nominally embrace evolution and other insights of science and who benefit from technological advances, science as a way of knowing may be ignored or disparaged. How might your congregation help to change this attitude, and work to support and encourage science education? Learn what is happening in the public school science classrooms in your community. Are there attacks on the teaching of evolution? Or is the subject glossed over for fear of attacks from conservative Christians? If there are conflicts and problems, visit the NCSE web site to find out what you can do to help.