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We are taking the dinosaurs back from the evolutionists.

Ken Ham, Creation Museum

Creationist Makeovers

GENESIS OR GEOLOGY?

By the 1960s the scene had shifted again. The shock of America being beaten into space by the Russian launch of *Sputnik I*, the first artificial satellite ever placed in orbit, thrust the quality of our science versus their science into the hysteria of Cold War rhetoric. On the plus side, the *Sputnik* debacle at least prompted thinking about a renewal in public school science education. I know that I benefited from the boom in science education funding that followed. The creationists, once so loud, had vanished from the public eye in the years following the Scopes Trial, because they had for all practical purposes won and no longer needed to be active. Publishers had cooled creationist fervor by letting evolution slip away from school textbooks. Nevertheless, creationists lay like dormant termites within the walls of American life. When new curricula and high school biology texts eventually restored the teaching of evolution as a fundamental idea of biology, creationism reappeared in fully energized righteousness.

Creationists have three distinct but interrelated concerns about teaching evolution. The first is theological, the threat of destruction of the literal truth of the Bible. The second is that they believe evolution removes any purpose to life. The third is that they sense that belief in evolution is the root of all bad behavior, because it makes us “just animals” and so removes all grounds for ethics. The first worry is true but irrelevant to science, and hardly more damaging to literalism than is biblical criticism. The second concern is highly debatable, and the third

is fatuous silliness. These fundamentalist frets fed the outrage that drove the twists of strategy of creationist campaigns over the years. As the Supreme Court by the 1970s had swept away the banning of teaching evolution as a viable option, the creationists started evolving a new sales gambit. Their switch was to a stance that claimed they also did science, called "creation science." Creation science is an oxymoron. Simply, creation science is to biology as astrology is to astronomy (or as an erectile dysfunction drug advertisement is to Shakespeare). Groups promoting creation science asserted that the Bible correctly told all when read literally, and that the six days of creation were a scientifically valid account. They also had touching attachment to the famous flood of Noah, which they rhapsodized into an account for the entire geological record, with all the fossils having dropped to the bottom in the great flood in the order in which they are found in the rock record. Thus trilobites are not hugely more ancient than people. They just sank faster.

This version of things is called "young Earth creationism," a fantasy take on science in which dating based on modern nuclear physics is negated and trumped by a chronology based on the life spans of imaginary nomadic patriarchs and the world is literally about six thousand years old. This daydream is unsustainable almost from the first line of Genesis. Literalists can't grasp the fact that the two books of Genesis tell entirely contradictory stories. Perhaps they should consider looking at R. Crumb's *Book of Genesis Illustrated*. In illustrated format, the nonconformity of stories is painfully obvious. Two distinct accounts from two cultural traditions have been uneasily jammed together to make a poor fit.

Noah's flood is firmly dated by literalists to about 2350 BC, despite the fact that the Egyptians were at that time busily building pyramids in the desert and not being inconvenienced or even feeling slightly dampened by the flood that fundamentalists are confident covered their structures, their pharaohs, and indeed everyone under a roiling depth of over five miles of water. In the last few decades of the twentieth century, a whole genre of heavy-breathing documentaries was born about intrepid hunters and their successive and nearly successful searches for Noah's Ark among the crevasses and glaciers of an obscure Turkish mountain called Mount Ararat. It's all high drama. Petrified boat hulls are glimpsed peeking out from mountain glaciers in out-of-focus photographs, old-looking

but undated pieces of wood are found on the mountain side and identified as parts of a ship's hull. Reproductions of pottery just like those said to have once been seen by searchers in the remains of the ark are lovingly shown. Strangely, those who found the ark somehow never actually went aboard and collected any of that pottery. Money is raised each time from the gullible for one expedition or another to go back onto Mount Ararat again to recover Noah's toothbrush and log book.

If you are curious as to how I can be so confident that the promoters of Noah's flood are deluded, there are small matters of physics, geology, and history that render it an impossible story. For example, it's easy to do a simple rough calculation. To have covered the entire Earth as claimed, the waters had to have been as deep as Mount Everest is high (8,848 meters or 29,029 feet). The oceans of the world contain 1.3 billion cubic kilometers of water and have an average depth of 3,790 meters (12,430 feet). Oceans cover 71 percent of the planet surface. The flood had to cover 100 percent. So we multiply 1.3 billion cubic kilometers $\times 1.4$ (the inverse of 0.71) $\times 2.4$ (the depth fraction $8,848/3,790 = 2.4$) to get the excess volume. The rough answer is that the water of the flood would have had to add up to just over three times the current volume of the oceans. So somehow about two and a half times the amount of water present on the Earth's surface had to be produced and added to the existing volume of the seas by Noah's deluge. Then, after forty days and nights, all that excess water had to be whisked away again. Pre-scientific writers thought that great underground caverns might have released the water and then imagined that it returned to these giant hidey-holes. No such enormous water-filled caverns exist or can exist in the Earth's crust. Nor could all of the excess water have been evaporated into space. The ice caps contain only about 2 percent of the water in the oceans. It's not hiding there either.

The claims that all of our geologic record comes from the flood was shown false over a century and a half ago – in fact, before Darwin published *Origin of Species*. I'm not making fun of the ark story. It is a remarkable legend from before the earliest days of written literature. But it is a legend, not a factual account of a global flood. The flood never happened. Part of the ancestry of the biblical tale lies even deeper in the past in the ancient Babylonian *Epic of Gilgamesh*, which contains the roots of the flood story and connects the Bible creation stories to a wider growth of

human culture. The creation stories from the dawn of civilization are made ridiculous not by science, but by those who try to make us believe that they should be read literally in modern times.

LET CREATIONISM BE CREATION SCIENCE

The creationist legal strategy of the late 1970s was to demand equal time laws for teaching “creation science” on a par with “evolution science.” By 1980, drafts of such laws were appearing in state houses across the country, like those big green flies that show up at a country summer hog roast. Bills were passed by a few impressionable state legislatures.

Not all of my involvement with evolution has actually been about doing the science, because evolution long ago became a social issue in America. I was only beginning to work with evolutionary problems in 1980 when the creation science equal-time-law road show came to Indiana. I decided to appear at the legislative hearing as a citizen opposing the bill. The Indiana State House is a magnificent late-nineteenth-century building that contains polished slabs of Indiana limestone containing fossils, silent witness to our planet’s deep past. I soon learned how things are done in state legislative hearings – a different homage to tradition. The witnesses in favor of the bill each had about half an hour to make their presentations, while each of us who testified against it was allowed an entire five minutes. The creationist witnesses provided a lavish coordinated show of the awesome power of creation science by bringing out the big guns, such as a talk by a former high school administrator and a cartoon film explaining how evolutionists think “Bossie the Cow” got carried out to sea and evolved into a whale. Finally a lesson on the legal reasons that creation science had to be given equal time was paraded by a Yale Law School–educated lawyer Wendell Bird, staff attorney for the Institute for Creation Research. This discourse was based on his law journal article as a student. His legal thesis was a bogus propaganda hash intended to impress nonlawyers.

Real scientists testifying against the bill were craftily neutralized in this hearing by having a creationist cardiologist from the Indiana University Medical School present a detailed argument based on the red protein of our blood, hemoglobin. This molecule has just over 140 amino

acids in its sequence, and there are 20 different amino acids. The witness did some Wizard of Oz math to show that for the correct sequence to arise at random, the number of tries would exceed the number of atoms in the universe and could never take place. Lots of pictures of models of globin molecules and calculations of probabilities were paraded before the legislators, all quite impressive on the face of it. Unknown to the lay audience, it was all simply an intellectual sleight of hand joined to a meaningless calculation. He was advertised with the title of “Dr.” in front of his name, but this presenter was, as is typical of creationist experts, not well versed in evolution. No evolutionary biologist has ever argued that complex molecular structures like proteins arose spontaneously as they are today. Their origins lie in evolution step by step under selection from smaller and simpler molecules. I left the hearing depressed, and I was surprised when the bill ultimately failed. I think that the rejection, though a happy one, was hardly due to the brilliant oratory of we five-minute science witnesses. It seemed to owe more to the good sense of most of the legislators, and to the testimony of some church groups that opposed the bill because it favored the views of a particular, narrow Christian sect. Such bills passed easily in some other states and resulted in legal challenges that inevitably led to highly publicized and decisive trials.

A few years later I was invited to do an hour’s televised debate with a creationist on Indianapolis’ Channel 8. I was to debate a former Indiana state senator named Donald Boyes, who by trade was a preacher. Much to my surprise, he dressed the part. The cut of his maroon jacket would have been in character for a stage production of *Inherit the Wind*. Fortunately, I had learned how to prepare for debates with creationists by reading accounts of other such public debates, which by that time littered the landscape from coast to coast like verbal popcorn. I was several times invited by Kentucky Moral Majority to come down to Louisville and debate various creationist champions brought to town to devour evolutionists before audiences bussed in en masse from Pentecostal churches all over the region. I declined to waste my time on those circuses, but the Channel 8 debate offered a fair moderator and a sane audience.

By this time, debates between creationists and scientists had evolved into a format of sorts in which the creationist threw out one “fact” after

another proving the Earth is young or that the second law of thermodynamics is violated by evolution, or that bombardier beetles could not have evolved their chemical defenses. The scientist had to refute these “facts” or lose credibility. It’s not hard to do if you are prepared for all the stuff that turns up in the creationist rummage bag, but still it’s a defensive role from which no decisive scientific argument can be made, and no concept appears on stage for long enough for it to be explained. I enjoyed the give and take and did well. I was especially pleased to get Boyes to admit that he thought that the Catholic Church was a cult, not really a Christian religion. A few days later I got a grumpy letter from his wife, who thought I was both disrespectful and had lost any chance of salvation. I was similarly denounced once in a letter to the editor of the *Bloomington Herald Times* by a local minister named Oliver Rogers over my role in science textbook committees and public discussions of choice of biology textbooks for our high schools. He told me that he felt sorry for me because, in the certainty of his belief, he knew that I had “no purpose in living, and no hope in dying.” People born and raised in modern America in an ostensibly shared culture in fact can be separated by a centuries-wide intellectual crevasse.

The federal courts would become the most effective means of defeating the notion of equal time for creation science. There, expert witnesses representing both sides could be examined and cross-examined under oath by the trial attorneys. The first challenge to the 1980 creation laws was not long in appearing. In 1981 the Arkansas version of a creation science act was challenged in U.S. District Court in a case called *McLean v. Arkansas Board of Education*. The judge was William R. Overton, who unlike Judge Raulston of Scopes fame had a sense of curiosity and admitted expert testimony to establish whether the act in question represented science or religion posing as science. Overton wrote an insightful decision in which he went to the heart of what science is. He found that evolution fits and creation science doesn’t. As district court decisions are limited in geographical extent, Overton’s decision didn’t affect things in other states, but that was coming. In 1987, the U.S. Supreme Court heard the case of *Edwards v. Aguillard*, which arose in Louisiana. The justices ruled against creationism in a seven-to-two decision. The critical issue was that the law served no secular purpose. Its aim was to have

public schools promote religion. The fact that there were two Supreme Court justices who voted in favor of the creationist charade was the only bizarre feature of the ruling. One of the two justices who voted in favor of teaching creation was Antonin Scalia. As recently as an interview in 2009, Justice Scalia said that he is against separation of church and state because “we are a religious people whose institutions presuppose a Supreme Being.”

INTELLIGENT DESIGNERS

These cases should have ended the matter in the United States, but creationism is like the Phoenix of legend. Declare it dead as science, then stand back and watch it arise from the ashes and assume a new guise. Creationism was thus once more reborn a few years ago in the resplendent plumage of Intelligent Design (ID). It helps to realize that the idea of design in nature is not new. This is a venerable idea that goes back to Aristotle and was enormously popular at the time Darwin was a student. Darwin read about design in the form of the influential book *Natural Theology*, published by William Paley in 1802. Here the analogy was made between a machine, Paley’s legendary watch lying on the ground, and an organism with its appearance of design and purpose. Paley lovingly detailed such elements as the human eye, so perfectly designed for sight. The appeal of design to humans is obvious. When we create something, we operate in a top-down way, like engineers. When we make something, we think of a design and execute it using the appropriate tools. Even if we are simply tinkering with a preexisting device, we have a notion of what we would like to achieve. Machines are built with a purpose in mind and are defined by the function they serve.

Living organisms are intricate and carry out “functions.” Their parts seem so well designed to match the function they serve that we have a hard time contemplating them in any other way than as designed. Even language gets in our way if we try to express the idea that organisms fundamentally are not watches or bicycles. We know what lungs or eyes or legs are “for.” We say that body structures appear “well designed” for what they do. There are a few nasty problems with applying the idea of design to biology. Is an organism a machine? Who is the designer? Does

the designer have to be intelligent? What about the problem of infinite regress? That is, if complex entities need a designer, then our designer had to have been designed by another, but superior designer, and so on up the chain of designer creation.

Natural selection is different; it is a bottom-up mechanism. There lies the naked ugly truth that has made natural selection unpalatable to so many. There is no benevolent designer, just trial and error, just failure and success in reproduction. There is no goal in evolution, and no divine guidance. Natural selection differentiates between those individuals that are more effective from those that are less so. Selection cannot look ahead, nor can it produce perfect organisms. To avoid providing lunch for the wolves, an individual reindeer doesn't have to be the fastest runner in the herd, just faster than the slowest. For most people, this is not a picture of a benevolent world. Despite our experiences in the real world, earthquakes, floods, plagues, and starvation, we can't quite believe it. The contingency of events is disquieting. The evident tragic unfairness of mindless contingency to some extent mitigates the problem of a god who allows evil, which has so severely tested the faith of people who have lost a child or have watched the greedy thrive at their expense. One might regard parasites such as tapeworms as incomprehensible evil, but the role of selection in evolution gives us the answer to the problem of why the majority of all animal species are parasites, which use other species to their own ends and often bring gruesome pointless misery to their hosts. Being a parasite works ever so well. That's just the way it came out. No god is consciously meting out evil as a test of faith.

Intelligent Design is interesting because it is not another Bible-based faux science put on by the usual cast of bumpkin creationists. Its advocates are sophisticated and well educated, including among their leaders a retired professor of law at Berkeley, a follower of Reverend Moon with a Ph.D. in developmental biology from Berkeley, another with a Ph.D. in paleontology from Harvard, a professor of biochemistry at Lehigh University, and a professor of philosophy at Baylor University who has since relocated to Southwestern Baptist Theological Seminary in Fort Worth, Texas. With a team like this, surely there is fire somewhere under all that smoke. Not really, just well-educated smoke. The Discovery Institute in Seattle, which is the home base of ID, produces no actual

scientific research and actually discovers nothing. What they promote is lots of propaganda about ID science, but their real aims were revealed when one of their internal documents, a sales strategy that has become known as the “Wedge document,” was leaked. I downloaded it from the National Center for Science Education website. This section describes the three phases of the project, summarized briefly:

Phase I. is to do the vital “research at the sites most likely to crack the materialist edifice.”

Phase II. “The primary purpose of Phase II is to prepare the popular reception of our ideas. We intend these to encourage and equip believers with new scientific evidences that support the faith, as well as to ‘popularize’ our ideas in the broader culture.”

Phase III. “Once our research and writing have had time to mature, and the public prepared for the reception of design theory, we will move toward direct confrontation with the advocates of materialist science.”

The propagandistic nature of this Wedge plan is plainly revealed in that Phase III is planned before the “scientific” results of Phase I become known. In a real scientific revolution, ambiguities in current theory would prompt proposal of new hypotheses. These would generate experimental tests. The evaluation of theories in conflict would be decided by scientists, not the pope, opinion makers, or high school students. The Wedge document doesn’t discuss the science to be done. The object of the Wedge program is not to persuade scientists but to influence “opinion makers” and ID’s “natural constituency, namely Christians.” In real science the goal would be to find a better explanation for natural phenomena. The document reveals the goal of the ID movement is “to replace materialistic explanations with the theistic understanding that nature and human beings are created by God.” Frank Ravitch, in *Marketing Intelligent Design*, points out that “from the perspective of the religious apologist, the end of serving ultimate truth justifies the means.” The Wedge program is not science. It is propaganda, and it is propaganda funded in part by a wealthy Christian reconstructionist,

Howard Ahmanson Jr. It is his privilege to donate to whom he wishes, and the Discovery Institute is free to accept his support, but doing so shows that they are only pretending to be scientists.

Perhaps the ID approach sounds harmless, but not once we have seen the results when dubious philosophies are applied to public policy. One highly publicized instance took place when Ronald Reagan appointed James Watt as secretary of the interior. Watt did not believe that any conservation of nature or resources was important because Jesus would be returning soon. Mining and lumber companies could prosper happily in the meantime. Reagan was also notorious for acting, or more accurately, not acting, on his belief that AIDS was a punishment meted out by God on homosexuals. He thus opposed and delayed funding for research and public health measures. AIDS is caused by a virus that was acquired by humans infected as a result of hunting of primates in Africa. AIDS is sexually transmitted and doesn't care about whether its victims are homosexual or heterosexual. It is tragic, but not supernatural. Reagan's spiritual descendant, the second George Bush, institutionalized fundamentalist theology as a part of the workings of government agencies dealing with birth control, disease prevention, stem cell research, global warming, and energy policy. The effects were just as heartbreaking as could be expected. Scientific panels were packed by ideologues. Irreplaceable years were lost on dealing with what could become irreversible environmental and population crises. Global warming was pushed to the back burner, where it could be ignored. Yes, it might be possible to pay no heed to a teapot full of gasoline on the back burner, too, but in either case the outcome won't be pretty. Ignored, disbelieved, and laid at God's door as political whim dictates, but finally we will own the disaster.

In a pattern of dysfunctional behavior as familiar as compulsive gambling, attempts by school boards to insert creationism in the guise of Intelligent Design into science classes, as a scientific alternative to evolution, became a new industry in America. Inevitably, another court case was soon to follow. This one, *Tammy Kitzmiller, et al. v. Dover Area School District, et al.*, was decided in December 2005. The motivations of the creationist members of a small Pennsylvania town were echoed in a sermon by a local minister, who said, "We have been attacked by the intelligent, educated segment of our culture." This is a book burner's take on intellect. Did he think that science is a religious cult devised by the

“educated segment” to seduce children into evil with pictures of godless geologic timescales?

Dover may be the most interesting and well-documented creationism trial so far. At the trial, Judge John Jones admitted testimony from both evolutionary biologists and ID scientists. The testimony of long-suffering teachers and devious school board members would be riveting. At least four readable and well-informed books were published about the saga. It can only be the greatest of ironies that the most amusing account was written by Darwin’s great great grandson, Matthew Chapman, a moviemaker by profession. Chapman came to town for the trial and was entranced enough to hang on through the entire event. He called his book *Forty Days and Forty Nights* (after the fortuitous exact length of the trial). Trials produce revealing exchanges; here an attorney for the school board questions a witness for the plaintiffs, John Haught, a Catholic theologian:

“Intelligent design is different than creationism, is it not?”

“Yes, in the same sense that, say, an orange is different from a naval orange.”

The contest did not go well for ID. It was discovered that the book that the school board had tried to adopt as a supplemental ID text, *Of Pandas and People*, had been drafted originally as a creation science text. Where those words appeared, they had simply been replaced by the words “Intelligent Design.” ID science witnesses dragged out impressive-sounding cellular structures as examples of entities too complex to have evolved. The all-time favorites, the bacterial flagellum and the enzymes of the blood-clotting system, were thrust into the fray as unbeatable lions, irrefutable evidence of design. They proved to be easily disposable sacrificial lambs. The ID examples lost their glow because research had by then shown that they in fact are not irreducibly complex and that their simpler evolutionary precursors actually do exist and function in nature – just as predicted by evolution.

How inconvenient the continuing discoveries of science can be. In a 2009 publication molecular evolutionist Russell Doolittle would further demonstrate just how completely the supposedly irreducibly complex blood-clotting system is rooted in the long history of vertebrate evolution. The most primitive jawless fish have the genes for the thrombin-catalyzed conversion of the precursor fibrinogen to the clotting protein

fibrin, but these creatures lack several supposedly irreducibly complex clotting factors. It is not until one reaches the pouched marsupial mammals that the full complement of proteins of the human system has evolved.

After days of listening to arguments in support of ID as science being laid to rest, the trial closed. A few weeks later, the judge's ruled that ID was religion and not science, and he took time to note that the actions of the school board were a "breathtaking inanity." He was just in time to get a few death threats for Christmas. There is an amusing footnote on the part of the attorneys involved in the suit against the Dover school board. Two of them, Stephen Harvey and Eric Rothschild, record that the standing joke during the trial was that "creationists are the best evidence for evolution: they adapt to a hostile legal environment."

SCHOOL BOARDS, SO EASILY SUBVERTED

With this last failure in court to ring in the new century, creationism has moved on to a strategy of requiring that schools feature "critical thinking" and "teaching the controversy." In that dodge, teachers are expected to point out the flaws in evolution so that students can evaluate the validity of alternate scientific views in evolutionary biology (namely, Intelligent Design). Such latitude doesn't seem to extend beyond evolution. No one asks ninth graders to decide on alternate views of numbers theory, chemistry, quantum mechanics, or black holes. Rather than fighting court decisions, creationists now focus largely on packing and subverting school boards. The most spectacular example was the recent fight in the Texas State Board of Education. In 2009, the Texas school board was freshly loaded up with creationists and chaired by a creationist dentist appointed by a governor running for reelection and seeking to score points with religious conservatives. The national importance of the move to influence science standards in Texas into an anti-evolution stance is that Texas has so large a share of the school textbook market that its tastes heavily influence what is included in textbooks everywhere in the country. Nonsense decided upon in Texas will end up in school texts used even in districts free of weekend cowboys. This battle reminded some of what Mark Twain observed in 1897: "In the first place God made idiots. This was for practice. Then he made school boards."

This same Texas state school board in 2010 shifted its efforts to the state standards for teaching American history. They aimed at turning the Founding Fathers from the thoughtful deists that most of them were into fiery-eyed evangelicals. By March, the Texas board had voted to remove Thomas Jefferson from American history texts because he was a subversive leftie suffering from insufficient religious fervor. But we make fun of the efforts of creationists and history revisionist at our peril. These ideas are cuckoo's eggs laid in the nest of democracy. All activity on the part of history revisionists I think comes from their realization that our past creates the setting for our present. They understand that to control the present, it is critical to control the past, and to control the past means changing our conception of it to suit ones political or religious beliefs. George Orwell in his novel *Nineteen Eighty-Four* created a frightening society in which totalitarian rulers effectively ruled by a day-to-day remodeling of the past, as was formerly done in the now-extinct Soviet Union. Observers used to watch for the removal of high Soviet officials by looking at doctored photographs of the previous year's May Day parade to learn who had been airbrushed out of last year's official picture. The study of evolution impedes the control of the deep past by those who would impose their own view of the world and humanity.

In line with the supposed ancient Chinese curse "May you live in interesting times," I've watched the continuing, and very interesting, rise in popularity of creationism in the guises of creation science and Intelligent Design. America seems particularly vulnerable to creationism – in part because our television media believes that all ideas are equal and thus always gives us two opposed talking heads on every issue. A scientist and a creationist are given equal time. This procedure gives crank ideas an undeserved respect. Critical thinking and knowledge are not required in these contests. The confused public is left to decide on a complex question from a five-minute face-off muddle. Supposedly the result represents balance, with both sides represented. The fact that one side is gaseous nonsense escapes notice in the shouting.

Science education standards in many states require that evolution must be presented. However, in many communities hostility from parents or a creationist teacher renders the requirements ineffective. The dominance of conservative religious outlooks has an enormous effect. In 2005 a survey of the public acceptance of evolution in thirty-four

advanced countries placed the United States at thirty-third, with only Turkey making a worse showing. Even Croatia, Romania, Bulgaria, and Slovenia do a better job teaching evolution than we do. Perhaps our pride can be assuaged by the fact that creationism is even more prevalent in the Muslim world. A worldwide survey shows that it's only in Europe that a majority of Christians accept evolution; North America, South America, Asia, and Australia are all not so good. We are not alone in obtuseness.

The creation of a bogus but passionately felt connection between a particular scientific theory and evil is disturbingly medieval. The actor Ben Stein, best known for his minor part in the teen movie comedy *Ferris Buhler's Day Off*, more recently produced a so-called documentary, *Expelled*, in which the "persecution" of ID science by the mainstream is revealed – with a big stretch of the evidence. In a 2008 television interview on the fundamentalist religious Trinity Broadcasting Network, Stein said, "When we just saw that man, I think it was Mr. Myers [biologist and blogger, Dr. P. Z Myers], talking about how great scientists were, I was thinking to myself the last time any of my relatives saw scientists telling them what to do they were telling them to go to the showers to get gassed. . . . That was horrifying beyond words, and that's where science – in my opinion, this is just an opinion – that's where science leads you." No, not quite. A comment like this shows where willful ignorance leads you. Stein doesn't seem to know, or perhaps doesn't care, that the first president of Israel was Dr. Chaim Weizmann, a chemist, who also founded the Weizmann Institute of Science in Israel. Sadly, he doesn't need to know, because the Trinity Broadcast Network by 2009 was the largest broadcast network in the world and capable of creating a reality of its own.

Such efforts should not be dismissed lightly. They have influence, and that influence can sometimes lie beyond popular belief in realms where it should have no impact at all. Perhaps the most shocking example is that the U.S. National Science Foundation's 2010 edition of *Science and Engineering Indicators*, which is meant to keep track of American's science literacy, omits any mention of evolution. Specifically, two survey questions and their responses were deleted. These were "Human beings as we know them today, developed from earlier species of animals" (45% responded true) and "The universe began with a huge explosion"

(33% said true to this). NSF officials said that they removed the items because they felt that the questions were “flawed indicators of scientific knowledge because the responses conflated knowledge and beliefs.” Am I being slow, or isn’t the lack of understanding of the difference between science and religion betrayed in the responses a significant indicator of scientific literacy? The questions asked were not just matters of opinion.

MEANWHILE, BACK ABOARD THE ARK

If you like willful ignorance and its sometime silly outcomes, American school conflicts provide a rich theater of unending farces. In 2009 the *Springfield News-Leader* reported that the Sedalia, Missouri, school superintendent had ordered the school band to recall its new t-shirt. The band’s theme was “Brass Evolutions,” and the shirt made clever use of the classic lineup of monkey to ape to hominid to humans marching along, but each with a trumpet in hand. One band parent who teaches in the district is quoted as saying, “I don’t think evolution should be associated with our school.” A sufficiency of similarly enlightened parents complained about what they saw as the evolution theme. The superintendent ruled that the shirt had to go because the “district is required by law to remain neutral on religion.” So even a mention of evolution is religion? What about physics, or organic chemistry, or anatomy, or astronomy? Would they count as religion too?

Another such debacle was reported in a 2006 issue of the Waco, Texas, *Tribune Herald*. Bill Nye, famous as “Bill Nye the Science Guy” for his excellent television science series for children, was invited to give a lecture and receive an award from a local college. Nye mentioned celebrated lines from Genesis: “God made two great lights – the greater light to govern the day, and the lesser light to govern the night. He also made the stars” He went on to say that we now know that it is the Sun that produces the light and the Moon only reflects it. Some members of the audience were angered by this observation and left mid-program. One woman who had hurried her three children away from such planetary depravity was quoted as saying, “We believe in a God!” Mind you, this Texas dustup over the light-producing capabilities of the Sun and Moon took place four hundred years after the facts became clear to astrono-

mers. Anyone who remembers the mid-twentieth-century comic strip *Pogo Possum* remembers Pogo's lament: "We have met the enemy and he is us."

I guess we can at least be proud of being just ahead of Turkey in acceptance of evolution. But another look suggests this is only a part of a parallel bad trend. Turkey is a majority Muslim country that established a secular state and constitution following World War I and the collapse of the Ottoman Empire. Muslim fundamentalists now vigorously challenge the secular status of Turkey. A key wedge issue for them is the forcing of creationism into Turkish schools. The effort has succeeded in suppressing most opponents in Turkey. A driving proponent of this mischief is a wealthy character named Adnan Oktar, who (evidently with swarms of anonymous ghost writer helpers) creates a flood of creationist material under the pen name of Harun Yahya. That he feels he needs a pen name when we all know his real name is just one of his foibles.

Yahya's willingness to spend large sums of money was dramatically illustrated in 2006, when I and many of my colleagues received gratis a twelve-pound green book from him titled *The Atlas of Creation*. This 800-page tome is lavishly produced and packed with wonderful color photographs, many of superb fossils. The text is not so wonderful. The basic strategy of the book is to show pictures of fossils similar to living forms and to claim that this similarity proves that no evolution has taken place in insects, salamanders, birds, plants, or anything else. Yahya is notably catholic in his coverage and tediously repetitive in his simplistic message. I'm puzzled that he would have bothered to go through the expense and trouble to send this expensive tome to so many evolutionary biologists, who would find it an amazing curiosity but never scientifically convincing. But it can still be a successful effort despite its scientific fallacies if sent to sympathetic nonscientist audiences. The gains for creationism in Turkey are disheartening. As it is, evolution is poorly accepted in most Muslim countries. Wherever they occur, the spread of the retrogressive ideologies of fundamentalism in major religions can only retard the development of more rational societies.

I address the religious origins of creationism directly in my undergraduate classes in evolution and explain the distinction between science and religion. Science can be defined as the seeking of natural explana-

tions for the phenomena of the natural world. Thus we can discover from the application of science the basic facts about our world, such as that the Earth is unnervingly ancient and that we have even been able to measure its age. The success of scientific explanations is borne out by the effectiveness of the hypotheses made. If the hypotheses fail the test, they are dropped from further consideration. Correspondingly, religious views are untestable and so cannot be admitted into science. In general, public education does a poor job teaching the notion that science can only be studied if we realize that nature is the result of natural phenomena that are underlain by natural laws. What creationists, including the Intelligent Designers, want is to insert supernatural explanations into science on an equal or even superior footing to natural laws. These explanations exist in the Bible, why shouldn't they be a part of studying the natural world? The answer is simply that once supernatural causes are admitted, they slowly strangle the impulse to do science. First, they make a joke of the replication and regularity of natural laws. Second, they admit hypotheses that can't be falsified. Third, they remove the very motivation to ask questions. If something is hard to explain, let's not bother about the effort of seeking a natural cause and just leave it as an expression of a divine plan or even God's whim. Science is hard, but religion is easy.

There is a clear application of the concept of natural phenomena arising as a result of natural processes. People have been highly tempted throughout history to see natural disasters as "acts of God" administered as punishment of some communal sin, and to seek scapegoats to punish in expiation. But as these disasters are understandable as the results of discernable natural laws, we can predict with certainty that they will occur again and again, whether we are naughty or nice, no matter what theological dogma we believe. We can also know why, and thus how, disasters might be predicted and ameliorated.

DINOSAURS IN EDEN

There are dinosaurs aplenty in our culture. Children grow up with them as virtual playmates. Now dinosaurs have a sacred job, too, and have been recruited as companions for Adam and shipmates for Noah. There is of all things a newly established and well-funded Creation Museum

in Kentucky that features dinosaurs frolicking with Adam and Eve. By the theology of this museum, there was no death before the Fall, so no fossils can predate Eve's fateful rendezvous with the serpent. That being the case, most fossils became fossils by being drowned by the flood. The now-extinct dinosaurs had to have ridden out the flood as passengers on Noah's ark as required by the story in which Noah takes a pair of all beasts aboard for the great sea cruise. The museum has a replica *Triceratops* strapped into a saddle. I know it's used for children's pictures, but I enjoy thinking about it as a representation of the very dinosaur Noah rode while he herded the other dinosaurs onto the ark. A reporter revealed that the full-sized replica of Adam was embarrassingly based on a local porn star "hunk." This gentleman apparently had not been well screened before he was invited to serve as the model for the father of humanity. Even more strangely, another observer noticed that the Adam statue lacks a penis. The omission of this awkward bit of anatomy may be "family friendly," but honestly, it is unrealistic in a garden where the inhabitants were instructed by the Creator to let it all hang out. As the text says, "They were not ashamed." That account was joined to the well-known admonition in Genesis to "be fruitful and multiply." Comedian Lewis Black said of people who attend the place as an educational experience, "These people are watching the Flintstones as if it was a documentary."

I want to note, though, that the Creation Museum does present a sketch of their philosophy of science, and it's an interesting one. Their concept seems to have three parts. They accept the accuracy of what they call "operational science," how things work in the present, but they claim that science cannot investigate the deep past. Instead, it's just a question of looking at evidence such as a dinosaur bone from a different perspective, which gives an equally valid different interpretation. The whole museum proclaims the third point. The only perspective from which we can really understand "origins" is through the genuine written words of the Creator that tell how he did it – literally and conveniently recorded in the Bible, of course.

Where do the crazy images come from? Dinosaurs are immensely popular in advertising, on science fiction programs, and now even as playmates on rainy days for Noah's children. Plastic dinosaurs are for

sale everywhere, but there is not so much saturation in teaching the actual science of how we know that dinosaurs ever existed and when. Students are rarely well taught before college (if even then) how scientists have come to know that there was an evolutionary history of life and how the physics of decay of radioactive isotopes led to the discovery that the Earth is billions of years old. The result is that nearly half of Americans think the world is actually only six thousand years old and that the age derived by nuclear physics is just a guess by evolutionists. Sixty percent of Texans surveyed in 2010 reported that they thought dinosaurs and humans co-existed, or they were not sure. Similar numbers believe that humans were created just as we see them now – except that we now have better dentistry, deodorants, hair dressers, tanning salons, botox injections, breast implants, plastic surgery, and hair restoratives than those available to Eve after leaving the Garden or from the cosmetics bar on the recreation deck of the ark.

I don't want to leave anyone with the idea that an absolute dichotomy with divine creationism and atheistic evolution as the only possibilities. Surveys show that a substantial fraction of people, including some scientists, accepts versions of theistic evolution that are consistent with the practice of science. Theistic evolution ranges from a direct role for God in directing the course of evolution to a deistic view that God set up the basic rules of the physical universe and has since then stood back to allow evolutionary processes to take their course. Theistic evolution and deism are religious and philosophical, not scientific, ideas, but they allow people to rationalize the science of evolution with personal religious belief. Others have taken the view that science and religion simply operate in different spheres. Again, this is a view that allows people to accept evolution without having to accept the kind of dualism that creationism requires, where one is limited to being either a godless supporter of evolution or a biblical literalist.