



DID
ADAM
AND
EVE
HAVE
NAVELS

?

Discourses on Réflexology,
Numerology, Urine Therapy,
and Other Dubious Subjects

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Did Adam and Eve have Navels?

Debunking Pseudoscience

Martin Gardner



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To Kendrick Frazier, editor of the *Skeptical Inquirer*, friend, and leader in the never-ceasing battle against superstition, paranormal nonsense, and dubious science.

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Introduction

Most of the chapters in this collection are attacks on far-out cases of pseudoscience. I am aware of the difficulties involving what philosophers of science call the “demarcation problem”—the task of formulating sharp criteria for distinguishing good science from bad. Clearly no such criteria are precise. Pseudoscience is a fuzzy word that refers to a vague portion of a continuum on which there are no sharp boundaries.

At the far left end of this spectrum are beliefs which all scientists consider preposterous. Examples include claims that the earth is a hollow sphere and we occupy its interior, that the earth was created in six literal days about ten thousand years ago, and that positions of stars correlate with character and future events. Moving to the right, toward slightly less weird claims, we come upon Velikovsky cosmology, homeopathy, phrenology, Scientology, the orgone theories of Wilhelm Reich, and scores of other bizarre medical and psychiatric fads.

As we move along the continuum toward more respectable science, we reach such controversial claims as the conjectures of Freud, the belief that God pushed evolution along with little miracle efforts to extract unlimited energy from the vacuum of space, Hans Arp’s attack on the red shift and his claim that quasars are nearby objects, and a raft of other speculations in areas where there is some evidence, but much greater doubt.

At the far right end, our spectrum fades into regions of open conjectures by scientists so eminent that no one dares call them cranks. I am thinking of David Bohm’s pilot-wave theory of quantum mechanics, Roger Penrose’s twistors, superstrings, speculations about a myriad of other universes, the notion that life came here from outer space, and ongoing efforts by physicists to construct a TOE (theory of everything). To the right of these reputable conjectures lie the undisputed facts of science such as that galaxies contain billions of stars, that water boils and freezes, and that dinosaurs once roamed the earth; there are millions of such claims that no informed person of sound mind doubts.

All the chapters in this anthology except one are reprints of my column “Notes of a Fringe Watcher,” which appears regularly in *Skeptical Inquirer*. This lively bimonthly, so ably edited by Kendrick Frazier, is the official organ of CSICOP, the Committee for the Scientific Investigation of Claims of the Paranormal. The exception is the chapter on the Wandering Jew, which was an article in *Free Inquiry*.

Although “debunker” is often considered a pejorative term, I do not find it so. A major purpose of *Skeptical Inquirer* has always been to debunk the more outrageous claims of bogus science. I make no apologies for being a debunker. I believe it is the duty of both scientists and science writers to keep exposing the errors of bad science, especially in medical fields, in which false beliefs can cause needless suffering and even death.

We know from polls how ignorant the general public is about science. Almost half of all adults in the United States now believe in astrology and in angels and demons, and that we are being observed by aliens in UFOs who frequently abduct humans. More than half believe that evolution is an unverified theory.

Science education in our nation, especially in lower grades, is getting worse, not better. Sever

states are constantly doing their best to force public schools to teach creationism. Greedy publishers interested only in profit, turn out book after book on astrology, ufology, the occult, dangerous programs to lose weight without exercising or cutting calories, and every known variety of dubious medicine.

The electronic media are equal offenders. Every year I hope the tide is about to turn, and that contributors to television, radio, and the Internet will become so appalled by the flood of fake science they keep flinging at the public that they will at least try to tone it down. Alas, every year the flood gets worse. As for book publishers, to be impressed by the flood's magnitude you need only visit any small bookstore and compare the size of its New Age or metaphysical section with its science section. Books on astrology far outnumber books on astronomy. As the late Carl Sagan liked to point out, there are more professional astrologers in the United States than there are astronomers. The scene is just as dismal, if not worse, in other countries.

I'm not sure why I became interested in debunking bad science. It may have been my disenchantment with the views of George McCready Price. Price was an uneducated Seventh-day Adventist whose many books defending a six-day creation and the flood theory of fossils I took seriously for a very brief period in my boyhood. It was not until I attended classes in biology and geology at the University of Chicago that I finally understood where Price went wrong and what an amusing dunce he was.

At any rate, after I found that the evidence for evolution was as overwhelming as the "theory" that the earth goes around the sun—when theories become strongly confirmed they become "facts"—I wrote an article titled "The Hermit Scientist" that appeared in the *Antioch Review*. A high-school friend who had become a Manhattan literary agent persuaded me to expand that article into a book, which he subsequently placed with Putnam. Titled *In the Name of Science*, it was quickly remaindered, but Dover picked it up, and as a paperback it became one of Dover's early best-sellers. Its sales were largely due to continual attacks on it by guests on the all-night radio show of Long John Nebel, the precursor of Art Bell. Bell's radio show, like Nebel's, owes its popularity to interviewing crackpots.

My book on pseudoscience led philosopher Paul Kurtz to contact me, along with magician James Randi, psychologist Ray Hyman, and sociologist Marcello Truzzi, to organize the group that became CSICOP in 1976. I have many other interests more important than pseudoscience, but the topic has provided material for four anthologies: *Science: Good, Bad, and Bogus*; *The New Age*; *On the Wrong Side*; and *Weird Water and Fuzzy Logic*. This is the fifth such collection. I don't expect any of those books, including this one, to alter minds set in concrete, but if occasionally they help an open-minded reader to discard a crazy belief, they may do more than simply provide entertainment and laughter for skeptics.

Martin Gardner
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Part I

Evolution vs. Creationism

Did Adam and Eve have Navels?

What did Adam and Eve never have,
yet they gave two of them to each
of their children?

Answer: Parents.

—*Old children's riddle*

If you ever find yourself in the company of a fundamentalist, much pleasant argumentation can result if you ask him or her a simple question: Did Adam and Eve have belly buttons?

For those who believe the Bible to be historically accurate, this is not a trivial question. If Adam and Eve did *not* have navels, then they were not perfect human beings. On the other hand, if they *had* navels, then the navels would imply a birth they never experienced.

Bruce Felton and Mark Fowler are the authors of *The Best, Worst, and Most Unusual* (Galaha Books, 1994). In this entertaining reference work, they devote several paragraphs (pp. 146–47) to what they call “the worst theological dispute.” They take this to be the acrimonious debate, which has been going on ever since the Book of Genesis was written, over whether the first human pair had what St. Thomas Browne, in 1646, referred to as “that tortuosity or complicated nodosity we usually call the Navell.”

Brown’s opinion was that Adam and Eve, because they had no parents, must have had perfectly smooth abdomens. In 1752, according to Felton and Fowler, the definitive treatise on the topic was published in Germany. It was titled *Untersuchung der Frage: Ob unsere ersten Uraltern, Adam and Eve, einen Nabel gehabt* (*Examination on the Question: Whether Our First Ancestors, Adam and Eve Possessed a Navel*). After discussing all sides of this difficult question, the author, Dr. Christian Tobias Ephraim Reinhard, finally concluded that the famous pair were navelless.

As Felton and Fowler tell us, some paintings of Adam and Eve from the Middle Ages and early Renaissance show navels; others do not. Michelangelo’s Sistine Chapel painting of Adam being created by God’s finger shows Adam with a navel. Most artists of later periods followed Michelangelo’s lead.¹

In 1944 the old conundrum had a hilarious revival in the United States Congress. A Public Affairs booklet titled “The Races of Mankind,” by Columbia University anthropologists Ruth Benedict and Gene Weltfish, was amusingly illustrated by Ad Reinhardt. Reinhardt later became notorious as an abstract expressionist who painted canvases that were solid black, or blue, or some other single color. One of his cartoons in the Public Affairs Pamphlet No. 85 had a little black dot on the abdomens of Adam and Eve.

Congressman Carl T. Durham of North Carolina and his House Military Affairs Committee were not amused. They believed that distribution of the government pamphlet to American servicemen would be an insult to those who were fundamentalists. As Felton and Fowler point out, some cynics suspected that the congressmen really objected to a table in the booklet showing that northern blacks scored higher on Army Air Force intelligence tests than southern whites. I suspect that another basis for their opposition to the booklet was their belief that Weltfish was a Communist, based on her refusal to testify whether she was or was not a member of the Communist Party. Years later, in 1953 she was much in the news when she charged the United States with using germ warfare in Korea.

The old question about the navels of Adam and Eve figured prominently in one of the strangest books ever written. The book, written by an eminent scientist who wished to defend the accuracy of Genesis, was titled *Omphalos: An Attempt to Untie the Geological Knot*, and it was published in England in 1857, two years before Darwin's *Origin of Species*.

Omphalos is the Greek word for *navel*. A wonderful ancient myth tells how Zeus, in an effort to determine the exact center of a circular flat earth, had two eagles fly at the same speed from opposite ends of one of the circle's diameters. They met at Delphi. To mark the spot, a piece of white marble called the Omphalos Stone, was placed in Apollo's temple at Delphi with a gold eagle on each side of the stone. The stone was often depicted on Greek coins and vases, usually in the shape of half an egg. (See William J. Woodhouse's detailed article "Omphalos" in James Hastings' *Encyclopaedia Religion and Ethics*.)

The author of *Omphalos* was British zoologist Philip Henry Gosse (1810–88), father of Sir William Edmund Gosse (1849–1928), a noted English poet and critic.² A fundamentalist in the Plymouth Brethren sect, the elder Gosse realized that fossils of plants and animals strongly implied life that predated Adam and Eve. At the same time, he was certain that the entire universe was created in six literal days about four thousand years before Christ.

Was there any way to harmonize this stark contradiction between Genesis and the fossil record? Gosse was struck by what Jorge Luis Borges would later call an idea of "monstrous elegance." If God created Adam and Eve with navels, implying a birth they never had, could not God just as easily have created a record of a past history of the earth that never existed except in the Divine Mind?

As Gosse realized, it is not just a question of belly buttons. Adam and Eve had bones, teeth, hair, fingernails, and all sorts of other features that contained evidence of previous growth. Allow me to quote at length from my 1952 book *Fads and Fallacies in the Name of Science*:

The same is true of every plant and animal. As Gosse points out, the tusks of an elephant exhibit past stages, the nautilus keeps adding chambers to its shell, the turtle adds laminae to its plates, trees bear the annual rings of growth produced by seasonal variations. "Every argument," he writes, "by which the physiologist can prove ... that yonder cow was once a foetus ... will apply with exactly the same power to show that the newly created cow was an embryo some years before creation." All this is developed by the author in learned detail, for several hundred pages, and illustrated with dozens of wood engravings.

In short—if God created the earth as described in the Bible, he must have created it a "going concern." Once this is seen as inevitable, there is little difficulty in extending the concept to the earth's geologic history. Evidence of the slow erosion of land by rivers, of the twisting and tilting of strata, mountains of limestone formed by remains of marine life, lava which flowed from long-extinct volcanoes, glacier scratchings upon rock, footprints of prehistoric animals, teeth marks on buried bones, and millions of fossils sprinkled through the earth—all these and many

other features testify to past geological events which *never actually took place*.

“It may be objected,” writes Gosse, “that to assume the world to have been created with fossil skeletons in its crust—skeletons of animals that never really existed—is to charge the Creator with forming objects whose sole purpose was to deceive us. The reply is obvious. Were the concentric timber-rings of a created tree formed merely to deceive? Were the growth lines of a created shell intended to deceive? Was the navel of the created Man intended to deceive him into the persuasion that he had a parent?”

So thorough is Gosse in covering every aspect of this question that he even discusses the finding of coprolites, fossil excrement. Up until now, he writes, this “has been considered a more than ordinarily triumphant proof of real pre-existence.” Yet, he points out, it offers no more difficulty than the fact that waste matter would certainly exist in the intestines of the newly formed Adam. Blood must have flowed through his arteries, and blood presupposes chyle and chyme, which in turn presupposes an indigestible residuum in the intestines. “It may seem at first sight ridiculous,” he confesses, “... but truth is truth.”

Gosse’s argument is, in fact, quite flawless. Not a single truth of geology need be abandoned, yet the harmony with Genesis is complete. As Gosse pointed out, we might even suppose that God created the earth a few minutes ago, complete with all its cities and records, and memories in the minds of men, and there is no logical way to refute this as a possible theory.

Nevertheless, *Omphalos* was not well received. “Never was a book cast upon the waters with greater anticipation of success than was this curious, this obstinate, this fanatical volume,” writes the younger Gosse in his book *Father and Son*. “... He offered it, with a glowing gesture, to atheists and Christians alike.... But, alas! atheists and Christians alike looked at it and laughed, and threw it away ... even Charles Kingsley, from whom my father had expected the most instant appreciation, wrote that he could not ... ‘believe that God has written on the rocks one enormous and superfluous lie.’ ... a gloom, cold and dismal, descended upon our morning tea cups.”

As Harold Morowitz points out in his article “Navels of Eden” in *Science* 82 (March 1982), Philip Gosse was acquainted with Thomas Huxley and elected to the Royal Society for his work on animals called rotifers. He had met Charles Darwin, and over a period of many years exchanged friendly letters with Darwin about matters concerning plants and animals. “Not a word passes about evolution or creation,” Morowitz writes, “or the enormous ideological gulf that separated the two great naturalists. The letters are quaint and polite and very British.”

One of Edmund Gosse’s best-known poems, “Ballad of Dead Cities,” ends with the following stanza:



ENVOY

*Prince, with a dolorous, ceaseless knell,
Above their wasted toil and crime
The waters of oblivion swell:
Where are the cities of old time?*

Gosse could have written a poem about how the waters of oblivion dissolve even more rapidly such as his crank works as his father's effort to explain the fossil record.

I would have supposed that no creationist today could take *Omphalos* seriously. Not so! The *Des Moines Sunday Register* (March 22, 1987) published a letter from reader John Patterson arguing that the existence of a million-year-old supernova contradicted the notion that God created the entire universe about 4000 B.C. In its April issue, the newspaper ran the following response from a Don Lowers:

In regard to John Patterson's letter ... on the supernova as a well-documented fact of science—of course it is! However, he cannot prove evolution except by circumstantial evidence, and creationists cannot prove creation except by God's word.

To be a Christian requires one important element called faith....

Yes, I believe in creation by God in six days! I also believe in one day He created full-grown trees that contained rings that any scientist would declare had been there for years. He created pockets of oil deep in the earth that nature would take millions of years to process. He placed aquatic fossils far inland, and He created exploding stars for us to marvel about in the 20th century....

Although few creationists today accept the thesis of *Omphalos*, a form of Gosse's argument frequently invoked by young-Earthers to explain why the speed of light seems to prove the existence of galaxies so far from Earth that it has taken the light millions of years to reach us. God created the universe, they insist, with light from these distant galaxies *already on the way!* Gosse would have been delighted with this argument had he known about galaxies. Indeed, I myself like it better than the alternate conjecture that in the past light traveled millions of times faster than it does now.

As for the problem of navels, today's young-Earth creationists, who believe God fabricated Adam from the dust of the earth and Eve from Adam's rib, are strangely silent about the pair's navels. Silent, too, about other aspects of life that imply past histories. Would the trees in the Garden of Eden, for example, show rings if their trunks had been sliced? How would Jerry Falwell and other televangelists answer such questions?

Many liberal Christians, both Catholic and Protestant, now accept the evolution of the bodies of the first humans. However, as the present pope emphasized in his recent declaration that evolution is a legitimate theory, one must insist that God infused immortal souls into Adam and Eve—souls not possessed by their apelike ancestors. This is now the opinion of almost all leading Catholic thinkers. It forces the belief that the first humans, whether one pair or more than two, were reared and suckled by mothers who were soulless beasts. I once wrote a story about this titled "The Horrible Horns"—the horns are the horns of a dilemma—that you will find in my collection *The No-Sided Professor* (Prometheus Books, 1987).

Belly buttons are the topic of many old jokes, so let me end this column on a lighter note. It has been suggested that navels are most useful as a spot to put salt when lying on your back in bed and eating celery. And, an officer tells a civilian he's a naval surgeon. "Goodness me," the man replies, "how you surgeons specialize!"

Phillip Johnson on Intelligent Design

In November 1996 more than 160 scientists and scholars converged on Biola University, in La Jolla, California, for the first annual conference of a movement called *intelligent design*. Its promoters are theists with views ranging from conservative Christianity to a philosophical theism unconnected with any religion.

Intelligent designers must not be confused with ignorant Christian fundamentalists who persist in believing that Earth and all its life were created about ten thousand years ago, in six literal days, and that fossils are relics of life destroyed by a worldwide flood. Many proponents of intelligent design (ID) have no quarrel with an ancient Earth. They accept the fact that life evolved over millions of years from simple one-celled forms in Earth's primeval seas. Their quarrel is only with the notion that evolution occurred without God's guidance.

On the other hand, many associated with the ID movement are unashamed "young-Earthers." Paul Nelson, who edits the ID newsletter *Origins and Designs*, is a fervent young-Earther, as is Nancy Pearcey, a featured speaker at the Biola conference. "Old-Earthers" are embarrassed by the young-Earth fundamentalists in their midst, but do their best to downplay their influence.

Two developments in modern cosmology have played strong roles in the rise of the movement. The big bang suggests a moment of creation in which the entire history of the universe, including the eventual emergence of you and me, existed potentially in the properties of a small number of fundamental particles and their fields. The other driving force is the strong anthropic principle. It asserts that the universe could not have permitted life, or even the formation of stars and planets, unless some dozen basic constants of nature were extremely fine-tuned. In brief, IDers argue that modern cosmology implies a transcendental Designer. As physicist and pantheist Freeman Dyson memorably put it, "The universe in some sense must have known that we were coming."

IDers go much further than this. In a raft of impressive books, including the recent *Darwin's Black Box* (1996) by the Roman Catholic biochemist Michael Behe (his name rhymes with *tee-hee*), they contend that Darwinism has died. By "Darwinism" they mean the belief that evolution operates solely by random mutations and natural selection. In a narrow sense, of course, Darwinism long ago was modified by the discovery of mutations. The modern theory of evolution incorporates genetics and a host of other relevant findings of twentieth-century science. Darwin was a Lamarckian who accepted the now abandoned notion of the inheritance of acquired traits.

In the last few years, many prominent political conservatives have defended ID. Irving Kristol, a firm believer in the God of Israel, has been attacking Darwinism for decades. His views are shared by his wife, Gertrude Himmelfarb, who in 1959 even wrote a biography of Darwin. Robert Bork, in *Slouching Towards Gomorrah* (1996), cites Behe as having proved that "Darwinism cannot explain life as we know it.... Religion will no longer have to fight scientific atheism with unsupported faith."

The presumption has shifted, and naturalistic atheism and secular humanism are on the defensive.”

In its June 1996 issue, the conservative journal *Commentary* featured “The Deniable Darwin,” a spirited defense of ID by David Berlinski, a mathematician who more recently published a popular introduction to calculus. “An act of intelligence is required to bring even a thimble into being,” he wrote; “why should the artifacts of life be different?”

Pat Buchanan, a right-wing Catholic, denies evolution entirely. He has attacked it in his newspaper columns and, echoing William Jennings Bryan, said, “You may think you’re descended from a monkey, but I don’t.” Of course, humans are not descended from monkeys, a common misconception.

The most influential book defending ID is Phillip E. Johnson’s *Darwin on Trial* (InterVarsity Press, 1991, revised 1993). William Buckley had Johnson on his television show in 1989, and his book was reviewed with high praise in Buckley’s *National Review* (April 19, 1991). The same magazine (April 22, 1996) allowed Johnson to do a hatchet job on Carl Sagan’s *The Demon-Haunted World*. The equally conservative *New Criterion* (October 1995) let Johnson blast Darwinian Daniel Dennett in *Darwin’s Dangerous Idea*.

Obviously I cannot comment here on all the many recent books by IDers, so let me focus on *Darwin on Trial*. Johnson is a mild-mannered, affable law professor at the University of California Berkeley. He should not be confused with Philip (one *I*) Johnson, the eminent architect who designed Manhattan’s AT&T building and televangelist Robert Schuller’s Crystal Cathedral, in Garden Grove, California.

Although today’s evolutionists all agree on the fact of evolution, they squabble over the mechanisms by which it operates. One major rift is between the gradualists, who follow Darwin in emphasizing slow change, and the “jump” theorists, notably Stephen Jay Gould, who stress long periods of stasis for many life forms, broken by periods of rapid change. By “rapid” they mean changes taking place by incremental mutations over tens of thousands of years—mere blips in geologic time.

Johnson is good in detailing these controversies. He takes them to bolster his view that there are dark mysteries about how life evolved—wide gaps that can be filled only by creative acts of God. He fully grants that random evolution occurs trivially within a species—the diversity of dogs, for example—but denies that new species can arise unless somehow directed from above. His fundamental claim, one stressed by all opponents of evolution from Darwin’s day to now, is that structures as complicated as eyes and wings have no survival value unless they appear suddenly and fully formed. Intermediate stages, he falsely insists, are not in the fossil record and simply did not exist.¹

It is strange that nowhere in his book does Johnson mention the British biologist St. George Mivart. Mivart spent a lifetime trying to persuade his church—he was a liberal Catholic—that its opposition to evolution was as monstrous a blunder as its earlier opposition to Galileo. Mivart argued in *The Genesis of Species* (1871), a book Darwin took seriously, that God’s help is needed to explain transitions to new species, and especially for infusing an immortal soul into the first human bodies. All of Johnson’s fundamental objections to Darwinism are in Mivart’s old book. Mivart was excommunicated and denied a Christian burial. Ironically, his approach to evolution has now been officially endorsed by Pope John Paul II and is held by almost all Catholic theologians.

Mivart was the first major scientist to emphasize that eyes and wings are too complex to have evolved by slight modifications, and that such structures must appear suddenly because earlier incipient stages would have no survival value.

From Mivart’s day until now, creationists of all stripes have monotonously asked, “What use is ha

a wing?” In his popular book *The Blind Watchmaker*, Richard Dawkins answered as follows:

There are animals alive today that beautifully illustrate every stage in the continuum. There are frogs that glide with big webs between their toes, tree-snakes with flattened bodies that catch the air, lizards with flaps along their bodies; and several different kinds of mammals that glide with membranes stretched between their limbs, showing us the kind of way bats must have got their start. Contrary to the creationist literature, not only are animals with “half a wing” common, so are animals with a quarter of a wing, three quarters of a wing, and so on. The idea of a flying continuum becomes even more persuasive when we remember that very small animals tend to float gently in air, whatever their shape. The reason this is persuasive is that there is an infinitesimally graded continuum from small to large.

Similar arguments, detailed by Darwin himself, give equally plausible conjectures about how eyes could slowly evolve independently, in many different species, from light-sensitive spots on the skin. Although Johnson quotes Dawkins’s scenarios for the gradual development of eyes and wings, he calls them speculative “fables” having no supporting evidence: “No one has ever confirmed by experiment that the gradual evolution of eyes and wings is possible.” Dawkins would strongly disagree. He has a eloquent chapter on the multiple evolutions of the eye in *A River Out of Eden* (1995).

I found it also curious that Johnson never refers to the Dutch botanist Hugo de Vries, the man who coined the word *mutation*. De Vries argued persuasively, and for a brief time won many followers, that every new species appears “suddenly” as a result of a single macromutation in one generation.

When I finished Johnson’s book, I was less interested in his moth-eaten objections to Darwinism than in what he would put in its place. On this all-important matter he is infuriatingly silent. There are four possibilities:

1. Johnson agrees that evolution operates by slight mutations followed by natural selection, but thinks God produced all the favorable mutations. I rule this out because Johnson constantly stresses the “abrupt” appearances of new species, with no transitional earlier forms.
2. Johnson thinks that new species, of which there are millions, emerged suddenly as a result of God-caused, massive mutations.
3. Johnson thinks that God intervened only in the creation of life and in producing massive mutations for broad classifications of life, such as plants, reptiles, mammals, fish, birds, and, of course, humans.
4. Johnson thinks that, at spots in the history of life, God created by fiat new life forms that had no ancestors. This is the view defended by many creationists who accept an ancient Earth but want to follow Genesis (assuming each “day” to be a long period of time) in having God perform thousands of miracles along the way.

In his books and writings, Johnson has steadfastly refused to explain how he thinks evolution crossed all those mysterious gaps in the fossil record. He sheds no light on what he thinks occurred when the gap between human and apelike creatures was bridged. Were there an Adam and Eve, or many Adams and Eves, created from the dust of the earth as Genesis tells? (In one of the Bible’s two versions of creation, Eve was fashioned from Adam’s rib, a miracle taken to be literally true by Jerry Falwell and other fundamentalists.) Or did God merely infuse souls into soulless animal bodies?

Please, Mr. Johnson, answer plainly some simple questions. Did the first mouse have a mother? Did the first humans have navels? If so, were they suckled and reared by beasts? Why did God put nipples

on males?

It seems to me unfair for Johnson to lambaste evolution so fiercely without letting us in on what he thinks, or at least suspects, should replace it. It's like writing a book denying that Earth is round but never indicating what shape you think it is. Hoping to gain some answers to these questions, I exchanged a dozen letters with Johnson. He flatly refused to tell what variety of creationism he espoused. His reason? *Darwin on Trial* was intended only as an attack on godless Darwinism. He saw no need to reveal what should go in its place.

In a 1992 lecture recorded on videotape, replying to a question, Johnson admits that IDers have contradictory opinions on how God intervened. He expresses his hope that after Darwinism has been thoroughly discredited, as he is certain it soon will be, a "paradigm shift" will occur and scientists will be free to search for empirical evidence of just when and how God shoved evolution along. It is possible, I suppose, that Johnson has no strong opinion about this question.

I did discover that Johnson is an evangelical Presbyterian. But how far does he go in accepting New Testament miracles? I wrote to ask if he believed in the virgin birth, that Jesus raised Lazarus from the decaying corpse, or walked on water, or turned water into wine. Again, he refused to answer, though he did say he believed in Jesus' Resurrection, and that acceptance of other Biblical miracles offered no problem.

Johnson's second book, *Reason in the Balance* (InterVarsity Press, 1995), is mainly an attack on atheism, though it includes a chapter in which he again bashes Dawkins. As in his earlier book, he never lets us know whether he thinks new species appeared as a result of massive mutations directed by the Lord, or whether he thinks God created life forms that had no ancestors.

I was startled by a footnote (p. 257) in which Johnson says he greatly admires my religious novel *The Flight of Peter Fromm*, even though it is an attack on Christianity. He cannot, however, comprehend how I can hold a "naturalistic worldview" and at the same time profess a belief in God.

Easy. Unlike Johnson, I am not shy about disclosing my basic convictions. I believe, by an emotional leap of faith, in a "wholly other" deity, utterly inscrutable to our little finite minds. I believe there are truths as far beyond our grasp as calculus is beyond the grasp of a cat. Because I also regard God as immanent in nature, we can say metaphorically that God both created and upholds the universe. I do not believe in what I call the "superstition of the finger"—the notion, to me close to blasphemy, that God finds it necessary at intervals to abrogate natural laws by injecting a finger in the universe to tinker with it. Newton not only was sure that God created the universe and all its laws in six days, he also believed it was necessary for God to periodically adjust the paths of planets to keep the solar system operating smoothly.

If Johnson does not share this Newtonian belief, why is he unable to grant that chance, combined with natural laws, is God's method of creation? I suspect it is because of his hidden agenda to defend conservative Presbyterianism. Regardless of Einstein's animadversions, chance is not a dirty word. It is absolutely and beautifully essential in quantum mechanics.

I sometimes fancy that quantum laws provided the only way, or perhaps the best way, God could bring about a monstrous universe capable of generating, after billions of years, intelligent life. The amazing thing is that an unconscious watchmaker, oblivious of any overhead plan, can actually work so well. Otherwise you would not be here to read these words.

One of Darwin's bitter crosses was the never-failing Anglican orthodoxy of his wife. In spite of her tearful entreaties, he abandoned his Christian beliefs early on, and eventually, after the death of his daughter Anne, lost faith in God entirely. However, in 1860, a year after the publication of his *Origin of Species*, Darwin defended intelligent design in a letter to Asa Gray:

I see no necessity in the belief that the eye was expressly designed. On the other hand, I cannot anyhow be contented to view this wonderful universe, and especially the nature of man, and to conclude that everything is the result of brute force. I am inclined to look at everything as resulting from designed laws, with the details, whether good or bad, left to the working out of what we may call chance. Not that this notion *at all* satisfies me. I feel most deeply that the whole subject is too profound for the human intellect. A dog might as well speculate on the mind of Newton.

I couldn't say it better.

By far the harshest criticism of *Darwin on Trial* is a review by Stephen Jay Gould in the July 1993 *Scientific American*. Another excellent review, by anthropologist Eugenie C. Scott, appeared in *Creation/Evolution*, vol. 13 (1993), pp. 36–47. She concludes: “*Darwin on Trial* deserves to be read by scientists, not for its scientific value, which is negligible, but for its potential social and political impact.”

Johnson's latest book is *Defeating Darwinism by Opening Minds* (Inter-Varsity Press, 1997). An advertisement in the publisher's catalog quotes Michael Behe: “Phillip Johnson is our age's clearest thinker on the issue of evolution and its impact on society.”

Addendum

David Berlinski's spirited attack on evolution (*Commentary*, June 1996), like Philip Johnson's earlier book *Darwin on Trial*, contains one huge glaring omission. Nowhere does he tell us what brand of creationism he supports.

Like Johnson, Berlinski seems to think that the punctuated evolution of Stephen Gould and his friends somehow damages the Darwinian view that all life evolved by gradual small changes. The jumps in Gould's theory are, of course, jumps only relative to the extremely long periods during which certain species remained stable. Trilobites for example. Gould's jumps are tens of thousands of years, arising from accumulated, tiny mutations within small, isolated populations. Darwin's bulldozer, Thomas Huxley, was well aware of such jumps, and they provided fuel for creationists from Darwin's day until now. Indeed, every argument against evolution put forth by Johnson and Berlinski goes back for more than a century. Today they are repeated over and over by Protestant fundamentalists who believe God created the entire universe in six days, about ten thousand years ago, just as it says in Genesis.

Commentary (September 1996) devoted twenty pages to letters attacking and defending Berlinski, including a letter of mine. I ended my letter by asking Berlinski, “Do you think the first humans had parents who were beasts, or no parents at all?” In his fifteen-page reply to the letters, Berlinski commented on my letter this way: “As for Mr. Gardner's last question: for many years I have been puzzling over whether the first humans had parents; sad to say, I still have no answer.” I find this remark astonishing. If the first humans had no parents, then they must have been created on the spot by Jehovah. One wonders if Berlinski is open to the possibility that Eve was created from Adam's rib.

Consider a week-old baby. It is less “human” than a week-old gorilla. There is no moment along the continuum of a baby's growth at which it suddenly becomes a mature person. The evolution of *Homo sapiens* is on a similar spectrum. If the laws governing evolution were made and are upheld by God

what need is there for God to poke a finger into the process? The head of the Vatican's astronomical observatory, on a television show about Galileo, said it well: "There was no magic moment. The whole thing is magic."

Berlinki's opinions grew more mystifying when he attacked cosmological evolution in his article "Was There a Big Bang?" in the February 1998 issue of *Commentary*. (I have not seen his earlier article "The Soul of Man Under Physics," in the January 1996 *Commentary*.)

Because, Berlinski argues, there are grave doubts about the red shift as a measure of the receding velocity of galaxies, there is equal doubt that the universe is expanding, therefore no sound reasons to assume the universe originated in a big bang. Presumably Berlinski prefers a static universe, either always the way it is or created at some moment in the past.

The "black box" in the title of Behe's book is the living cell. He believes it to be far too complex to have evolved without divine aid. Behe's central exhibit is the rotating flagellum of certain bacteria. He insists there is no way to conceive of incipient forms that could explain how the flagellum could have evolved by slow natural selection. Like Johnson and Berlinski, we never learn just how he thinks God helped evolution along. "Don't worry, Mike," Johnson wrote to Behe. "Even if the [*New York Times*] bashes you in their review, a cultural earthquake will take place in the United States on August 4 when they publish it."

Of course no such quake occurred.

For a recent thoroughgoing attack on intelligent design, with special focusing on Johnson and Behe, I recommend Robert T. Pennock's *Tower of Babel: The Evidence Against the New Creationism* (1999). The unusual aspect of this book is that Pennock, unlike most defenders of Darwinian evolution as a blind watchmaker, is a theist in the Quaker tradition. He sees no need to assume that God boosted evolution along by performing little miracles along the way, since all laws operating on the evolution of life were created and are sustained by a wholly other deity.

It is odd, Pennock writes, that creationists who take the Bible so seriously should see God as analogous to humans by having him constantly tinkering with the universe in a way similar to how humans keep improving their cars, ships, and airplanes. He reminds them of Isaiah (55:8): "For my thoughts are not your thoughts, neither are your ways my ways, says the Lord."

In a column in the *Wall Street Journal* (August 16, 1999), Johnson referred to a "Chinese paleontologist" who "lectures around the world saying that recent fossil finds in his country are inconsistent with the Darwinian theory of evolution." As reported in *Skeptical Inquirer* (November/December 1999), physicist David Thomas wrote to Johnson to ask who this mysterious scientist was, and had he published any papers on the fossil findings? Johnson refused to name the man, adding that as yet he had published nothing in English. "My jaw dropped," said Thomas. "I expect a Deep Throat in politics—but not in science."

Part II

Astronomy

Near-Earth Objects:

Monsters of Doom?

Asteroid! Asteroid!

Speeding through the sky.

Will it strike or graze the earth?

Will everybody die?

—Armand T. Ringer

In March 1998 astronomer Brian Marsden, at the Harvard-Smithsonian Astrophysical Observatory in Cambridge, Massachusetts, issued a spine-chilling announcement. Based on eighty-eight days observing asteroid 1997 XF11, his computer calculated that this massive rock would come perilously close to Earth at 1:30 P.M. Eastern time, on Thursday, October 26, 2028. It could miss Earth by a mere 30,000 miles, only about one-eighth our distance from the moon. If the rock, almost a mile wide, struck the earth the devastation would be too awful to contemplate.

The next day, before fundamentalist cult leaders had time to integrate this possible cataclysm into their Second Coming prophecies, Marsden was humbly apologizing. Eleanor Helin and her associates at NASA's Jet Propulsion Laboratory located a seven-year-old photo of XF11 that permitted a more precise calculation of its path. The asteroid circles the sun every twenty-one months. On its 2028 crossing of Earth's orbit it will miss us by 600,000 miles, about two and a half times the moon's average distance from Earth.

"Near-earth objects" (NEOs) is today's term for massive objects that periodically cross Earth's orbit not far from our planet. They include asteroids, meteoroids that are mostly asteroid fragments resulting from collisions, and comets that come from regions far beyond Pluto. Disasters caused by NEOs striking Earth were common themes in early science fiction as well as in some modern disaster movies.

As usual, H. G. Wells pioneered the theme.¹ His novel *In the Days of the Comet* concerns the effect on Earth of a near miss by a giant comet. His short story "The Star" is a vivid account of devastation caused by a mammoth NEO. An asteroid (Wells calls it a "planet") from the outskirts of the solar system is shifted from its orbit. It collides with Neptune. The two coalesce to form a flaming "star" that almost demolishes Earth before it plunges into the sun.

Wells's story first ran in the 1887 Christmas issue of the London periodical *The Graphic*. I have framed in my study the magazine's full-page, full-color illustration showing Londoners staring upward at the star and shouting, "It is brighter!" A newsboy holds a paper with the headline "Total Destruction of the Earth" in huge scarlet letters.

Here is how Wells describes what happens as Earth and star swing around each other:

And then the clouds gathered, blotting out the vision of the sky, the thunder and lightning wove a garment round the world; all over the earth was such a downpour of rain as men had never before seen, and where the volcanoes flared red against the cloud canopy there descended torrents of mud. Everywhere the waters were pouring off the land, leaving mud-silted ruins, and the earth littered like a storm-worn beach with all that had floated, and the dead bodies of the men and brutes, its children. For days the water streamed off the land, sweeping away soil and trees and houses in the way, and piling huge dykes and scooping out Titanic gullies over the countryside. Those were the days of darkness that followed the star and the heat. All through them, and for many weeks and months, the earthquakes continued.

I still recall as a boy reading in Hugo Gernsback's *Science and Invention*, then my favorite magazine, the six installments of a preposterous novel that ran in issues July through December 1927. The author was Ray Cummings, and his novel was titled *Around the Universe: An Astronomical Comedy*. It was about a spaceship that carried Tubby, his girlfriend, and an astrophysicist called Sir Isaac. After exploring the universe, they learn that evil Martians are planning to invade the earth. To prevent this, Sir Isaac steers his spaceship in circles around a tiny asteroid, causing it to shift its orbit slightly. This results in a series of collisions with larger asteroids, all precisely calculated by Sir Isaac that finally create a giant fireball which collides with Mars and obliterates its inhabitants.

This is not as crazy as it seems. The orbits of asteroids are chaotic. A minute change in one orbit could start a "butterfly effect" of the sort triggered by Sir Isaac. Even our solar system is unstable. A giant NEO coming close to a small planet or striking it could set off a chain reaction that could conceivably kick a planet out of the solar system. (See "Crack in the Clockwork," by Adam Frank, *Astronomy*, May 1998, pp. 54–59.) Newton was well aware of this instability. He believed it was necessary for God to intervene at times to readjust planetary orbits to keep the system running smoothly.

Later science fiction novels about NEOs that wreck Earth are far too numerous to list. On the movie screen New York City has twice been destroyed by NEOs. It was demolished in a dreary 1979 film *Meteor*, which wasted the talents of Sean Connery, Natalie Wood, Henry Fonda, and Trevor Howard. In an earlier and even more absurd film, *When Worlds Collide* (1951), a wandering star called Ball's Star flattens New York City with a gigantic tidal wave. The recent XF11 scare has been great publicity for two new disaster films about NEO impacts released this year just after the time I am now writing: Disney's *Armageddon*, starring Bruce Willis, and Paramount's *Deep Impact*, featuring Robert Duvall. It's a good bet that the visual effects of both films will be superior to their scientific accuracy.

When Worlds Collide was based on a popular 1933 novel by Philip Wylie and Edwin Balmer. In the book the doomsday NEO is called Bronson Alpha—a huge planet around which a small earthlike planet (Beta) whirls. The pair have broken away from a far-distant sun system. Beta once supported a culture of sentient beings, and the cold of outer space has, of course, frozen everything on its surface.

Alpha's close brush with Earth destroys its cities with violent tidal waves, earthquakes, and volcanic eruptions. As the authors put it: "The Earth burst open like a ripe grape." There are survivors. The planets loop around the sun, then return to Earth. After destroying the moon, Alpha collides with Earth, reducing it to fragments. Alpha then leaves the solar system on a hyperbolic path.

Beta remains to replace Earth as a permanent member of the sun's system. Just before Earth vanishes, a group of several hundred brave men, women, and children manage to escape in two atomic-powered spaceships. They land on Beta, where they find a warmed-up planet with an emerald sky, surviving plants, and a breathable atmosphere almost identical to Earth's. They will colonize the

planet and preserve humanity. Lovers Tony and Eve provide the book's romantic interest.

When the novel began serialization in *Blue Book* magazine in 1932 it was an instant sensation among SF buffs. One critic called it "an astronomical fantasy of the first magnitude." The hardcover became a best-seller. In my opinion it is low-level pulp fiction with little hard science to redeem it.

The sequel, *After Worlds Collide*, which began in *Blue Book* in 1933 and was published as a book the following year, is even worse. The colonizers find plastic-covered cities on the planet, metal roads, curious airships, and a vast electric power station. There is no trace of inhabitants. Paintings show the denizens to be humanoid. Other earthlings have also escaped in spaceships to Beta. A war breaks out between the Americans and a group of Asiatic Communists. The Americans win. A great mystery remains. What happened to Beta's humanoids? A second sequel was contemplated to answer the question, but Balmer and Wylie failed to agree on the plot and it was never written.

Later science-fiction authors have been less concerned with NEO collisions than with adventures who mine the asteroids for iron, nickel, and more valuable minerals. Examples are Clifford Simak's story "The Asteroid of Gold," and Malcolm Jameson's "Prospectors of Space." Other tales involve asteroids that are disguised as spaceships, or being used as stopover spots for explorers on their way to more distant reaches of the solar system.

Asteroid comes from a Greek word meaning "starlike." They were named that because early telescopes could see them only as points of light. Two large asteroids have since been photographed up close by space probes. They resemble misshapen potatoes, their surfaces pockmarked with craters like the surface of our moon.

The asteroid belt, between the orbits of Mars and Jupiter, contains tens of thousands of asteroids with diameters of a mile or more. The larger ones are spherical, but smaller ones, their cohesion greater than their gravity, are extremely irregular. There is no lower limit to asteroid size because they grade down to tiny rocks and particles of dust. None is big enough to hold an atmosphere.

Ceres, the largest asteroid and the first to be discovered (in 1801) is more than 600 miles across. A year later Pallas, about 370 miles wide, was found. Juno, about 140 miles across, and Vesta, with a diameter of possibly 330 miles, were found in 1804 and 1807 respectively. Because of its surface's high reflectivity, Vesta can at times be seen by unaided eyes. The four asteroids combined account for more than half the total mass of all the asteroids. Altogether they would make a planet smaller than our moon.

Ida, the second asteroid to be photographed close up (Gaspara was the first), is about thirty-six miles long. To the amazement of astronomers, the photo revealed a tiny moon orbiting Ida, possibly a piece chipped off the asteroid. Several other asteroids are believed to have a moon. In 1999 a moonlet was photographed orbiting an asteroid called Eugenia. A probe called "Near Earth Asteroid Rendezvous" (NEAR) will soon be snapping close-up pictures of Eros, the largest of the NEOs, which crosses Earth's orbit every forty-four years.

Asteroids were once thought to pose a grave hazard to space flight, but it turned out that distances between those large enough to damage a spaceship are so vast—typically millions of miles—that the danger of such accidents is near zero. Fatal collisions of spaceships with asteroids were common in early space operas before the asteroid belt was found to be much cleaner than previously suspected.

For a while the asteroids were named after Greek gods (at first, only females), but when such names ran out, they began to be named for cities, states, nations, persons (real and fictional), and even pets. Whoever found a new asteroid was usually allowed to name it. Today, most asteroids are designated by the year of discovery followed by letters and maybe a number. I am pleased to report that James Randi and I have asteroids named for us. CSICOP and its founder Paul Kurtz both had asteroids named

for them on CSICOP's twentieth anniversary (*Skeptical Inquirer*, September/October 1996, p. 8).

What produced the asteroids? In Conan Doyle's novel *The Valley of Fear* we learn that Sherlock Holmes's bitter enemy, Professor Moriarty, wrote a treatise titled "The Dynamics of an Asteroid." Isaac Asimov once conjectured that this obscure paper argued that asteroids are remnants of a small planet whose inhabitants discovered nuclear energy and blew their world to smithereens. This notion, once a favorite of science-fiction writers, has been abandoned on the grounds that not even a nuclear explosion would be great enough to form the asteroid belt. The prevailing view is that the rocks are material that failed to coagulate into a planet, perhaps because of the strong gravitational influence of nearby Jupiter.

There is no doubt that eventually Earth will be struck by a massive NEO, because such events have often occurred in the past. The most recent was the 1908 crash of a large NEO in the Tunguska River Valley of central Siberia. It flattened trees for many miles around and killed a herd of reindeer. Almost two hundred impact craters have been identified that testify to similar impacts, and there are surely thousands of craters that vanished long ago from erosion. It is widely believed that the impact of a giant NEO caused a mass extinction of life, including the dinosaurs, 65 million years ago at the end of the Cretaceous era.

Almost all asteroids are confined to the asteroid belt, but many wander far beyond the orbit of Jupiter, and others plunge inward past the orbit of Venus. One called Icarus swings inside Mercury's orbit, and Charon floats beyond Saturn. The two moons of Mars may be captured asteroids. It is estimated that more than a thousand asteroids at least a mile wide are NEOs. Perhaps a dozen are three or more miles wide. They pose a monstrous threat to humanity if they come close to Earth or hit it.

In 1937 Hermes, half a mile wide, missed us by about twice the distance from Earth to the moon. In 1989 an asteroid called Asclepius, also about half a mile across, came even closer. In 1991 a small asteroid about thirty feet wide missed the earth by less than half the distance to the moon. The latest near miss was in 1996 when JA1, a third of a mile wide, set a record for large asteroids by missing us by a mere 280,000 miles, only forty thousand miles more than the Earth-moon distance.

If some time in the future an asteroid is determined to be on a near collision with Earth, what can be done to prevent disaster? One suggestion, not overlooked in science fiction, is to attach a nuclear bomb to the rock that will blow it into a harmless orbit. (Early science fiction used cannon-balls to deflect comets.) The danger of this is that it could produce fragments that would hit the earth, causing even more damage than the intact rock.

This is exactly what happens in *Asteroid*, a four-hour 1977 television film which NBC aired again in March, 1998. A comet alters the orbits of a group of asteroids and sends them hurtling toward Earth. The largest, Eros, is exploded with laser beams, but the thousands of resulting fragments are large boulders that rain down on Earth to cause unspeakable devastation. The film's visual effects are riveting, especially the leveling of Dallas skyscrapers, but the search for survivors and the rescue scenes seem interminable. Better techniques for diverting an asteroid may be landing a rocket engine on the rock to nudge it into a harmless trajectory, or attaching a large solar sail to let the sun's radiation do the nudging.

Suppose, however, there is not enough time for measures to be taken to prevent a collision, and Earth is shattered by a giant NEO that will hurl us all into oblivion. What are the philosophical implications of such an event? This obviously is not a problem for atheists, agnostics, or pantheists because they are resigned to the fact that Nature does not care a rap about preserving a species.

What about theists? I'm inclined to think that even to them a sudden extinction of humanity would be acceptable. The Biblical Jehovah, remember, is said to have drowned every man, woman, baby, and

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